University of California
Agriculture and Natural Resources

UC ANR Urban Ag Bay Area Workshop Series

Workshop #3: Food Safety Basics for Urban Farmers

How to ensure a safe harvest, from the field to the fork.

Thursday
June 8th, 2017,
9AM-4:00PM

Agenda

Time	Speaker	Topic
9:00-9:15	Rob Bennaton & Reyna Yagi, UC ANR	**Welcome, intros and refreshments**
9:15-9:30	Jennifer Sowerwine, Assistant Cooperative Extension Specialist, University of California at Berkeley	**What is food safety and why is it important?** · What causes people to get sick? · Why you need a food safety plan
9:30-10:00	Christina Oatfield, Food Policy Director, Sustainable Economies Law Center	**Food Safety Legal Considerations:** Brief Overview of California Laws related to community food producers, food safety and the CDFA Small Farm Food Safety Guidelines
10:00-10:30	Jennifer & Shermain	**Developing your Food Safety Plan** · Assess your need (what is being asked of you?) · Conduct risk assessment · Implement corrective actions · Food Safety Policies, GAPs/GHPs, SOPS · Volunteer/Worker Training · Signage & Record Keeping
10:30-10:45		BREAK
10:45-11:00	Shermain Hardesty, Extension Economist and Leader of the UC Small Farm Program	How to Assess & Minimize Risk of Contamination on the Farm? **1. Water and Food Safety** · Sources of Water - municipal/rainwater · Rainwater Catchment Discussion
11:00-11:45	Alda Pires, Assistant Cooperative Extension Specialist, Urban Agriculture & Food Safety	**2. Animals** · Animal Husbandry · Wildlife Intrusion · Domestic Pet issues · Untreated Manure in Gardens · Pest Monitoring & Control Plan
11:45-12:15	Rex Dufour, Western Regional Office Director, The National Center for Appropriate Technology (NCAT)	**3. Soils** · Compost/Manure (*as it relates to food safety guidelines)*
12:15-1:00		LUNCH: Catering by Zella's Soulful Kitchen
1:00-1:30	Rob Bennaton, Bay Area Urban Ag Advisor, UC Cooperative Extension – Alameda and Contra Costa County	**3. Soils (continued)** · 10 Best Mgmt Practices on Soil Quality (Rob) · 10 Best Management Practices on Chicken Coops and Eggs
1:30-2:15	Shermain Hardesty	**4. Sanitation and Post-Harvest Handling** · Sanitizing equipment/surfaces/harvest buckets · Co-mingling · Wash water · Packaging – glo-germ exercise with boxes! · Transportation
2:15-2:25		BREAK
2:25-3:00	Maurice Pitesky, Cooperative Extension Specialist, Veterinary Medicine Extension, University of California at Davis	**5. Husbandry Practices to Maximize Food Safety** · Chickens, chicken coops and safe egg handling practices
3:00-3:15	Jennifer Sowerwine	**6. Worker Health and Hygiene** · Create a Health and Hygiene Policy · Worker Training Guidelines · Field Sanitation Policy · Signage and Record Keeping
3:15-3:25		EVALUATIONS & BREAK
3:25-3:55		**Activity: How to Conduct an On-Farm Risk Assessment**
3:55-4:00		Closing & Optional Tour with City Slickers

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Alameda County: 100 Years & Counting!

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Since 1914, UCCE scientists and academics, along with community partners, have been helping make California the nation's leading agricultural state.

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UCANR Strategic Initiatives

Endemic/Invasive Pests & Diseases

Healthy Families & Communities

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- a National/Local Publicly Funded Educational System
- Links Education and Research through Land Grant Universities with County Residents
- Specialists @ UC Berkeley, Davis, Riverside, Merced, Santa Cruz - Statewide Scope
- Advisors - County Based/Regionally-Focused
- Use SCIENTIFIC Research to Meet Community Needs

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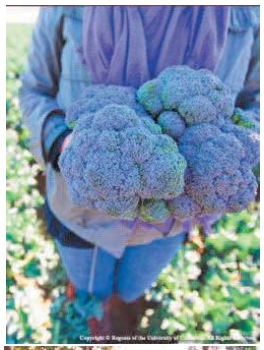
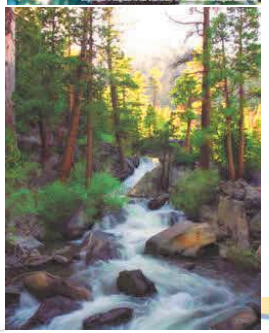
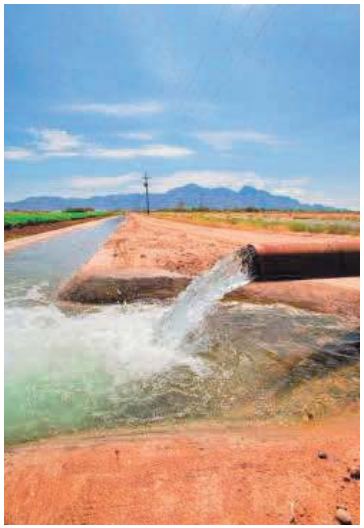


Sustainable Food Systems



Sustainable Natural Ecosystems



Water Quality, Quantity and Security

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UCCE Alameda & Contra Costa Counties

Goal: Work As a Team To:

- Collaborate with Local Communities
- Identify Critical Emerging Community Needs in Agricultural, Natural Resources & Family Sciences
- Develop Research & Educational Programs to Help Solve Local Problems

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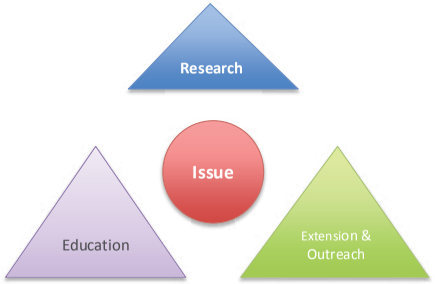

Our Approach to Outreach, Action and Involvement

1. Identify Issue
2. Conduct Research
3. Measure/Monitor Potential Impact
4. Select Educational Approach
5. Conduct Outreach & Program
   Assess & Evaluate;
   ID Further Needs.

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100 Years of Cooperative Extension

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UC Agriculture & Natural Resources is celebrating the centennial of the passage of the Smith-Lever Act and the beginning of Cooperative Extension in California.

- Local Programs:
  - Master Gardeners
  - 4-H
  - Viticulture
  - Weed Science
  - IPM
  - Livestock/Rangeland & Natural Resources Mgmt
  - Watershed Management
  - Urban Ag
  - Food Systems

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People we Serve

- ✓Low-income Families
- ✓ Grandparents
- ✓ Senior Citizens
- ✓ Low-income mothers with young children
- ✓ Schools serving low-income children
- ✓ Teens
- ✓ Community Based Organizations
- ✓ Park and Recreation Department
- ✓ Youth Development Professionals.
- ✓ Community Health/Human Services Providers
- ✓ Professional Organizations
- ✓ School and Public Ground Services Agencies
- ✓General Public

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What is Food Safety and Why is it Important?

Jennifer Sowerwine, Asst. Cooperative Extension Specialist, UC Berkeley

UC ANR Workshop #3: Food Safety Basics for Urban Farmers
June 8, 2017

Materials developed by UC Berkeley, UC Cooperative Extension Fresno/ Sacramento & Small Farm Program.
Funding from USDA, NRI & BFRDP & ANR.

USDA United States Department of Agriculture
National Institute of Food and Agriculture

What is Food Safety?

Food safety is a scientific discipline describing handling, preparation, and storage of **food** in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards.

What causes people to get sick?

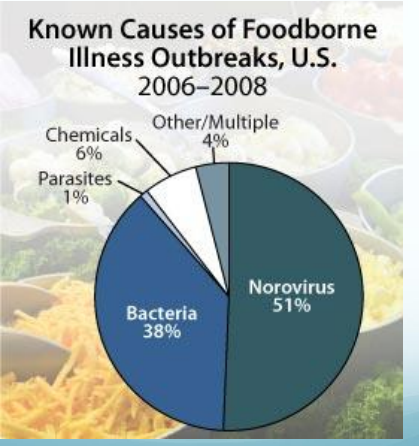
Three Types of On-Farm Contamination

Biological, chemical, physical

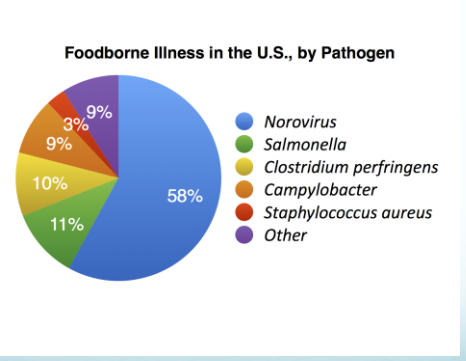
Foodborne Illness Outbreaks

- About 48 million people (1 in 6 Americans) get sick each year, 128,000 are hospitalized, and 3,000 die from foodborne diseases, (CDC).

Primary Causes of Illness - CDC

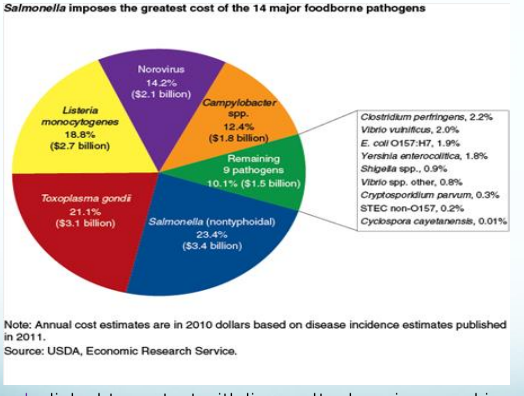


Norovirus sickens the most people



USDA-ERS

Salmonella, Norovirus, imposes greatest cost (hospitalization,death)



Outbreaks linked to contact with live poultry have increased in recent years as more people keep backyard flocks. In 2016, a record number of illnesses were linked to contact with backyard poultry (895 infected, 209 hospitalized, 4 deaths)

Which is best?

HANDWASHING IS BEST!

- Washing hands well and often is the most important thing you can do to prevent **germs (bacteria, viruses, fungi)** from leading to infections and sickness.
- Hand sanitizers **do not** kill some common germs such as salmonella, e. Coli, MRSA (methicillin-resistant staphylococcus aureus) and norovirus. - CDC

Contamination in the Field: Small Strawberry Farm

- Locally grown berries in NW Oregon, 2011
- Strawberries tainted with E. coli O157:H7 Sicken 14, One Dies
- Sold at U-pick, farm stands, farmers markets
- High concentration of deer feces




Some outbreaks associated with infected workers

Date	Produce	Pathogen	# of cases	Produce origin
1987	raspberries	Hepatitus A virus	92	United Kingdom
1990	strawberries	Hepatitus A virus	53	United States
1994	green onions	Shigella	72	CA
1996	leaf lettuce	E. coli 0157:H7	49	United States
1997	strawberries	Hepatitus A virus	250	CA
1997	green onions	Cryptospordium	55	United States
1997	basil	Cyclospora	341	United States
1998	green onions	Hepatitus A virus	43	United States/CA
1999	parsley	Shigella	486	United States
2003	parsley	enterohemorrhagic E. coli	77	United States

Summary: Why is food safety important?

- We do not want our customers to get sick.
- Fresh fruit and vegetable consumption has grown significantly
- Rise of foodborne illness (*Salmonella*, *E. coli* O157:H7; *Shigella*, *Listeria*)
- Protect reputation of urban farms
- Many buyers (schools, packing houses, grocery stores) are requiring farmers to have food safety programs.
- State legislation requiring food safety assurances

LEGAL CAFE BITE

HOW TO Sell Produce from Backyards, Community Gardens, and Small Farms

A new law that applies to mostly urban (and some rural) producers of fresh fruits, vegetables, and eggs in California went into effect in 2015. It defines anyone growing those food products on land that is not zoned as agricultural as a "community food producer" and the law requires these producers to follow safe food handling practices and labeling requirements. The law also allows the local environmental health department to require these producers to register with the department in some situations. However, effective in 2016 there are numerous exemptions from the requirement to register with the Department of Environmental Health, so very few community food producers will need to register. However, the safety and labeling requirements still apply to all community food producers, regardless of registration exemptions.

Small Farm Food Safety Guidelines

All "community food producers," whether exempt from registration or not, must follow the California Small Farm Food Safety Guidelines provided by the California Department of Food and Agriculture (CDFA). CDFA has published a set of guidelines for farmers on how to safely grow, harvest, and handle fresh produce. Regardless of whether your farm falls under any of the laws that specifically require following these guidelines, it is generally advisable that all farmers, gardeners, and food distributors abide by these guidelines to minimize the risk of eaters getting sick. Make sure that all people involved in planting, harvesting, or handling food at your farm, garden, or gleaning organization are familiar with these guidelines.

Download the Small Farm Food Safety Guidelines here: http://www.cdfa.ca.gov/is/i_&_c/sffsg.html

Note: "Community food producers" selling/donating eggs must also follow these laws. However, additional laws enforced by CDFA apply to selling eggs that are not discussed in this handout.

Registration Exemptions for "community food producers" and gleaners include transactions where:

- a gleaner sells or donates produce from a "community food producer" to consumers and the producer or gleaner keeps records for 30 days of the type of food sold and the date;
- a gleaner donates produce (that was produced by a "community food producer") to a food bank or food kitchen if the producer or gleaner keeps records for 30 days of the type of food sold and the date;
- a community food producer or gleaner provides produce directly to the public at their farm or garden or some other premises controlled by the "community food producer";
- a "community food producer" donates produce to a food bank or food kitchen that provides food at no cost to consumers; and

- a “community food producer” sells produce directly to a food facility that is permitted by a health regulatory agency, such as a corner store or grocery store that has a permit to operate from the County Department of Environmental Health.

Because all of the transactions described above are exempt from registration under state law, there are almost no situations in which a community food producer or gleaner would need to register. One type of transaction that is not exempt is where a community food producer wants to set up a produce stand at a festival, other temporary event, or other site that is not at the farm or garden where produce is grown. This could be done lawfully if the community food producer obtains a Temporary Food Facility permit from the local Department of Environmental Health.

You can learn more about how to apply for a permit as a Temporary Food Facility from your local department of environmental health. This is the same type of permit required of many food booths at outdoor events.

Farms Using Pesticides Must Obtain Permits

We generally recommend that community gardens and urban farms use organic practices as much as possible, but if you decide to use pesticides, the county Commission or Department of Agriculture and the California Department of Pesticide Regulation have helpful information about how to mitigate risks and comply with the law. Numerous registration requirements and pesticide use restrictions apply that are beyond the scope of this guide.

Standard Container Requirements for Farmers Selling Fresh Produce

Fresh fruits and vegetables must generally be sold in standard sized containers. Specifications for standard container sizes are detailed in the California Code of Regulations Section 1380.19. These so-called “standard pack” requirements are designed for produce that is sold through large distribution supply chains and are not generally convenient for a small farmer selling to a store or restaurant.

However, certain sales known as “direct marketing” in California law are exempt from these standard pack requirements, including:

- sales at certified farmers markets
- sales at or near the site of the farm
- sales or donations to a charitable organization within the state for charitable purposes, and
- certain types of fresh fruits and vegetables do not have standard pack requirements, regardless of the type of sale or delivery involved.

Individual consumers, grocery stores, and restaurateurs alike can purchase fresh produce from farmers at the site of a farmers market, at a farm or at a roadside stand near a farm without the farmer having to sell the produce in standard container sizes. A farmer delivering to a restaurant or store, however, must still comply with standard pack rules. See Food and Agricultural Code Section 47002 and California Code of Regulations Section 1392.19.

The following fruits and vegetables <u>must</u> be packed and sold in containers of specific dimensions:

- Apples
- Apricots
- Artichokes
- Avocados
- Cabbage
- Cantaloupe
- Cauliflower
- Celery
- Cherries
- Citrus fruits
- Grapes
- Lettuce

- Melons
- Honey ball melons
- Nectarines
- Peaches
- Plums
- Fresh prunes
- Sweet potatoes
- Tomatoes
- Baskets of fruits

The regulations describing the container dimensions are in the California Code of Regulations, Title 3, §1380.19. Other produce does not need to be sold in containers of specific dimensions.

Labeling Requirements

When selling produce to a *retail food facility*, containers carrying produce must have the following information:

• name, address and ZIP code of the producer,

• name of the produce in the package, and

• quantity of the produce in the package.

When selling or providing produce *directly to consumers*, "community food producers," need to label produce with their name and address. However, that information may be provided on a sign at the site of a produce stand at the farm or garden and does not need to appear on a label attached to each portion of produce purchased by a consumer when produce is sold or given away at the site of the farm or garden. Special sign requirements apply to farmers selling at any Certified Farmers Market and the market manager can provide more detailed information.

Selling Produce by Weight

If you sell any food by weight, your business must have a scale approved by the County Division of Weights and Measures. This is required if you have bulk bins of produce, or other foods, and you allow customers to choose their own quantity to purchase at a certain price per unit of weight. For more information contact your local Department of Agriculture/ Weights and Measures.

Keeping Records

Any time a farmer sells produce to a restaurant, store or other food facility, the farmer must also provide a receipt that lists

1. the date, the identity of the producer, 2. the address of the producer, and 3. the identity and quantity of the produce purchased. Food facilities (such as restaurants and grocery stores) are also required to keep records of this information for all food coming into their facility in case of an incident of food borne illness, so that the source of the illness may be traced back to its source.

When selling directly to the public (not through a food facility such as a store or restaurant), "community food producers" and gleaners must keep records related to their sales, which include the type of food sold, and the date. These records must be kept for 30 days. For example, if your farm operates a produce stand once per week, you must keep a list of the products you sold at the farm stand for each date you operated the farm stand.

Find more legal resources for food and farm enterprises on our website at http://www.theselc.org/food_resources

Created by the Sustainable Economies Law Center with funds from the Health Trust.

Sustainable Economies Law Center

California Small Farm Food Safety Guidelines

Fruit and vegetable consumption has grown significantly in the past two decades as the health benefits of these crops have been emphasized. Unfortunately, the incidence of food borne illnesses has also increased. In some cases, the financial impact on the growers of the crops associated with these incidents has been devastating. This means that it is important for all growers to be aware of food safety practices that minimize contamination of their crops with human pathogens. The most important disease organisms are Salmonella, E. coli O157:H7, Listeria, Shigella and Bacillus cereus. The primary path- ways for these pathogens to enter the field or packing shed are: contaminated irrigation or processing water, poor field/packing shed worker hygiene, improperly aged or treated organic soil amendments (manure, etc.), domestic or wild animals entering the field, contaminated harvest equipment, inadequate or unsanitary processing and storage conditions and improper transportation.

The following checklist of recommendations should be considered during crop production, harvest, processing and transport.

Prior to Planting

- Keep records of all farm activity, especially food safety practices.
- If manure will be used as a fertilizer, apply untreated manure in the fallow period after the last harvest and incorporate it as soon as possible.
- Be sure that there is a buffer between the production field and manure/compost storage, concentrated animal feeding operations, grazing or open range areas, surface water, sanitary facilities and composting operations.
- Test irrigation water and, if contaminated, find the source and fix it or request that your water supplier do so.
- Train your employees about hygiene (handwashing, etc.) and other aspects of food safety that apply to them. Do follow-up training during the growing season.
- Evaluate fields for evidence of animal entry. If you see animal signs use mitigation procedures (fences, noisemakers, etc.).
- Assess adjacent lands for possible sources that might contaminate the production field, and take corrective actions if needed.

During the Growing Season

- Provide proper sanitation and hand washing facilities in an area outside of the field.
- Provide an area outside of the field for eating, breaks, smoking and storage of personal items.
- Do not allow pets or other domestic animals to wander in the field and continue to look for signs of wild animals. Minimize standing water in the field because it attracts wildlife.
- If you side dress with composted manure try to minimize manure contact with the crop and incorporate it, if possible.

- Clean and sanitize tractors and other implements that were used in manure application and incorporation prior to entering the field.
- Test irrigation water as close to point-of-use as possible at least once during the growing season, and more often if you use surface water.
- Ensure that water used for spray applications of pesticides and fertilizers is not contaminated.
- Consider using drip irrigation wherever possible. It minimizes the risk of contamination because above-ground plant parts are not directly wetted.
- Sick employees should not have direct contact with produce. Assign them other duties while they are sick or send them home. Employees who cut themselves should wear gloves and use bandages until the wound is healed.

Harvest

- Continue to emphasize worker hygiene, monitor employees for symptoms of illness and for wounds.
- Clean and sanitize harvesting equipment at least once a day or more often, if needed.
- High-pressure wash, rinse and sanitize all crop production bins.
- Cover clean bins to avoid contamination.
- Do not allow workers to stand or place personal items in bins.
- Remove field soil from the outside of bins prior to moving them into packing areas.
- Emphasize hygiene to U-Pick customers.
- Use clean water and ice made from clean water during field processing.
- Remove or prevent the harvest of any potentially contaminated produce if signs of animal intrusion are detected.

Postharvest Processing and Storage

- Clean facilities, equipment and food contact surfaces thoroughly and then sanitize just before the first use and then once a day during use or more often, if needed.
- Provide sanitary and hygiene facilities and an area for smoking, meals, breaks and personal item storage for employees away from processing and storage areas. Continue to monitor use.
- Use a potable water source for processing and use ice made from potable water.
- Wash, rinse and sanitize storage facilities.
- Fix or fill in any cracks or defects in the processing and storage building to keep out pests.
- Establish an ongoing pest control program (rodents, birds etc.).
- Ensure that refrigeration equipment is working properly. Measure and record temperatures at least once daily.
- Do not wear field clothes, especially shoes and boots, in the packing house.
- Use chlorinated water and other labeled disinfectants to wash produce.
- Store packaging materials in a clean, covered area.

- Do not load refrigeration rooms beyond their cooling capacity.

Transportation

- Ensure that transport vehicles are clean and sanitary.
  Be sure that vehicles that have carried live animals or harmful substances (pesticides, etc.) are thoroughly washed, rinsed and sanitized before shipping produce.
- Use refrigerated trucks when possible.
- Be sure that each package leaving the packing area can be traced to the field of origin and date of packing.

Additional Information

Record Keeping

This is very important in documenting the steps you take to ensure that you have complied with food safety recommendations. Some of the important things that need to be recorded are:

- Planting date(s) – varieties, suppliers, etc.
- Applications of fertilizer, pesticides or any other inputs.
- Water testing dates and results.
- Employee training – type of training (general safety, food safety etc.), dates, who was trained, follow-up training.
- Animal entry – dates when checked or observed, type(s) of animal signs, what action(s) you took to try to solve or mitigate the problem.
- Equipment maintenance – dates, type of maintenance, which piece of equipment, cleaning.
- Harvest date(s) – sanitation of harvest implements and harvest containers.
- Cleaning schedule for processing and storage facilities.
- Pest control program in processing and storage facilities – who does the program, treatment or trapping dates.
- Maintenance of refrigeration equipment and temperature of storage rooms.
- Dates of farmers' markets or other marketing options.
- Package identification.

Hygiene

To prevent field and packing shed workers from contaminating crops:

- They should be trained in handwashing - use plenty of soap and water, wash for at least 20 seconds, clean under fingernails and between fingers, rinse under clean water and dry hands with a single-use towel. Wash hands before they start work, after each break, after handling unsanitary items such as animals, manure, etc. and after using the toilet.

- They should not eat, chew gum, use tobacco, spit, urinate or defecate while in growing/processing areas.
- They should use the toilet/hand washing facilities and use them properly.
- Workers who show signs of diarrhea, vomiting, fever, jaundice or infected wounds should not handle fresh produce.
- They should use single-use cups or fountains for drinking water.
- The grower, packer or labor contractor should also provide signs that reinforce good hygiene, both in the field and in the packing shed.

Water Testing

Water needs to be tested to know whether it is contaminated with unacceptable levels of bacteria. While there is no standard for food safety testing levels, a number of commodity groups have used the recreational water standard as a safe level. Water should be tested as near to the point-of-use as possible. All of the water used to produce and process crops should be tested (pesticide spray water, water used in processing, etc.).

Manure

Unprocessed manure is a perfect medium to support bacterial growth. Many food safety programs do not allow the use of unprocessed manure. Only properly composted or aged manure can be used. They also require that root crops not be grown for one year after manure application. If untreated manure must be applied shortly before planting, apply and incorporate at least two weeks before planting and don't harvest the crop for 120 days after application. If the 120 day waiting period is not feasible, apply only properly composted or aged (at least one year) manure. Composted manure use as a side dressing is very difficult. If you must use it this way, do all you can to reduce manure-crop contact and, if possible, incorporate it as soon as you can.

Other Sources of Information

The following web sites have additional information on food safety:

http://sfp.ucdavis.edu/pubs/articles/foodsafetybeginsonthefar

m.pdf http://www.caleafygreens.ca.gov/food-safety-

practices/downloads

http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/FruitsVegetablesJuices/GuidanceComplianceRegulatoryInformation/ucm17 1695.htm

http://agr.wa.gov/inspection/FVinspection/docs/GHP_GAP_Presentation.pdf http://agr.wa.gov/inspection/FVinspection/GAPGHP.aspx

http://www.gaps.cornell.edu/Eventscalendar/USDA_GAP_GHP_Audit_Matrix_P

P.pdf http://oregon.gov/ODA/ADMD/gap_ghp.shtml

http://datcp.wi.gov/OnFarmFoodSafety/ResourcesTools/index.aspx

http://www.kimberly.uidaho.edu/potatoes/gap.htm

http://www.miffs.org/tools/GAPAuditVerification.pdf

References

U.S. Food & Drug Administration Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards of Tomatoes: Draft Guidance. July,2009

Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens. California Leafy Green Handler Marketing Board. January, 2012

Food Safety Begins on the Farm: A Growers Guide. Cornell University. 2000

Developing Your Food Safety Program

Jennifer Sowerwine
Asst. Cooperative Extension Specialist, UC Berkeley

UC ANR Workshop: Food Safety Basics for Urban Farmers
June 8, 2017

Materials developed by UC Berkeley, UC Cooperative Extension Fresno/ Sacramento & Small Farm Program.
Funding from USDA, NRI & BFRDP & ANR.

USDA United States Department of Agriculture
National Institute of Food and Agriculture

Where do I start?

Attend a Training! ☑
Learn about GAPS/GHPS

Good Agricultural Practices

Good Handling Practices

Methods farmers follow to prevent or minimize the risk of on-farm contamination of fruits and vegetables.

Take it one step at a time

1. Talk to your buyer: what do they require?
2. Assess food safety risks on your farm:
3. Develop your Food Safety Plan/Program
   1. Food safety policies
   2. SOPs
   3. GAPs
   4. Worker Training
4. Follow your plan, implement corrective actions
5. Keep Records

Step 1: Talk to your Buyer(s)

- What kind of food safety program/certificate do they require if any?
  - Self-certification?
  - Third party certification?
  - Any particular 3rd party certifier? (Primus, CDFA)
  - Organic certification sufficient?
  - CDFA Small Farm Food Safety guidelines?

Step 2: Assess risks on your farm
What are potential sources of contamination?

WASSH!

Water

Runoff

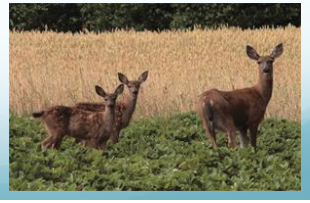
Contaminated irrigation and produce wash water

Clean water for handwashing

Animal contamination

Domestic

Wild

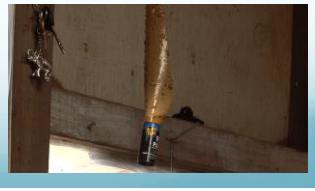


Animal Feces

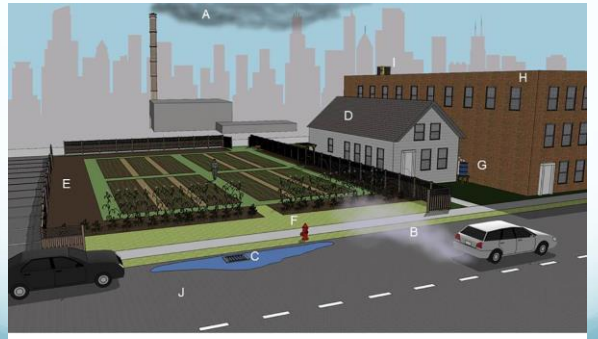
Bird Droppings

Deer Droppings

Rodents and Pests



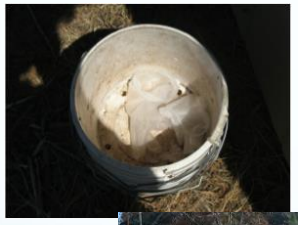
Soil contamination



Soil contamination

Surfaces

Dirty Harvest buckets



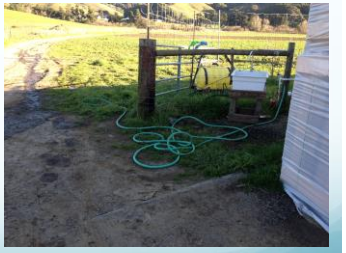
Dirty packing tables

Cross-contamination in transportation

Dirty Boxes

Clean boxes?

Dirty Hose



Health & Hygiene

Handling product with dirty hands

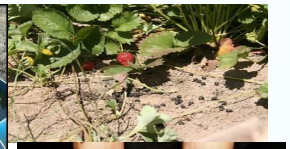
Not washing hands after using toilet

Dirty Toilets

Sick workers

Summary of Risks

- Water
- Animals
- Soils
- Surfaces
- Hygiene (WASSH!)



How do I assess risks on *my* farm?
Conduct a Farm Assessment/Self-Audit

USDA Good Agricultural Practices Good Handling Practices
Audit Verification Checklist

USDA

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's *"Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables,"* and generally recognized good agricultural practices.

Firm Name: _____

Contact Person: _____

Audit Site(s): _____

Main Address: _____

City: _____ State: _____ Zip: _____

Telephone No: _____ Fax: _____

E-mail: _____

Auditor (s): (list all auditors with the lead listed first) _____

_____

USDA or Fed-State Office performing audit:

Arrival Date: _____ Time: _____

Departure Date: _____ Time: _____

Travel Time _____ Code _____

Person(s) Interviewed (use back of sheet if necessary to list all persons interviewed) _____

_____

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January 26, 2012
Page 1

General Questions

Implementation of a Food Safety Program

	Questions	Points	Yes	NO	N/A	Doc
P-1	A documented food safety program that incorporates GAP and/or GHP has been implemented.					D
P-2	The operation has designated someone to implement and oversee an established food safety program. Name _____					D

Traceability

	Questions	Points	Yes	NO	N/A	Doc
G-1	A documented traceability program has been established.	15				D
G-2	The operation has performed a "mock recall" that was proven to be effective.	10				R

Worker Health & Hygiene

	Questions	Points	Yes	NO	N/A	Doc
G-3	Potable water is available to all workers.	10				R
G-4	All employees and all visitors to the location are required to follow proper sanitation and hygiene practices.	10				P
G-5	Training on proper sanitation and hygiene practices is provided to all staff.	15				D
G-6	Employees and visitors are following good hygiene/sanitation practices.	15				
G-7	Employees who handle or package produce are washing their hands before beginning or returning to work.	15				
G-8	Readily understandable signs are posted to instruct employees to wash their hands before beginning or returning to work.	10				
G-9	All toilet/restroom/field sanitation facilities are clean. They are properly supplied with single use towels, toilet paper, hand soap or anti-bacterial soap, and potable water for hand washing.	15				
G-10	All toilet/restroom/field sanitation facilities are serviced and cleaned on a scheduled basis.	10				R

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January 26, 2012
Page 4

Part 1 - Farm Review

Water Usage

(1-1) What is the source of irrigation water? (Pond, Stream, Well, Municipal, Other) Please specify:

(1-2) How are crops irrigated? (Flood, Drip, Sprinkler, Other) Please specify:

	Questions	Points	Yes	NO	N/A	Doc
1-3	A water quality assessment has been performed to determine the quality of water used for irrigation purpose on the crop(s) being applied.	15				D
1-4	A water quality assessment has been performed to determine the quality of water use for chemical application or fertigation method.	15				D
1-5	If necessary, steps are taken to protect irrigation water from potential direct and non-point source contamination.	15				

Sewage Treatment

	Questions	Points	Yes	NO	N/A	Doc
1-6	The farm sewage treatment system/septic system is functioning properly and there is no evidence of leaking or runoff.	15				
1-7	There is no municipal/commercial sewage treatment facility or waste material landfill adjacent to the farm.	10				

Animals/Wildlife/Livestock

	Questions	Points	Yes	NO	N/A	Doc
1-8	Crop production areas are not located near or adjacent to dairy, livestock, or fowl production facilities unless adequate barriers exist.	15				
1-9	Manure lagoons located near or adjacent to crop production areas are maintained to prevent leaking/overflowing, or measures have been taken to stop runoff from contaminating the crop production areas.	10				

USDA United States Department of Agriculture
Agricultural Marketing Service
Fruit and Vegetable Programs
Fresh Products Branch

April 2011

Good Agricultural Practices and Good Handling Practices Audit Verification Program

User's Guide

USDA
GAP & GHP
AUDIT PROGRAM
FRUIT & VEGETABLE PROGRAMS

If risks are identified, then what?

Implement Corrective Actions

Risks

- Water
- Land & Soils
- Animals (intrusion)
- Surfaces & Equipment
- Worker Health & Hygiene
- Chemicals
- Transportation

Corrective Actions

- Water test & treatment
- Soil test, manure records, land use history
- Fencing, avoid harvest, traps
- Clean & sanitize
- Worker Training, Toilets & handwashing facilities
- Proper use & storage
- Covered, Traceback

Step 3: Develop your Food Safety Plan

"Say what you do, do what you say"

- Steps you take to address risks.
- Food safety policies for your farm
- GAPs/GHPs.
- SOPs for your farm
  - WASSH
- Worker training guidelines
- Record keeping sheets

Step 4: Follow your plan!

Step 5: Documentation/Record Keeping

Record your actions.

UC Berkeley/UCCE Food Safety For Small Farms Program

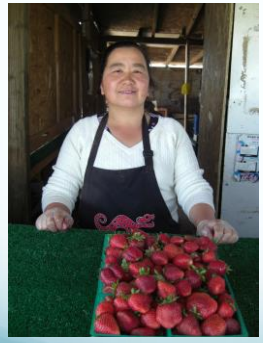
3. Toilet & Handwashing Maintenance Record

Date	Cleaned by	Hand Wash Water	Soap	Paper towels	Toilet paper	Toilet cleaned Mark with x
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	

Remember: 5 Steps

1. Talk to your buyer(s)
2. Assess your food safety risks
3. Develop food safety manual
4. Implement your program
5. Documentation

What a food safety plan looks like



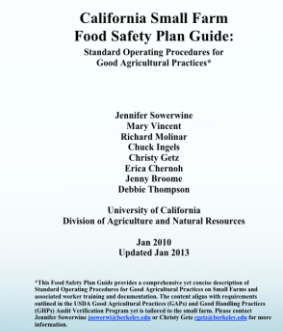
Basic components of a food safety plan

- F.S. Contact Person
- Farm Description & Map
- Traceability
- Worker Health & Hygiene
- Worker Training
- Signage
- Toilets & handwashing stations
- Visitor sign in sheet
- Water test results
- Land and soil assessment
- Animal/wildlife monitoring & pest control program.
- SOP for Cleaning/sanitizing all surfaces, packing area, equipment, etc.
- SOP for Storage and Transportation
- Documentation

Resources

- Food Safety Plan Guide
- Food Safety Plan Template
- Food Safety Record Keeping Sheets
- Basic GAPs checklist – what you should have
- How to develop an SOP
- Daily checklist for on-farm food assessment
- Visitor/Volunteer Food Safety Policy for your farm
- Food Safety Tips for School Gardens

Food Safety Plan Guide



California Small Farm
Food Safety Plan Guide:
Standard Operating Procedures for Good Agricultural Practices*

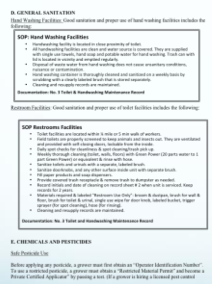
Jennifer Sowerwine
Mary Vincent
Richard Molinar
Chuck Ingels
Christy Getz
Erica Chernoh
Jenny Broome
Debbie Thompson

University of California
Division of Agriculture and Natural Resources

Jan 2010
Updated Jan 2013

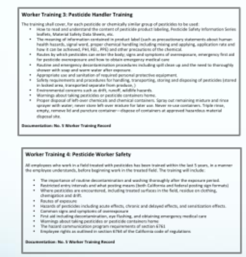
*This Food Safety Plan Guide provides a comprehensive yet concise description of Standard Operating Procedures for Good Agricultural Practices on Small Farms and associated worker training and documentation. The content aligns with requirements outlined in the USDA Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) Audit Verification Program yet is tailored to the small farm. Please contact Jennifer Sowerwine jsowerwine@berkeley.edu or Christy Getz cgetz@berkeley.edu for more information.

Note: Standard Operating Procedures (SOP)



- **SOP: BOXES**
- Standard Operating Procedures—A set of procedures or steps farmers follow the same way every time to ensure food is clean and safe.
- All SOPs have record keeping sheets.

Note: Worker Training Guidelines



- **WORKER TRAINING BOXES**
- ALL helpers and workers are trained, understand, and implement GAPs.
- Worker trainings are recorded.

Note: Record Keeping Sheets

3. Toilet & Handwashing Maintenance Record

Date	Cleaned by	Hand Wash Water	Soap	Paper towels	Toilet paper	Toilet cleaned Mark with x
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
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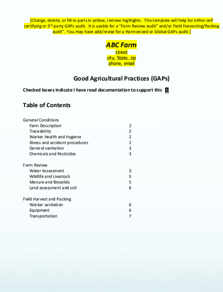
Food Safety Plan Template



Basic Gaps Checklist

WASSH!

General
- **Map of farm** (fields, structures (toilets, buildings, storage sheds), water source, chemical storage site, adjacent land & use),
- **Documentation**: See checklists,

Water
- **Drinking water:** Clean, potable drinking water available at all times,
- **Irrigation water:** Water test results available (total coliform for well water, E. coli for surface) to measure presence of fecal coliform. Treatment as needed,
- **Hand washing water, and produce wash water**: Must be potable.

Animals
- **Wildlife**: Monitor and record presence,
- **Rodents**: Develop pest control program as needed,
- **Domestic animals**: Exclude domestic animals during growing and harvest season,

Surfaces
- **Clean and Sanitize**: Develop SOPs for cleaning and sanitizing all surfaces (buckets, harvest equipment, wash tubs, packing area, transportation vehicles), Packing containers are protected from contamination,

Soils
- **Land Use History:** no known risk of prior contamination,
- **Manure**: Analysis reports available

Health & Hygiene
- **Signage**: (handwashing, designated lunch/smoking area, non-potable water on handwashing station),
- **Field Sanitation units** (toilet & handwashing facilities available for every 20 workers; 1 male & 1 female or if <5 workers, only 1 lockable unit required),
- **Worker Hygiene Training:** Train all workers in (handwashing, hygiene, illness & accident response procedures),
- **Chemical Storage**: in locked, separate shed,

How to develop Standard Operating Procedures (SOP)

- Standard Operating Procedures—A set of procedures or steps farmers follow the same way every time to ensure food is clean and safe.
- All SOPs have record keeping sheets.

On-Farm Food Safety Assessment
Daily Check List

Pre-Harvest:
1. Are toilet and wash facilities properly located, clean and stocked with toilet paper, wash water, soap, and paper towels?
2. Is drinking water and shade available to all workers?
3. Are harvest containers available, clean, well located and protected?
4. Is harvest, washing and packing equipment and area clean, sanitized and in good condition?
5. Are shade or other pre-cool measures in place?
6. Is there evidence of animal feces, dead animals, animal crop damage or other physical contamination in the crop area that needs to be isolated for "no-harvest"?
7. Are there other notable sources of contamination such as dump sites, fuels or chemicals, manure, burning debris, or water runoff that may affect food safety?
8. Is transportation equipment clean and available with protective covering?
9. Are all signs posted to a) instruct workers and visitors to wash hands before and after handling food, harvesting, eating and smoking, and b) indicating that wash water is not potable?
10. Have all new workers and visitors been trained in proper hygiene practices and their training been recorded?
11. Have all traps or pest control measures been checked and any animals disposed?

End of Day:
1. Are harvest buckets and washing bins cleaned and sanitized?
2. Has the drinking water container been cleaned and sanitized?
3. Is the packing area cleaned, sanitized and free of debris?
4. Is all packaging stored in a safe, secure location.
5. Are all chemicals stored in a safe, locked storage cabinet away from the packing area?
6. Have all Personal Protective Equipment been cleaned?
7. Have all garbage cans been emptied?
8. Do any supplies need to be updated (hand gloves, cleansers, sanitizers, toilet or hand-washing supplies, first aid kit, record keeping sheets, signage)
9. **Have all activities been recorded in the food safety record keeping sheets?**

University of California
Agriculture and Natural Resources

Visitor/Volunteer Food Safety Policy

1. **Hand Washing & Hygiene**: Have clean and cut nails. Hands must be washed before beginning or returning to work and after the following activities: using the restroom, smoking or tobacco use, taking breaks, eating, handling trash containers, handling money, coughing and sneezing, shoveling manure/compost and after applying sunscreen. Hands are washed with soap and water, for 20 seconds and dried with disposable towels.

2. **Field Hygiene**: never spit, eat, smoke, drink chew gum in the field or packing area. Use garbage cans for trash. Always use designated toilet facilities and wash hands thereafter. Tie back hair, keep all glass containers away from field. Avoid using product containers (harvest bins) for personal use. Return tools after use.

3. **Hydration:** To avoid heat exhaustion, drink lots of water frequently (2 quarts per person/day especially when hot). Take breaks in the shade when necessary.

4. **Illness and Injury Prevention**:
   a. Know where the first aid kit is
   b. Anyone suffering from a contagious disease, and with temporary illness (diarrhea, nausea, vomiting or excessive sneezing/runny nose) are advised to stay at home.
   c. Anyone who gets a cut or has a nosebleed while working must stop immediately, contact your supervisor and have it treated.
   d. Wounds are immediately cleaned, treated, bandaged and covered with rubber glove as soon as possible.
   e. Discard any product that is contaminated with bodily fluids and disinfect any tools, surfaces or containers immediately.
   f. Report and record all accidents, illnesses or injury immediately.

5. **Glove Use:** If using gloves, wash hands and dry thoroughly before and after they are removed for 20 seconds with water; replace when ripped or worn out.

6. **Designated areas**: Only eat, smoke, drink, and chew gum in areas designated for these activities. Put all personal belongings in designated area.

7. **Good Agricultural Practices**: Follow all standard operating procedures outlined in the farm manual related to pre and post-harvest checklists, cleaning & sanitizing, good hygienic practices, and avoidance of cross contamination.

8. **Security**: Report any strange or suspicious activity and/or chemicals in or around the facility

Questions?

USDA Good Agricultural Practices Good Handling Practices
Audit Verification Checklist

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's *"Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables,"* and generally recognized good agricultural practices.

Firm Name: _____

Contact Person: _____

Audit Site(s): _____

Main Address: _____

City: _____ **State:** _____ **Zip:** _____

Telephone No: _____ **Fax:** _____

E-mail: _____

Auditor (s): (list all auditors with the lead listed first) _____

_____

USDA or Fed-State Office performing audit:

Arrival Date: _____ **Time:** _____

Departure Date: _____ **Time:** _____

Travel Time _____ **Code** _____

Person(s) Interviewed (use back of sheet if necessary to list all persons interviewed) _____

_____

Did the auditee participate in GAP & GHP training?

Yes ☐ **No** ☐

Is there a map that accurately represents the farm operations?

Yes ☐ **No** ☐ **N/A** ☐

Legal Description/GPS/Lat.-Long. of Location: _____

Are all crop production areas located on this audit site?

Yes ☐ **No** ☐ **N/A** ☐

Total acres farmed (Owned, leased/rented, contracted, consigned): _____

Does the company have more than one packing facility?

Yes ☐ **No** ☐ **N/A** ☐

Is there a floor plan of the packing house facility(s) indicating flow of product, storage areas, cull areas, employee break rooms, restrooms, offices?

Yes ☐ **No** ☐ **N/A** ☐

Is any product commingled prior to packing?

Yes ☐ **No** ☐

Audit Scope: (Please check all scopes audited)

General Questions (All audits must begin with and pass this portion)

Part 1 – Farm Review…… ☐

Part 2 - Field Harvest and Field Packing Activities……..… ☐

Part 3 - House Packing Facility…… ☐

Part 4 – Storage and Transportation……..…. ☐

Part 5 – (Not Used)

Part 6 – Wholesale Distribution Center/Terminal Warehouse…… ☐

Part 7 – Preventive Food Defense Procedures…….……..…. ☐

Products: _____

Auditors' Signature(s): _____

Conditions Under Which an Automatic "Unsatisfactory" Will be Assessed

- **An immediate food safety risk is present when produce is grown, processed, packed or held under conditions that promote or cause the produce to become contaminated.**
- **The presence or evidence of rodents, an excessive amount of insects or other pests in the produce during packing, processing or storage.**
- **Observation of employee practices (personal or hygienic) that have jeopardized or may jeopardize the safety of the produce.**
- **Falsification of records.**
- **Answering of Questions P1 or P2 as "NO".**

Auditor Completion Instructions

- **For clarification and guidance in answering these questions, please refer to the Good Agricultural Practices & Good Handling Practices Audit Verification Program Policy and Instruction Guide.**
- **Place the point value for each question in the proper column (Yes, No, or N/A).**
- **Gray boxes in the "N/A" column indicate that question cannot be answered "N/A".**
- **Any "N/A" or "No" designation must be explained in the comments section.**
- **The "Doc: column-**
  - **A "D" indicates that a document(s) is required to show conformance to the question. A document may be a combination of standard operating procedures outlining company policy as well as a record indicating that a particular action was taken.**
  - **A "R" indicates that a record is required to be kept showing an action was taken.**
  - **A "P" indicates that a policy/standard operating procedure (SOP) must be documented in the food safety plan in order to show conformance to the question.**

General Questions

Implementation of a Food Safety Program

	Questions	Points	Yes	NO	N/A	Doc
P-1	A documented food safety program that incorporates GAP and/or GHP has been implemented.					D
P-2	The operation has designated someone to implement and oversee an established food safety program. Name _____					D

Traceability

	Questions	Points	Yes	NO	N/A	Doc
G-1	A documented traceability program has been established.	15				D
G-2	The operation has performed a "mock recall" that was proven to be effective.	10				R

Worker Health & Hygiene

	Questions	Points	Yes	NO	N/A	Doc
G-3	Potable water is available to all workers.	10				R
G-4	All employees and all visitors to the location are required to follow proper sanitation and hygiene practices.	10				P
G-5	Training on proper sanitation and hygiene practices is provided to all staff.	15				D
G-6	Employees and visitors are following good hygiene/sanitation practices.	15				
G-7	Employees who handle or package produce are washing their hands before beginning or returning to work.	15				
G-8	Readily understandable signs are posted to instruct employees to wash their hands before beginning or returning to work.	10				
G-9	All toilet/restroom/field sanitation facilities are clean. They are properly supplied with single use towels, toilet paper, hand soap or anti-bacterial soap, and potable water for hand washing.	15				
G-10	All toilet/restroom/field sanitation facilities are serviced and cleaned on a scheduled basis.	10				R

	Questions	Points	Yes	NO	N/A	Doc
G-11	Smoking and eating are confined to designated areas separate from where product is handled.	10				P
G-12	Workers with diarrheal disease or symptoms of other infectious diseases are prohibited from handling fresh produce.	15				P
G-13	There is a policy describing procedures which specify handling/disposition of produce or food contact surfaces that have come into contact with blood or other bodily fluids.	15				P
G-14	Workers are instructed to seek prompt treatment with clean first aid supplies for cuts, abrasions and other injuries.	5				P
G-15	Company personnel or contracted personnel that apply regulated pre-harvest and/or post harvest materials are licensed. Company personnel or contracted personnel applying non-regulated materials have been trained on its proper use.	10				R

COMMENTS:

Total Points earned for General Questions =

Total Possible	**=**	**180**	*The total number of points possible for this section.*
Subtract "N/A"	**=**	_____	*Enter the additive number of N/A points (+points) here.*
Adjusted Total	**=**	_____	*Subtract the N/A points from the Total possible points*
X .8 (80%)			*Multiply the Adjusted Total by .8 and show it as the Passing Score*
Passing Score	**=**	_____	

☐ **Pass** ☐ **Fail** **(please mark one)**

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables," and generally recognized good agricultural practices.

Part 1 - Farm Review

Water Usage

(1-1) What is the source of irrigation water? (Pond, Stream, Well, Municipal, Other) Please specify:

(1-2) How are crops irrigated? (Flood, Drip, Sprinkler, Other) Please specify:

Questions		Points	Yes	NO	N/A	Doc
1-3	A water quality assessment has been performed to determine the quality of water used for irrigation purpose on the crop(s) being applied.	15				D
1-4	A water quality assessment has been performed to determine the quality of water use for chemical application or fertigation method.	15				D
1-5	If necessary, steps are taken to protect irrigation water from potential direct and non-point source contamination.	15				

Sewage Treatment

Questions		Points	Yes	NO	N/A	Doc
1-6	The farm sewage treatment system/septic system is functioning properly and there is no evidence of leaking or runoff.	15				
1-7	There is no municipal/commercial sewage treatment facility or waste material landfill adjacent to the farm.	10				

Animals/Wildlife/Livestock

Questions		Points	Yes	NO	N/A	Doc
1-8	Crop production areas are not located near or adjacent to dairy, livestock, or fowl production facilities unless adequate barriers exist.	15				
1-9	Manure lagoons located near or adjacent to crop production areas are maintained to prevent leaking/overflowing, or measures have been taken to stop runoff from contaminating the crop production areas.	10				

Questions		Points	Yes	NO	N/A	Doc
1-10	Manure stored near or adjacent to crop production areas is contained to prevent contamination of crops.	10				
1-11	Measures are taken to restrict access of livestock to the source or delivery system of crop irrigation water.	10				
1-12	Crop production areas are monitored for the presence or signs of wild or domestic animals the entering the land.	5				R
1-13	Measures are taken to reduce the opportunity for wild and/or domestic animals from entering crop production areas.	5				R

Manure and Municipal Biosolids

Please choose one of the following options as it relates to the farm operations:

_____ **Option A. Raw manure or a combination of raw and composed manure is used as a soil amendment.**

_____ **Option B. Only composted manure/treated municipal biosolids are used as soil amendments.**

_____ **Option C. No manure or municipal biosolids of any kind are used as soil amendments.**

<u>Only answer the following manure questions (questions 1-14 to 1-22) that are assigned to the Option chosen above</u>. DO NOT answer the questions from the other two options. The points from the manure and municipal biosolids are worth 35 of a total 190 points, and answering questions from the other two options will cause the points to calculate incorrectly.

Option A: Raw Manure		Points	Yes	NO	N/A	Doc
1-14	When raw manure is applied, it is incorporated at least 2 weeks prior to planting or a minimum of 120 days prior to harvest.	10				R
1-15	Raw manure is not used on commodities that are harvested within 120 days of planting.	10				R
1-16	If both raw and treated manure are used, the treated manure is properly treated, composted or exposed to reduce the expected levels of pathogens.	10				R
1-17	Manure is properly stored prior to use.	5				

Option B: Composted Manure		Points	Yes	NO	N/A	Doc
1-18	Only composted manure and/or treated biosolids are used as a soil amendment.	10				R
1-19	Composted manure and/or treated biosolids are properly treated, composted, or exposed to environmental conditions that would lower the expected level of pathogens.	10				D
1-20	Composted manure and/or treated biosolids are properly stored and are protected to minimize recontamination.	10				
1-21	Analysis reports are available for composted manure/treated biosolids.	5				R
Option C: No Manure/Biosolids Used		**Points**	**Yes**	**NO**	**N/A**	**Doc**
1-22	No animal manure or municipal biosolids are used.	35				P

Soils

Questions		Points	Yes	NO	N/A	Doc
1-23	A previous land use risk assessment has been performed.	5				R
1-24	When previous land use history indicates a possibility of contamination, preventative measures have been taken to mitigate the known risks and soils have been tested for contaminants and the land use is commensurate with test results.	10				R
1-25	Crop production areas that have been subjected to flooding are tested for potential microbial hazards.	5				R

Traceability

Questions		Points	Yes	NO	N/A	Doc
1-26	Each production area is identified or coded to enable traceability in the event of a recall.	10				R

COMMENTS:

Total Points earned for Farm Review = _____

Total Possible = 190 *The total number of points possible for this section.*

Subtract "N/A" = _____ *Enter the additive number of N/A points (+points) here.*

Adjusted Total = _____ *Subtract the N/A points from the Total possible points*

X .8 (80%) *Multiply the Adjusted Total by .8 and show it as the Passing Score*

Passing Score = _____

☐ **Pass** ☐ **Fail** **(please mark one)**

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables," and generally recognized good agricultural practices.

Part 2 - Field Harvest and Field Packing Activities

Field Sanitation and Hygiene

Questions		Points	Yes	NO	N/A	Doc
2-1	A documented pre-harvest assessment is made on the crop production areas. Risks and possible sources of crop contamination are noted and assessed.	15				D
2-2	The number, condition, and placement of field sanitation units comply with applicable state and/or federal regulations.	10				
2-3	When question 2-2 is answered "N/A" (sanitation units are not required), a toilet facility is readily available for all workers.	10				
2-4	Field sanitation units are located in a location that minimizes the potential risk for product contamination and are directly accessible for servicing.	10				
2-5	A response plan is in place for the event of a major spill or leak of field sanitation units or toilet facilities.	10				P

Field Harvesting and Transportation

Questions		Points	Yes	NO	N/A	Doc
2-6	All harvesting containers and bulk hauling vehicles that come in direct contact with product are cleaned and/or sanitized on a scheduled basis and kept as clean as practicable.	10				D
2-7	All hand harvesting equipment and implements (knives, pruners machetes, etc.) are kept as clean as practical and are disinfected on a scheduled basis.	10				D
2-8	Damaged containers are properly repaired or disposed of.	5				
2-9	Harvesting equipment and/or machinery which comes into contact with product is in good repair.	10				
2-10	Light bulbs and glass on harvesting equipment are protected so as not to contaminate produce or fields in the case of breakage.	10				

Questions		Points	Yes	NO	N/A	Doc
2-11	There is a standard operating procedure or instructions on what measures should be taken in the case of glass/plastic breakage and possible contamination during harvesting operations.	5				P
2-12	There is a standard operating procedure or instructions on what measures should be taken in the case of product contamination by chemicals, petroleum, pesticides or other contaminating factors.	5				P
2-13	For mechanically harvested product, measures are taken during harvest to inspect for and remove foreign objects such as glass, metal, rocks, or other dangerous/toxic items.	5				
2-14	Harvesting containers, totes, etc. are not used for carrying or storing non- produce items during the harvest season, and farm workers are instructed in this policy.	5				P
2-15	Water applied to harvested product is microbially safe.	15				R
2-16	Efforts have been made to remove excessive dirt and mud from product and/or containers during harvest.	5				
2-17	Transportation equipment used to move product from field to storage areas or storage areas to processing plant which comes into contact with product is clean and in good repair.	10				
2-18	There is a policy in place and has been implemented that harvested product being moved from field to storage areas or processing plants are covered during transportation.	5				P
2-19	In ranch or field pack operations, only new or sanitized containers are used for packing the product.	10				D
2-20	Packing materials used in ranch or field pack operations are properly stored and protected from contamination.	10				
2-21	Product moving out of the field is uniquely identified to enable traceability in the event of a recall.	10				D

COMMENTS:

Total Points earned for Field Harvesting & Field Packaging = _____

Total Possible	**=**	**185**	*The total number of points possible for this section.*
Subtract "N/A"	**=**	_____	*Enter the additive number of N/A points (+points) here.*
Adjusted Total	**=**	_____	*Subtract the N/A points from the Total possible points*
X .8 (80%)			*Multiply the Adjusted Total by .8 and show it as the Passing Score*
Passing Score	**=**	_____	

☐ **Pass** ☐ **Fail** **(please mark one)**

This program is intended to assess a participant's efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration's "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables," and generally recognized good agricultural practices.

Part 3 - HOUSE PACKING FACILITY

Receiving

	Questions	Points	Yes	NO	N/A	Doc
3-1	Product delivered from the field which is held in a staging area prior to packing or processing is protected from possible contamination.	5				
3-2	Prior to packing, product is properly stored and/or handled in order to reduce possible contamination.	5				

Washing/Packing Line

	Questions	Points	Yes	NO	N/A	Doc
3-3	Source water used in the packing operation is potable.	15				R
3-4	If applicable, the temperature of processing water used in dump tanks, flumes, etc., is monitored and is kept at temperatures appropriate for the commodity.	10				D
3-5	Processing water is sufficiently treated to reduce microbial contamination.	10				D
3-6	Water-contact surfaces, such as dump tanks, flumes, wash tanks and hydro coolers, are cleaned and/or sanitized on a scheduled basis.	10				D
3-7	Water treatment (strength levels and pH) and exposure time is monitored and the facility has demonstrated it is appropriate for the product.	10				D
3-8	Food contact surfaces are in good condition; cleaned and/or sanitized prior to use and cleaning logs are maintained.	15				D
3-9	Product flow zones are protected from sources of contamination.	10				
3-10	The water used for cooling and/or making ice is potable.	15				R
3-11	Any ice used for cooling produce is manufactured, transported and stored under sanitary conditions.	10				R

Packing House Worker Health & Hygiene

	Questions	Points	Yes	NO	N/A	Doc
3-12	Employee facilities (locker rooms, lunch and break areas, etc.) are clean and located away from packing area.	10				
3-13	When there is a written policy regarding the use of hair nets/beard nets in the production area, it is being followed by all employees and visitors.	5				P
3-14	When there is a written policy regarding the wearing of jewelry in the production area, it is being followed by all employees and visitors.	5				P

Packing House General Housekeeping

	Questions	Points	Yes	NO	N/A	Doc
3-15	Only food grade approved and labeled lubricants are used in the packing equipment/machinery.	10				R
3-16	Chemicals not approved for use on product are stored and segregated away from packing area.	10				
3-17	The plant grounds are reasonably free of litter and debris.	5				
3-18	The plant grounds are reasonably free of standing water.	5				
3-19	Outside garbage receptacles/dumpsters are closed or are located away from packing facility entrances and the area around such sites is reasonably clean.	5				
3-20	Packing facilities are enclosed.	5				
3-21	The packing facility interior is clean and maintained in an orderly manner.	5				
3-22	Floor drains appear to be free of obstructions.	5				
3-23	Pipes, ducts, fans and ceilings which are over food handling operations, are clean.	5				
3-24	Glass materials above product flow zones are contained in case of breakage.	10				
3-25	Possible wastewater spillage is prevented from contaminating any food handling area by barriers, drains, or a sufficient distance.	10				
3-26	There is a policy describing procedures which specify handling/disposition of finished product that is opened, spilled, or comes into contact with the floor.	15				P

	Questions	Points	Yes	NO	N/A	Doc
3-27	Only new or sanitized containers are used for packing the product.	10				D
3-28	Pallets and containers are clean and in good condition.	5				
3-29	Packing containers are properly stored and protected from contamination (birds, rodents, and other pests).	10				

Pest Control

	Questions	Points	Yes	NO	N/A	Doc
3-30	Measures are taken to exclude animals or pests from packing and storage facilities.	10				D
3-31	There is an established pest control program for the facility.	10				D
3-32	Service reports for the pest control program are available for review.	5				R
3-33	Interior walls, floors and ceilings are well maintained and are free of major cracks and crevices.	5				

Traceability

	Questions	Points	Yes	NO	N/A	Doc
3-34	Records are kept recording the source of incoming product and the destination of outgoing product which is uniquely identified to enable traceability.	10				D

COMMENTS:

Total Points earned for House Packing Facility = _____

Total Possible	**=**	**290**	*The total number of points possible for this section.*
Subtract "N/A"	**=**	_____	*Enter the additive number of N/A points (+points) here.*
Adjusted Total	**=**	_____	*Subtract the N/A points from the Total possible points*
X .8 (80%)			*Multiply the Adjusted Total by .8 and show it as the Passing Score*
Passing Score	**=**	_____	

☐ **Pass** ☐ **Fail** **(please mark one)**

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Part 4 - STORAGE AND TRANSPORTATION

Product, Containers & Pallets

	Questions	Points	Yes	NO	N/A	Doc
4-1	The storage facility is cleaned and maintained in an orderly manner.	5				
4-2	Bulk storage facilities are inspected for foreign material prior to use and records are maintained.	5				R
4-3	Storage rooms, buildings, and/or facilities are maintained and sufficiently sealed or isolated and are protected from external contamination.	10				
4-4	Storage grounds are reasonably free of litter and debris.	5				
4-5	Floors in storage areas are reasonably free of standing water.	5				
4-6	Possible wastewater spillage is prevented from contaminating any food handling area by barriers, drains, or sufficient distance.	10				
4-7	There is a policy describing procedures which specify handling/disposition of finished product which is opened, spilled, or comes into contact with the floor.	15				P
4-8	Packing containers are properly stored and sufficiently sealed, to be protected from contamination (birds, rodents, pests, and other contaminants).	10				
4-9	Pallets, pallet boxes, tote bags, and portable bins, etc. are clean, in good condition and do not contribute foreign material to the product.	5				
4-10	Product stored outside in totes, trucks, bins, other containers or on the ground in bulk is covered and protected from contamination.	10				
4-11	Non-food grade substances such as paints, lubricants, pesticides, etc., are not stored in close proximity to the product.	10				
4-12	Mechanical equipment used during the storage process is clean and maintained to prevent contamination of the product.	5				D

Pest Control

Questions		Points	Yes	NO	N/A	Doc
4-13	Measures are taken to exclude animals or pests from storage facilities.	10				D
4-14	There is an established pest control program for the facility.	10				D
4-15	Service reports for the pest control program are available for review.	5				R
4-16	Interior walls, floors, and ceilings are well-maintained and are free of major cracks and crevices.	5				

Ice & Refrigeration

Questions		Points	Yes	NO	N/A	Doc
4-17	The water used for cooling and/or making ice is potable.	15				R
4-18	Manufacturing, storage, and transportation facilities used in making and delivering ice used for cooling the product have been sanitized.	10				R
4-19	Climate-controlled rooms are monitored for temperature and logs are maintained.	5				D
4-20	Thermometer(s) are checked for accuracy and records are available for review.	5				D
4-21	Refrigeration system condensation does not come in contact with produce.	10				
4-22	Refrigeration equipment (condensers, fans, etc.) is cleaned on a scheduled basis.	10				D
4-23	Iced product does not drip on pallets of produce stored below.	10				

Transportation

Questions		Points	Yes	NO	N/A	Doc
4-24	Prior to the loading process, conveyances are required to be clean, in good physical condition, free from disagreeable odors, and from obvious dirt/debris.	10				P
4-25	Produce items are not loaded with potentially contaminating products.	10				P
4-26	Company has a written policy for transporters and conveyances to maintain a specified temperature(s) during transit.	10				P
4-27	Conveyances are loaded to minimize damage to product.	5				P

Worker Health and Personal Hygiene

	Questions	Points	Yes	NO	N/A	Doc
4-28	Employee facilities (locker rooms, lunch and break areas, etc.) are clean and located away from storage, shipping, and receiving areas.	10				
4-29	When there is a written policy regarding the use of hair/beard nets in the storage and transportation areas, it is being followed by all affected employees and visitors.	5				P
4-30	When there is a written policy restricting the wearing of jewelry in the storage and transportation areas, it is being followed by all affected employees and visitors.	5				P

Traceability

	Questions	Points	Yes	NO	N/A	Doc
4-31	Records are kept regarding the source of incoming product and the destination of outgoing product which is uniquely identified to enable traceability.	10				D

COMMENTS:

Total Points earned for Storage & Transportation = _____

Total Possible	**=**	**255**	*The total number of points possible for this section.*
Subtract "N/A"	**=**	_____	*Enter the additive number of N/A points (+points) here.*
Adjusted Total	**=**	_____	*Subtract the N/A points from the Total possible points*
X .8 (80%)			*Multiply the Adjusted Total by .8 and show it as the Passing Score*
Passing Score	**=**	_____	

☐ **Pass** ☐ **Fail** **(please mark one)**

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Part 6-Wholesale Distribution Center/Terminal Warehouses

Receiving

Questions		Points	Yes	NO	N/A	Doc
6-1	All companies that supply fresh produce are required to have passed a third party audit verification of GAP and/or GHP.	15				D
6-2	Upon receiving, conveyances are required to be clean, in good physical condition and free from obvious objectionable odors, dirt and/or debris at time of unloading.	10				P
6-3	Company does not accept produce items that are loaded with or are not protected from potentially contaminating products.	10				P
6-4	Refrigerated commodities are monitored for temperatures at the time of receiving.	5				R
6-5	The company has a written policy regarding the disposition of product when temperatures are not within the company's guidelines at the time of receiving.	5				P

Storage Facility/Temperature Control

Questions		Points	Yes	NO	N/A	Doc
6-6	The facility is clean and maintained in an orderly manner.	5				
6-7	Refrigerated rooms are monitored for temperature and logs are maintained.	5				D
6-8	Thermometer(s) are checked for accuracy and records are available for review.	5				D
6-9	Refrigeration system condensation does not come into contact with produce.	10				
6-10	Refrigeration equipment (condensers, fans, etc.) is cleaned on a scheduled basis.	10				D
6-11	Iced product does not drip on pallets of produce stored below.	10				
6-12	The water used for cooling/ice is potable.	10				R
6-13	Manufacturing, storage, and transportation facilities used in making and delivering ice used for cooling the product are sanitized on a scheduled basis.	10				D
6-14	There is a policy describing procedures which specify handling/disposition of finished product which is opened, spilled, or comes into contact with the floor.	15				P

Questions		Points	Yes	NO	N/A	Doc
6-15	Product flow zones are protected from sources of contamination.	10				
6-16	Glass materials above product flow zones are contained in case of breakage.	10				
6-17	The grounds are reasonably free of litter and debris.	5				
6-18	The grounds are reasonably free of standing water.	5				
6-19	Outside garbage receptacles/dumpsters are closed or are located away from facility entrances and the area around such sites is reasonably clean.	5				
6-20	The facility is enclosed.	5				
6-21	Floor drains appear to be free of obstructions.	5				
6-22	Pipes, ducts, fans, and ceilings in the facility are reasonably clean.	5				
6-23	Possible wastewater spillage is prevented from contaminating any food storage or handling area by barriers, drains, or a sufficient distance.	10				
6-24	Non-food grade substances such as paints, lubricants, pesticides, etc., are not stored in close proximity to the product.	10				

Pest Control

Questions		Points	Yes	NO	N/A	Doc
6-25	Measures are taken to exclude animals or pests from the facility.	10				D
6-26	There is an established pest control program for the facility.	10				D
6-27	Service reports for the pest control program are available for review.	5				R
6-28	Interior walls, floors and ceilings are well-maintained and free of major cracks and crevices.	5				

Repacking/Reconditioning

(6-29) Does the facility repack and/or recondition product?

☐ **YES** ☐ **NO** **(please mark one)**

If the answer to question 6-29 is YES, answer questions 6-30 through 6-41. If the answer for question 6-29 is NO, then questions 6-30 through 6-41 are answered N/A.

Questions		Points	Yes	NO	N/A	Doc
6-30	Repacking/reconditioning processes are confined to an established location in the facility.	5				P
6-31	Food contact surfaces are in good condition; cleaned and/or sanitized prior to use and cleaning logs are maintained.	15				D
6-32	Source water used in the repacking operation is potable.	15				R
6-33	Processing water is sufficiently treated to reduce microbial contamination.	10				D
6-34	Water treatment (strength levels and pH) and exposure time is monitored and is appropriate for product.	10				D
6-35	If applicable, the temperature of processing water used in dump tanks, flumes, etc., is monitored and is kept at temperatures appropriate for the commodity.	10				D
6-36	Any ice used for cooling produce is manufactured, transported and stored under sanitary conditions.	10				R
6-37	Water used for chilling and/or to make ice is potable.	15				R
6-38	Only food grade approved and labeled lubricants are used in the repacking equipment/machinery.	10				D
6-39	Only new or sanitized containers are used for product repacking.	10				P
6-40	Pallets and other containers are clean and in good condition.	5				
6-41	Packing containers are properly stored and protected from contamination (birds, rodents, and other pests, etc.).	10				

Worker Health and Personal Hygiene

Questions		Points	Yes	NO	N/A	Doc
6-42	Employee facilities (locker rooms, lunch and break areas, etc.) are clean and located away from repack and storage area.	10				
6-43	When there is a written policy regarding the use of hair nets/beard nets in the facility, it is being followed by all affected employees and visitors.	5				P

	Questions	Points	Yes	NO	N/A	Doc
6-44	When there is a written policy restricting the wearing of jewelry in the facility, it is being followed by all affected employees and visitors.	5				P

Shipping/Transportation

	Questions	Points	Yes	NO	N/A	Doc
6-45	Prior to the loading process, conveyances are required to be clean, in good physical condition, free from disagreeable odors and from obvious dirt/debris.	10				P
6-46	Produce items are not loaded with potentially contaminating products.	10				P
6-47	Company has a written policy for transporters and conveyances to maintain a specified temperature(s) range during transit.	10				P

Traceability

	Questions	Points	Yes	NO	N/A	Doc
6-48	Records are kept recording the source of incoming product and the destination of outgoing product which is uniquely identified to enable traceability.	10				D

COMMENTS:

Total Points earned for Wholesale Distribution Center/Terminal Warehouse = _____

Total Possible = 410 *The total number of points possible for this section.*

Subtract "N/A" = _____ *Enter the additive number of N/A points (+points) here.*

Adjusted Total = _____ *Subtract the N/A points from the Total possible points*

X .8 (80%) *Multiply the Adjusted Total by .8 and show it as the Passing Score*

Passing Score = _____

☐ **Pass** ☐ **Fail** **(please mark one)**

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Part 7 - Preventive Food Defense Procedures

Based on the U.S. Food and Drug Administration's Food Producers, Processors, and Transporters: Food Security Preventive Measure Guidance for Industry.

Secure Employee/Visitor Procedures

	Questions	Points	Yes	NO	N/A	Doc
7-1	The company has a documented food defense plan and a person has been designated to oversee it. Name: _____	5				D
7-2	Food defense training has been provided to all employees.	5				D
7-3	Employees are aware of whom in management they should contact about potential security problems/issues. Name of management representative: _____	5				
7-4	Visitors are required to check in (showing proof of identity) and out, when entering/leaving the facility.	5				D
7-5	The purpose of visitation to site is verified before admittance to the facility.	5				D
7-6	Visitors are prohibited from the packing/storage areas unless accompanied by an employee.	5				D
7-7	Incoming and outgoing employee and visitor vehicles to and from the site are subject to inspection.	5				D
7-8	Parked vehicles belonging to employees and visitors display a decal or placard issued by the facility.	5				
7-9	Staff is prohibited from bringing personal items into the handling or storage areas.	5				D
7-10	Staff access in the facility is limited to the area of their job function and unrestricted areas.	5				D
7-11	Management is aware of which employee should be on the premises, and the area they are assigned to.	5				D
7-12	A system of positive identification of employees has been established and is enforced.	5				

Secure Facility Procedures

Questions		Points	Yes	NO	N/A	Doc
7-13	Uniforms, name tags, or identification badges are collected from employees prior to the termination of employment.	5				D
7-14	The mailroom is located away from the packing/storage facilities.	5				
7-15	Computer access is restricted to specific personnel.	5				D
7-16	A system of traceability of computer transactions has been established.	5				
7-17	A minimum level of background checks has been established for all employees.	5				D
7-18	Routine security checks of the premises are performed for signs of tampering, criminal or terrorist activity.	5				D
7-19	Perimeter of facility is secured by fencing or other deterrent.	5				
7-20	Checklists are used to verify the security of doors, windows, and other points of entry.	5				D
7-21	All keys to the establishment are accounted for.	5				D
7-22	The facility has an emergency lighting system.	5				
7-23	The facility is enclosed.	5				
7-24	Storage or vehicles/containers/trailers/railcars that are not being used are kept locked.	5				
7-25	Delivery schedules have been established.	5				
7-26	The off-loading of incoming materials is supervised.	5				
7-27	The organization has an established policy for rejecting deliveries.	5				D
7-28	Unauthorized deliveries are not accepted.	5				D
7-29	The company does not accept returned (empty) containers for packing of product unless they are sanitized containers intended for reuse.	5				D
7-30	The facility has a program in place to inspect product returned to the facility for tampering.	5				D
7-31	The company has identified the individual(s), with at least one backup, who are responsible for recalling the product.	5				D
7-32	The company has performed a successful mock recall of product to the facility.	5				D

Questions		Points	Yes	NO	N/A	Doc
7-33	Product imported from outside the United States is segregated from domestic product.	5				D
7-34	Allergens handled by the facility are segregated from products to avoid cross contamination.	5				D
7-35	Floor plans, product flow plans, and/or segregation charts are in a secure location.	5				D
7-36	The organization has registered with the FDA and has been issued a registration number (do not record the number on checklist).	5				D

COMMENTS:

Total Points earned for Preventative Food Defense Procedures = _____

Total Possible	**=**	**180**	*The total number of points possible for this section.*
Subtract "N/A"	**=**	_____	*Enter the additive number of N/A points (+points) here.*
Adjusted Total	**=**	_____	*Subtract the N/A points from the Total possible points*
X .8 (80%)			*Multiply the Adjusted Total by .8 and show it as the Passing Score*
Passing Score	**=**	_____	

☐ **Pass** ☐ **Fail** **(please mark one)**

For further information regarding the USDA GAP & GHP Program Please contact:

USDA Fruit and Vegetable Programs, Fresh Products Branch, Audit Programs Section at 800-560-7956 Ext. 5

United States Department of Agriculture
Agricultural Marketing Services
Fresh Products Branch

Good Agricultural Practices & Good Handling Practices
Audit Verification Program Scoresheet

www.ams.usda.gov/gapghp

Facility Name (Print) as it should appear on Certificate:			
Street Address (Print):	**City (Print):**	**State (Print):**	**Zip (Print):**
e-mail Address (Print):	**fax number:**	**Date Audit Requested:**	
		Date of Previous Audit :	

Date Audit Began:		**Date Audit Completed:**		**USDA Commodity Procurement Audit?**
Time Audit Began:		**Time Audit Completed:**		**Check One** **Yes** ☐ **No** ☐

EVALUATION ELEMENTS

Scopes Requested	Element	Possible Points	Less N/A Points	Adjusted Points	Passing Score*	Facility Score	Pass Fail	Date Passed	General Questions	Reviewing Official	Un-announced
X	General Questions	180									
	Part 1 – Farm Review	190									
	Part 2 – Field Harvesting & Field Packing Activities	185									
	Part 3 – House Packing Facility	290									
	Part 4 – Storage and Transportation	255									
	Part 6 – Wholesale Distribution Center/ Warehouses	410									
	Part 7 – Preventative Food Defense Procedures	180									

**A Passing Score is 80% of the Possible Points or the Adjusted Points, if adjustment are necessary, with no "automatic unsatisfactory" conditions is required for certification.

Commodities Reviewed (Print):	**Commodity:**								
	Acres:								

Send completed GAP&GHP Certificate to: (choose one) Inspection office: (list office) Directly to auditee above:

Lead Auditor Name (Print): _____ **Duty Station:** _____ **Signature & Date:** _____

Facility Representative signature: _____ **Date:** _____ **All Scopes Completed:** _____

By signing this form, the facility representative agrees to have company information posted to the USDA website. A company will only be listed on the USDA website if all scopes audited receive a passing score.

For USDA HQ use:

Reviewing Official Name (Print) _____ **Signature:** _____

Date Received: _____ **Date Certificate Mailed:** _____ **Date Posted to USDA Website:** _____

To verify a company's continued good standing in the USDA GAP&GHP Program please visit http://www.ams.usda.gov/gapghp

Revised January 26, 2012
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USDA Good Agricultural Practices and Good Handling Practices
Corrective Action Report

USDA Fruit and Vegetable Programs **Good Agricultural Practice & Good Handling Practices** **CORRECTIVE ACTION REPORT**	**Report #:** _____ of _____
Company Name/Farm:	**Date:**
Lead Auditor:	
Crop(s):	
Description of Non-Conformity: Notified company staff at time of finding non-conformity: _____	
Checklist question number and/or section of auditee food safety plan non-conformity is associated with: _____	
Company Representative Signature: SIGNATURE AFFIRMS FACTS CONCERNING NON-CONFORMITY ARE CORRECT	
Corrective Action Proposed and Time Frame for Implementation:	
Auditor Signature for Acceptance of Proposed Corrective Action and Timetable for Implementation:	

California Small Farm Food Safety Guide:

Standard Operating Procedures for Good Agricultural Practices*

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Jan 2010
Updated Jan 2013

***This Food Safety Guide provides a comprehensive yet concise description of Standard Operating Procedures for Good Agricultural Practices on Small Farms and associated worker training and documentation. It can be used as a reference when developing your own On-Farm Food Safety Plan. The content aligns with requirements outlined in the USDA Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) Audit Verification Program and was reviewed by Trevor Suslow, UC Food Safety Research Specialist. Please contact Jennifer Sowerwine jsowerwi@berkeley.edu or Christy Getz cgetz@berkeley.edu for more information.**

Table of Contents

I. GENERAL CONDITIONS

A. CONTACT INFORMATION/FARM DESCRIPTION

Standard Operating Procedures for Good Agricultural Practices (GAP's)
At

Farm Name:_____

Contact Person:_____

Farm Location (s): _____

_____

Mailing Address:_____

Phone:_____Email Address: _____

Legal Description of Location (s): (if available, section, township, range); cross streets, city

_____

Total acres farmed (at each location): _____

Crops grown: _____

Food safety is an integral part of our entire operation and is taken very seriously.

_____(Farm Owner/Manager) has been designated to oversee and implement our food safety program for our farm and has participated in GAP & GHP training. In the absence of the farm owner/manager _____ is responsible.

This food safety program includes a set of on-farm policies and standard operating procedures (SOP), worker training programs, and record-keeping sheets which address several areas of our agricultural operation, including traceback procedures, worker health and hygiene, irrigation water, soil management, pesticide use, transportation and equipment. Any personnel violating food safety policies and procedures will receive disciplinary action on a timely basis.

A map of our farm(s) identifying coded fields, structures, water source, and chemical storage sites, is attached. Our food safety plan is reviewed annually and revised as necessary and we complete self-audits annually.

B. TRACEBACK AND RECALL POLICY AND PROCEDURES

Our farm has a documented traceback program with established traceability standard operating procedures that include IRQ box labels, invoicing & record keeping. Our program enables all product to be traced back to the production area and date harvested.

SOP: IRQ/Traceback Labels

All boxes destined for wholesalers/retailers will be labeled with IRQ information:

- **I = Idenity**: What is in the box: The common name of the commodity in package.
- **R = Responsible Party**: The name and address (county is sufficient) of individual (or company) responsible for packing the product .
- **Q = Quantity**: amount in box, weight or count
- **D = Date** of harvest/packing

Invoice: All sales transactions beyond the farm stand are documented with invoices. Information recorded in the invoice is found in the textbox below.

SOP: Invoice Content

- Name of Farm & contact information (Get pre-printed book or use custom stamp)
- Responsible party (who packed the product)
- Date of transaction
- Identity of product
- Quantity of product (amount in box, weight or count)
- Price
- To whom the product is sold/shipped.

Documentation: No. 6 Traceback Record

In combination with the invoice, a detailed traceback log (No. 5 Traceback Record) tracks all sales beyond the farm stand. Information includes the name of operation, date harvested, production area harvested, date shipped, crop, # boxes, picked up/delivered by, sent to and total price. Either or both of these modes of documentation provide necessary traceback information.

Procedures for a Mock Recall: In preparation for an audit, when selling product beyond the farm stand, our farm will conduct a mock recall to be implemented during the second year. We will work with our customers (wholesale, retail) to track the path the product takes from the farm to the consumer. We will have documented evidence of completing at least one mock recall within 12 months prior to an audit. We will use the following standard operating procedures**:**

SOP: Mock Recall Plan

1. Farm communicates with customers that they are preparing a mock recall.
2. Farm owner selects date for mock recall.
3. Farmer documents:
    a. total number of cases packed on chosen recall date from a particular production area or farm.
    b. how much product and to whom it was shipped (eg. 300 cases to 3 wholesaler)
4. Farmer initiates recall
    a. Contact all customers who received product from the lot harvested on specified date and location.
    b. Forward a form to each customer asking them to supply an accounting of the number of cartons from that lot still in their possession and the number of cartons sold and/or destroyed. The form will contain instructions on what to do with remaining product and required proof of disposal, where to send the form when completed and timeframe when it must be sent back.
5. Farmer summarizes the forms from the customers and determines the number of cartons still in the retailers' control and the number that are not.

Documentation will include:

- Total number of cases packed on a particular date, the customers contacted, the amount of product originally shipped, the amount of product remaining from original shipment and disposition of product which could not be effectively recalled (or returned). Such as sales to customers, reshipment to a subsequent customer that could be contacted if a recall were necessary, or destruction of product.

Documentation: No. 10 Mock Recall Record

C. WORKER HEALTH AND HYGIENE POLICY AND PROCEDURES

Worker Health and Hygiene

Worker Training: All visitors, employees or workers are trained in and must follow good hygiene practices. The training takes place during orientation for new employees and before harvest season for all returning employees or workers and is documented. All visitors are required to sign in and abide by farm healthy and hygiene policies outlined above. See text box for content of training.

Signage: Signs are posted to instruct workers and visitors to wash hands before and after handling food, harvesting, eating and smoking. Signs demonstrating how to wash hands (with soap and water after using toilet) are posted in toilet area. Designated areas for smoking and eating lunch are established away from harvest and packing/sorting area.

Clean, Potable Drinking Water: is available, renewed daily, and water source documented.

Personal Protective Equipment: PPE is cleaned after each use to prevent contamination in the home and at work.

Worker Training 1: Health and Hygiene

Proper Hand Washing: Hands must be washed before beginning or returning to work and after the following activities: using the restroom, smoking or tobacco use, taking breaks, handling trash containers or disposing of trash, using the telephone, handling money, coughing and sneezing. Hands are washed with soap for 20 seconds and dried with disposable towels. Water is turned off with disposable towel. Towels are deposited in a covered receptacle. Hands are dried before putting on gloves.

Personal Hygiene: All workers must follow good hygiene/sanitation practices including:

- Wear clean work clothes
- Take a daily shower
- Not wear dangling strings or jewelry including rings and necklaces
- Have clean and cut nails
- Eat and smoke in designated area
- Use only clean, non-ripped gloves
- Tie back long hair
- Keep all glass containers away from the field
- Wear clean, un-ripped, sanitary gloves (best are non latex)
- Not take gloves into lunch room or restroom
- Not use product containers for personal use

Documentation: No. 5 Worker Training Record

Illness and Accident Prevention and Response

Training to all workers in illness prevention is provided and documented. See the following text box for content.

Worker Training 2: Bleeding / Bodily Fluids and Illness Policy

- To avoid heat exhaustion, drink lots of water frequently (2 quarts per person/day) especially when hot.
- Access to shade (umbrella or other shade) is provided close by. Take breaks in the shade.
- Any worker who is ill or appears to be ill with diarrheal or other infectious disease will be sent home or assigned work away from crop production areas and harvested produce.
- Workers who get a cut or have a nosebleed while working must stop immediately, contact your supervisor and have it treated. The wound is cleaned, disinfected, bandaged and gloved as soon as possible. Any product that is contaminated with bodily fluids is discarded immediately away from the field. Any container, surface, or tools that are contaminated are disinfected as soon as possible.
- All accidents and responses are recorded (Record Sheet #8).
- All workers know the location of the first aid kit.

Documentation: No. 5 Worker Training Record

An updated First Aid Kit with bandages, antiseptic solution, antibacterial ointment, and non-latex gloves is located on site at all times. All workers are aware of the location of first aid supplies and what steps they should take should an injury occur.

D. GENERAL SANITATION

Hand Washing Facilities: Good sanitation and proper use of hand washing facilities includes the following:

SOP: Hand Washing Facilities

- Handwashing facility is located in close proximity of toilet.
- All handwashing facilities are clean and water source is covered. They are supplied with single use towels, hand soap and potable water for hand washing. Trash can with lid is located in vicinity and emptied regularly.
- Disposal of waste water from hand washing does not cause unsanitary conditions, nuisance or contamination.
- Hand washing container is thoroughly cleaned and sanitized on a weekly basis by scrubbing with a clearly labeled brush that is stored separately.
- Cleaning and resupply records are maintained.

Documentation: No. 3 Toilet & Handwashing Maintenance Record

Restroom Facilities: Good sanitation and proper use of toilet facilities includes the following:

SOP Restrooms Facilities

- Toilet facilities are located within ¼ mile or 5 min walk of workers.
- Field toilets are properly screened to keep animals and insects out. They are ventilated and provided with self-closing doors, lockable from the inside.
- Daily spot checks for cleanliness & spot cleaning/trash pick up.
- Weekly thorough cleaning (toilet, walls, floors) with Green Power (20 parts water to 1 part Green Power) or equivalent & rinse with hose.
- Sanitize toilets and urinals with a separate, labeled brush.
- Sanitize doorknobs, and any other surface inside unit with separate brush.
- Fill paper products and soap dispensers.
- Provide covered trash receptacle & remove trash to dumpster as needed.
- Record initials and date of cleaning on record sheet # 2 when unit is serviced. Keep records for 2 years.
- Materials required & labeled “Restroom Use Only”: broom & dustpan, brush for wall & floor, brush for toilet & urinal, single use wipe for door knob, labeled bucket, trigger sprayer (for spot cleaning), hose (for rinsing).
- Cleaning and resupply records are maintained.

Documentation: No. 3 Toilet and Handwashing Maintenance Record

E. CHEMICALS AND PESTICIDES

Safe Pesticide Use

Before applying any pesticide, a grower must first obtain an “Operator Identification Number”. To use a restricted pesticide, a grower must obtain a “Restricted Material Permit” and become a Private Certified Applicator” by passing a test. (If a grower is hiring a licensed pest control

business to make an application of restricted materials, the grower does not need to become certified. The grower only needs to obtain the Permit.

Before applying any pesticide, all employees must be trained by a qualified person or have a private applicator card, a qualified applicator certificate or a qualified applicator license. Training must be done annually and before any applications are made.

Only pesticides—weed killers, bug killers, etc., that are registered by the State of California and are used according to the label may be applied.

All sources of water used to mix pesticides must be protected by an air-gap separation, or a back flow prevention device such as a "chemigation valve". (The water source also needs to be protected when putting fertilizer through the drip lines).

All pesticides and empty, rinsed containers must be stored in a locked area that does not present a hazard to persons or property. If storing materials with the words Danger or Warning, the area needs to be posted. Containers must be rinsed out at the time of use and the rinse water applied back to the area that was treated. All equipment also needs to be rinsed at the time of use.

Pesticide Reporting & Record Keeping

Growers are required to keep records of all pesticide applications. Pesticide Use Reports must be filled out and submitted to the Agricultural Commissioner's office within 10 days of the month following the application. The grower must keep a copy. The appropriate form is called the Production Agriculture Monthly Pesticide Use Report (PR-ENF-017C). It can be found online at: http://www.cdpr.ca.gov/docs/enforce/prenffrm/enf017c.pdf.

All pesticide records – permits, Identification numbers, use reports, training records, training programs, etc.must be kept for 2 years (3 years if using carbamates/organophosphates). If any pesticide has been used within the last 30 days, and there are employees on the farm, all of the information (use reports, MSDS, labels, Pesticide Safety Information Series, etc.) must be readily available to all employees.

Pesticide Handler Training

All workers who handle pesticides are trained in the program outlined below. Training is completed before the employee/worker is allowed to handle pesticides, updated regularly to cover any new pesticides, and repeated at least annually thereafter. Materials used in the training may include study guides, pamphlets, pesticide product labeling, Pesticide Safety Information Series leaflets, Material Safety Data Sheets, slides and videos/DVDs. Training records, which include the date of training, the content and materials used, and who provided the training, are kept on site while in use and for two years after use at a central location.

Worker Training 3: Pesticide Handler Training

The training shall cover, for each pesticide or chemically similar group of pesticides to be used:

- How to read and understand the content of pesticide product labeling, Pesticide Safety Information Series leaflets, Material Safety Data Sheets, etc.
- The meaning of information contained in product label (such as precautionary statements about human health hazards, signal word, proper chemical handling including mixing and applying, application rate and how it can be achieved, PHI, REI., PPE) and other precautions of the chemical.
- Routes by which pesticides can enter the body; signs and symptoms of overexposure, emergency first aid for pesticide overexposure and how to obtain emergency medical care
- Routine and emergency decontamination procedures including spill clean up and the need to thoroughly shower with soap and warm water after exposure.
- Appropriate use and sanitation of required personal protective equipment.
- Safety requirements and procedures for handling, transporting, storing and disposing of pesticides (stored in locked area, transported separate from produce,)
- Environmental concerns such as drift, runoff, wildlife hazards.
- Warnings about taking pesticides or pesticide containers home.
- Proper disposal of left-over chemicals and chemical containers. Spray out remaining mixture and rinse sprayer with water; never store left-over mixture for later use. Never re-use containers. Triple rinse, empty, remove lid and puncture container—dispose of containers at approved hazardous material disposal site.

Documentation: No. 5 Worker Training Record

Worker Training 4: Pesticide Worker Safety

All employees who work in a field treated with pesticides has been trained within the last 5 years, in a manner the employee understands, before beginning work in the treated field. The training will include:

- The importance of routine decontamination and washing thoroughly after the exposure period.
- Restricted entry intervals and what posting means (both California and federal posting sign formats)
- Where pesticides are encountered, including treated surfaces in the field, residue on clothing, chemigation and drift.
- Routes of exposure
- Hazards of pesticides including acute effects, chronic and delayed effects, and sensitization effects.
- Common signs and symptoms of overexposure
- First aid including decontamination, eye flushing, and obtaining emergency medical care
- Warnings about taking pesticides or pesticide containers home
- The hazard communication program requirements of section 6761
- Employee rights as outlined in section 6764 of the California code of regulations

Documentation: No. 5 Worker Training Record

II. FARM REVIEW/POLICIES AND PROCEDURES

A. WATER ASSESSMENT

The source of irrigation water is *PRIVATE WELL/MUNICIPAL WATER* (circle one) or _____.
Crops are irrigated by *DRIP IRRIGATION, FURROW, SPRINKLER* or_____.

Water Risk Assessment: Water quality is known to be adequate for the crop irrigation method and this is shown by water test results from a GLP lab in this food safety program.

All water sources are tested for the presence of an indicator organism(s) that may signal the presence of pathogens. Indicator organisms (such as Total Coliform and E. coli) are not used specifically to predict the *presence* of pathogens, but are useful *predictors* of undesirable conditions (e.g., ineffective treatment, defective manufacturing process, presence of fecal material). Annual water tests for **Total Coliform *and* Fecal Coliform/E. coli** (requires an analysis of two 100 ml samples at 35C and 42-44.5C, respectively) at the beginning of the season are conducted for wells, bore-holes, spring-boxes, water-tower, rainwater cisterns. If water source is open (reservoir, pond, stream, creek, river, tailwater return (field runoff), or sedimentation pond water), water tests for ***Generic E. coli*** are collected every three months. When using municipal water, annual public tests conducted by irrigation districts, municipal authorities, etc. are accepted (and reports are attached to F.S. Manual). Renters will need to request a report from the water district. Water test results for all water sources, including for irrigation, human consumption and postharvest application are available for review.

SOP Collecting Water Sample

- Sterile sample containers are obtained from testing laboratory.
- If water is collected from tap, water should run for 2-3 minutes before the sample is taken.
- The tap should be cleaned with sodium hypochlorite (bleach) prior to collecting the sample; let water run for an additional 2-3 minutes before collecting sample.
- Sample should be analyzed as soon as possible and no more than 30 hrs after collection.
- Samples should be kept cool (in an iced cooler) during transport.
- Water is tested for total coliform & will be treated according to industry standards.
- Testing for additional contaminants (heavy metals, nitrogen, protozoa, salmonella) should be conducted if risk is evident.

Documentation: Water analysis attached

If water test results exceed the recommended Action Threshold for this operation, corrective action will be taken. While no federal or state regulatory standards for irrigation water exist, based on surveys within California, current recommendations follow a guidance level of 1000 fecal coliform or 126 generic *E. coli* per 100 ml of water as an Action Threshold. Although there is currently no established correlation of these levels to the presence of true pathogens in irrigation water, if this level is exceeded appropriate chlorination will be started.

If necessary, steps are taken to protect irrigation water from potential contamination. All irrigation sources are inspected for unauthorized use or potential contamination with microbial

infection, chemicals or other dangerous substances. **There is no municipal/commercial sewage treatment facility or waste material landfill adjacent to the farm.**

B. DOMESTIC ANIMALS, WILDLIFE AND LIVESTOCK

If crop production areas are located near or adjacent to manure lagoons, or dairy or livestock facilities appropriate action such as building berms, ditches or fencing are constructed to avoid contamination as a result of flooding or animal movement..

Surface water resources are protected from livestock contamination by FENCING, DRAINAGE CANAL *or*_____. Domestic animals (including dogs) will be excluded from crop production areas during the growing and harvesting season.

All fields are routinely monitored and recorded for unauthorized entry of wildlife or neighboring domesticated animals to the fields. In the event that unauthorized entry is discovered, the operation will take steps to minimize the risks of potentially contaminated product or production areas, and the detected risk and corrective actions are documented.

C. MANURE AND MUNICIPAL BIOSOLIDS

At our farm operation:

☐ NO MANURE or municipal biosolids of any kind are used as a soil amendment.

☐ RAW MANURE or a combination of raw and composted manure is used as a soil amendment. When raw manure is applied, it is incorporated at least 2 weeks prior to planting or a minimum of 9 months prior to harvest. Raw manure is not used on commodities that are harvested within 9 months of planting. If a combination of raw and treated manure is used, the treated manure is properly treated, composted or exposed to reduce the expected levels of pathogens. Untreated manure is properly stored prior to use. Our source of raw manure is from _____.

☐ Only COMPOSTED MANURE and/or treated biosolids are used as a soil amendment. Composted manure and/or treated biosolids are properly treated, composted, or exposed to environmental conditions that would lower the expected level of pathogens. Composted manure and/or treated biosolids are properly stored and are protected to minimize recontamination. Analysis reports are available for composted manure/treated biosolids. Our source of composted manure and/or treated biosolids is_____ (Name of Compost Company). Please find the treatment documentation from the company attached herein. **A manure application log is attached to this food safety plan that documents all applications, their treatment method and any supporting documentation.**

D. LAND ASSESSMENT AND SOIL

Land Risk Assessment: There are no known sites on the farm that may have a risk of prior contamination (such as former dumpsites, old homesteads, barn sites, and livestock pens). I have

farmed this land for the last ____ years and prior to that the land was fallow / farmed (circle one)
<If there is a risk, then provide the following information>

☐ There are several sites on the facility that may have a risk of prior contamination. These fields are shown on the enclosed map and those with possible contamination risk have been tested for _____. Please see attached map and testing results for a comprehensive review of soil contamination risk and planting plans.

☐ During the past *3 YEARS*, **no** domestic sewage, sewage sludge, septic waste, portable toilet waste, or other product that might contain human feces has been placed on or adjacent to any crop production areas. If it has occurred, affected areas are mapped and soil test results contained herein.

☐ During the past *3 YEARS*, **no** flooding from creeks or rivers has occurred on any part of the land, nor have any adjacent domestic septic tank systems flooded onto the field. If flooding has occurred, areas affected are documented with maps and soil test results are contained herein.

III. FIELD HARVEST AND FIELD PACKING POLICY AND PROCEDURES

A. FIELD WORKER SANITATION AND HYGIENE

No smoking, tobacco use, or eating should take place around crop production areas or harvested produce. Food, drinks, and smoking are only allowed in the designated location. That location is _____.

There is one male and one female toilet for every twenty workers that is located within a 1/4 mile or 5-minute walk, and all other OSHA regulations are complied with. For fewer than 5 employees, only 1 field sanitation unit is required but the toilet must be lockable from the inside. All workers and visitors must follow proper health and hygiene practices and use the restroom and hand washing facilities provided. If restroom facilities are not properly maintained, any employee or visitor should notify the onsite supervisor.

Field sanitation units are directly accessible for servicing and in the event of a spill or major leak, a response plan is in place. The area will be secured and contaminated soil will be removed from the production area and properly disposed. These accidents and responses will be documented.

B. PRE-HARVEST ASSESSMENT

Prior to harvesting any crop, the farm operation will complete a pre-harvest assessment on each production area to address known risks that are applicable to the operation. The assessment will determine:

- Are toilet and wash facilities properly located?
- Are all workers trained in GAPs?
- Is potable water and shade available to all workers?
- Are harvest containers available, clean, well located and protected?
- Is harvest, washing and packing equipment clean, sanitized and in good condition?

- Are shade or other pre-cool measures in place?
- Is there evidence of animal feces, dead animals, animal crop damage or other physical contamination in the crop area that needs to be isolated for “no-harvest”?
- Are there other notable sources of contamination such as dump sites, fuels or chemicals, manure, burning debris, or water runoff that may affect food safety?
- Is transportation equipment clean and available with protective covering?

C. FIELD HARVESTING EQUIPMENT

All harvesting equipment is cleaned and washed during harvest season on a daily basis and recorded following our SOP below:

SOP Cleaning Harvest Equipment

Step 1: Place harvest containers next to sanitized surface (plastic) that has been pre-rinsed, scrubbed with detergent, rinsed & sanitized (see solution below).
Step 2: All buckets will be pre-rinsed, using scraping, brushing and hosing to remove any visible soil.
Step 3: Buckets will be scrubbed with detergent and rinsed.
Step 4: **Sanitizing solution (1 tablespoon pure unscented bleach (5.25%) to 1 gallon water=150ppm**) is poured into sanitation tub. Buckets are dipped in sanitizer and then air-dried and stacked in sanitary storage.
Step 5: Check water with chlorine test strips to determine when to change water. Waste-water will be disposed of daily away from production area with proper drainage.

All brushes & tubs are labeled for “Harvest Equipment Only” and stored separately. Workers will use proper protective gear (water proof aprons, rubber gloves, goggles).

Documentation: No. 4 Farm Cleaning Record

During harvest, equipment will be as clean as practical, maintained to prevent contamination from leaking oil, grease, loose parts, and any other source of foreign material contamination. If equipment does become contaminated with oil, grease, or any other foreign substance, all contaminated product with be disposed of, buried, or put into covered garbage containers and work will stop until equipment can be cleaned, washed and inspected.

Measures are taken during harvest to inspect for and remove foreign objects such as glass, metal, rocks, dead animals or other dangerous/toxic items that can contaminate the product.

If any glass is broken and contaminates product, all product will be properly disposed of, work will stop until equipment is repaired and all product containers cleaned, washed and inspected.

IV. PACKING HOUSE/SHED/FACILITY

A. RECEIVING

All product is properly handled, stored, and moved to protect and reduce possible contamination.

B. WASHING/PACKING

For any crop that requires post-harvest washing, water used in the washing/packing operation is potable. Wash tanks, tubs and food contact surfaces are cleaned/sanitized regularly following a pre-rinse, wash, rinse & sanitizing protocol as outlined above. Chlorine use keeps microbial content in the water down to prevent the potential for cross contamination of all produce in the washing system, **it will not sterilize the produce**.

Our farm practices the following SOP for post-harvest washing.

SOP Cleaning Produce

- All water, which comes in contact with produce for washing is tested and is safe to drink.
- If using chlorine (sodium hypochlorite), water should contain between 5 and 10 parts per million (ppm) total chlorine. **1/2 Teaspoon pure unscented bleach (5.25%) in 6 gallons of water = 5 ppm** Use chlorine test strips to determine chlorine content.
- For chlorine to be effective, water should have a pH of between 6 and 7.5 with minimal organic matter (soil) in the water. Use pH test strips to determine pH.
- Water is changed in the dump tanks daily or when pH, chlorine content or organic matter makes chlorine ineffective.
- To minimize chlorine residue, rinse produce with potable water only prior to packaging

C. GENERAL SANITATION

There is a pest/rodent control program for the packing shed/farm stand:

SOP Pest Control in farm stand/packing shed and storage area

- Take measures to prevent rodents from entering farm stand and storage area.
  - Remove all potential food sources and nesting sites from inside and around the storage area and farm stand.
  - Seal off entry points with screens, barriers.
  - Store empty boxes off the ground and covered in plastic (wrapped).
- Best to trap rodents between winter and spring.
- Monitor for rodent presence (droppings, sightings)—keep records.
- Place mechanical (snap) or sticky traps inside where there is evidence of rodents. **Do not use <u>bait traps</u> inside farm stand or packing shed.**
- Monitor traps regularly and record effects.
- Dispose of trapped animal immediately and document effects.

Documentation: No. 7 Pest/Rodent/Wildlife Control Record

Traps or other non-poison methods should be the only control program located within a structure. **All bait stations containing poison must be located outside the facility**. Poison bait stations pose a risk to wildlife, cats, and other farm animals and should be used secondary to mechanical (snap or sticky) traps. Poisoned rodents, may be eaten by a hawk or owl and intern poison the predator. Traps or bait stations that work to keep the rodent inside of the trap can be helpful in reducing the chances of poisoning predators. Birds of prey are beneficial in reducing populations of rodents. Many organic growers build owl or hawk nests and perches along field borders to encourage their presence. Traps and bait stations are regularly checked and have

documentation showing when this was completed. A pest control log is maintained that includes inspection dates, inspection reports, and procedures implemented to eliminate any problems (record sheet # 6). Frequent monitoring of affected and treated areas must take place to determine the effectiveness of the treatment applied. Generally, all traps and bait stations will be marked and flagged by numbers or some type of coding system. It is likely that there will also be a map of the premises that shows the location of such traps and bait stations.

Flies: Fly strips will be installed, monitored and changed regularly to minimize presence of flies in the produce packing, storage and sales area.

V. STORAGE AND TRANSPORTATION

A. STORAGE

All empty packing containers, (trays, baskets and boxes) are stored off the ground and protected/covered from contamination.

SOP Cleaning Farm Stand/Packing Shed/Storage Facility

- Storage facilities are cleaned regularly, prior to loading with product and records maintained.
- Materials used include a broom, dustpan, and trigger spray bottle with clean rags.
- Cleaning includes removal of all spider webs, dust and debris from the floor, shelves and ledges. All potential nest sites or food sources for rodents are removed.
- Spot cleaning is conducted as needed. Trashcans are emptied.
- All cleaning materials will be labeled & stored separately.

Documentation: No. 4 Farm Cleaning Record

B. TRANSPORTATION

Vehicles transporting product have not been previously used to haul domestic sewage, manure, or hazardous material. Vehicles are clean and in good working condition, prior to loading and on a regular basis Transport vehicles (trucks) are inspected and cleaned regularly by sweeping out debris followed by hosing down and recorded.

- Produce items are not loaded with any potentially contaminating products or chemicals.
- Produce is kept as cool as possible following harvest and in transit.
- Produce is loaded and transported so as to minimize physical damage.
- Product is covered from the field to packing/storage site and from packing site to market.

C. EMERGENCY RESPONSE PLAN/MAP

Our farm is prepared in case of an emergency spill, leak or other hazardous material event. Our farm safety map indicates fuel and chemical storage sites.

SOP Emergency Response Plan

If an emergency spill or leak should happen, immediately stop all other activities and,

- Stop the initial spill or leak at its source
- Make necessary phone calls to notify officials and obtain assistance, equipment and supplies.
- Contain spill or leak and prevent materials from contaminating water sources.
- Contact company that can aid in containing and removing contaminated material. Action includes using soil to divert flows, remove contaminated soils.

Documentation: No. 9. Contamination Response Record

- This document was prepared by UC Berkeley, UC Cooperative Extension Sacramento, UC Cooperative Extension Fresno, and the Community Alliance with Family Farm's Growers Collaborative with support from the National Research Initiative of the National Institute of Food and Agriculture, USDA, Grant # 2009-5561805065.

** The Pesticide Use & Reporting Protocol is based on California laws and standards; there may be different requirements for other states.

REFERENCES

California Leafy Greens Product Handler Marketing Agreement; http://www.caleafygreens.ca.gov

California OSHA Guide to Developing Your Workplace Injury and Illness Prevention Program with Checklists for Self-inspection; http://www.dir.ca.gov/dosh/dosh_publications/iipp.html

California Strawberry Commission Food Safety Program (2006).

Cornell Univeristy's Dept. of Food Science: National GAPs Educational Materials: http://www.gaps.cornell.edu/educationalmaterials.html

EPA Office of Prevention, Pesticides, and Toxic Substances: How To Comply with the Worker Protection Standard for Agricultural Pesticides: What Employers Need to Know; http://www.epa.gov/oecaagct/epa-735-b-05-002_AppA.pdf

Food Safety Begins on the Farm: A Grower's Guide. By A. Rangarajan, E.A. Bihn, RB. Gravani, D.L. Scott, M.P. Pritts, 2000. Cornell GAPs Program, Cornell University Dept. of Food Science.

Good Agricultural Practices: A Self-Audit for Growers and Handlers: ucce.ucdavis.edu/files/filelibrary/5453/4362.pdf

Oregon Dept. of Agriculture Farm Safety Manual; http://www.oregon.gov/ODA/ADMD/docs/pdf/gap_safety_program.pdf

Oregon Dept. of Agriculture Good Agricultural Practices Manual: http://www.oregon.gov/ODA/ADMD/docs/pdf/gap_full_0210.pdf

Penn State Univeristy Dept of Food Science – USDA Auditor Guidance November 2009 : http://foodsafety.psu.edu/gaps/

US Food and Drug Administration: Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables

USDA Good Agricultural Practices & Good Handling Practices Audit Verification Checklist; http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5050869

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[Change, delete, or fill-in parts in yellow, remove highlights. This template will help for either self certifying or 3rd party GAPs audit. It is usable for a "Farm Review audit" and/or Field Harvesting/Packing audit". You may have add/revise for a Harmonized or Global GAPs audit.]

ABC Farm
street
city, State, zip
phone, email

Good Agricultural Practices (GAPs)

Checked boxes indicate I have read documentation to support this ☑

Table of Contents

1. GENERAL FARM DESCRIPTION:

ABC FARMS , registered with the California Department of Food and Agriculture as # _____, is engaged in direct marketing to consumers in California. At ___*ABC FARMS* food safety is an integral part of our entire operation and taken very seriously.

Farm Location:

Crops grown include: _____ _____
_____ _____

*MR./MS.*___ *A. BeeCee* has been designated to oversee and implement our food safety program. The GAPs listed below several areas of an agricultural operation, including land, irrigation water, manure practices, pesticides, equipment and worker health and hygiene.

Total acres farmed (owned, leased/rented, contracted) is: _____

Check boxes

☐ **2. Traceability**

A traceability program has been developed and adopted. We can track one-step forward, one-step backward for all fresh produce at our farm. This includes tracking from a production area (one field or group of fields), harvest date (or group of dates), and crop through storage and where product is sent after leaving the farm. Each container leaving the farm has our name and address, crop, size, and date harvested, except for sales made at the roadside stand.

GENERAL OPERATING PROCEDURES

☐ **3. Health and Hygiene- for employees and visitors**

All employees are trained in and must follow good hygiene practices. *This training takes place during orientation for new employees and before harvest season for all returning employees.*

Company food safety policies should be followed by everybody, including visitors. Visitors must sign in the form prior to entering any growing areas. They are not permitted to touch any harvestable crop without following the company procedures below. The following personal hygiene and safety practices are included in the training program and should be followed.

- Smoking and eating is allowed only in designated areas.
- Hands must be washed before beginning or returning to work, and after the following activities: using the restrooms, smoking or tobacco use, taking breaks, handling trash containers or disposing of trash, using the telephone, handling money, coughing and sneezing. Readily understandable signs are posted to instruct employees to wash their hands before beginning or returning to work.
- Work clothes shall be clean.
- Fingernails should be clean and kept short.
- Daily showering is required.
- Gloves should not be taken to the lunchroom or restrooms.
- Tools or parts to be repaired or replaced should not be left near production areas.

- Dangling strings and/or jewelry are prohibited.
- Glass, bottles, cans, cups, and items made of glass are not allowed in the production area.
- If long hair is worn, it must be tied back. Beard and hairnets are required where applicable.

4. Illness and Accident Procedures

Any employee who is ill or appears to be ill with diarrhea or another possibly communicative disease will be sent home or assigned work away from crop production areas and harvested produce.

If an employee has an open wound or cut, it must be bandaged. A first aid kit is available on the farm for injuries. If an employee obtains a wound or cut, or has a nosebleed while working, he/she needs to stop working immediately, contact his/her supervisor, and have it attended to. The employee's work area will be cleaned and disinfected as soon as possible. All product that has come into contact with blood or other bodily fluids should be discarded off the farm. If any bodily fluids come into contact with harvest bins or transport equipment, these surfaces must be disinfected as soon as possible.

All other possible accidents, such as leakage or damage to a restroom or sanitation facility will be attended to as soon as possible, and contaminated soil around facility will be removed and properly disposed of.

All workers are aware of the location of first aid supplies and what steps they should take in case of a first aid emergency to stop work and avoid bodily fluid contact with others or product.

5. General Sanitation

Good sanitation of restroom facilities includes the following:

- Wash walls from top to bottom, as needed.
- Sanitize toilets, urinals, doorknobs, and any other surface inside unit.
- Fill paper products and soap dispensers.
- Remove trash to dumpster.
- Record initials and date of cleaning on "Service Record" sheet when unit is serviced.
- Brushes and any other cleaning utensils used to clean the restrooms must be identified for this use and stored separately from brushes, or any other cleaning utensil used to clean the equipment, utensils, etc.

6. Chemicals

Employees must become familiar with the labels of products they are handling. Handling means opening or closing, mixing, loading, and/or applying the concentrate or working solution of the product(s). All precautionary statements and mixing instructions must be strictly adhered to. Employees need to protect themselves, the food, the equipment, and the packaging materials when working with chemicals.

Employees applying chemicals are trained in:

- Proper chemical handling, including proper disposal of containers
- Re-entry period and other use restrictions
- Required protective gear
- Application rate
- Label information

7. Pesticide Use

MR./MS. A. BeeCee is registered with the county ag department as a grower. The grower identification is attached.

Only employees certified by the XXX County Agricultural Commissioner for pesticide application may apply restricted-use chemicals.

Only those chemicals that are lawfully registered under the Federal Insecticide, Fungicide, and Rodenticide Act and other applicable state law are used on this operation and applied according to label.

FARM REVIEW

8. Water Usage

The source of irrigation water is *PRIVATE WELL AND IRRIGATION DISTRICT*.
Crops are irrigated by *Overhead sprinklers……drip……flood*

Water quality is known to be adequate for the crop irrigation method application, and for chemical and fertigation application; this is shown by water test results in this food safety program. If necessary, steps are taken to protect irrigation water from potential contamination.

All water sources from wells are tested once a year by a certified laboratory and quarterly for surface water sources, if used. Municipal water is tested by the city. Potable water safe for drinking is available to workers at all times. Water testing results for all water sources, including irrigation, human consumption and postharvest application, are available for review.

All irrigation sources are inspected for unauthorized use or potential contamination with chemicals or other dangerous substances.

9. Test Criteria (could be changing with new 2013 proposed FSMA regulations)

We test for fecal coliforms in our well water and the limit is less than 2.2 fecal coliforms/100 mL of water. The Environmental Protection Agency (EPA) established this standard for reclaimed water (treated effluent). This 2.2 fecal coliforms/100 mL limit is considered free of pathogens for nonpotable agricultural purposes by the EPA. If we ever use surface (canal) water we test for generic E coli with an upper limit of 126 MPN / 100 ml. Corrective action for wells is the addition of chlorine per instructions attached.

~~~~~~~~~~~~~~~~~~~~~~~~

Drinking and hand washing	POTABLE WATER
Well water	< 2.2 MPN / 100 ml total coliform Pick one or the other
Surface water, canal	< 126 MPN / 100 ml generic E Coli or

Water in general for irrigation <235 colony forming units (CFU) (or most probable number (MPN), as appropriate) generic E. coli per 100 ml for any single sample or or a rolling geometric mean (n=5) of more than 126 CFU (or MPN, as appropriate) per 100 ml of water. These are the proposed standards as of January 2013 for the FSMA guidelines http://www.fda.gov/Food/FoodSafety/FSMA/ucm334552.htm#E

Documentation: *Water Tests, the results and actions are documented in this manual*
~~~~~~~~~~~~~~~~~~~~~~~~

10. Wildlife and Livestock

Crop production areas are not located near or adjacent to dairy, livestock or fowl production facilities. Additionally, no manure lagoons are located on or near the crop production areas.

Surface water resources are protected from livestock contamination by *FENCING (OR OTHER METHOD)*. Domestic animals will be excluded from crop production areas during the growing and harvesting season.

All fields are routinely monitored for presence or signs of entry by wildlife or neighboring domesticated animals to the fields. When needed, measures will be taken to reduce entry by wild and domesticated animals--including poultry and pets--to minimize the risks of potentially contaminated product or production areas.

11. Manure and Municipal Biosolids

The farm sewage treatment is known to be functioning properly and there is no evidence of leaking or runoff. Additionally, there is no municipal/commercial sewage treatment facility or landfill adjacent to the farm or within ¼ mile.

ABC FARM does not use any manure or municipal biosolids in its operation.

**If used, please outline your operation's manure use plan. DELETE THIS SECTION IF NO MANURE IS USED*

ABC FARM applies raw manure to its production fields at least two weeks before planting or 120 days prior to harvest. Prior to use, the manure is stored such that it does not leach or runoff into adjacent crop production areas.

OR

ABC FARM uses only composted manure and/or treated biosolids are used as a soil amendment. These materials are purchased from *DEF COMPOST, and have been properly treated, composted or exposed to environmental conditions that lower the expected level of pathogens;* the supplier's treatment documentation from the company is attached. A manure application log is attached to this food safety plan that documents all applications, their treatment method and any supporting documentation. These materials are properly stored and are protected to minimize recontamination.

12. Land and Soil

History of the land =

Fields known to be former dumpsites, old homesteads, barn sites, and livestock pens containing excess material or otherwise contaminated soils are not used by *ABC FARMS* in the cultivation of *ABC COMMODITIES (PLEASE NAME)*, nor are they within ¼ mile. This land has been farmed for the last _____ years.

INSERT IF APPLICABLE: There are several sites on the facility that may have a risk of prior contamination. These fields are shown on the enclosed map and those with possible contamination risk

have been tested for _____. Please see attached map and testing results for a comprehensive review of soil contamination risk and planting plans.

During the past *5 YEARS*, no domestic sewage, sewage sludge, septic waste, portable toilet waste, or other product that might contain human feces has been placed on or adjacent to any crop production areas.

During the past *5 YEARS*, no flooding from creeks or rivers has occurred on any part of the land, nor have any adjacent domestic septic tank systems flooded onto the field. If flooding has occurred, areas affected are documented with maps and soil test results and contained herein.

B. FIELD HARVEST AND PACKING PROCEDURES

ABC Farms conducts a pre-harvest assessment of each production area prior to harvesting any crop; risks and possible sources of crop contamination are noted and assessed.

13. Worker Sanitation and Hygiene

Field sanitation units (toilet and hand-washing facilities) are located within a 1/4 mile or 5-minute walk, for all workers. One toilet facility and one hand washing facility shall be provided for each twenty (20) employees or fraction thereof (working more than three hours during the day, including travel time). These sanitation units are in a location that minimizes the potential risk for product contamination. If there are fewer than eleven employees, a toilet facility must be readily available for all workers; home toilet facilities may be used.

All employees and visitors must follow proper health and hygiene practices and use restroom facilities provided. They are equipped with hand-washing facilities with potable running water, single use hand towels, toilet paper and hand soap and are maintained on a scheduled basis that is indicated on the unit, or more frequently as necessary. If restroom facilities are not properly maintained, any employee or visitor should notify the onsite supervisor.

Field sanitation units are directly accessible for servicing and directly accessible in the event of a spill or major leak. In the event of a major spill or leak of field sanitation units, a response plan is in place. The area will be secured and contaminated soil will be removed from the production area and properly disposed.

14. Equipment

All harvesting equipment, including hand harvesting implements, is maintained, cleaned and washed before harvest; hand implements are disinfected on a scheduled basis.

During harvest, equipment will be kept as clean as practical, maintained to prevent contamination from leaking oil, grease, loose parts, and any other source of foreign material contamination.
If equipment does become contamination with oil, grease, pesticides or any other foreign substance, all contaminated product will be disposed of, buried, or put into covered garbage containers and work will stop until equipment can be cleaned, washed and inspected.

All bulbs or lighting on harvest equipment are covered, or protected from breakage. If glass is broken and contaminates product, all product will be properly disposed of and work will stop until equipment can be repaired and all product containers are cleaned, washed and inspected.

For mechanically harvested product, measures are taken to inspect for and remove foreign objects, such as glass, metal, rocks, or other dangerous/toxic items. Efforts are made to remove excessive dirt from product and/or containers during harvest.

Employees shall not use product containers for personal use or to carry any non-produce items. Damaged containers are repaired or disposed of. In ranch or field pack operations, only new or sanitized containers (or new plastic liners) are used for packing product. Packaging materials are properly stored and protected from contamination.

☐ **15. Transportation**

Vehicles transporting product have not been previously used to haul domestic sewage, manure, or hazardous material. Harvested product is covered from the field to packing/storage site.

Self-Certification:

I certify that, at *ABC FARMS*, we comply with all of the Good Agricultural Practices (GAPs) checked off in this document; I review this material annually with my employees; and I have records of worker training.

_____ _____

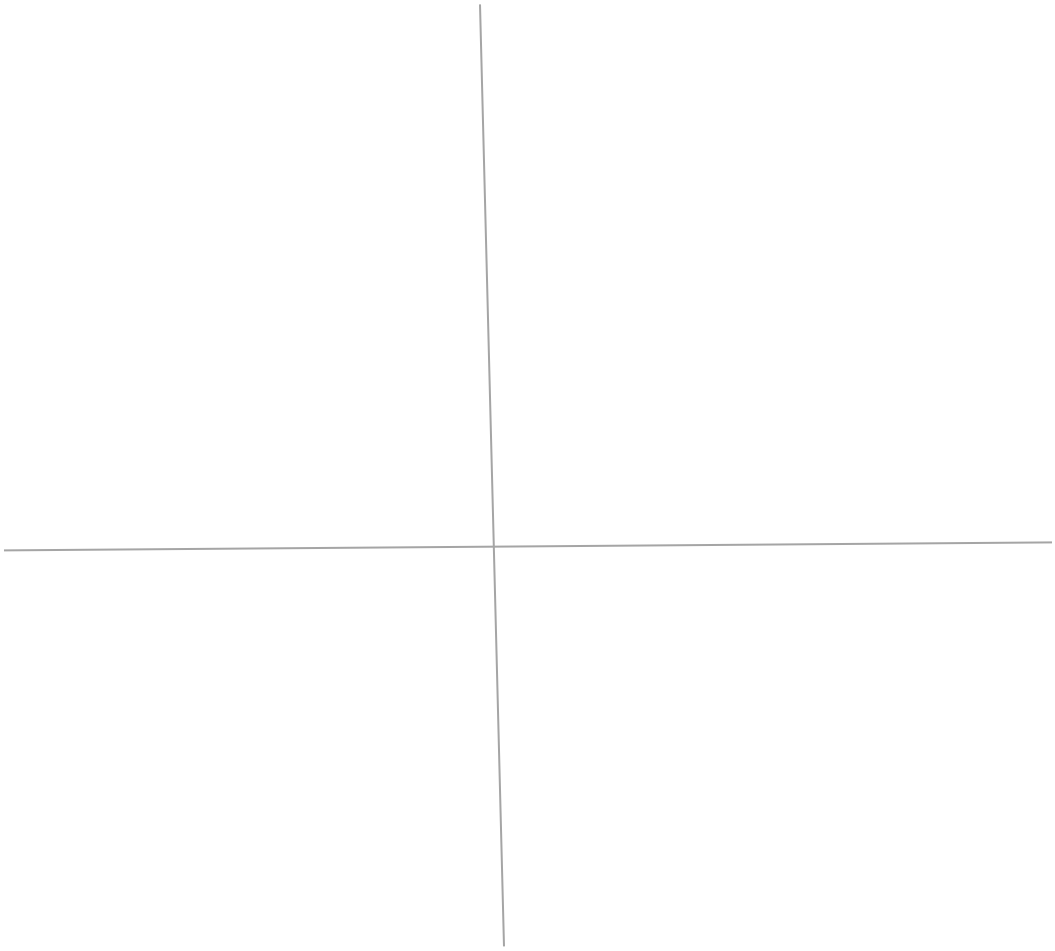
Signed date

Adapted from Oregon Department of Agriculture; their revision 12/5/08
http://www.oregon.gov/ODA/ADMD/docs/pdf/gap_safety_program.pdf
MAP of My Farm – showing wells, fields, field designations if any, packing facilities, permanent restrooms, house structures, etc.

Revised by R. Molinar, UC Cooperative Extension Fresno, December 2011, May 2012
Revised by S. Hardesty, Ag & Resource Economics, UC Davis, January 2012, April 2012. June 2012..

Add sheet(s) - laboratory water test for well(s)

FARM MAP



WORKER TRAINING AND INSTRUCTION RECORD

WORKER NAME	TRAINING DATES	TYPE OF TRAINING	TRAINERS
1_____	_____	_____	_____
2_____	_____	_____	_____
3_____	_____	_____	_____
4_____	_____	_____	_____
5_____	_____	_____	_____
6_____	_____	_____	_____
7_____	_____	_____	_____
8_____	_____	_____	_____
9_____	_____	_____	_____
10_____	_____	_____	_____
11_____	_____	_____	_____
12_____	_____	_____	_____
13_____	_____	_____	_____
14_____	_____	_____	_____
15_____	_____	_____	_____
16_____	_____	_____	_____
17_____	_____	_____	_____
18_____	_____	_____	_____
19_____	_____	_____	_____
20_____	_____	_____	_____

Visitor Log

Name of operation:

Please see the food safety plan for information on food safety procedures for visitors.

Date	Enter/ Exit time	Visitor name/company	Employee initials	Reviewed Hygiene Policy (√)

1. Fertilizer and Pesticide Input Use Record

Name of Operation:_____

Each time you apply fertilizer, herbicide or pesticide, please record it here.

Date of application	Type/Brand	Location/Fields (Where?)	Amount Used (How much?)

2. Monthly Pesticide Use Record

Name of Operation:_____

Each time you apply pesticide, please record it on the pesticide use report available online at:

http://www.cdpr.ca.gov/docs/enforce/prenffrm/prenf183.pdf

(a copy is included in the Food Safety Binder)

3. Toilet & Handwashing Maintenance Record

Date	Cleaned by	Hand Wash Water	Soap	Paper towels	Toilet paper	Toilet cleaned Mark with x
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	
		checked/refilled	checked/refilled	checked/refilled	checked/refilled	

4. Pre-harvest Assessment and Farm Cleaning Record

(Mark with X)

Date	Cleaned by		Pre-harvest Assessment	Harvest Container	Washing Bin	Storage/Packing Shed	Truck

5. Worker Training and Instruction Record

Name of Farm:_____

Manager Responsible:_____

Training Material (Please see Food Safety Manual for content of Worker Training).

Worker Name	Date of Training	Type of Training - Health and Hygiene - Accident and Illness Prevention - Pesticide Worker Safety - Pesticide Handler Training	Name of Trainer(s)

6. Traceback Record

Name of Operation:_____

Please record any produce you sell beyond your farm stand here.

Date Harvested	Date Shipped	Crop	Production Area/field	# Boxes	Picked up/delivered by	Sent to	Total Price

7. Pest/Rodent/Wildlife Control Record

Name of Operation:_____

See food safety manual for Pest/rodent/wildlife control procedures.

Date	Type of Pest Sighted	Location	Action Taken (trap, poison, monitor, fencing,etc.)	Follow up date	Results?

8. Injury/Illness Reporting Record

Name of Operation:_____

See food safety plan for Injury/Illness record procedures.

Date	Name of Worker	Injury	Action Taken	Initials

9. Contamination Response Record

Name of Operation:_____

See food safety plan for contamination response procedures.

Date	Type of Contamination	Location	Action Taken	Initials

10. Mock Recall Record

Name of Operation:_____

See food safety plan for Mock Recall procedures.

Date(s) of recall: _____

Harvest date of recalled product:_____

Product recalled:_____

Total number of cases shipped:_____

Names of customers (wholesale/retailer) contacted that received shipment and total number of cases sent.

1.

2.

3.

4.

Summary of Customer Recall forms: (Total number of cartons still in retailers control and disposition of remaining product that cannot be recalled (total sold, reshipment (to whom) and total destroyed)

11. Visitor Log

Name of operation:

Please see the food safety plan for information on food safety procedures for visitors.

Date	Enter/ Exit time	Visitor name/company	Employee initials	Reviewed Hygiene Policy (√)

Basic Gaps Checklist

WASSH!

General

- **Map of farm** (fields, structures (toilets, buildings, storage sheds), water source, chemical storage site, adjacent land & use).
- **Documentation**: See checklists.

Water

- **Drinking water:** Clean, potable drinking water available at all times.
- **Irrigation water:** Water test results available (total coliform for well water, E. coli for surface) to measure presence of fecal coliform. Treatment as needed.
- **Hand washing water, and produce wash water**: Must be potable.

Animals

- **Wildlife**: Monitor and record presence.
- **Rodents**: Develop pest control program as needed.
- **Domestic animals**: Exclude domestic animals during growing and harvest season.

Surfaces

- **Clean and Sanitize**: Develop SOPs for cleaning and sanitizing all surfaces (buckets, harvest equipment, wash tubs, packing area, transportation vehicles). Packing containers are protected from contamination.

Soils

- **Land Use History:** no known risk of prior contamination.
- **Manure**: Analysis reports available

Health & Hygiene

- **Signage**: (handwashing, designated lunch/smoking area, non-potable water on handwashing station).
- **Field Sanitation units** (toilet & handwashing facilities available for every 20 workers; 1 male & 1 female or if <5 workers, only 1 lockable unit required).
- **Worker Hygiene Training:** Train all workers in (handwashing, hygiene, illness & accident response procedures).
- **Chemical Storage**: in locked, separate shed.

SOPS NEEDED FOR GAPS AND HOW TO WRITE THEM

Well written standard operating procedures, provide direction, improve communication, reduce training time, and improve work consistency.

How to write an SOP:

1. Watch someone do the task
2. Write down everything they do, breaking it into 10 steps or less, long steps should be
   broken into sub-steps – This becomes your first draft
3. Ask employees or co-workers to review and suggest changes
4. Have someone test the SOP by following all of the steps exactly as written – make any
   changes needed
5. Post the SOP where workers can see it, keep another copy in your Food Safety Plan
6. Train all workers to follow the SOP and explain why it is important to follow

General SOP for Cleaning and Sanitizing Food Contact Surfaces

There are 4 general steps that should always be used for cleaning and sanitizing surfaces that come in contact with food. For your SOPs on cleaning harvest and packing containers, you should note if you are using a hose, power washer, or dunk tank, and any other relevant details, such as the type of disinfectant used.

1. Pre-rinse surface with clean water to remove any visible soil
2. Wash with food-safe soap and water, and brush
3. Rinse with water to remove soil and soap residues
4. Sanitize with disinfectant
   - If using Storox or other hydrogen peroxide/peracetic acid product, note the percent and parts per million used, how measured, etc...
   - If using chlorine, note percent solution used, and how measured, etc...

Following are some examples of SOPs and a list of SOPs required by the USDA GAPs Audit. Your SOPs should reflect your operation, that is, add the names of people to be informed of incidents, phone numbers to call, products to use, and exact places to dispose of contaminated items.

EXAMPLES OF SOPs

__[G-3] If you provide field workers with water to drink in the field there needs to be an SOP that indicates you provide potable water for field workers in some type of container (describe container), the potable water source used to fill the container, how often, and an SOP for cleaning and sanitizing the container on a scheduled basis. The water container should also be plainly labeled as "Drinking water."

__[G-13] Policy and SOP on how to handle product and surfaces that come in contact with bodily fluids

1. Put on latex gloves
2. If large enough, isolate contaminated area by marking off with tape or string
3. Notify food safety coordinator _____
4. Dispose of any contaminated product in a covered trash bin
5. Wash and sanitize surfaces first with soap and water and then with 10% bleach solution
6. Remove and wash any affected clothing
7. Record incident in illness/injury log

__[1-19] SOP FOR TREATING COMPOST

1. The compost pile should be maintained an internal temperature between 130° and 150° degrees Fahrenheit.
2. It must achieve a minimum of 131° F for 3 days at a depth of 3 feet from the surface of the pile in the static or 'precondition' stage, or in the turned windrow phase, have achieved a minimum of 131° F at either the one foot or three foot depth for a minimum of 15 days
3. The pile will be turned a minimum of 5 turnings during the period while it exceeds 131°F in order to kill bugs, seeds and any internal parasites or disease in the compost.
4. Temperatures and dates of turning compost piles are recorded in the compost log
5. If storing compost or other soil amendments prior to application, the pile is covered to
   reduce the chance of runoff, leaching, wind spread, or recontamination.

__[3-7] SOP FOR TREATING PROCESSING WATER

1. If necessary, rinse out dunk tank to remove soil
2. Fill dunk tank with water
3. Measure temperature of water – make sure that it is not greater than 10 degrees colder
   than product for tomatoes, cantaloupes, peppers, apples, and potatoes or processing
   water could be drawn into fruit pulp.

4. Measure and add disinfectant so that it is at appropriate level (you will need to write
   your own instructions depending on disinfectant and size of tank)
5. If using chlorine, measure pH. pH should be between 6 and 7.5, Chlorine levels should
   be between 50 and 200 ppm, depending on the crop
6. Monitor level of disinfectant (how often? may depend on crop being washed, explain how you monitor the level – test strips, digital or automatic monitor)
7. Monitor temperature (how often?)
8. Water in dunk tank should be changed (describe how often)

CHECKLIST OF SOPs REQUIRED BY USDA GAPs

GENERAL SECTION

__[G-13] Policy and SOP on how to handle product and surfaces that come in contact with bodily fluids
__[G-14] First aid policy and SOP for cuts and injuries

FARM REVIEW

__[1-19] Policy and SOP (if applicable) on how composted manure is treated

FIELD HARVESTING AND PACKING

__[2-5] SOP for how to respond if there is a toilet overflow, septic discharge or tipped over field sanitation unit
__[2-6] Policy and SOP for cleaning and sanitizing field harvest containers (may vary by type of crop – e.g. containers used for leafy greens may be cleaned more frequently than those used for root crops)
__[2-7] Policy and SOP for cleaning and sanitizing all hand harvesting equipment and implements (knives, etc...)
__[2-9] Policy and SOP for cleaning and sanitizing bulk hauling vehicles
__[2-11] SOP for how to handle glass or plastic breakage and possible contamination of product
__[2-12] SOP for how to handle contamination of product by pesticides, chemicals, petroleum or other contaminating factors
__[2-19] Policy and (if applicable, SOP) for using only new or sanitized containers for packing product (cleaning SOP not needed if you are only using new containers)
__[2-21] Policy and SOP for uniquely identifying product for traceability

HOUSE PACKING

__[3-4] SOP for monitoring temperature of water in dump tanks (if necessary)
__[3-6] SOP for cleaning and/or sanitizing water contact surfaces such as dump tanks, hydrocoolers, etc..
__[3-7] SOP for treating processing water to reduce risks of microbial contamination (addition of disinfectants, measuring pH (if necessary), monitoring of temperature and disinfectant level, how frequently processing water is changed (can be per type of crop), whether crop is single, double or triple washed, etc...)
__[3-8] SOP for cleaning and/or sanitizing food contact surfaces
__[3-11] SOP for cleaning and sanitizing ice machine – this must be done on a regular schedule and recorded in a log
__[3-26] SOP for how product is handled if it is dropped or spilled on floor
__[3-31] SOP for Pest control program for house packing facility

STORAGE AND TRANSPORTATION

__[4-7] SOP for how product is handled if it is dropped or spilled on floor
__[4-14] SOP for pest control program for storage facility
__[4-24] SOP for checking and cleaning transportation equipment

Source: http://www.uvm.edu/~susagctr/Documents/gapresHowtoWriteSOPsforGAPs412.pdf

On-Farm Food Safety Assessment

Daily Check List

Pre-Harvest:

1. Are toilet and wash facilities properly located, clean and stocked with toilet paper, wash water, soap, and paper towels?
2. Is drinking water and shade available to all workers?
3. Are harvest containers available, clean, well located and protected?
4. Is harvest, washing and packing equipment and area clean, sanitized and in good condition?
5. Are shade or other pre-cool measures in place?
6. Is there evidence of animal feces, dead animals, animal crop damage or other physical contamination in the crop area that needs to be isolated for "no-harvest"?
7. Are there other notable sources of contamination such as dump sites, fuels or chemicals, manure, burning debris, or water runoff that may affect food safety?
8. Is transportation equipment clean and available with protective covering?
9. Are all signs posted to a) instruct workers and visitors to wash hands before and after handling food, harvesting, eating and smoking, and b) indicating that wash water is not potable?
10. Have all new workers and visitors been trained in proper hygiene practices and their training been recorded?
11. Have all traps or pest control measures been checked and any animals disposed?

End of Day:

1. Are harvest buckets and washing bins cleaned and sanitized?
2. Has the drinking water container been cleaned and sanitized?
3. Is the packing area cleaned, sanitized and free of debris?
4. Is all packaging stored in a safe, secure location.
5. Are all chemicals stored in a safe, locked storage cabinet away from the packing area?
6. Have all Personal Protective Equipment been cleaned?
7. Have all garbage cans been emptied?
8. Do any supplies need to be updated (hand gloves, cleansers, sanitizers, toilet or hand-washing supplies, first aid kit, record keeping sheets, signage)
9. **Have all activities been recorded in the food safety record keeping sheets?**

Food Safety Tips for School Gardens

Schools across the nation are using gardens to help children discover where food comes from and to develop healthy eating habits. Gardens provide a way for children to grow, harvest, prepare, and ultimately taste new fruits and vegetables. When appropriate precautions are taken fruits and vegetables from school gardens can be served safely to students. Before starting a school garden, check with your local health department about their policies on serving food grown in gardens in school meals.

Potential food safety risks should be taken seriously. Produce grown in gardens can be contaminated during growth, harvest, transportation, preparation, or service and result in foodborne illness. The practices addressed in this document will help program operators enhance the safety of fruits and vegetables grown in school gardens.

Produce grown in school gardens may also be served in classrooms. These food safety tips are also applicable for produce served in classrooms. For additional tips, see *Handling Fresh Produce in Classrooms*.

Site Selection, Materials, and Water Use

- Locate gardens away from potential contamination sources (garbage, utilities, animals, water runoff, flooding, septic systems, etc.).
- Contact the utility companies or call 811, the national "Call Before You Dig" number, a few days before digging to ensure that you avoid gas or electric lines.
- Identify soil history from all sources. Have soil tested to determine levels of contaminants such as chemicals, pesticides, lead, etc., especially if located near high-traffic zones. Contact your local Cooperative Extension Office for information on soil testing services available in your area.
- Create reasonable barriers to keep wild animals away from the garden. Examples include fencing or cages over produce items such as strawberries, leafy greens, etc.
- Consider purchasing soil that has been commercially packaged and labeled for growing food crops. Soil purchased from a commercial source ensures traceability.
- Use non-toxic, non-leaching materials for raised-bed gardens, containers, stakes, or trellises. Do not use pressure-treated wood, used tires, single use plastics, old railroad ties, etc.
- Select non-allergenic and non-toxic plants. Check with your local Cooperative Extension office if you need assistance determining plant safety or toxicity.

Food Safety Tips for School Gardens, continued

- Test all water sources annually, except municipal sources, for potentially harmful organisms, such as fecal coliforms, to make sure they meet the standards of the Environmental Protection Agency (EPA). Test water collected in cisterns. Contact your local Cooperative Extension Office for assistance.
- Maintain water testing records.
- Use food grade containers to transport water.

Chemical and Fertilizer Use

- Do not use any pesticides or herbicides due to potential health hazards to children.
- Check with your county Cooperative Extension Office for the best non-chemical method of control for local pest problems.
- Read and follow the manufacturer's instructions when using fertilizer.
- Secure all fertilizers in a safe and locked location when not in use.
- Allow only adults to handle fertilizers.
- Check with your local health department about applicable Occupational Health and Safety Administration (OSHA) hazard communication requirements. Maintain Material Safety Data Sheets (MSDS) as required. More information is available at: http://www.osha.gov/dsg/hazcom/index.html.
- Maintain information on safe use and potential hazards that is available on product labels or from the manufacturer, for all fertilizers.
- Label the container with the common name of the fertilizer if transferring fertilizers into a dispensing container. Never use a food container.
- Dispose of fertilizer and its containers according to the manufacturer's instructions.

Compost and Manure Use

Composting is a highly complex process that requires strict attention to specific procedures and conditions. This fact sheet summarizes key points, but is not comprehensive. Contact your local Cooperative Extension Office, or a composting expert for assistance.

- Avoid the use of raw manure, as it may increase the risk of contamination from pathogens.
- Use of composting manure in school gardens is not recommended due to increased risk of contamination from pathogens that are not completely destroyed. Contact your Cooperative Extension Office to ensure that proper procedures are followed if you plan to compost manure for a school garden.
- Consider purchasing traceable, commercially prepared compost, if manure-based compost is desired.
- Consider using worms to form vermicompost. Learn about vermicomposting at: http://www.bae.ncsu.edu/topic/vermicomposting/.

Food Safety Tips for School Gardens, continued

- Add only plant products, such as fresh fruit and vegetable culls from food production (apple and pear cores and vegetable trimmings), to a school compost pile. Other plant material, such as grass clippings, leaves, and twigs also can be added to fruit and vegetable clippings.
- Do not use animal products, animal waste, or any cafeteria waste in a compost pile, as it might contain animal products. Harmful pathogens might be introduced through animal products and must be properly managed to ensure their destruction.
- Wear gloves when handling compost material.
- Locate the compost pile in a secure location away from potential contamination, such as garbage, water runoff, etc. Restrict access by animals as much as possible.

Growing and Harvesting Produce

A school garden provides an opportunity for children and volunteers to learn about how to handle food safely. The following are some food safety tips to follow when growing and harvesting produce.

- Ensure that all persons, including staff, students, and volunteers receive basic food and gardening safety training instructions according to local health regulations. The following topics are recommended:
  - Handwashing and personal hygiene
  - Cleaning and sanitizing garden equipment and containers used to hold produce
  - Handling produce during harvest, washing, and transportation
  - Glove use
- Ensure that volunteers are covered by the school district insurance policy in the event of accident or injury.
- Require signed permission slips for all student gardeners. Permission slips should list potential hazards of working in a school garden and identify any allergies the child may have.
- Do not allow anyone to work in the garden while sick, or until 24 hours after symptoms, such as vomiting or diarrhea, have subsided.
- Ensure that all harvesters wash hands thoroughly in warm, soapy water for at least 10 to 15 seconds, and then rinse with potable water. Ensure that all open cuts or wounds on hands, arms, or legs are properly covered prior to participating in the harvest.
- Require harvesters to wear closed-toed shoes to prevent cuts, stings, or other injuries.
- Consider using single-use disposable gloves when harvesting, or handling, fresh produce as an extra precaution.
- Harvest the garden regularly and remove any rotten produce.

Food Safety Tips for School Gardens, continued

- Use cleaned and sanitized food grade containers, such as plastic bins or buckets, to hold harvested produce. Do not use garbage bags, garbage cans, and any container that originally held chemicals. These types of containers are made from materials that are not intended for food use.
- Clean harvesting tools, such as knives, scissors, etc., with soap and potable water immediately before and after each gardening session.

Using School Garden Produce in your School Meal Program

- Check with your local health department to ensure that local regulations permit food from gardens to be served as part of school meals.
- If the harvest from the school garden will be used in the school meals program, the school garden coordinator should work cooperatively with the school nutrition director to plan and implement the garden.
- Discuss food safety practices in the garden with school garden coordinators. Consider asking gardeners to document their practices. Use the information in this document as a guide to identify appropriate practices.
- Accept produce harvested from school gardens only when school nutrition staff is present to receive it. All produce dropped off or left when staff is not present should not be used in the school meal programs.
- See Best Practices: *Handling Fresh Produce in Schools* for guidelines on receiving, storage, preparation, and service of fresh produce in schools.
- Reject produce that does not meet school nutrition program standards.
- Receive and inspect produce harvested from school gardens according to the same procedures used to inspect produce from the district's distributors.
- Do not use any produce that has been noticeably contaminated by animals or insects.
- Refrigerate garden produce immediately, unless the particular item is normally held at room temperature.
- Store, prepare, and serve school garden produce separately from other sources of produce to maintain traceability.
- Document service of school garden produce on the menu management/ food production record. See *Ensuring Traceability of Fresh Produce* for more information.
- Ensure that liability for a potential foodborne illness caused by produce grown in school gardens is covered by your school district.

Food Safety Tips for School Gardens, continued

Addressing Community Donations

Members of your local community, or staff or faculty at your school(s) may want to donate produce grown in private or community gardens to your school meal programs or to your school(s). Although their intentions are good, these products must be safe and of acceptable quality to serve in your school meals program. Before accepting donations, ensure that donated produce food safety practices have been followed to grow, handle, and transport the produce.

- Check all local and state health regulations regarding receiving community donations before you accept these products.
- Provide information to community members about USDA policies and regulations for school meal programs and state and local health requirements that you must follow. Address questions in a positive manner.
- Determine whether your school district has liability insurance to cover any food safety issues that may result from produce received from private or community gardens. These entities typically do not carry product liability insurance for potential food safety risks.
- Develop guidelines and expectations for growing and handling practices for any fruits or vegetables used in your schools. Share this information with individuals or groups who are interested in donating produce to your schools.
- Visit any gardens that supply produce to your school foodservice program to evaluate food safety practices. Discuss the practices in this document with gardeners. (See *Veriflying On-Farm Food Safety* for additional information)

- Only accept donations that are dropped off when a school nutrition staff member is present to receive them.
- Conduct a visual inspection of any vehicle used to transport produce to a school to assess whether it is clean. A vehicle should not be used to transport fresh produce if it is also used to transport live animals.
- Rotten or damaged produce should not be accepted.

Food Safety Tips for School Gardens, continued

Resources

Verifying On-Farm Food Safety

Ensuring Traceability of Fresh Produce

Best Practices: Handling Fresh Produce in Schools

Handling Fresh Produce in Classrooms

Healthy School Meals Resource System School Gardens and Farm to School Resources: http://healthymeals.nal.usda.gov/nal_display/index.php?info_center=14&tax_level=2&tax_subject=526&level3_id=0&level4_id=0&level5_id=0&topic_id=2314&&placement_default=0

National Gardening Association, www.kidgardening.org

Garden to Table: Five steps to food safe fruit and vegetable home gardening. University of Rhode Island, Connecticut, Maine, New Hampshire and Vermont. http://www.sde.ct.gov/sde/LIB/sde/pdf/DEPS/Nutrition/OPmemos/10/5stepsOM1010.pdf

Grow It Healthy, University of Maryland Extension, www.growit.umd.edu

Safety in the garden, California, http://www.cde.ca.gov/ls/nu/he/gardensafety.asp

Bucklin-Sporer, A. & Pringle, R.K. (2010). *How to grow a school garden: A complete guide for parents and teachers.* Portland, OR: Timber Press, Inc.

McGrath, M. (2006). *Book of Compost.* New York: Sterling Publishing Company, Inc.

Note: USDA's Food and Nutrition Service has addressed questions regarding the operation of a school garden in Memo SP 32-2009, dated July 29, 2009: http://www.fns.usda.gov/cnd/governance/Policy-Memos/2009/SP_32-2009_os.pdf.

While this policy memo outlines how school food authorities may operate or purchase foods from school gardens, school nutrition programs are not required to grow or use any produce from school gardens.

Water and Food Safety

Shermain Hardesty
Ag & Resource Economics-UC Davis/UC Small Farm Program

Food Safety Basics for Urban Farmers
June 8, 2017

Water-Key Component of Farm & Community Garden Food Safety

- Water provides moisture to crops
  - But it can also carry chemicals and bacteria
- Common Sources of Agricultural Water
  - Surfaces-canals, rivers, streams
  - Reservoirs
  - Wells
  - Municipal sources

Municipal Water

- US EPA has established Federal drinking water standards and California has similar standards
  - Some are stricter
  - See handout comparing US & California standards
- Required to be tested annually in California
- Must meet State drinking water standards

MAXIMUM CONTAMINANT LEVELS AND REGULATORY DATES FOR DRINKING WATER U.S. EPA VS CALIFORNIA
LAST UPDATED JULY 2014

Contaminant	U.S. EPA		California	
	MCL (mg/L)	Date[a]	MCL (mg/L)	Effective Date
Inorganics				
Aluminum	0.05 to 0.2[b]	1/91	1 0.2[b]	2/25/89 9/8/94
Antimony	0.006	7/92	0.006	9/8/94
Arsenic	0.05 0.010	eff: 6/24/77 eff: 1/23/06	0.05 0.010	77 11/28/08
Asbestos	7 MFL[c]	1/91	7 MFL[c]	9/8/94
Barium	1 2	eff: 6/24/77 1/91	1	77
Beryllium	0.004	7/92	0.004	9/8/94
Cadmium	0.010 0.005	eff: 6/24/77 1/91	0.010 0.005	77 9/8/94
Chromium	0.05 0.1	eff: 6/24/77 1/91	0.05	77
Copper	1.3[d]	6/91	1[b] 1.3[d]	77 12/11/95
Cyanide	0.2	7/92	0.2 0.15	9/8/94 6/12/03

Municipal Water

- Must meet State drinking water standards
- Alameda County issues an annual water quality report for its drinking water

ALAMEDA COUNTY WATER DISTRICT

2013 WATER QUALITY REPORT

Dear ACWD Customer:

This report summarizes the results of the thousands of analyses conducted on your drinking water during 2013. I'm pleased to report that your water consistently met or surpassed all federal and state drinking water standards for public health and safety over the course of the year. To learn more about the quality of your drinking water, turn to the following pages:

ACWD
ALAMEDA COUNTY WATER DISTRICT

43885 South Grimmer Blvd.
Fremont, CA 94538

PRESORTED STANDARD
U.S. POSTAGE
PAID
PERMIT NO. 2
HAYWARD CA

Report includes only key chemicals

2013 WATER QUALITY INFORMATION

In 2013, the laboratory analysts and water treatment plant operators in ACWD's state certified laboratories and satellite laboratories analyzed for more than 180 substances and found very few of them in your water. In all cases, your water was in compliance with federal and state standards for public health and safety. There are two types of standards ACWD is required to meet:

Primary Drinking Water Standards set limits for substances in water that may be harmful to humans if consumed in excess. They include MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards deal with aesthetic qualities such as taste and odor which relate to consumer acceptance rather than health factors.

A summary of key results for 2013 is presented in the following tables. Technical terms and abbreviations used in the tables are explained below.

Primary Drinking Water Standards for Alameda County's key parameters

Parameters	Units	Primary MCL or [MRDL]
Fluoride (naturally-occurring) [1]	ppm	2
Fluoride (treated water) [1]	ppm	2
Bromate	ppb	10
Disinfectant Residual (as Cl_2) [2]	ppm	[4]
Gross Alpha [3]	pCi/L	15
5 Haloacetic Acids (HAA5) [7]	ppb	60
Nitrate (as NO_3)	ppm	45
Nitrate + Nitrite (as N)	ppm	10
Radium-226 [3]	pCi/L	NA [8]
Total Coliform [5]	%	5 [5]
Total Trihalomethanes (TTHMs) [7]	ppb	80
Turbidity [6]	NTU	TT = 0.1 or 0.3 [6] TT = 5.0 [6]

Secondary Drinking Water Standards

Parameters	Units	Secondary MCL
Chloride	ppm	500
Copper	ppm	1
Color	units	15
Manganese	ppb	50
Odor	TON	3
Specific Conductance	µS / cm	1,600
Sulfate	ppm	500
Total Dissolved Solids	ppm	1,000

Alameda Co Well Water Testing to meet Potable Water Standards

- Chemical & Bacterial Testing
  - samples must be drawn at well, before any treatment or filtration
  - samples can be taken by lab personnel or others if using bottles from the lab & the lab procedures
  - testing must be done by a California State Approved Lab; a list of local labs is on back of this sheet.
  - write the address or APN of where sample was taken, on the lab slip.

Chemical	Maximum
• Chloride	500 mg/l
• Color	15 Units
• Copper	1,000 µg/l (micrograms per liter)
• Iron	300 µg/l
• Manganese	50 µg/l
• Nitrate (as NO_3)	45.0 mg/l
• Odor - Threshold	3 Units
• Sulfate	500 mg/l
• Total Dissolved Solids	1,000 mg/l
• Turbidity	5 Units
• Zinc	5,000 µg/l
• Bacteria	Must be absent of Coliform

Captured Rainwater

- If capture rainwater is used only to irrigate crops, it does not need to be potable
  - Confirm with Alameda Co Environmental Health Dept
- Captured rainwater should be examined weekly
  - prone to rodents, mosquitoes, algae growth, insects and lizards
  - may seep chemicals, insects, dirt or animals droppings
- Captured rainwater should not be used to wash harvested produce or for handwashing

FSMA Water Quality Criteria for Water Used During Growing Activities*

- Each source of production water (including captured rainwater) must be tested to evaluate whether its water quality profile meet the following criteria:
  - **126 or less** colony forming unites (CFU) generic *E. coli* per 100 mL water geometric mean (GM)

    AND
  - **410 or less** CFU generic E. coli per 100 mL water statistical threshold value (STV)
- This requirement is difficult to understand. But it basically means that your testing costs will be more than your water cost savings from harvesting rainwater

*SOURCE: Produce Safety Alliance Train the Trainer, Module 5.1, slide 21

BSK Associates Engineers & Laboratories

Certificate of Analysis

[redacted]
P.O. Box 828
Selma, CA 93662

Report Issue Date: 03/21/2012 14:39
Received Date: 03/13/2012
Received Time: 10:42

Lab Sample ID: A2C0852-01
Sample Date: 03/13/2012 10:42
Sample Type: Routine
Sample Control Qualifiers: SC02
Sample Description: Water Canal MID

Sampled by: [redacted]
Matrix: Water

Microbiology

Analyte	Method	Result	RL	Units	Batch	Prepared	Qual
E.Coli by 1x10 MTF							
*E. Coli	SM 9221 F	>23	1.1	MPN/100 mL	A202592	03/13/12 15:18	

Drip Irrigation

- Consider using drip irrigation wherever possible. It minimizes the risk of contamination because above-ground plant parts are not directly wetted

CDFA's Small Farm Food Safety Guidelines Related to Water

- **If you use only municipal water, you do not need to get your water tested so you can ignore the 2 water testing requirement in this slide**
- Prior to planting, test irrigation water and, if contaminated, find the source and fix it or request that your water supplier do so
- During the growing season, test irrigation water as close to point-of-use as possible at least once during the growing season
- Ensure that water used for spray applications of pesticides and fertilizers is not contaminated

In summary

- Using municipal water for all of your crop production, harvesting and postharvest activities will save you from the hassles and costs of having to get your water tested

MAXIMUM CONTAMINANT LEVELS AND REGULATORY DATES FOR DRINKING WATER U.S. EPA VS CALIFORNIA

LAST UPDATED JULY 2014

Contaminant	U.S. EPA		California	
	MCL (mg/L)	**Date**[a]	**MCL** (mg/L)	**Effective Date**
Inorganics				
Aluminum	0.05 to 0.2[b]	1/91	1 0.2[b]	2/25/89 9/8/94
Antimony	0.006	7/92	0.006	9/8/94
Arsenic	0.05 0.010	eff: 6/24/77 eff: 1/23/06	0.05 0.010	77 11/28/08
Asbestos	7 MFL[c]	1/91	7 MFL[c]	9/8/94
Barium	1 2	eff: 6/24/77 1/91	1	77
Beryllium	0.004	7/92	0.004	9/8/94
Cadmium	0.010 0.005	eff: 6/24/77 1/91	0.010 0.005	77 9/8/94
Chromium	0.05 0.1	eff: 6/24/77 1/91	0.05	77
Copper	1.3[d]	6/91	1[b] 1.3[d]	77 12/11/95
Cyanide	0.2	7/92	0.2 0.15	9/8/94 6/12/03
Fluoride	4 2[b]	4/86 4/86	2	4/98
Hexavalent Chromium	-	-	0.010	7/1/14
Lead	0.05[e] 0.015[d]	eff: 6/24/77 6/91	0.05[e] 0.015[d]	77 12/11/95
Mercury	0.002	eff: 6/24/77	0.002	77
Nickel	Remanded		0.1	9/8/94
Nitrate	(as N) 10	eff: 6/24/77	(as N03) 45	77
Nitrite (as N)	1	1/91	1	9/8/94
Total Nitrate/Nitrite (as N)	10	1/91	10	9/8/94
Perchlorate	-	-	0.006	10/18/07
Selenium	0.01 0.05	eff: 6/24/77 1/91	0.01 0.05	77 9/8/94
Thallium	0.002	7/92	0.002	9/8/94
Radionuclides				
Uranium	30 ug/L	12/7/00	20 pCi/L 20 pCi/L	1/1/89 6/11/06
Combined Radium - 226+228	5 pCi/L	eff: 6/24/77	5 pCi/L 5 pCi/L	77 6/11/06
Gross Alpha particle activity (excluding radon & uranium)	15 pCi/L	eff: 6/24/77	15 pCi/L 15 pCi/L	77 6/11/06
Gross Beta particle activity	4 millirem/yr	eff: 6/24/77	50 pCi/L[f] 4 millirem/yr	77 6/11/06
Strontium-90	8 pCi/L	eff: 6/24/77 now covered by Gross Beta	8 pCi/L[f] 8 pCi/L[f]	77 6/11/06
Tritium	20,000 pCi/L	eff: 6/24/77 now covered by Gross Beta	20,000 pCi/L[f] 20,000 pCi/L[f]	77 6/11/06

Contaminant	U.S. EPA		California	
	MCL (mg/L)	**Date**[a]	**MCL** (mg/L)	**Effective Date**
VOCS				
Benzene	0.005	6/87	0.001	2/25/89
Carbon Tetrachloride	0.005	6/87	0.0005	4/4/89
1,2-Dichlorobenzene	0.6	1/91	0.6	9/8/94
1,4-Dichlorobenzene	0.075	6/87	0.005	4/4/89
1,1-Dichloroethane	-	-	0.005	6/24/90
1,2-Dichloroethane	0.005	6/87	0.0005	4/4/89
1,1-Dichloroethylene	0.007	6/87	0.006	2/25/89
cis-1,2-Dichloroethylene	0.07	1/91	0.006	9/8/94
trans-1,2-Dichloroethylene	0.1	1/91	0.01	9/8/94
Dichloromethane	0.005	7/92	0.005	9/8/94
1,3-Dichloropropene	-	-	0.0005	2/25/89
1,2-Dichloropropane	0.005	1/91	0.005	6/24/90
Ethylbenzene	0.7	1/91	0.68 0.7 0.3	2/25/89 9/8/94 6/12/03
Methyl-tert-butyl ether (MTBE)	-	-	0.005[b] 0.013	1/7/99 5/17/00
Monochlorobenzene	0.1	1/91	0.03 0.07	2/25/89 9/8/94
Styrene	0.1	1/91	0.1	9/8/94
1,1,2,2-Tetrachloroethane	-	-	0.001	2/25/89
Tetrachloroethylene	0.005	1/91	0.005	5/89
Toluene	1	1/91	0.15	9/8/94
1,2,4 Trichlorobenzene	0.07	7/92	0.07 0.005	9/8/94 6/12/03
1,1,1-Trichloroethane	0.200	6/87	0.200	2/25/89
1,1,2-Trichloroethane	0.005	7/92	0.032 0.005	4/4/89 9/8/94
Trichloroethylene	0.005	6/87	0.005	2/25/89
Trichlorofluoromethane	-	-	0.15	6/24/90
1,1,2-Trichloro-1,2,2-Trifluoroethane	-	-	1.2	6/24/90
Vinyl chloride	0.002	6/87	0.0005	4/4/89
Xylenes	10	1/91	1.750	2/25/89

Contaminant	U.S. EPA		California	
	MCL (mg/L)	**Date**[a]	**MCL** (mg/L)	**Effective Date**
SOCS				
Alachlor	0.002	1/91	0.002	9/8/94
Atrazine	0.003	1/91	0.003 0.001	4/5/89 6/12/03
Bentazon	-	-	0.018	4/4/89
Benzo(a) Pyrene	0.0002	7/92	0.0002	9/8/94
Carbofuran	0.04	1/91	0.018	6/24/90
Chlordane	0.002	1/91	0.0001	6/24/90
Dalapon	0.2	7/92	0.2	9/8/94
Dibromochloropropane	0.0002	1/91	0.0001 0.0002	7/26/89 5/3/91
Di(2-ethylhexyl)adipate	0.4	7/92	0.4	9/8/94
Di(2-ethylhexyl)phthalate	0.006	7/92	0.004	6/24/90
2,4-D	0.1 0.07	eff: 6/24/77 1/91	0.1 0.07	77 9/8/94
Dinoseb	0.007	7/92	0.007	9/8/94
Diquat	0.02	7/92	0.02	9/8/94
Endothall	0.1	7/92	0.1	9/8/94
Endrin	0.0002 0.002	eff: 6/24/77 7/92	0.0002 0.002	77 9/8/94
Ethylene Dibromide	0.00005	1/91	0.00002 0.00005	2/25/89 9/8/94
Glyphosate	0.7	7/92	0.7	6/24/90
Heptachlor	0.0004	1/91	0.00001	6/24/90
Heptachlor Epoxide	0.0002	1/91	0.00001	6/24/90
Hexachlorobenzene	0.001	7/92	0.001	9/8/94
Hexachlorocyclopentadiene	0.05	7/92	0.05	9/8/94
Lindane	0.004 0.0002	eff: 6/24/77 1/91	0.004 0.0002	77 9/8/94
Methoxychlor	0.1 0.04	eff: 6/24/77 1/91	0.1 0.04 0.03	77 9/8/94 6/12/03
Molinate	-	-	0.02	4/4/89
Oxamyl	0.2	7/92	0.2 0.05	9/8/94 6/12/03
Pentachlorophenol	0.001	1/91	0.001	9/8/94
Picloram	0.5	7/92	0.5	9/8/94
Polychlorinated Biphenyls	0.0005	1/91	0.0005	9/8/94
Simazine	0.004	7/92	0.010 0.004	4/4/89 9/8/94
Thiobencarb	-	-	0.07 0.001[b]	4/4/89 4/4/89
Toxaphene	0.005 0.003	eff: 6/24/77 1/91	0.005 0.003	77 9/8/94
2,3,7,8-TCDD (Dioxin)	$3x10^{-8}$	7/92	$3x10^{-8}$	9/8/94
2,4,5-TP (Silvex)	0.01 0.05	eff: 6/24/77 1/91	0.01 0.05	77 9/8/94

Contaminant	U.S. EPA		California	
	MCL (mg/L)	**Date**[a]	**MCL** (mg/L)	**Effective Date**
Disinfection Byproducts				
Total Trihalomethanes	0.100 0.080	11/29/79 eff: 11/29/83 eff: 1/1/02 [g]	0.100 0.080	3/14/83 6/17/06
Haloacetic acids (five)	0.060	eff: 1/1/02 [g]	0.060	6/17/06
Bromate	0.010	eff: 1/1/02 [g]	0.010	6/17/06
Chlorite	1.0	eff: 1/1/02 [g]	1.0	6/17/06
Treatment Technique				
Acrylamide	TT[h]	1/91	TT[h]	9/8/94
Epichlorohydrin	TT[h]	1/91	TT[h]	9/8/94

a. "eff." indicates the date the MCL took effect; any other date provided indicates when US EPA established (i.e., published) the MCL.
b. Secondary MCL.
c. MFL = million fibers per liter, with fiber length > 10 microns.
d. Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
e. The MCL for lead was rescinded with the adoption of the regulatory action level described in footnote d.
f. Gross beta MCL is 4 millirem/year annual dose equivalent to the total body or any internal organ; Sr-90 MCL = 4 millirem/year to bone marrow; tritium MCL = 4 millirem/year to total body
g. Effective for surface water systems serving more than 10,000 people; effective for all others 1/1/04.
h. TT = treatment technique, because an MCL is not feasible.

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
ALEX BRISCOE, Agency Director

DEPARTMENT OF ENVIRONMENTAL HEALTH
1131 Harbor Bay Parkway Alameda, Ca 94502
(510)567-6700 (510)337-9432 (Fax)

Drinking Water Well Testing

Before a Building Permit can be issued for a building not served by public water, the quality & quantity of well water must be approved by this Department. Send a copy of the chemical, bacterial & flow test report to this Department (to the inspector handling the case).

- Chemical & Bacterial Testing
  - samples must be drawn at well, before any treatment or filtration
  - samples can be taken by lab personnel or others if using bottles from the lab & the lab procedures
  - testing must be done by a California State Approved Lab; a list of local labs is on back of this sheet.
  - write the address or APN of where sample was taken, on the lab slip.

Chemical	Maximum
• Chloride	500 mg/l
• Color	15 Units
• Copper	1,000 µg/l (micrograms per liter)
• Iron	300 µg/l
• Manganese	50 µg/l
• Nitrate (as NO_3)	45.0 mg/l
• Odor - Threshold	3 Units
• Sulfate	500 mg/l
• Total Dissolved Solids	1,000 mg/l
• Turbidity	5 Units
• Zinc	5,000 µg/l
• Bacteria	Must be absent of Coliform

- Flow Test
  - must be done by a Licensed Water Well Driller & **witnessed by this Department**. Call & arrange with inspector 3 business days in advance. A list of local drillers is on the back of this sheet.
  - well flow must be ≥ 5 gpm for 4 hours per house. ≥ 3 gpm well flow may be acceptable with ≥ 1200 gallon potable water storage per house
  - fee for this Department's evaluating the lab reports & witnessing the flow test is $488.

This Department does not issue Permits for drilling or abandoning drinking water wells. Contact:

- Dublin, Livermore, Pleasanton, Sunol area: Zone 7 Water Agency (925)454-5000
- Alameda, Albany, Berkeley, Castro Valley, Emeryville, Hayward, Oakland, San Leandro, San Lorenzo area: Alameda County Public Works (510)670-6633
- Fremont, Newark, Union City area: Alameda County Water District (510)659-1970

5/6/13 - RH

California State Approved Water Testing Laboratories

For chemical & bacterial testing of water, look in Yellow Pages 'Laboratories - Analytical'. Here are some local labs. No endorsement implied.

- Alpha Analytical
  Dublin (925)828-6226
- Cerco Analytical
  Concord (925)462-2771
- Sequoia Analytical
  Concord (925)356-3150
- Soil Control Lab
  Watsonville (831)724-5422

Licensed Water Well Drillers

To find a water well driller for drilling, flow testing, repair, etc. look in Yellow Pages 'Water Well Drilling & Pump Contractors'. Following is a list of some local licensed water well drillers. No endorsement implied.

- Aqua Systems Engineering
  (925)838-5512 Lic # 629340
- Clearwater Supply
  (800)820-0533 Lic # 647572
- Dan's Water Well & Pump
  (888)326-9355 Lic # 892546
- Dejesus Pump & Well Services
  (925)634-3392 Lic # 542644
- Freitas Water Well Drilling & Pump
  (209)835-2814 Lic # 967863
- Maggiora Brothers
  (800)728-1480 Lic # 249957
- Martell Water Systems
  (800)498-4282 Lic # 510952
- Pacific Coast Well & Pump
  (925)798-8875 Lic # 810579

5/6/13 - RH

Animal Husbandry in Urban Agriculture

Food Safety Basics for Urban Farmers

2017 UC ANR Urban Agriculture Workshop Series

June 8, 2017

Alda Pires, DVM, MPVM, PhD, Dipl. ACVPM
Assistant Specialist in CE for Urban Agriculture & Food Safety
School of Veterinary Medicine, UC Davis

UC DAVIS VETERINARY MEDICINE

University of California Agriculture and Natural Resources

Background

Food Animal Clinician (small - large - scale farms) and Lecturer, Portugal & UC Davis

Veterinary Epidemiologist (Food Safety & Epidemiology of Infectious Diseases), MSU & UC Davis

Urban Agriculture & Food Safety, Extension Specialist, School of Veterinary Medicine, UC Davis

Goat Herd Characteristics

- **Dairy, Meat, Fiber, Brush clearance, Packing, Biomedical use, Companion**

Commercial producer
Seedstock breeder
Family/small herd
Youth 4H/FFA project
Individual pets

Slide courtesy of Dr. Rowe

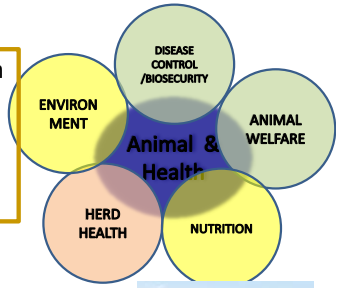
What is the desired product?

Milk, Cheese, Market Kids, Fiber, Ability to Browse/Travel, Companionship

Slide courtesy of Dr. Rowe

Animal & Herd Health

- **Animal Husbandry:** 'a branch from agriculture concerned with the production and care of domestic animals'
- **Good Husbandry Practices**



https://en.wikipedia.org/

Animal & Herd Health
Housing

- **Space available**
  - Barn/Coop
  - Pasture
- **Appropriate shelter**
- **Ventilation** (respiratory diseases)
- **Feeding Facilities**
- **Watering facilities**
- **Separation of animals by age groups**
- **Protection from predators/wildlife** (fencing)
- **Cleaning and sanitation** of the barn and equipment

Animal & Herd Health
Predator Prevention

Fencing
Housing
Guardian Animals
Pets as predators

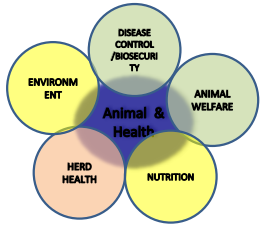
Mortality- adult & kid
Pregnancy loss
Welfare

Slide courtesy of Dr. Rowe

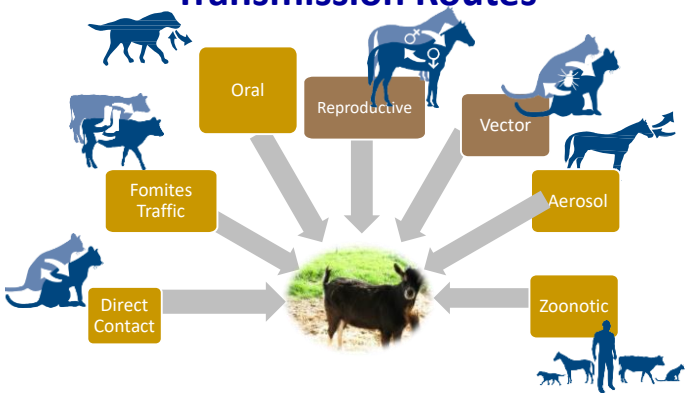
Animal & Herd Health
Disease Control

Management measures taken **to prevent disease agents** from being introduced and spreading to and/or from animal populations or their proximity (**biosecurity**)

- **ISOLATION/ ADDITIONS:** confinement of animals away from other animals
- **TRAFIC CONTROL:** movement of people, animals, and equipment
- **SANITATION/HUSBANDRY:** cleanliness and care of animals and their environment
- **PEST CONTROL:** Rodents



Transmission Routes



Introduction of Diseases and Transmission

There are multiple hosts and multiple routes of Transmission

(Adapted from www.cfsph.iastate.edu/BRM)

Disease Control
Animal Additions

- **Health status** of the **source flock/herd(s)**
  - Commercial Herd/Flock
  - Hatcheries
  - Breeder
  - Neighbor
  - Feed Stores
- Number of animal sources should be minimized
- **High Health Herd:** Regularly monitors for diseases in the herd and keeps records

Photos courtesy of Dr. Rowe

Disease Control
Animal Additions

- **Quarantine**
  - Isolate new animals **for 30 days** (at least **15 days)**
  - Isolation areas
- Time for:
  - **Observation of the animals:** signs of disease
  - **Testing for diseases** of concern
  - **Preventive Health**
    - Vaccination
    - Deworming
- **Uniform age groups**

Photo courtesy of Myrna Cadena

Disease Control
Record Keeping

- New Additions
- Individual/Group Disease Events
- Feed changes
- Reproductive Records (breeding, kidding)
- Production records
- Body Condition Scores
- Disease Test Results
  - Fecal tests
  - Diagnostic lab reports

Adapted from http://www.oakhillhomestead.com

Disease Control
Traffic Control

Movement of people, animals and equipment

- People & Equipment can carry pathogens
- Avoid exposure of the owner/employees to other flocks or other livestock

- *Q Fever, CAE, CL, Orf, Toxoplasma*, foodborne pathogens

Disease Control
Traffic Control & Sanitation

- **Visitors**
  - Restrict access visitors (e.g., barns, pastures, kidding areas)
  - Strict sanitation standards

Vehicles

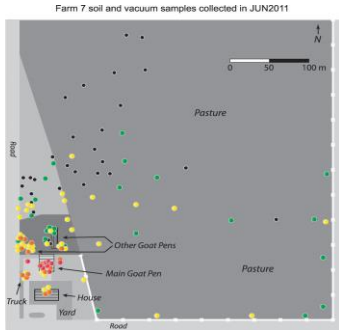
- Clean and disinfect your vehicle after returning from events (fairs/shows)

Disease Control
Traffic Control & Sanitation

- Wear **personal protective equipment (PPE)** when handling animals
  - Gloves
  - Dedicated clothing (coveralls) & boots
  - Footbath (?) or bucket w scrub brush
- Different PPE to handle animals and vegetable garden
- **Wash hands after removing outwear, gloves, boots**

Disease Control
Traffic Control & Sanitation

- **Q Fever** (Coxiella burnetii) Ubiquitous & persistence in the environment



Kersh et al., 2013

Disease Control
Sanitation

Equipment & Facilities
- Sources of infection
- Clean and disinfect equipment and avoid sharing equipment & feed from neighbor/healthy & sick Animals



Disease Control
Sanitation: Cleaning & Disinfection

- Pre-Cleaning Removal of debris (aka remove the dirt)
- Apply soap (aka wet the dirt with a foamy soap)
- Wash the dirt away
- Let the surface drain and dry

80%

- Apply disinfectant (Right disinfectant, concentration, consistency, time)

20%

(Slide courtesy of Dr. Maurice Pitesky)

Disease Control
Sanitation: Cleaning & Disinfection

- Dilute chlorine bleach most common agent
  - Between 65 and 200 ppm
    - 1 tablespoon bleach per gallon water = 200 ppm (max for sanitizing food contact surfaces)

Table 1 – Amount of chlorine bleach per gallon of water for a given chlorine concentration[1]

Amount of chlorine bleach per gallon of water	*Approximate concentration of total chlorine[2] (ppm)[3]*
1 teaspoon	65
1 tablespoon	200
1 fluid ounce	400
1/4 cup	800
1/2 cup	1600
2/3 cup	2200
3/4 cup	2400
1 cup	3200

1. *Assuming 5.25% sodium hypochlorite in chlorine bleach.*
2. *Typically present as both hypochlorous acid and hypochlorite ion.*
3. *ppm = parts per million.*

(McGlynn, FAPC-116))

Characteristics of Selected Disinfectants

For More Information, see the "Disinfection 101" document at www.cfsph.iastate.edu

Disinfectant Category	Alcohols	Aldehydes	Biguanides	Halogens: Hypochlorites	Halogens: Iodine Compounds	Oxidizing Agents	Phenols	Quaternary Ammonium Compounds (QAC)
Sample Trade Names	Ethyl alcohol Isopropyl alcohol	Formaldehyde Glutaraldehyde	Chlorhexidine Nolvasan® Virosan®	Bleach	Betadyne® Povidone®	Hydrogen peroxide Peracetic acid Virkon S® Oxy-Sept 333®	One-Stroke Environ® Pheno-Tek II® Tek-Trol®	Roccal® DiQuat® D-256®
Mechanism of Action	•Precipitates proteins •Denatures lipids	•Denatures proteins •Alkylates nucleic acids	•Alters membrane permeability	•Denatures proteins	•Denatures proteins	•Denature proteins and lipids	• Denatures proteins • Alters cell wall permeability	• Denatures proteins • Binds phospholipids of cell membrane
Advantages	•Fast acting •Leaves no residue	•Broad spectrum	•Broad spectrum	•Broad spectrum •Short contact time •Inexpensive	•Stable in storage •Relatively safe	•Broad spectrum	• Good efficacy with organic material • Non-corrosive • Stable in storage	• Stable in storage • Non-irritating to skin • Effective at high temperatures and high pH (9-10)
Disadvantages	•Rapid evaporation •Flammable	•Carcinogenic •Mucous membranes and tissue irritation •Only use in well ventilated areas	•Only functions in limited pH range (5–7) •Toxic to fish (environmental concern)	•Inactivated by sunlight •Requires frequent application •Corrodes metals •Mucous membrane and tissue irritation	•Inactivated by QACs •Requires frequent application •Corrosive •Stains clothes and treated surfaces	•Damaging to some metals	• Can cause skin and eye irritation	
Precautions	Flammable	Carcinogenic		Never mix with acids; toxic chlorine gas will be released			May be toxic to animals, especially cats and pigs	
Vegetative Bacteria	Effective	Effective	Effective	Effective	Effective	Effective	Effective	YES–Gram Positive Limited–Gram Negative
Mycobacteria	Effective	Effective	Variable	Effective	Limited	Effective	Variable	Variable
Enveloped Viruses	Effective	Effective	Limited	Effective	Effective	Effective	Effective	Variable
Non-enveloped Viruses	Variable	Effective	Limited	Effective	Limited	Effective	Variable	Not Effective
Spores	Not Effective	Effective	Not Effective	Variable	Limited	Variable	Not Effective	Not Effective
Fungi	Effective	Effective	Limited	Effective	Effective	Variable	Variable	Variable
Efficacy with Organic Matter	Reduced	Reduced	?	Rapidly reduced	Rapidly reduced	Variable	Effective	Inactivated
Efficacy with Hard Water	?	Reduced	?	Effective	?	?	Effective	Inactivated
Efficacy with Soap/ Detergents	?	Reduced	Inactivated	Inactivated	Effective	?	Effective	Inactivated

? Information not found

Disclaimer: The use of trade names does not in any way signify endorsement of a particular product. For additional product names, please consult the most recent Compendium of Veterinary Products.

References: Linton AH, Hugo WB, Russel AD. Disinfection in Veterinary and Farm Practice. 1987. Blackwell Scientific Publications; Oxford, England; Quinn PJ, Markey BK. Disinfection and Disease Prevention in Veterinary Medicine. In: Block SS. ed., Disinfection, Sterilization and Preservation. 5th edition. 2001. Lippincott, Williams and Wilkins; Philadelphia.

the Center for Food Security & Public Health
Iowa State University

Disease Control
Pests Control: Rodents

Roof Rat

http://ipm.ucanr.edu/

- **Rats and Mice** carry diseases that can affect livestock, poultry, pets and humans (*Salmonella*, *Leptospira*, rat bite fever, etc.)
- **Mice and rats** have different behaviors
- Rats (Norway Rat & Roof Rats, different habitats) are more cautious, more opportunistic and have a larger geographical range of land
- **Spilled feed** will attract rats, mice, insects and birds
- **Management of Rats & Mice**: Sanitation, Building Construction and Population Control

Disease Control
Pests Control: Rodents

- **To get rid of rats/mice, remove food, water, and s and seal entryways**
  - Feed pets only the amount of food they will ea single feeding or bring food inside at night.
  - Keep garbage, trash, and garden debris in receptacles with tight-fitting lids.
  - **Habitat Control**: Thin dense vegetation (shrubs, climbing hedges, tree limbs)
  - Seal all cracks and openings (house, barns, coops, etc.)
  - Put **traps or bait stations** every **25 to 50 feet** around the perimeter of the house
  - Put traps along **beams, walls** and **ceiling routes** and at each **door**

Disease Control
Pests Control: Rodents

- **Ground Squirrels** cause damage by:
  - Eating food-bearing & ornamental plans
  - gnawing on plastic sprinklers and irrigation lines
  - burrowing (trip hazards and damages landscapes & structures)
- Carry diseases that can affect livestock, poultry, pets and humans (*Salmonella*, *Leptospira*, rat bite fever, plague etc.)

Disease Control
Pests Control: Rodents

- **Management of Ground Squirrels**: Traps, Fumigation and Toxic baits (depending of level of infestation, season and resources available)
- More info: UC ground Squirrel best management practices http://www.groundsquirrelbmp.com/?redirect=SB

Disease Control
Pests Control

- **UC IPM:** http://ipm.ucanr.edu/PMG/menu.house.html#STING
-

Goat Herd Health

- Ration formulation
- Feeds available
- Body condition assessment
- Feedbunk&Water management

Prevention

Veterinary-Client – Patient Relationship (VCPR)

- Space
- Shelter
- Ventilation
- Fencing
- Sanitation

- Mycoplasma
- CAEV
- CLA
- Johnes
- (Scrapie)
- Abortion agents

Protocols

- Vaccination
- Deworming
- Kidding /Doe
- Milk Quality
- Culling
- Disease Diagnosis &Treatment

Photos courtesy of Dr. Rowe

Goat Herd Health
Veterinary-Client-Patient-Relationship (VCPR)

- Essentially means that the veterinarian is familiar with the client and his livestock
- Allows the veterinarian to write a prescription for medications, without actually examining every sick animal
- Keeping medications on hand allows prompt treatment of sick animals

Slide Courtesy of Dr. Bauman

Zoonotic Diseases

- Zoonoses:
  - are **diseases or infections** naturally transmissible **directly** or **indirectly between animals and humans**
- 70% of human infections diseases are zoonotic

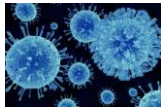
Adapted from: http://n2gf.com/

Foodborne Diseases
Some definitions

- **Foodborne Pathogens:** a biological infectious agent (bacteria, virus, parasites) that causes foodborne illness to host (food poisoning)
- **Food poisoning** is any illness resulting from consumption of contaminated food

Bacteria:
- *Campylobacter*
- *Salmonella*
- *E. coli* O157:H7
- *E. coli* non –O157 STEC
- *Listeria monocytogens*
- *Shigella*
- Staphylococcus

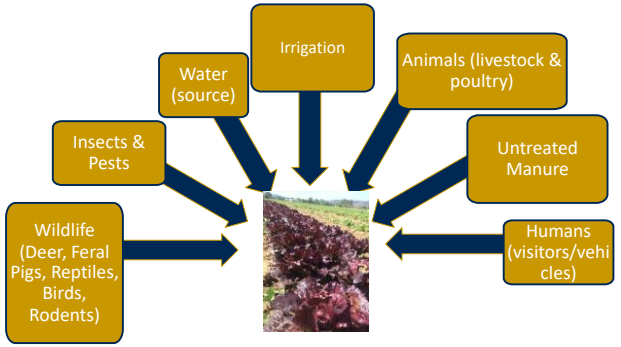
Virus:
- Noravirus
- Rotavirus
- Hepatitis virus



Parasites:
- Cryptosporidium
- Cyclospora
- Toxoplasma
- Trichinella

Adapted from CDC,NARMS

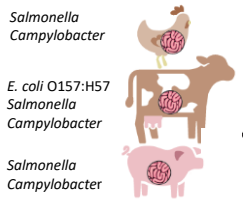
Foodborne Diseases



Introduction of Foodborne Pathogens in produce crops

Foodborne Diseases
Animals on Diversified Farms

- Certain **animals** are **reservoirs** for certain pathogens
- What can **affect animals shedding** in their feces
  - Age (e.g. young animals)
  - Husbandry practices (e.g. stocking density)
  - Diet (e.g. distillers grain)
  - Season (summer)
  - Environmental conditions
- **Good Husbandry Practices** (prevention)



Adapted from CDC,NARMS

Foodborne Diseases
Animals on Diversified Farms

- All manures can carry pathogens (causing human illness)
- There is an increased **risk of pathogen spread** via food products (e.g., vegetables, fruits and nuts) when **manure is applied to crop fields**

Foodborne Diseases
Manure & Risk Reduction

Soil

- Enteric Pathogens can persist for long periods in the soil:
  - ***Salmonella*** can persist in the litter applied to fields almost **4 months,** can survive up to **2 years**
  - ***Campylobacter*** can persist for about **25 days**

- Factors affecting the survival in the soil : livestock species, pathogen, manure type, composition (e.g., humidity, dry matter), soil type, environmental conditions (e.g. season, ambient temperature, rainfall, sunlight, etc.)

Foodborne Diseases
Wildlife Intrusions

- Wildlife animals can carry pathogens in their feces:
  - Rodents (gopher, ground squirrels, mice, rats)
  - Birds (wild turkeys)
  - Deer (ex: strawberry outbreak in Oregon)
  - Feral pigs (Salinas spinach outbreak 2006)
- Contamination car occur directly or indirectly (water & soil)


ORIGINAL ARTICLE

***Salmonella* Oranienburg Isolated from Horses, Wild Turkeys and An Edible Home Garden Fertilized with Raw Horse Manure**


Food Safety News

Did Deer Cause Oregon's Strawberry Outbreak?

Foodborne Diseases
Wildlife Intrusions

- **Prevention of Contamination**
  - Integrated Pest Management (IPM)
  - Fencing of the vegetable garden (wildlife & pets)
  - Composting bins (avoid meat/fatty products)
  - Animals, manure and vegetable crops well separated
  - Co-management


Photo courtesy of Myrna Cadena

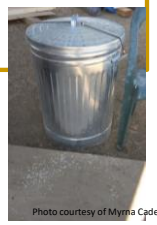
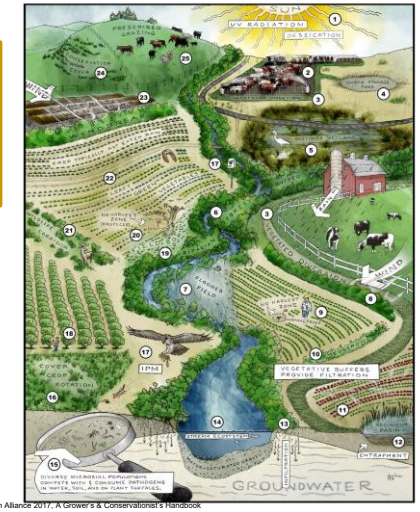


Photo courtesy of Myrna Cadena

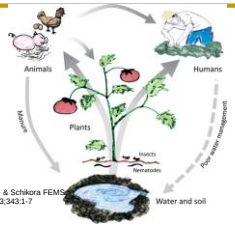
- Co-management
- encourage the application of practices that can enhance food safety and that are also consistent with sustainable conservation



Adapted from Wild Farm Alliance 2017, A Grower's & Conservationist's Handbook

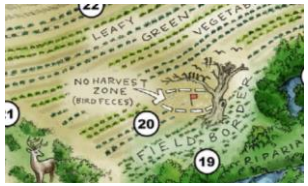
- Contaminated Crops
- What to do?

- **Grazing animals, Working Animals and Animal Intrusion**
- Evidence of potential contamination of produce (during growing)?
- Yes (observation of animals, animal excreta or crop destruction)
  - Can be harvested or not based on measures taken during the growing and assessment of the risks/contamination at the harvesting (FSMA § 112.83)



Hernández-Reyes & Schikora FEMS Microbiol Lett 2013;343:1-7

- Contaminated Crops
- Buffer zones
- No harvest



Adapted from Wild Farm Alliance 2017, A Grower's & Conservationist's Handbook

References

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  http://ucanr.edu/sites/Small_Farms_/
- Pests Control
  - http://ipm.ucanr.edu/PMG/menu.vertebrate.html
  - http://www.groundsquirrelbmp.com/management-cgs.html
  - http://ipm.ucanr.edu/PMG/menu.house.html#STING
- Animal Husbandry
  - https://store.extension.iastate.edu/Product/An-Introduction-to-Animal-Husbandry-and-Nutrition
- Zoonoses & Disinfection
- http://www.cfsph.iastate.edu/Zoonoses/index.php
- http://www.cfsph.iastate.edu/Disinfection/index.php
- http://ucfoodsafety.ucdavis.edu/files/26437.pdf
- Co-management
  - http://ucfoodsafety.ucdavis.edu/Preharvest/Co-Management_of_Food_Safety_and_Sustainability/
  - http://www.wildfarmalliance.org/food_safety_and_conservation_resources

Thank you for your attention!

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http://ucanr.edu/sites/Small_Farms_/

UC DAVIS VETERINARY MEDICINE

University of California Agriculture and Natural Resources

Populations at higher risk

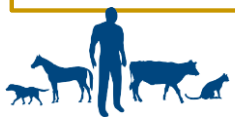
- Children (< 5 years)
- Older persons
- Weaken immune system (immunocompromised, chemotherapy)
- Pregnant women

- People without previous livestock exposure more at risk (may not have immunity)

(Adapted from www.cfsph.iastate.edu/BRM)

Human-Animal Interaction

- **Animal may not show obvious signs of illness**
- **Disease risk cannot be totally eliminated**
  - Animals & its environment
  - Decrease exposure
  - Infectious agent interactions
  - Many routes of transmission
- **Identify risk areas** or **risky behaviors**
- **Minimize the threat** to animals and huma



Adapted from: http://n2gf.com/

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Tipsheet: Compost

Farmer Chris Hay, Say Hay Farms, inspecting compost prior to application by spreader. Photo: Rex Dufour, NCAT

Introduction

If managed properly, incorporating compost is an effective long-term method for building soil fertility in organic production systems. Compost contributes to overall soil fertility by increasing organic matter, the water holding capacity of the soil, and, over a longer period of time, nutrient availability in soils. Compost also improves soil structure and stability, suppresses soil-borne diseases, and can increase the number of beneficial micro-organisms in the soil (Rodale Institute, 2014).

The process of composting is a controlled decomposition of manure, crop residue, bedding, or other organic matter by microorganisms in the presence of oxygen. The end product is a nutrient-stable product that is added to the soil (Marriott and Zaborski, 2013).

Advantages include:

- Slow release of nutrients
- Spreads easier than manure
- Fewer viable weed seeds
- Less potential for runoff
- Less pathogens
- Fewer restrictions on time of application

Disadvantages include:

- More expensive than manure
- May be more difficult to obtain
- Lower nutrient content than manure
- Volume and space requirements
- Time and labor to produce own compost
- Potential nutrient leaching during composting process

USDA Organic Regulations for Organic Compost 7 CFR § 205.203(c)

Composting and vermicomposting (worm composting) systems should be outlined in a grower's Organic System Plan (OSP). Production records should include the source of all materials used in the compost. If animal materials (such as fish meal and bat guano) are used, accurate temperature monitoring logs need to be kept to demonstrate that compost reaches the optimal temperatures as per the NOP guidelines (listed below). Vermicomposting production records should include a time log and description of practices used to maintain adequate moisture and aerobic conditions.

"The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances" 7 CFR § 205.203(c)(2).

The NOP guidelines state that animal and plant materials for compost include: raw manure, composted plant and animal materials, and un-composted plant materials. Raw manure is restricted in use, and compost containing animal materials must be produced under certain conditions.

NOP-Approved Compost Materials/Feedstock

- Animal bedding and manure: Must meet requirements for raw manure. *USDA Organic Regulations: § 205.203(c)(1)*
- Crop residues
- Yard wastes
- Fish wastes and by-products
- Seaweed by-products
- Paper (must be newspaper or other recycled paper without glossy surface or colored ink)
- Green waste that has not been exposed to pesticides
- Guano—Bat or Bird (allowed with restrictions): Must be decomposed and dried deposits and must meet requirements for raw manure. *USDA Organic Regulations: § 205.203(c)(1)*
- Other nonsynthetic substances

NOP Time/Temperature Guidelines

Compost and vermicompost guidance parameters can be found in NOP 5021: Compost and Vermicompost in Organic Crop Production at www.ams.usda.gov/NOP ProgramHandbook

- Initial C: N ratio of between 25:1 and 40:1
- For an in-vessel or static aerated pile, compost should maintain a temperature of between 131°F (55°C) and 170°F (77°C) for three days.
- For a windrow system, this temperature must be maintained for 15 days and the pile turned a minimum of five times within that time period. Accurate temperature records are needed to satisfy the NOP standards.
- Incorporates acceptable feedstocks (see above list)

Compost-turning equipment at Groverat Grover Compost in the San Joaquin Valley, California. Compost must maintain a temperature between 131°F (55°C) and 170°F for 15 days and be turned a minimum of five times in that 15 day period for a windrow system. Photo: Rex Dufour, NCAT

Vermicompost USDA Organic Guidance

Vermicomposting occurs at room temperature using specific earthworms (e.g. *Eisenia fetida*) and microbial activities. Vermicompost systems can be set up indoors, and finished vermicompost usually has a higher nutrient level than typical compost. If using vermicompost, the NOP 5021 specifies the following conditions:

- Vermicompost is made from allowed feedstock materials (see above);
- Aerobic conditions are recorded and maintained by adding thin layers of organic matter at 1- to 3-day intervals;
- Moisture is maintained at 70% to 90%; and
- The vermicompost must cure for 6 to 12 months for outdoor windrows, 2 to 4 months for indoor container systems, 2 to 4 months for angled wedge systems, or 30 to 60 days for continuous-flow reactors.

Compost Teas

The NOP draft guidance on crop materials states that compost tea made from compost not meeting the requirements of § 205.203(c) or NOP 5021 is subject to restrictions of § 205.203(c)(1) for raw animal manure. The following guidelines were set forth by the National Organic Standards Board and are not regulatory requirements.

- Use only potable water to make compost tea or to dilute it.
- Sanitize all of the equipment used to prepare compost tea.
- Make compost tea only from compost that has maintained a temperature of at least 131°F for three days and that has been mixed so all of the pile or windrow has heated up.
- Avoid additives when fermenting compost tea, as these can promote the growth of harmful organisms. In particular, simple sugar sources, like molasses, should be avoided.
- Additives can be used if sample batches of compost tea are tested before using it to make sure it meets the Environmental Protection Agency's (EPA) Recreational Water Quality Criteria with regard to coliform bacteria.
- If compost tea is made with additives but is not tested, or if it doesn't meet water quality guidelines, then food crops may not be harvested until 90 to 120 days after the compost tea has been applied (as with raw manure use on organic farms).

When is compost finished?

The compost pile is mixed or managed to ensure that all of the feedstock heats to the minimum of 131º F (55º C) for a minimum of three days. The active composting process is finished when the pile returns to ambient temperature levels. The monitoring of the above parameters must be documented in the OSP in accordance with § 205.203(c) and verified during the organic inspector's site visit.

Compost that is 5° to 10°above ambient temperature cannot be counted as being finished and can actually be detrimental to plants because bacteria and fungi are still sequestering nutrients rapidly enough that plants can be harmed, and possibly die, as a result of the lack of available nutrients (Rodale Institute, 2014).

Food Safety Modernization Act Guidelines for Compost

The Food Safety Modernization Act (FSMA) requires the Food and Drug Administration (FDA) to develop regulations aimed at improving the safety of produce. These new regulations are set to be finalized in late 2015. For the most up to date information on FSMA, please check the FDA website **www.fda.gov/Food/GuidanceRegulation/FSMA/.**

The new food safety standards may address topics such as the following:

- Definitions for determining whether the soil amendment is treated or untreated;
- Microbial standards applied to treatment processes;
- Application requirements and minimum interval requirements;
- The option to offer an alternative approach;
- Instructions for how to convey, handle, and store soil amendments;
- Prohibitions on the use of human waste; and
- Recordkeeping requirements

Producers should sign up for updates related to the new rules from organizations they trust.

Common Farm Compost Systems

Passive pile method— Compost feedstocks are stacked in a pile without turning, ventilating or monitoring temperatures. Compost produced by this method is subject to raw manure restrictions.

Windrow method— A mixture of compost feedstock is placed in a long narrow pile, which is turned on a regular basis. This method is approved for organic systems.

Aerated static pile— Compost feedstocks are piled, but instead of turning, oxygen is delivered through PVC pipes placed along the bottom of the pile. Piles can be five to eight feet high. This method is approved for organic farm systems.

On-farm windrow compost system. Photo: Rex Dufour, NCAT

How much compost will you need?

A typical farm will need five to 20 tons of compost per acre, depending on the present soil conditions and crops. It is a good idea to have an annual soil test to determine nutrient needs and to make sure the compost is not adding too much phosphorous to the soil (Rodale Institute, 2014).

Critical Components of Composting: Temperature, Moisture, and Oxygen

After the initial heating period to between 131°F and 171°F, the compost needs to cool down so that beneficial organisms can continue to thrive. It is important to monitor the compost temperature to make sure that there is sufficient oxygen for beneficial organisms.

When piles remain hot (above 131°F) for long periods, the lack of oxygen kills beneficial fungi, protozoa, and nematodes that help retain key nutrients. It is important to balance the temperature with the right amount of turnings to bring oxygen into the pile. Keeping accurate track of the temperature of the pile is important so that the pile is hot enough to kill pathogens and weed seeds, but not overheated so that other beneficials are killed, too (Rodale Institute, 2014).

An adequate supply of moisture and oxygen is needed for a compost pile to break down efficiently. The moisture content should be between 40% and 65% in an active compost pile. The optimal pH is between 6.5 and 8.

To check the moisture level, dig into the pile at least one foot, pick up a handful of compost, and squeeze. You should feel liquid, or at least a few drops of liquid will be squeezed out (Rodale Institute, 2014).

Compost Application Rates

Compost should be considered a slow-release source of nitrogen (N). Most N remaining after the composting process is bound into organic forms and thus not available immediately for plant uptake. Compost applied at rates high enough to meet immediate crop N requirements will almost always result in excess phosphorus (P) and potassium (K) application. Excess P can cause surface water pollution (and potentially threaten organic certification). In some cases, excess K can upset crop nutrition balance (Baldwin and Greenfield, 2009).

Compost application rates can be calculated using fertilizer recommendations from soil tests and compost nutrient analysis. General guidelines suggest that 10% to 25% of compost N will be plant-available during the first year of application. P and K availability in the first year is between 40% and 60%. These are general guidelines, and actual availability will depend on the compost quality (Baldwin and Greenfield, 2009).

Calculating application rates for compost is similar to figuring the application rates for manure on cropland. First, estimate the nitrogen (N), phosphate (P) and potassium (K) requirement for the crop (based on realistic yield expectations for a particular soil or field). A chemical analysis will show the N-P-K content of the compost. Then calculate a compost

rate based on N, P, or K as the critical or priority nutrient. Colorado State University has a detailed checklist with instructions for calculating compost application rates. It can be found at: www.extsoilcrop.colostate.edu/Soils/powerpoint/compost/Calculating_compost_application_rate.pdf

The amount of compost to apply is calculated from the recommended rate of the priority nutrient and the plant-available nutrient content of the compost. Plant-available Nitrogen (PAN) is the amount of nitrogen made available to the plant in the growing season after fertilizing materials have been applied. Compost application rates are based on PAN rather than the total nitrogen. The C: N ratio of mature compost is commonly in the range of 8:1 to 14:1.

Useful Equipment/Tools for Making Compost

- Front-end loader to mix compost in windrow composting
- Manure spreader: not always necessary but helpful for spreading large amounts of compost
- Thermometer with 2-foot to 3-foot probe (36-inch dial thermometer)
- PVC pipes for aeration to center of pile in larger windrow systems

Compost Spreader at Say Hay Farms, Woodland, California. Photo: Rex Dufour, NCAT

Sources of Chemical Contamination of Compost in Organic Systems

It is important to be aware of the potential for prohibited substances to contaminate compost that is being used from off-farm sources in organic systems. Refer to the USDA organic regulations, the NOP Handbook, and the National List of Allowed and Prohibited Substances for more information.

Arsenic in Chicken Litter

The use of broiler litter as a feedstock for compost production poses some particular concerns. Arsenic is a component of some feed medications or growth promoters used in commercial broiler operations, although the FDA recently has been limiting their use in poultry operations. The majority of arsenic consumed by poultry is excreted and incorporated into the litter, leading to the potential for build-up in the soil and leaching from compost piles into lakes and streams. For more information, consult the ATTRA publication *Arsenic in Poultry Litter: Organic Regulations.*

References

USDA Organic Regulations 7 CFR 205
www.ams.usda.gov/nop

USDA National List of Allowed and Prohibited Substances
www.ams.usda.gov/NOPNationalList

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Rodale Institute. 2014. Transition to Organic: Waste Management. http://rodaleinstitute.org/waste-management/

Rodale Institute. 2014. Improved Compost Management for Certified Organic Farms. http://rodaleinstitute.org/improved-compost-management-for-certified-organic-operations/

Additional Resources

USDA National Organic Program Handbook: www.ams.usda.gov/NOPProgramHandbook

The following documents are within the NOP handbook, and contain information about compost in organic production systems:

NOP 5016: Allowance of Green Waste in Organic Production Systems

NOP 5006: Processed Animal Manure in Organic Crop Production

NOP 5021: Compost and Vermicompost in Organic Crop Production

NOP 2602: Recordkeeping of Certified Operations

NOP 2610: Sampling Procedures for Residue Testing

PM 11-4: Evaluation of Materials Used in Organic Crop, Livestock, and Handling Operations

ATTRA Video "Composting: You can do it!" www.youtube.com/watch?v=-y69lLc3n3o&feature=youtu.be

Making and using compost at the Rodale Institute Farm www.newfarm.org/features/0804/compost/index.shtml

Basic On-Farm Composting Manual www.cwc.org/wood/wd973rpt.pdf

The Art and Science of Composting: A resource for farmers and compost producers. University of Wisconsin-Madison. www.cias.wisc.edu/wp-content/uploads/2008/07/artofcompost.pdf

Composting on Organic Farms www.cefs.ncsu.edu/resources/organicproductionguide/compostingfinaljan2009.pdf

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Tipsheet: Compost
By Thea Rittenhouse, NCAT Agriculture Specialist
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Tipsheet: Manure in Organic Production Systems

Benefits of Manure

Livestock manure is a valuable resource for organic and sustainable soil management. It is most effectively used in combination with other sustainable practices such as crop rotation, cover cropping, green manuring, and liming. In organic production, manure is commonly applied to the field as raw manure (fresh or dried) or composted manure (Kuepper, 2003). Manure can add important plant nutrients (nitrogen, potassium, and phosphorus, collectively known as NPK) to the soil and improve soil quality. Composting raw manure by adding other feedstocks and bedding will aid decomposition and produce a humus-rich finished product with little to no ammonium or soluble nitrate. This finished product will build soil fertility (Evanylo et al., 2008). The timing of manure application is very important to ensure that the manure benefits the plants and soil. Manure, if applied and managed correctly, can be a great means of enhancing soil and crop quality, but there are some important aspects of soil health and food safety to consider when using it in an organic farm system.

USDA Organic Regulations for Manures and Manure-Based Compost 7 CFR § 205.203(c)

The NOP has very specific guidelines about manure-composting procedures.

- Raw manure must not contaminate soil, water, or crops with pathogens, excess nutrients, etc. Manure should not be applied on frozen ground.
- Raw animal manure must be composted unless it is:
  - Applied to land used for a crop not intended for human consumption;
  - Incorporated into the soil not less than 120 days prior to the harvest of a product whose edible portion has direct contact with the soil surface or soil particles; or
  - Incorporated into the soil not less than 90 days prior to the harvest of a product whose edible portion does not have direct contact with the soil surface or soil particles.
- For composted manures, an initial C:N ratio of between 25:1 and 40:1 must exist for the blend of materials. The NOP Guidance Document 5021: Compost and Vermicompost in Organic Crop Production provides alternative methods and recommendations: www.ams.usda.gov/NOPProgramHandbook
- Temperatures between 131° F and 170° F must be sustained for three days using an in-vessel or static aerated pile system.
- Temperatures between 131° F and 170° F must be sustained for 15 days using a windrow composting system, during which period the materials must be turned a minimum of five times, and this period must be followed by an adequate curing period.

Sheep manure in a cover cropped walnut alley. This farmer stopped grazing sheep in their walnut orchard due to the potential risk (and liability) of contamination by pathogens from undecomposed manure contacting walnuts during harvest. Photo: Rex Dufour, NCAT

Considerations

- Organic producers making their own compost must keep accurate records of their composting operations to demonstrate that the compost was produced according to the criteria cited above.

- Compost that contains no animal materials as feedstock may be used without restriction provided that it contains no prohibited or restricted-use plant materials.
- If the composted manure is purchased, the grower needs documentation from the supplier showing that the compost process meets NOP requirements or else must undertake further composting on-site that meets NOP requirements.
- Manure left unincorporated for even a couple of days can lose a significant part of its nitrogen content through volatilization.
- Fresh manure can possibly transmit human disease (salmonella/E.coli), so fresh manure should not be used as a side-dress fertilizer on vegetable crops, and there are specific parameters on intervals between manure application and harvesting crops.
- Continual manure use tends to acidify soil. As manure breaks down, it releases various organic acids that assist in making soil minerals available. Over time, this process depletes the soil of calcium and causes pH levels to fall below the optimum for most crops. Manures do supply some calcium, but not enough to counterbalance the tendency toward increased acidity.
- Use of raw manures can sometimes increase weed problems. Some manure contains weed seed from bedding materials like straw and old hay. This problem can be eliminated if using composted manure.
- Fresh manure with high levels of nitrogen and salts can burn seedling roots. Manure should be tested before applying to soil.
- Heavy applications of raw manure can cause increased salinity in soils that do not drain well.
- Manure is rich in specific nutrients like phosphate and potash. These nutrients can benefit crops, but repeated applications can result in a detrimental buildup in the soil. Specifically, there has been a concern with an oversupply of phosphorus in soils where too much broiler litter or dairy manure is used. Excessive phosphate in the soil can interfere with plant uptake of other nutrients, such as copper and zinc. Excessive potash can restrict boron, manganese, and magnesium uptake (Kuepper, 2003).

NOP Recordkeeping Requirements

Accurate records of manure and compost application and production must be kept by all farmers using these types of soil amendments. Farmers must accurately record the application date of any untreated or composted soil amendment of animal origin. If the amendment came from a third-party source, documentation is required that the amendment has undergone a scientifically valid process to meet requirements for a treated amendment, and that it has been stored in a manner that prevents contamination of surrounding areas and water supplies.

NOP Manure Storage and Handling Requirements

- NOP requires farmers to handle and store biological soil amendments of animal origin in a way that does not contaminate covered produce; food-contact surfaces; areas used for growing, harvesting, holding, and packing; and water sources and distribution systems. Farmers must also make sure that treated amendments are not contaminated by untreated or "in-process" amendments.
- FDA does not allow the use of human waste for growing produce, except for sewage sludge bio-solids that are used according to Environmental Protection Agency requirements (FDA, 2015). Sewage sludge is prohibited under the USDA organic regulations at section 205.105(g).
- Manure can be stored if it is under the cover of a building or a tarp and away from any drainage areas and standing water.

Raw Manure vs. Composted Manure

- An effective composting process converts animal wastes, bedding, and other raw products into humus—the relatively stable, nutrient-rich, and chemically active organic fraction found in fertile soil. In stable humus, there is practically no free ammonia or soluble nitrate, but nitrogen is tied up as proteins, amino acids, and other biological components. Other nutrients are stabilized in compost as well (Kuepper 2003).
- Composting livestock manure reduces many of the drawbacks associated with raw manure use. It's also less likely to cause nutrient imbalances. The composted manure can safely be applied directly to growing vegetable crops.

- Raw manure can be an excellent and effective source of available nitrogen and other nutrients, and can stimulate biological processes in the soil if the application is timed correctly, and if it is applied in the correct manner (refer to above considerations and NOP 5021 recommendations).

Manure Application and Rates

- Tilling manure into the soil shortly after spreading or applying it on cover crops are two safe application methods that conserve manure nutrients. Grass cover crops, such as rye and ryegrass, are especially good as "catch crops"—cover crops grown to absorb soluble nutrients from the soil profile to prevent them from leaching.
- Sheet composting, a process where a thin layer of slowly decomposing organic matter is applied on top of the soil and then tilled in, improves the capture of ammonia nitrogen from manure, but requires tillage, which leaves the soil bare and vulnerable to erosion and leaching losses. Surface application of manure (with no soil-incorporation) eliminates most leaching and erosion losses but increases ammonia losses to the atmosphere.
- A combination of soil testing and nutrient budgeting for NPK levels is recommended when using manures, as nutrient levels can fluctuate based on many factors, and the timing of manure application is crucial to optimize nutrient uptake and minimize leaching. More information about nutrient budgeting can be found in ATTRA's publication *Nutrient Management Plan (590) for Organic Systems*.
- The best time to apply manure, for the strongest effect, is just before planting. Applications too far in advance of planting risk nitrogen loss through leaching if rainfall is significant. Plowing or incorporating the manure into the soil is one method to use so that nutrient loss is minimal.
- It is important to monitor soil fertility regularly when using manure, to avoid manure-induced soil imbalances as described above.
- Typically, manure is applied before the most nitrogen-demanding crop in the rotation and after the amount of plant-available nitrogen during the year of application has been estimated. Nitrogen availability of manure varies greatly, depending on the type of animal, type and amount of bedding, and age and storage of manure. Manure should not be the sole nitrogen source in an organic system. Excess levels of soil phosphorus (P) can result from continual manure applications. Where P buildup is a concern, legumes should be included in the rotation in place of manures to provide additional nitrogen (Eghball and Power, 1999).

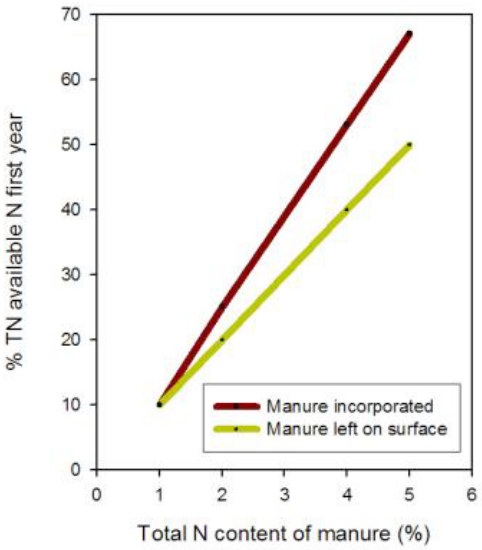

Figure 1. This graph predicts N release during the first year after manure application. Source: Adapted from Bary et al., 2000.

Food Safety Modernization Act (FSMA) Proposed Regulations for Manure Use

The Food Safety Modernization Act (FSMA) requires the Food and Drug Administration (FDA) to develop regulations aimed at improving the safety of produce. The process of developing these regulations is currently underway. It is good for producers to sign up for updates related to the new rules from organizations they trust. The FDA website contains up-to-date information about the proposed FSMA regulations: www.fda.gov/Food/GuidanceRegulation/FSMA/.

New food-safety standards may address such topics as the following:

- Methods for preventing contamination of produce from exposure to pathogens potentially present in biological soil amendments of animal origin
- New standards for using manures and compost

References

USDA Organic Regulations 7 CFR 205
www.ams.usda.gov/nop

USDA National Organic Program Handbook
www.ams.usda.gov/NOPProgramHandbook

The following guidelines and policy memos contain additional information related to manure use in organic systems and can be found in the NOP handbook:

NOP 5006: Processed Animal Manure in Organic Crop Production

NOP 5016: Allowance of Green Waste in Organic Production Systems

NOP 5021: Compost and Vermicompost in Organic Crop Production

NOP 5025: Commingling and Contamination: Prevention in Organic Production and Handling

NOP 2602: Recordkeeping of Certified Operations

NOP 2615: Organic System Plans, Updates and Notification of Changes

PM 11-4: Evaluation of Materials Used in Organic Crop, Livestock and Handling Operations

USDA National List of Allowed and Prohibited Substances www.ams.usda.gov/NOPNationalList

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Further Resources

Using Manure as Fertilizer for Vegetable Crops
www.soils.umn.edu/academics/classes/soil3416/veg_manure.htm

Manure Management Plan: A step-by-step guide for Minnesota Feedlot Operators
www.pca.state.mn.us/publications/wq-f8-09.pdf

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Tipsheet: Manure in Organic Production Systems
By Thea Rittenhouse, NCAT Agriculture Specialist
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Farm Food Safety and Organic Federal Co-Compliance Chart for Crop Producers

Plan = Written description of policies and Standard Operating Procedures (SOPs) including materials.
Types of Plans: FSP = Food Safety Plan, required for 3rd party food safety audit, not by FSMA
OSP = Organic System Plan with content based on USDA organic regulations. Each USDA-accredited organic certifier may require use of its own OSP template.

Types of recordkeeping reviewed and verified during a food safety audit or organic inspection:
Document (D): the evidence of something (ex. seed or input material purchase invoice and label, or letter of guarantee, organic system plan)
Record (R): certain documents that are completed and managed in a way that's compliant with industry, federal and state guidelines. (ex. Water test, equipment cleaning log, input application record)

Topics	FOOD SAFETY	ORGANIC	CO-COMPLIANCE
FEDERAL REGULATIONS GUIDANCE DOCUMENTS AND APPLICABILITY	**"FDA Produce Safety Rule"** *Law:* Food Safety Modernization Act (FSMA) *Regulation:* Final Rule on Produce Safety, Standards for Growing, Harvesting, Packing and Holding Produce for Human Consumption *Exemption:* • Produce not eaten raw, food grains, and produce for personal consumption • Any farm or mixed farm facility that has a $25,000 average annual sales or less of covered produce during the previous 3-year period • Qualified Exemption (see criteria in text box)**	**"USDA Organic Regulations"** *Law:* Organic Foods Production Act *Regulation:* National Organic Program, USDA Organic Regulations *Guidance:* NOP Handbook http://www.ams.usda.gov/rules-regulations/organic/handbook *Exemption:* Producers with annual organic production of less than $5,000 are exempt from certification, but must follow all other organic regulations, including recordkeeping.	Producers should be familiar with and follow USDA Organic and FDA Produce Safety Rule, as applicable to their food production, handling and sales activities. Keep records to show how your operation meets exemption criteria AND complies with applicable regulations.
WRITTEN PLANS	FDA's Produce Safety Rule recommends, but does NOT require, a Food Safety Plan. **Required for 3rd party food safety audit:** *D: Food Safety Plan (FSP)*	An Organic System Plan (OSP) is required and based on content as described in USDA organic regulations: • Description of practices and procedures, • list of materials to be used, • monitoring, • recordkeeping system, and • contamination prevention.	Plans are farm management tools helpful for establishing operations. A producer must review and update the OSP & FSP at least annually. Information required for both plans may be attached or copied.
RECORD-KEEPING	Each subpart of the regulation has its own recordkeeping requirements. • Sales records to prove and maintain a qualified exemption, kept 4 years. • Water test records, kept 4 years or longer. • Other records must be kept for 2 years • Some records must be signed by the person responsible for food safety.	A complete audit trail includes OSP practice descriptions & material lists and : • Sales records, • Post-Harvest Handling records • Harvest records • Input application records • Input purchase receipts • Crop production and rotation All documents and records must be kept for at least 5 years	Plans, Records and Documents are all critical recordkeeping components that show implementation of good organic and food safety practices. Keep records and documents for at least 5 years to meet both sets of regulations.
LAND Land Use History and Production Site Assessment	FDA's Produce Safety rule recommends, but does NOT require, a farm to carry out an operational assessment ***Required for a 3rd party food safety audit:*** *D: Risk assessment and* *D: Affidavit of land use history*	• Must not use prohibited materials (synthetic fertilizers, pesticides, sewage sludge, etc.) for 36 months before harvest of a certified organic crop • Must use organic soil and nutrient management, seed & planting stock, pest management, and crop rotation. • Boundaries and buffers must prevent contamination & be described in OSP. ***Required:*** *D: Lan use letter from landowner or prior land manager, county agricultural commissioner or R: Pesticide Use Reports, or previous organic certificate*	Production land use history assessment must address both substances prohibited for use in organic systems, and risks to food safety. Land use documentation should meet both food safety and organic requirement; Include site map showing boundaries and buffers.
WORKER HEALTH AND HYGIENE	***Training is required.*** • **Supervisor or responsible party** must successfully complete an FDA-approved training in food safety and personal health and hygiene • **Personnel and volunteers** must receive basic training in principles of food safety & importance of persona health and hygiene • **Harvesting employees** crop must be trained on pre-harvest inspections of produce and harvest equipment and packaging materials ***Required:*** *R: Worker Training Log / Certificates required*	*This topic is not addressed directly by USDA organic regulations.*	Train all workers in good personal hygiene practices and procedures. ***R: Record of worker training.***
NATURAL RESOURCES, DOMESTICATED & WILD ANIMALS	• Monitor crop production and handling areas for evidence of domestic or wild animal intrusion. • Prevent contamination of produce by pathogens from animals, both domesticated and wild, and the environment. ***Required:*** *R: Field monitoring Log/ Pest Control Log* *R: Pre-harvest risk assessment*	• Maintain or improve the natural resources of the operation, including soil, water, wetlands, woodlands, and wildlife. • Prevent contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances ***Required:*** *D: OSP with description of natural resource management and monitoring plans* *R: Monitoring records appropriate to the operation*	Monitor crop production and handling areas for evidence of domestic or wild animal intrusion. FSMA'S Produce Safety Rule does not conflict with, or duplicate regulations of other federal agencies (including USDA NOP) that support natural resource management and conservation practices.
CROP NUTRIENT AND PLANT PROTECTION MANAGEMENT **1. Fertilizer and Soil Amendments Not of Animal Origin**	This topic is not addressed directly by FDA Produce Safety Rule ***Required for 3rd party audits :*** *D: Supplier letters of guarantee that materials do not present a contamination risk to crops or soil*	• Producers must verify that all material is allowed for use in organic production, AND • Materials must be in the producer's OSP and approved for their intended use by the certifier ***Required:*** *D: Approved material's list*	A complete audit trail includes tracking of all substances used. Although FDA Produce Safety Rule does not specifically require input applications in the audit trail, many third party auditors require both input material and application method. ***Required:*** *D: Product Labels and Receipts* *R: Farm Input Application Records*
2. Biological Soil Amendments of Animal Origin (Compost, manure, blood meal, feather meal, fish emulsion, hydrolyzed fish)	Produce Safety Rule requires documentation that a scientifically validated treatment process was used & the handling, conveyance and storage of a biological soil amendment of animal origin (BSOAO) is adequate to minimize the risk of contamination by an untreated or in-process BSOAO. **Bio solids and Sewage Sludge are permitted.** **Raw manure:** Further research will inform future regulations. Currently, no application interval is given. ***Required:*** *D: If purchased from a 3rd party, Certificate of Conformance & Certificate of Analysis required at least annually* *R: **If self-prepared**, record of treatment process controls: time/temp/turning schedule with signature of responsible party.*	**Bio solids and Sewage Sludge** are NOT permitted **Compost system in-vessel or static aerated pile** system: Temperature maintained 131°F to 170°F for 3 days; **Compost system is a windrow:** Temperatures above must be maintained for 15 days and turned > 5 times. **Raw manure** must be incorporated 90 days prior to harvest of a crop that does not have direct contact with the soil surface or 120 days prior to harvest of a crop that does have direct contact with the soil surface. ***Required:*** *R: Verification of treatment process, procedures, temperature, and turning schedule*	**Biosolids & Sewage Sludge:** Certified organic producers are prohibited from using these materials. **Raw Manure application:** Certified organic producers MUST follow USDA NOP regulations related to raw manure application intervals. All other producers are advised to follow organic regulations' application interval until the FDA provides an application interval for raw manure. Both organic and food safety regulations require verification documentation of treatment process, procedures, temperature, and turning schedule and handling.

Topics	FOOD SAFETY	ORGANIC	CO-COMPLIANCE
CROP NUTRIENT AND PLANT PROTECTION MANAGEMENT *(continued)* **3. Pest Management Practices and Plant Protection Products**	This topic is not addressed directly by FDA Produce Safety Rule. **Required for 3rd party food safety audits:** *D: Approved Supplier List* *D: Product Label and Safety Data Sheets* *D: Farm Input Record* *R: Pesticide Use Report*	First use preventative practices including crop rotation, cultural, biological, physical and mechanical control practices as outlined in OSP. Only when preventative controls are insufficient, allowed materials may be applied. All materials must be listed and approved by organic certifier ***Required:*** *D: Approved Materials List*	A complete audit trail includes tracking of all substances used. Although FDA Produce Safety Rule does not specifically require input applications in the audit trail, many third party auditors require both input material and application method an more. ***Required:*** *D: Product Labels and Receipts* *R: Farm Input Application Records*
4. Seed and Planting Stock	FDA Produce Safety Rule establishes requirements ONLY for seeds or beans used for sprouting. Verify that the seed or bean is not a contaminant to crops or soil by: • preventing hazards, • visually examine seeds, beans & packaging, & discontinue use of all seeds & beans with issues and report issues to supplier, • treat or rely on prior treatment of seeds and beans with documentation of such treatment. ***Required:*** *D: Documentation of seed/bean treatment required*	• Annual seedlings and seed for edible sprouts must be organic. • Must use organically grown seed and planting stock; Except: May use nonorganic, untreated, non-GMO seed or stock when an equivalent organic variety is commercially unavailable (form, quality, or quantity) **Documentation:** • Inoculants must be non-GMO. • Seed treatments must be allowed. • Perennial stock sold as organic must be managed organically ≤ 1 year.	Seed & planting stock must meet detailed quality requirements to protect against pathogens and comply with federal regulations. ***Required:*** ***D:*** *Input purchases receipts specifying type (certified organic, or if commercially unavailable, untreated and documented to be non-GMO).* *D: Documentation of seed/bean treatment for sprouts* *R: Seeding, transplanting or sprouting records*
WATER **1. Crop Production Water:** Irrigation, Fertilizer and Plant Protection Product Application	Requirements for crop production water, EXCLUDING sprouts: • Inspection of water system • Water source sampling methods, frequency, analysis • Bacterial analysis: generic E. coli ≤ 126 CFU/100 mL and STV 410 CFU/100 mL • Data collection: verify treatment efficiency, delivery, and any mitigation strategies ***Required:*** *R: Record of Corrective Action when bacterial levels exceed threshold*	Any material used to clean or sanitize the irrigation system must be listed in the producer's OSP AND approved by the certifier for its intended use. ***Allowed:*** • Alcohols (ethanol and isopropanol) as algaecides, disinfectants, sanitizers, irrigation system cleaning • Chlorine (see NOP Guidance) • Copper sulfate, as algaecide in aquatic rice systems; • Ozone gas, as an irrigation system cleaner only	Minimize risks of contamination of produce and protect water quality. • Inspect and maintenance water sources, storage, transport and application systems • Monitor and test water as regulations require • Treat water as appropriate to control microbial levels for food safety using materials that comply with organic regulations.
2. POST HARVEST: Water in direct contact with crops for icing cooling, equipment cleaning, hand washing, and sprout irrigation	Post-harvest water and sprout irrigation water standards: • Bacterial Analysis demonstrating 0 CFU/100 mL of generic E. coli at water source • Standard Operating Procedures on how to sample water & corrective procedures if water exceeds bacterial threshold ***Required:*** *R: Record of Corrective Action when bacterial levels exceed threshold*	Any material used in wash water or surfaces that come into contact with crops must be in your OSP and approved for its intended use. Allowed sanitizer materials: • Alcohols • Chlorine materials <4PPM in final crop rinse • Hydrogen peroxide • Peracetic acid in wash/rinse water per FDA limitations, as a sanitizer on food contact surfaces, facility and equipment; for disinfecting seed & asexually propagated planting material; permitted in hydrogen peroxide formulations at <6% per product label.	
HARVEST AND POST-HARVEST: Produce, Tools, equipment, and containers	• Maintain and store harvest, tools, equipment and containers to prevent contamination of crops • Perform a pre-inspection of produce to be harvested and any harvest equipment and packaging • Properly handle and pack harvested produce to prevent contamination ***Required:*** *R: Documentation of field and harvest tools pre-inspection required* *R: Documentation of cleaning and sanitation noting date and method of cleaning/sanitation required*	Producers must implement measures necessary to prevent the commingling of organic and nonorganic products and protect organic products from contact with prohibited substances, such as: Packaging, storage containers or bins containing a synthetic fungicide, preservative, fumigant • Use or reuse of any container that would compromise organic integrity (thorough cleaning is an option, with records kept).	Producers must manage harvest and post-harvest handling facilities, food contact surfaces, containers, tools and packaging to prevent contamination of produce with pathogens or with materials prohibited for use in organic production and handling. *R: Harvest Equipment Cleaning Logs*

ORGANIZATIONS THAT ASSIST WITH FOOD SAFETY AND ORGANIC COMPLIANCE

USDA
National Organic Program (NOP)
http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title07/7cfr205_main_02.tpl

FDA Final Rule on Produce Safety (FSMA)
http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm334114.htm

Agriculture and Land-Based Training Association (ALBA)
http://www.albafarmers.org
Se habla español

National Center for Appropriate Technology (NCAT)
ATTRA Sustainable Agriculture Program
https://attra.ncat.org/
Se habla español

This chart intends to provide farmers with the understanding they need to design, implement, and document compliant practices with federal regulations for both food safety and organic certification. ALBA/NCAT's On-Farm Food Safety and Organic Certification Guide for Crop Producers, parallels this chart to provide more detailed explanation.

**The FSMA Qualified Exemption

http://www.fda.gov/downloads/Food/GuidanceRegulation/FSMA/UCM472499.pdf

Growers are eligible for a qualified exemption for a calendar year from FSMA rules if the following are true in the past 3 years:

1) The average food sales sold to qualiied end users (direct to consumer, restaurant, or retail) is more than the average sales of covered produce to non-qualified end users;

2) the average sales were less than $500,000; and

3) the average sales were adjusted to inflation using 2011 as the baseline year.

**FSMA exempt farms still must follow Subparts A, O, Q, & R. In addition, exempt prodcuers must adhere to subpart A §112.6-labeling requirements for direct markets and §112.7 annual review to verify conintued eligiblity for qualified exemption.*

Regulatory References:

Full FDA FSMA Regulation
http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm247548.htm#SEC105
USDA National Organic Program (NOP)
http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title07/7cfr205_main_02.tpl

Other Resources:

Food Safety
On-Farm Food Safety Project
http://onfarmfoodsafety.org/
Produce Safety Alliance (PSA) from Cornell University Department of Food Science
http://producesafetyalliance.cornell.edu/
Organic
NOP Handbook
http://www.ams.usda.gov/rules-regulations/organic/handbook

Disclaimer regarding Food Safety and Organic Compliance: *Before using any of these sample templates or forms, please check with your intended certifier. Although content is based on regulations, the format or terminology of specific forms required may vary between certification agencies.*

This product was developed with support from U.S. Department of Agriculture's Agricultural Marketing Service, National Organic Program.

Soil Sampling, Risk Mapping & Exposure Prevention

Second Session of a Three Part Series on Soil Quality/Health

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Goal:

Understand Soil Quality to Assess Site-Risk & Manage Soils to Grow Food, Farm, Family Safely

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Objective:

Provide Soil Testing & Best Practice Guidance to ↑ Informed Decision Making that ↓ Risk of Soil Contaminant Exposure

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Why should you care about your soil?

Soil Quality

→ How Your Crops Grow!!!

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Some Soils Are Easy To Improve:

Plants Grow Best With Proper Soil

Nutrients/Structure/Composition/pH

Dont Guess! Test!!

Some Soils are Harder to Improve: If Contaminated…

Soil Quality Affects Human/Plant Health

→ Crop Quality/Risk Management

Home Tests vs. Lab Test Results

DIY Home Tests →~Approximate Results

Lab Tests → Reliable & Precise

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Where are Soil Contaminants a Concern?

- **Agricultural Lands - Historical Contaminants can Inhibit Plant Growth/Affect Human Health**
- **Residential Properties - Contaminants could be > Allowable for Human or Plant Health**
- **Urban Ag/Community Garden Sites - Based on Site History/Possibly Several Risks**

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Common Soil Contaminant Sources

Source:	Contaminant
Paint (before 1978):	lead
High traffic areas:	lead, zinc, PAHs
Treated lumber:	arsenic, chromium, copper
Burning wastes:	PAHs, dioxins
Manures:	copper, zinc
Coal ash:	molybdenum, sulfur
Sewage sludge:	cadmium, copper, zinc, lead, PBTs
Petroleum spills:	PAHs, benzene, toluene, xylene
Commercial / industrial	PAHs, petroleum products, solvents, lead,
site use:	other heavy metals
Pesticides:	lead, arsenic, mercury (historical use),
	chlordane and other chlorinated pesticides

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Where to start?

Understand/Interpret:

- Site History
- Soil Sample Testing
- Remediation **(STOP!)**

  versus Best Management Practices **(GO!)**

Observe Plant Growth/Soil Organisms/Debris

→ Dig test, Soil Structure Tests.

Site History→ What to Look For:

- **Public Access Maps (Sanborn)**
- **Walk around, ask neighbors/property owners, identify other homes in neighborhood that show similar potential hazards.**
  - **Parking lots, auto repair, junkyards, machine shops, dry cleaners, gas stations, concrete plants, illegal dumping sites!!**

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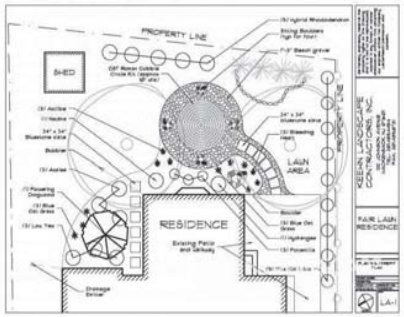
Mapping YOUR Soil Sample Sites

Make Maps with Notes for

Different Sample-Site Locations

Ex: Front/Back/Side Yard Sample Maps

Map your Garden Based on Planting Areas (Exs: veggies, native perennials, fruit trees, etc…)



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Every site is different, Soils vary too…

Ask Yourself….:

Are there plants currently growing?

- **Is the soil easy to dig into?**
- **Are you finding any micro organisms in the soil? (worms, insects, larvae)**
- **Do you come across any debris or trash?**
- **Consider a Bean Test: plant in testing site soil, and compare growth with potting soil.**

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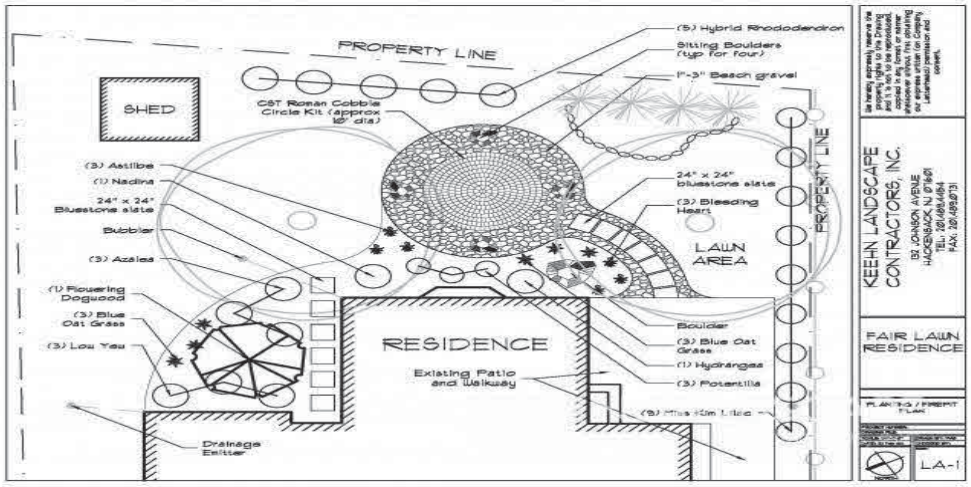
Mapping Your Food Growing Site 2-3x

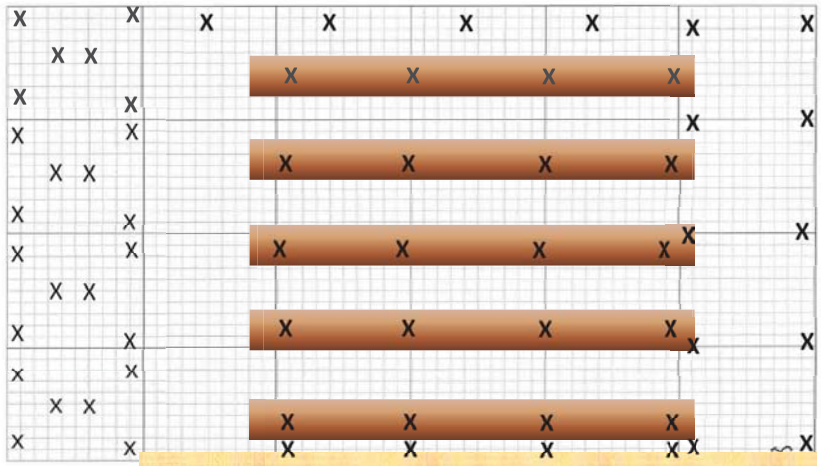
- Areas that show differences in plant growth should be sampled separately
  - Peeling paint, evidence of contamination
- # Samples per Area (top 4-6 inches of soil)
  - Keep accurate notations per site-area
  - Each distinct area should be sampled

Map Your Growing Site



GAS STATION or DRY CLEANERS

Example of Soils Sampling Map



HOUSE & PATIO

Soil Testing

See UCCE Contra Costa/Alameda Master Gardeners

Growing Your Own Food Web Page(s)

for Analytical Laboratories for Soil Testing

EPA Suggests Urban Garden Soils should Be Tested for: -pH -% organic matter

-Nutrients -Heavy Metals/Petro-/Dioxins

(based on site history including lead)

Why are soil contaminants a concern in urban areas?

Contaminants Can:

-Inhibit Plant Growth

-Affect Human Health!

-Persist in Soils Long Term

-Persist without Us Knowing

Sources of Heavy Metal/Lead Exposure

- **Lead paint hazards**
  → lead **dust** in homes; from exterior prep work & friction of windows
- **Bare soil** in yards with lead contamination from house paint or previous use of leaded gasoline
- **Take-home** lead dust from construction work or other occupations

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How do we get lead into our body while growing food?

- **Hands contaminated with leaded soil**
  Contaminated hands touch mouth, food, drink container, cigarette
- **Hands contaminated with leaded paint**
  Hands touch damaged lead paint and its dust. Then hands touch mouth, food, drink container, cigarette, etc.
- **Eating lead-containing soil or paint dust on unwashed produce, or eating produce that has lead uptake**

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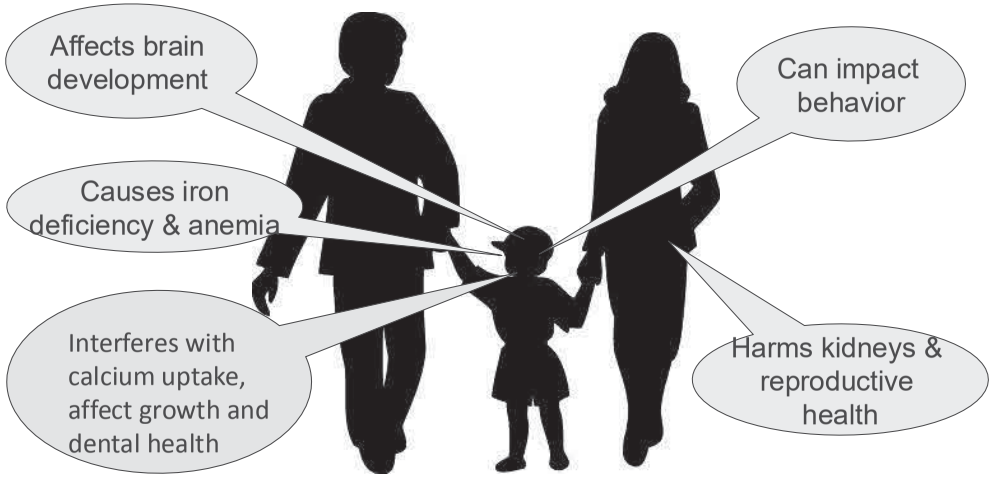
How Lead Toxicity Affects Health



Children at most risk- their brains & bodies are still developing (& fetus, because lead easily crosses placenta).

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Human Exposure Pathways:

→Soils/Dust Ingestion

→Skin/Eye Contact (& Bare Feet)

→Inhalation

Who is impacted?

-Humans/Children/Seniors -Pets

~ Based on Contaminant Concentrations

Plant/Crop-Contaminant Exposure Pathways

Through Plants Roots → Plant Root Uptake

(In Plants=Lab Tests) (Plant-Internal/Now what?)

On Plants' Parts/Leaves →Topical

(ALL Plant/Leaf Surfaces) (Plant-External/Wash)

If contamination found, how manage soils?

→Use Best Management Practices ~ Site

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Soil-Contaminants

No Single PPM Standard for Acceptable [ ]

→US EPA/Cal EPA provide Benchmarks

(Values Developed for Industrial Site Clean Ups)

If contamination found, how manage soils?

→Use Best Management Practices/Remediate ~ Site

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Best Practices: Recognize Potential Contamination → Know Risks

- **Test Soils: Dont Guess! Research! Investigate! Do Soil Tests!!**

- Buy Organic Materials Review Institute (OMRI)
- Test soils to confirm lead is < 80 ppm/HMetals

- Wear Gloves & Practice Good Hygiene/Boots
- Don't Let Kids Garden/Play in > 80 ppm Soils

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Best Practices:

Raise Beds	→	Import Clean Soils/Make & Use Compost
Amend With OM	→	To Bind Soil Contaminants With Phoshorous/Dilute Low [%] Contaminants
Mulch	→	To Prevent Airborne Soil Dust & Prevent Upsplash
Sub-Surface Irrigate	→	To Prevent Up-Splash/Spreading Particles

Best Practices:

Adjust pH	→	-Neutral pH → Optimal Growth/Nutrition
Promote Good Drainage	→	-Soil Contaminants Concentrate @ Slopes-Bottoms/Allow H20 Infiltration
Post-Harvest	→	-Soak in Vinegar/Wash Produce & Peel Root Crops
Manage Inputs	→	-Avoid Waste-Derived Fertilizers

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S.F. Department of Public Health, Sept. 2012

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Alameda County and Contra Costa County
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Alameda County: 100 Years & Counting!

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Learn more about our UC Cooperative Extension County-Based Programs at:

On Urban Ag	http://ucanr.edu/sites/UrbanAg/
UCCE Alameda County:	http://cealameda.ucanr.edu/
UCCE Contra Costa County:	http://cecontracosta.ucanr.edu/

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Urban Agriculture – Urban Poultry Risk Management Workshop!!

Rob Bennaton
Bay Area Urban Agriculture Advisor

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What Growers can do: Risk Management Tips for Urban Chicken Keepers….

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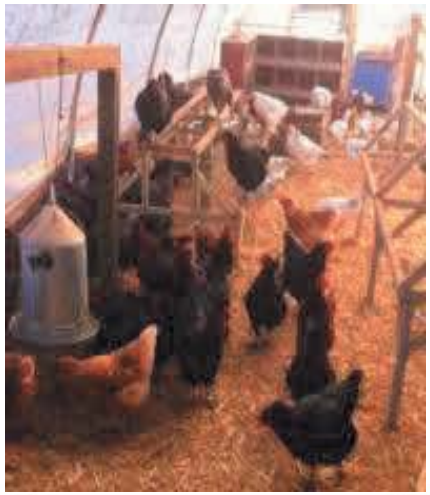
10. Use Clean Soil

- For New Chicken Runs
- Have Soil Tested by a Certified Soil Lab



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9. Add Clean Cover

If You Have Already Existing Runs:

- Clean/Tested Soils
- Clean Mulch/Straw
- Clean Compost – Feed Stock

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8. Use a Feeder Instead of Scattering Feed

Helps Reduce the Soil Amounts Chickens Ingest

-Consider Food Scraps Feeding

-Produce Scraps vs. Protein Scraps

-Store Bought or DIY Works

7. Be Aware of/Look for Possible Contaminant Sources

- Site History

  Heavy Metals/Lead/Perc?

--> Manage Risk

→ Create Coop Away from Known Potential or Historical Contaminants

6. Limit Foraging Activity if Known Risk (Soil Quality, Food Safety, Avian Exposure, Other)

5. Remove Small Loose Objects

Ingestion Risks:

- Physical/Veterinary
- Soils Contaminants
- Flock Food Safety

4. Don't Feed Chickens Unwashed Plant Material

- Especially from Contaminated Garden/Farm/Yard Areas
- Consider Your Plant Sources (your lawn, urban gardens & farms, kitchen scraps, etc.)

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3. Provide a Calcium Supplement

- Important for Laying Hens
- Research Suggests May Reduce Lead (Pb) Uptake into Eggs

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2. Clean Coop=Healthy Flock

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1. Clean the Coop Often

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Understanding Your Test Results for Chicken Run Soils/Eggs

- Egg Lead Levels ~→FDA's Recommendation: [Pb] in CANDY not > 0.1 ppm

- European Guidelines - > 0.10 - 0.3
  for solid foods, none specific to eggs

Think: Relevant Frames of Reference to Reduce Potential Exposures

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Chicken Run Soils

- IF Soil Lead Test Result < 80ppm, no specific practices recommended

- IF Soil Lead Test Result > 80ppm, add clean soil/clean cover material

- IF Soil Lead Test Result was higher than Guidance Value > 80ppm/400ppm… try the following practices:

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Discourage Flock from Eating Soil

→ Avoid Feed Scattering of

a. scratch grains and

b. foodscraps

Provide Flock regular feed, grit, and calcium supplements in feeders.

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Chicken Eggs

- IF Eggs-[Pb] <0.02ppm-
  ~Similar Levels of [Pb] as Store bought Eggs

- IF >0.02 - 0.1ppm
  → low risk at Egg Consumption of 2-3/week.

- If Eggs-[Pb] is between 0.1 - 0.30ppm
  → ***High*** Potential Risk for (Esp. for Children at 1 Egg/day over Time…

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Chicken Eggs

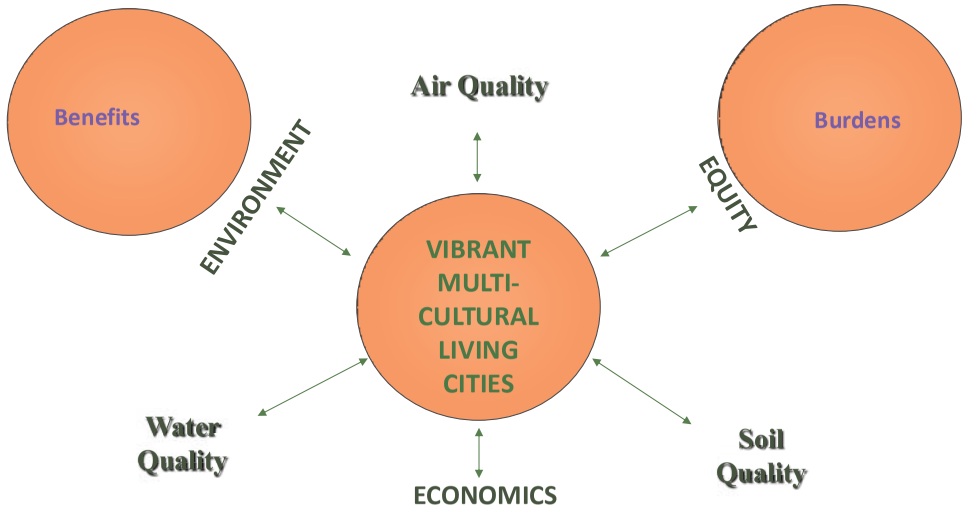
If Eggs-[Pb] > 0.1 and 0.30ppm-

High Potential Risk for Children

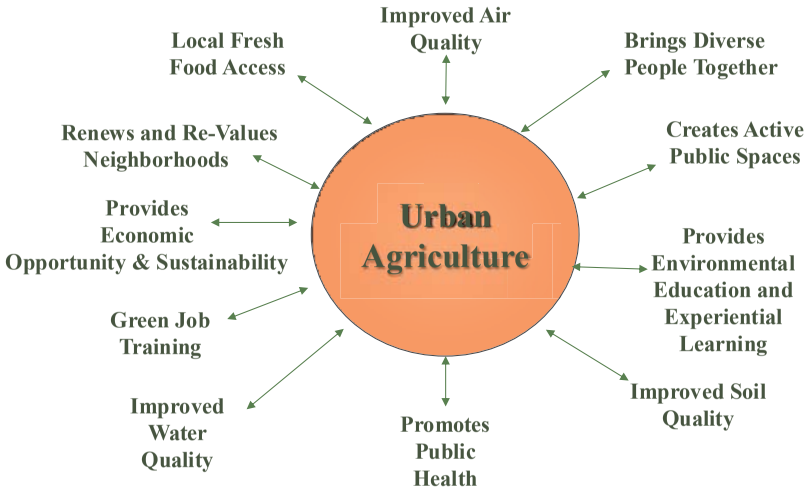
at 1 Egg/Day over Time…

- Remove Dust/Soil/Manure/Feathers from Eggshells
- Consider Serving Fewer Egg Yolks

Urban Ag Contributes …



Urban Ag As it Grows…



Credits

Cornell Cooperative Extension:

Healthy Soils, Healthy Communities Project

Reyna Yagi, (current)

Urban Agriculture Prog. Coordinator, UCCE NorCal

Diego Ortiz, (former)

Urban Agriculture Prog. Coordtr., UCCE Alameda

Dr. Maurice Pitesky, UC Davis Vet. Medical School

Let's Grow Together!

Future 4-Hers, Urban Farmers, Composters, Food Preservers And Gardeners!

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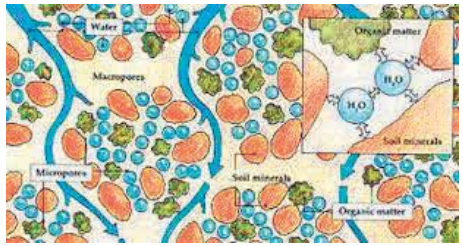


University of California
Agriculture and Natural Resources

Cornell University
College of Agriculture and Life Sciences
Department of Crop and Soil Sciences

Cornell Waste
Management Institute

Contaminants in Soils:
Data Collection, Interpreting Test Results, and Minimizing Exposure

Hannah Shayler and Murray McBride

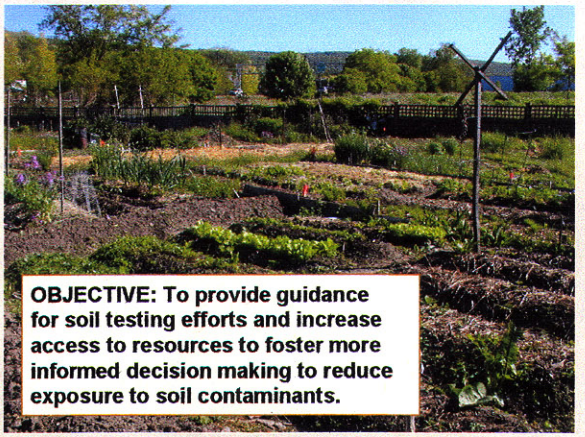
WHERE ARE SOIL CONTAMINANTS A CONCERN?

Soil quality is affected by land use and proximity to pollution sources.

AGRICULTURAL LANDS: Contaminant levels may sometimes be high enough to inhibit crop growth or affect human health.

RESIDENTIAL PROPERTIES: Contaminants in yards or gardens may exceed levels recommended for the health of humans or plants.

COMMUNITY GARDENS: Garden sites, especially in urban areas, might have a history of contamination. However, there is increasing interest in creating community green and food-producing spaces.



OBJECTIVE: To provide guidance for soil testing efforts and increase access to resources to foster more informed decision making to reduce exposure to soil contaminants.

WHAT ARE SOME COMMON SOURCES OF SOIL CONTAMINANTS?

Paint (before 1978):	*lead*
High traffic areas:	*lead, zinc, PAHs*
Treated lumber:	*arsenic, chromium, copper*
Burning wastes:	*PAHs, dioxins*
Manure:	*copper, zinc*
Coal ash:	*molybdenum, sulfur*
Sewage sludge:	*cadmium, copper, zinc, lead, PBTs*
Petroleum spills:	*PAHs, benzene, toluene, xylene*
Commercial / industrial site use:	*PAHs, petroleum products, solvents, lead, other heavy metals*
Pesticides:	*lead, arsenic, mercury (historical use), chlordane and other chlorinated pesticides*

HOW ARE PEOPLE EXPOSED TO CONTAMINANTS?

1) INGESTION: People may ingest small amounts of soil while working in soil, gardening or playing. Contaminants may accumulate on or in produce, or in meat, eggs, milk, or water.

2) SKIN CONTACT : Some contaminants, such as many pesticides, can easily pass through the skin and enter the body.

3) INHALATION: People may inhale contaminants with airborne soil particles (such as windblown dust) or that vaporize from soil.

The most likely route of human exposure will vary with the contaminant and with site conditions.

Contaminant levels depend on the history of a particular site. Soil testing can inform decision making about crop management, gardening practices, or land use to reduce human exposure and protect crops.

HOW SHOULD SOIL SAMPLES BE COLLECTED?

The best sampling strategy will depend on the particular site conditions and on the questions being asked. For example:

- To measure contaminant levels in specific locations, such as play areas or possible contamination sources, collect separate samples of the top 1-2 inches of soil from these areas.
- To measure average contaminant levels in surface soil, collect composite samples of the top 1-2 inches of soil across the site.
- To measure contaminants in garden soil, collect deeper samples (from 0-6 inches) from several locations in the garden and mix them together. Collect separate samples if you want to know if some parts of the garden have higher concentrations.

WHAT DO SOIL TEST RESULTS MEAN?

There is no single standard for acceptable soil contaminant levels, but the resources of state and federal agencies and university extension programs can provide guidance for interpreting results.

The USEPA Soil Screening Levels and NYSDEC Soil Cleanup Objectives in particular may provide useful benchmarks for comparison. However, these values were designed primarily for the cleanup of industrial sites.

HOW CAN EXPOSURE BE REDUCED?

- Wash hands or wear gloves when in contact with soil.
- Prevent soil from coming indoors on shoes, pets, or clothing.
- Avoid or contain contaminated areas: use raised beds for gardening, or mulch to reduce dust.
- Incorporate clean soil or organic matter, adjust soil pH, promote good drainage, wash produce, and peel root crops.
- Avoid or limit activities that can increase soil contamination, such as the use of certain waste-derived fertilizers.

WHERE CAN I FIND ADDITIONAL INFORMATION, FACT SHEETS, AND OTHER RESOURCES?

For updates as our project progresses, please visit us at: **http://cwmi.css.cornell.edu/soilquality.htm**

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Soils in Urban Agriculture: Testing, Remediation and Best Management Practices for California Community Gardens, School Gardens, and Urban Farms

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Urban agriculture, including community and school gardens, and small farms in cities, has become a popular means of obtaining fresh local produce. San Francisco, San Diego, Los Angeles and several other California municipalities have changed policies to facilitate these activities.

Soils are an important consideration for individuals, community groups, and local governments becoming involved in urban agriculture. In many situations, urban soil has been contaminated and degraded by past uses and activity, including industry, unauthorized dumping, construction, heavy nearby traffic, and adjacent buildings where lead-based paint has been applied.

Elevated levels of lead in particular are fairly common in urban soils, and pose health risks, especially to young children who can ingest soil while playing or helping in gardens. Ongoing exposure to lead can cause damage to

the nervous system and interfere with brain development, along with creating other health problems. Arsenic, cadmium, copper, zinc and other naturally occurring trace elements in soils can also be elevated to unsafe levels by various past land uses.

Although soil degradation and contamination are important concerns and should be addressed, they are not always a problem with urban agriculture sites. A study conducted at several Los Angeles area community gardens by University of California researchers found that "in nearly all cases concentrations of trace elements were well within natural ranges" (Hodel, D.R. and A. C. Chang, 2002). In contrast, a study conducted in San Francisco found that "a majority of the gardens exceeded the California Human Health Screening Level for arsenic, cadmium, and lead" (Gorospe, 2012).

Even where there are elevated levels of lead or other metals or contaminants in soil, relatively little is absorbed by plants that can be harmful to humans, although this varies depending on the soil condition and the plant characteristics. Accidentally swallowing or inhaling contaminated soil and dust is the most likely way urban farmers will be exposed to unsafe levels of lead or other contaminants. This can happen easily, for example, when people put their fingers in their mouths without thinking.

Beyond heavy metals, other sources of soil contamination and soil hazards might include solvents found at sites with a history of manufacturing use, various petroleum based chemicals – common at previous gas station sites and other industrial sites, chlorinated pesticides and residual herbicides on former agricultural lands or public landscaped areas, saline soil, and issues where a contaminant may not be harmful to people, but may prevent plant growth or production. Physical debris such as lumber, concrete, wire, broken glass or discarded syringes can also create hazards for the urban farmer.

Clearly, there are no easy answers. Each site and situation is unique. However, putting in place reasonable policies and encouraging sustainable practices will help to ensure that participants and those who consume urban agriculture products are not exposed to unsafe levels of lead or other heavy metals and contaminants. This publication outlines strategies for urban soil contamination assessment, remediation, and municipal policy around safe soils for urban agriculture, and offers additional resources for further exploration. This publication does not cover soil fertility or other important soil science topics, although resources are listed on page 10. Instead, the goal is to provide an overview of issues unique to urban soil use for food production.

Soils Assessment for Urban Agriculture

Site Selection: Overall soil conditions should be a consideration when selecting a site for urban agriculture. If plants, even weeds, are growing abundantly on the site, this is a good indication that the soil will be able to support crops. If soil is reasonably easy to dig, this is a positive sign as well. The presence of plant roots and earthworms can indicate soil health. However, note that these indicators do not guarantee that soil is uncontaminated. When assessing potential sites, be aware that properties with considerable amounts of trash and rubble, or with obvious dead spots where plants do not grow, may pose greater challenges. Heavy herbicide or pesticide use may have even

sterilized the soil on a site. *A simple test for evaluating soil fertility is to plant bean seeds in soil from the site, perhaps in a pot or some biodegradable paper cups, and compare their germination and growth with an equal number of beans grown in purchased potting soil.* It is also advisable to dig a hole one-to-two feet deep in several places to assess the type of debris on the site.

Site History: It is important to learn as much as possible about the history of a proposed site and how it has been used in the past. Walking around the site may provide some clues. Adjacent older homes with peeling paint, paint chips or evidence of sandblasting indicate potential soil lead contamination. Any building built before 1979, with old or peeling paint, may be a hazard due to use of lead-based paint. Proximity to a freeway or heavily trafficked road is also a source of lead. Although leaded gasoline has not been in use since the 1980s, lead particles in vehicle exhaust may have settled from the air into the soil.

Talking to the property owner and neighbors is a good strategy, as neighbors are often familiar with past use of the property. It may also be necessary to do some internet or library research. For example, at some public libraries it is possible to access Sanborn maps, which were used in the past by insurance companies to determine the risk involved with insuring individual properties. These maps can provide information about prior uses of a proposed site. These are available at public libraries, and may be available online through some libraries. Old aerial photographs, which can sometimes be found in local libraries or online, can help identify a site's history as well.

The local city hall may also have some of these aerial photographs accessible in their archives. There is also a fee-for-service website, ***http://www.historicalaerials.com***, which includes aerial maps of various regions of California where the history of a site can be researched. The county tax assessor's office and city hall are important sources of tax records and permits that have been obtained for the property, which can help uncover past uses of the site. Potential sites can be checked on the California Department of Toxic Substances website at ***http://www.envirostor.dtsc.ca.gov/public/*** to see if there are any documented issues or ongoing cleanup activity associated with the property.

Some examples of prior uses of sites that may have caused soil contamination are parking lots, junkyards, auto repair/auto painting, carpentry, machine shops, dry cleaners, gas stations, railroad yards, and illegal dumping. The history of the site will help to determine what kind and how much soil testing is necessary. **A site that has been primarily residential or used as green space is generally lower risk. A site that has had past industrial or commercial uses should be more carefully analyzed.**

Soil Testing

Having soil tested at a laboratory is always recommended. This should be considered a basic cost of starting any urban agriculture project. The cost will depend on the size of the proposed site, the number of soil samples needed, and the type of analysis conducted by the lab.

Soil test kits sold at hardware stores or garden centers provide some basic estimates of soil fertility, but are not suitable for assessing soils at a potential urban agriculture site, as they do not provide information about soil contaminants.

Selecting a Soil Testing Lab: Finding a university or commercial lab to do soil

testing is not difficult; performing an internet search for your region or state should result in several choices. In many publications, the Cooperative Extension service is listed as a resource for testing soil. However, the University of California Cooperative Extension does not offer soil testing. Some other state land grant universities accept out of state soil sample submissions by mail at very reasonable prices, including University of Massachusetts at Amherst and Penn State University.

When selecting a soil testing lab, here are some questions to ask when talking to the labs:

1. Do you participate in the North American Proficiency Testing Program (NAPT – this program assures that soil test analyses are being performed using validated testing methods).
2. Which tests do you recommend for an urban agriculture site with no site history?
3. Do you recommend any specific tests for sites with a history of industrial or commercial use?
4. Do you perform tests for elevated levels of heavy metals and other contaminants– in particular, those listed in the California Code of Regulations Title 22: *Inorganic Persistent and Bioaccumulative Toxic Substances*?
5. What costs are involved for testing?
6. What is the recommended procedure for taking soil samples?
7. Is it okay for people to call the lab for advice and information?
8. Is a narrative provided with the soil test results? Is there an extra charge for this?
9. Do you provide remediation recommendations with the soil tests?
10. What is your turnaround time?

The US Environmental Protection Agency recommends that for urban areas, "at a minimum, the soil test should include pH, percent organic matter, nutrients, micronutrients, and metals, including lead" (See EPA Publication No. 905R1103, "Evaluation of Urban Soils: Suitability for Green Infrastructure or Urban Agriculture"). This level of testing is adequate for a site that has been residential or green space. Most commercial soil labs can test for the most important heavy metals, including not only lead, but also arsenic, cadmium, chromium and nickel.

More testing may be appropriate for a site with a history of industrial or commercial use, which might include CAM-17 testing (CAM stands for California Administrative Manual. CAM 17 refers to the list of 17 metals specified in the manual: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc). An EPA-recognized laboratory is the best choice for this level of testing.

It is possible that other types of tests may be necessary, such as testing for PAHs (polynuclear aromatic hydrocarbons), a class of potentially toxic byproducts of incompletely burned garbage, oil, wood, coal or other organic materials. These accumulate in soils and can be a concern on a site that has been a car wash, parking lot, road and maintenance depot, vehicle

services site, or where coal, oil, gas or garbage were burned on site.

In many situations, staff members at soils labs are great sources of information. They are generally willing to talk on the phone about appropriate testing based on site history. However, there are instances where additional support may be necessary.

Resources for brownfields soil assessment: According to the California Department of Toxic Substance Control (DTSC), "brownfields are properties that are contaminated, or thought to be contaminated, and are underutilized due to perceived remediation costs and liability concerns." In some cases involving former industrial or manufacturing sites, old gas station sites, and some other situations, expert assistance may be necessary. Some sites may have cleanup issues beyond what a community project can accomplish without technical expertise and a significant budget. Some sites may be too expensive to test and remediate. Help may sometimes be available, though, through state and local brownfield programs. California DTSC oversees a voluntary cleanup program for brownfield sites. Some cities have brownfields programs that may be able to provide guidance, resources and perhaps even help secure funding for cleanup. Although urban agriculture is not yet a common reuse for brownfield sites, this is an area for further exploration. Local offices of the USDA Natural Resources Conservation Service (NRCS) may also be able to provide technical assistance and guidance on a case by case basis.

Taking Soil Samples: Laboratories generally provide an online instruction sheet on how to sample the soil, prepare the sample, and mail it to the lab. Once a lab has been selected, review its website for instructions, or speak to a staff member on the telephone. Detailed instructions on collecting soil samples are also available in several of the resources listed on page 10. It's important to review these instructions, since poorly collected or unrepresentative soil samples may not provide good information.

Generally, it's essential to approach soil testing with a plan in mind. By making a simple map of a proposed site, and noting areas with different characteristics, it is possible to decide how many samples to collect.

Mapping sampling area.

1. If there is an area where plants are not growing, or the soil is discolored, that area should be sampled separately.
2. An area of the site adjacent to a building with peeling paint should be sampled separately.
3. For each area to be sampled, it is usually appropriate to take five to seven sub-samples which will be mixed together to create a composite sample.
4. Samples should be taken from the top four to six inches of soil.
5. Any litter, leaves, grass, or anything else covering the soil should be removed before sampling. The sub-samples can then be mixed together thoroughly in a clean bucket to form a composite sample.
6. For each distinct area of the site, this process should be repeated.
7. Keeping track of sampling location is important. Once results come back, it will be necessary to refer to records that clearly show where on the site samples were taken.

Transporting samples.

1. A clean plastic resealable bag that holds approximately two cups (1 – 1 ½ lbs.) should be used to transport the soil sample.
2. Removing most of the air from a double-bagged sample is a good precaution to prevent spillage.
3. Some labs also supply sample jars, which may be free with testing.
4. The soil sample does not need to be refrigerated, but keeping it in the shade or a cool, dry place until shipping or delivery to the lab can be beneficial to achieving accurate test results.
5. Wet samples should not be shipped – inaccurate testing may result.
6. Soil samples can be dried prior to shipment by keeping the bag open in a dry and well-ventilated place or by spreading the soil in a thin layer on clean butcher or waxed paper, and allowing it to dry at room temperature.

Interpreting Soil Test Results: Some soil labs provide a narrative report with recommendations. Most labs are receptive to phone calls with questions on interpretation, upon receipt of test results. Results of soil testing indicate if plant nutrients are low and need to be raised for best plant growth, and if soil pH needs to be adjusted. The soil test can also indicate if there are higher than acceptable levels of heavy metals, or other contaminants, depending on what tests were requested.

Heavy metals are the most commonly tested, and there is more guidance available about heavy metals, especially lead, than for many other contaminants. Even so, there is not one standard as to what constitutes safe levels of heavy metals in urban agriculture. Most guidelines that exist are created for residential use scenarios and contact with soil through skin exposure or accidental ingestion, rather than formulated for gardening or farming. Still, they provide some guidance about what's acceptable.

One standard to consider is the California Human Health Screening Level (HHSL), which is used by the City and County of San Francisco, and the City of San Jose, in their guidance on lead hazard assessment for urban gardens and farms. For lead, the HHSL is 80 parts per million (ppm). Anything lower is considered "below the level of concern for human health." Another standard is the US EPA's Soil Screening Levels (SSLs) for residential use, which consider lead to be a hazard at levels of 400 ppm or more. In 2013 the EPA's Technical Review Workgroup (TRW) for Lead provided a bit of clarification specifically for gardening, and deemed soil lead at less than 100 ppm to be "low risk" for home-grown produce. The HHSL levels for heavy metals and other potential contaminants are listed in the chart at ***http://www.oehha.ca.gov/risk/chhsltable.html***, and some of the most common are listed in Table 1 along with the corresponding SSLs. The EPA's TRW chart with specific, tiered soil lead recommendations for gardening is available in Table 2. **It is important to note that these standards are advisory only. Check with local municipalities (or school districts for school-based projects) to find out if more specific requirements have been established.**

Remediating Soils

If soil testing indicates that there are higher than acceptable levels of lead or other heavy

metals, there are strategies to mitigate the problem.

Working with existing soil: Many times, urban farmers automatically plan for raised beds to avoid potential soil problems. However, raised beds do have some drawbacks, including the cost of materials, obtaining quality "clean" soil to fill them, and the fact that plant roots dry out faster in raised beds, potentially increasing irrigation needs. When possible, it's more economical to plant in the existing soil. If the site has been residential or green space, without a history of industrial use, and soil test results are borderline, it may be possible to work with existing soil by following some best management practices.

1. Turn over the soil deeply and thoroughly. Contaminants are often concentrated in the top two inches of soil, and can be diluted through digging and mixing.
2. Maintain the soil pH at or close to neutral, 6.5 to 7.0. Soil nutrients are most available to plants at this pH, while lead and some other heavy metals are less available.
3. Add organic matter to the soil, and continue to do so each planting season. By adding soil amendments and compost, the soil will hold water and nutrients more effectively, and heavy metals will bind to organic matter and become less available to plants. Organic matter improves soil structure, infiltration and water-holding capacity, creates a better environment for plant roots and slowly releases plant nutrients. Adding organic matter also helps to dilute soil contaminants.

Soil Removal: The most cautious strategy, perhaps most likely to be considered when dealing with a brownfield site, is to remove existing soil from the growing area, and replace it with soil that is certified safe. However, this is an expensive strategy, and is out of the range of what most community groups or individuals can afford. Contaminated soil has to be disposed of according to law, and this can prove expensive, in addition to the costs involved with excavating soil, removing it, and bringing in clean soil.

Raised Beds: A more common approach is to build raised beds and fill them with clean soil. A study of backyard, school and community garden soils in San Francisco showed that raised bed gardens had significantly lower levels of arsenic, cadmium, and lead than in-ground gardens (Gorospe, 2012). Another study, conducted in Chicago, measured significantly less lead in raised bed gardens than in-ground gardens (Witzling et. al, 2010).

To create raised beds, urban farmers can build frames of redwood or other lumber, brick, concrete, rocks, or any other sturdy material that won't leach contaminants into the soil. Treated lumber should be avoided since lumber treatments may cause leaching of copper or other metals into the soil.

Water-permeable fabrics can be applied as a barrier between the on-site soil and the imported soil used to fill raised beds. Landscape fabric is liquid- and air-permeable, unlike black plastic. Landscape fabrics are made from various materials, including nonwoven polypropylene, woven fabric, biodegradable paper mulch, or flexible geotextile fabric.

Once the frame has been lined with landscape fabric it should be filled with "clean" soil. One way of ensuring clean soil is to purchase OMRI (Organic Materials Review Institute) -certified topsoil or

planting mix. OMRI performs an independent review of products intended for use in certified organic production, handling, and processing. OMRI reviews producer-submitted products against the National Organic Standards and generates a list of acceptable products. See the OMRI Crop Products list at ***http://www.omri.org/sites/default/files/opl_pdf/crops_category.pdf***. Some products that are not OMRI listed may still meet USDA organic rules; the producer may have decided against the expense of being reviewed by OMRI. Local urban farmers or gardeners may have recommendations on potential sources of quality soil. Some vendors may be able to provide documentation that soil has been tested, and if not, the soil could be sent to a lab for testing to be sure that it is not contaminated.

Other Containers: There are other types of containers besides raised beds. Some are commercially available growing systems that are self-watering for smaller-scale projects. Others are mesh "socks" that are filled with growing medium and placed on top of the soil. These types of "instant gardens" may be especially appropriate for short term projects.

Although tires are sometimes used as planters, this practice is not recommended, since tires can contaminate soil with leached metals as they degrade over time.

Asphalt Removal: Sometimes, especially at school sites, there is no open ground available, and gardens are constructed over blacktop, or asphalt is removed in order to have a garden.

Asphalt removal, also known as "depaving", can convert an unused paved area into a garden space. This is a sizeable project to undertake, especially if doing it manually with the help of volunteers. If a professional company is hired to do the job, though, asphalt removal can be a major expense.

Many sites have created successful urban agriculture projects through depaving. For example, in 2006, volunteers removed 5,000 square feet of asphalt from the grounds of Carthay Center Elementary School in Los Angeles and created a thriving garden – the Garden of Possibilities – which is a centerpiece for the entire community. To improve the hardened clay soil, tons of soil, mulch and compost were donated and tilled into the soil by volunteers. The garden is a great success for the school; the students now participate in a year-round garden science program. The garden consists of raised beds and in-ground beds, as well as a stone fruit orchard, citrus orchard, tropical garden, butterfly garden and poetry garden.

If a site plan calls for asphalt removal, it is important to test for heavy metals and other contaminants prior to removal. Testing soil beneath asphalt requires cutting triangular holes in the asphalt with a hand-held concrete saw to expose the soil. The asphalt triangles can then be removed along with any subgrade debris or stones in order to obtain a sample (Replacing pavement triangles and adding sand or pea gravel is necessary afterwards to prevent a tripping hazard). If soil tests show heavy metals above recommended levels, rather than removing the asphalt, raised beds or large containers might be considered for gardening.

Choosing Ornamentals over Food Crops: Some sites not appropriate for growing food might still be perfect for ornamental trees and shrubs, or a wildflower meadow. Not every site needs to be a food production site, but can serve other purposes in the community, such as green space and beautification.

Best Management Practices

There are several practices that make sense in many urban agriculture settings, whether gardening in the soil, raised beds, or other containers, even where soil testing does not indicate problems.

1. Remove any debris from the site, such as trash, metal, wood, and tires. Use care in removal and disposal of these materials, being aware of and following any pertinent regulations.
2. Mulch paths and walkways between planting beds. It is also possible to use a landscape fabric then cover the fabric with mulch. Mulch will not only keep weeds in check and conserve water, it will also help keep dust that may contain lead or other contaminants from getting on crops or other surfaces that participants may touch.
3. Wear gloves while working on the site.
4. Facilitate hand washing. Hand washing immediately after working in the urban farm is important. Incorporate a hand washing station into the urban farm, and train participants to use it frequently. Handwashing is important for everyone but even more so for children, who tend to put their fingers in their mouths.
5. Thoroughly wash produce before storing, cooking and eating. Remove older, outer leaves of lettuce or leafy greens before eating. Peel root vegetables before eating.
6. Wear closed-toe footwear while working on the urban farm. If possible, remove shoes worn while at the farm before entering the home.

Municipal Policies for Soil Testing and Urban Agriculture

As urban farming in all its forms becomes more popular, municipalities are beginning to consider a variety of policies related to land use for this purpose, including requirements for soil testing and remediation. Generally, the decision faced by municipalities is whether to require soil testing and a remediation plan where appropriate, or to make recommendations and provide educational materials on best practices. Requiring soil testing can create challenges for municipalities if they do not have staff available and qualified to review and evaluate soil test results and remediation plans. Some municipalities require soil testing for contaminants (and sometimes other soil properties) for community gardens. Anyone contemplating establishment of such a garden or farm should check with the local city or county environmental health or parks and recreation department or other jurisdiction.

It is important to ensure that policies do not create insurmountable barriers for urban agriculture. Many community groups pursuing community gardens or other urban agriculture projects have limited funds to conduct extensive site analysis for contaminants and any resulting remediation.

At the same time, contamination of urban soil is an important environmental health consideration. It is possible to have urban agriculture that is both safe and cost-effective. **Soil testing is extremely important and should be facilitated and encouraged by municipalities.** Ideally, this would include subsidizing the cost of soil testing and providing assistance with interpretation of soil tests and development of simple remediation plans. Minimally, it would involve a list of best practices, such

as some of those in this publication, that urban farmers would agree to implement at their site.

Education is important in any case. Many best management practices, such as adding organic matter and managing soil pH are important strategies for ensuring safe soils, but are not practical to handle via policy. Cities and counties should explore forming partnerships with the local UC Cooperative Extension office to provide educational resources and training on soil management for urban agriculture. UC Cooperative Extension has trained Master Gardener Volunteers available who may be able to help provide education at the local level.

Cities should also foster a connection between their own brownfields program, if one exists, and urban farmers. Municipal brownfields programs should be encouraged to work with urban farmers to identify potential sites and support testing and remediation for urban agriculture projects. This strategy is being used successfully in several US cities, including Milwaukee, Wisconsin and Kansas City, Missouri.

TABLE 1.

Advisory Levels to Guide Interpretation of Soil Test Results for Heavy Metals in parts per million (ppm)[1]		
Inorganic Chemicals	**California Residential HHSLs**	**US EPA SSLs**
Arsenic[2]	.07	.4
Cadmium and compounds	1.7	70
Chromium III	100,000	120,000
Chromium VI	17	230
Lead and lead compounds	80	400
Nickel and compounds	1,600	1,600
Zinc	23,000	23,000

[1] These state and federal soil screening level standards are for advisory purposes only. Please refer to page 6 for details.
[2] The screening numbers for arsenic are for contamination resulting from human activity. Concentrations of naturally occurring arsenic may be far above the screening number. When levels of arsenic at a site are a concern, the agency with authority over remediation decisions should be consulted.

TABLE 2.

EPA TRW Lead Committee Recommended Best Management Practices for Gardening in Lead Contaminated Areas (reprinted from publication #OSWER 9200.2-142)

Soil-Lead Concentration (ppm)	Category	Recommendation: Gardening Practices	Recommendation: Choosing Plants[a]
<100	Low risk	No specific remedial action needed. Wash hands, produce, clothes (good gardening and housekeeping practices).	No restrictions of crop types.
>100–400 [b] 400 - 1200	Potential risk	Increasing use of good gardening and house- keeping practices as described in Table 3. Relocate garden to lower risk garden areas. Increasing use of soil amendments (e.g., compost, clean fill), barriers (e.g., mulch), and other remedial measures up to and including raised beds and containers. Ensure gardeners wear gloves and use tools to reduce soil contact and ingestion.	Decrease planting of root vegetables or relocate root crop planting to lower risk areas. Increase use of soil amendments and barriers to reduce soil deposition onto leafy vegetables. Increase planting of fruiting vegetables, vegetables that grow on vines, and fruit trees.
>1200	High risk	All of the above good gardening and housekeeping practices. Raised beds, soil containers, soil replacement (i.e., excavate contaminated soil and replace with soil containing low lead concentrations) are strongly recommended.[c] Consider finding other locations for garden. Restrict child access to only established safe areas. Restrict all gardening by or for children in contaminated soils.	Select plants with shallow roots for raised beds or areas with replacement soil to ensure that roots do not reach contaminated soil that is left in place, if any, otherwise, no restrictions.

[a] Source: Hemphill et al., 1973; Moir and Thornton, 1989; U.S. EPA, 1995; U.S. DOE, 1998; Jorhem et al., 2000; Heinegg et al., 2000; Finster et al., 2003; Pichtel and Bradway, 2008; Shayler et al., 2009; Leake et al., 2009; Chaney et al., 2010; Nabulo et al., 2010; U.S. EPA, 2011a; U.S. EPA, 2011b; Säumel et al., 2012

[b] While 400 ppm lead in soil is considered an appropriate screening level for residential soil-lead, the TRW recommends that 100 ppm be used as the low end of the range of soil lead concentrations to mitigate exposure to lead in soil when gardening is an important exposure pathway. Lacking the information to support a quantitative approach for estimating risk for gardening scenario to support establishing acceptable concentration of lead in garden areas, best professional judgment was used to establish the low end of the range. This soil concentration is below the 400 ppm soil screening level for lead because the gardening exposure pathway includes other sources of lead exposure not sufficiently accounted for in the soil screening level. The basis for the Soil Screening Level (SSL) is children playing in lead contaminated soil and some other exposures, with the predominant source of exposure from direct soil ingestion or ingestion of soil manifested as house dust. Scientific limitations when it was developed did not allow the SSL for lead to adequately account for consuming home-grown produce. In developing an acceptable concentration of lead in soil for home garden exposures, the same child receptor would be exposed if accompanying the adult in the garden and also exposed through consumption of lead in and on the produce grown in the soil. Hence, the garden-based level is lower than the SSL and reasonable steps to mitigate exposure to lead while gardening in soil lead concentrations between 100–400 ppm would be appropriate. The TRW acknowledges that background soil lead concentrations in some communities may exceed the guidance values recommended for garden areas. Mitigation may be necessary for those communities.

[c] Twenty-four (24) inches of clean soil cover is generally considered adequate for gardening; however, site specific conditions should also be considered. A 24-inch barrier normally is necessary to prevent contact of contaminated soil at depth with plant roots, root vegetables, and clean soil that is mixed via deep rototilling. Raised garden beds could cost effectively add 24 inches of clean soil (U.S. EPA, 2003).

Where Can I Get More Information?

Basic Soil Science

The California Master Gardener Program's "Garden Web" offers a helpful list of common questions and answers on basic soil science, including soil texture, structure, pH, salinity, nutrients, and fertilizers. ***http://ucanr.org/sites/gardenweb/Vegetables/?uid=26&ds=462***

UC Davis Soil Web

The UC Davis Soil Web is a useful online tool that can give clues to past disturbances, soil removal, fill dirt additions, etc. in many areas of California. For more information, please visit ***http://casoilresource.lawr.ucdavis.edu/soilweb/***.

Brownfields Reuse

Although urban agriculture is not yet a common reuse, the California Department of Toxic Substances Control (DTSC) offers helpful information about brownfields and California's voluntary cleanup program at ***http://www.dtsc.ca.gov/SiteCleanup/Brownfields/index.cfm#CP_JUMP_13298***.

"Re-Use: Creating Community-Based Brownfield Redevelopment Strategies" is a website and downloadable guidebook that provides details on the reuse of brownfield sites, including agricultural use of remediated brownfields, and is a helpful guide to community engagement, funding, site assessment and cleanup of contaminated sites. The guidebook includes a case study of a brownfields site converted to a successful urban farm. ***http://www.planning.org/research/brownfields/***.

Soil Quality/Soil Health

The USDA Natural Resources Conservation Service has a great website with a variety of resources, including assessment cards to use to evaluate soil. See ***http://soils.usda.gov/sqi/index.html***.

Soil Testing and Remediation for Urban Agriculture

Cornell University's Waste Management Institute has great information on soil testing and remediation. ***http://cwmi.css.cornell.edu/soilquality.htm#soil***.

"Heavy Metals and Gardens" offers multilingual resources for urban California residents on soil testing, interpreting results, and remediation. ***https://sites.google.com/site/healthygardeners/home***.

The Organic Materials Review Institute (OMRI) provides lists of certified organic soil and soil amendment sources. This can help in identifying possible sources of certified clean soils and amendments. ***http://omri.org***.

Policy-Related Resources on Urban Agriculture and Soil

"Seeding the City: Land Use Policies to Promote Urban Agriculture" is a downloadable toolkit focuses on policy best practices for urban agriculture, with helpful model comprehensive plan language on various aspects of farming in cities, including soil testing. ***http://changelabsolutions.org/sites/default/files/Urban_Ag_SeedingTheCity_FINAL_%28CLS_20120530%29_20111021_0.pdf***

"Dig, Eat, and Be Healthy: A Guide to Growing Food on Public Property" is a guidebook that offers strategies for negotiating the use of public land for growing food, including types of agreements and specific suggestions on how to handle the issue of soil testing in such agreements. It includes a helpful section on school gardens. ***http://changelabsolutions.org/sites/default/files/Dig_Eat_and_Be_Happy_FINAL_20130610_0.pdf***

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Sanitation & PostHarvest Handling

Shermain Hardesty
Ag & Resource Economics-UC Davis/UC Small Farm Program

Food Safety Basics for Urban Farmers
June 8, 2017

Good Sanitation and Postharvest Handling Practices

- Are essential to ensure food safety
- Will improve produce quality and shelf life

Sanitation

- Clean
- Scrub
- Rinse
- Then sanitize
- **Cleaning** removes food and other types of soil from a surface such as a countertop.
- **Sanitizing** reduces the number of pathogens on that **clean** surface to safe levels.

- DO NOT re-use anything that cannot be cleaned and sanitize

Cleaning and sanitizing harvest bins

Clean Field Harvesting Equipment, Bins, Tools
with 1 Tab chlorine bleach (5.25%)/gallon

- Step 1: Place harvest containers next to sanitized surface (plastic) that has been pre-rinsed, scrubbed with detergent, rinsed & sanitized
- Step 2: Pre-rinse all buckets to remove visible soil
- Step 3: Scrub buckets with detergent, then rinse
- Step 4: Scrub buckets, dip in bleach, then air-dry and stack
- Step 5: Check water with chlorine test strips for proper strength, before cleaning more items

CDFA's Small Farm Food Safety Guidelines during Harvest/Post Harvest

- Clean and sanitize harvesting equipment at least once a day or more often, if needed
- High-pressure wash, rinse and sanitize all crop harvest bins
- Cover clean bins to avoid contamination
- Remove field soil from the outside of bins prior to moving them into packing areas
- Use clean water and ice made from clean water during field packing

Packing Under a Tree

- Provides shade but also creates risk of contamination from birds and falling objects
- Washing & packing surfaces can't be kept clean
- Increased risk if packing boxes/crates are placed on the ground
- Use designated hoses; ensure that the end does not touch the ground
- Use an awning or pop-up tent instead if possible

Keep Harvested Produce Covered

- Protects produce from the sun
- Protects produce from contamination by birds and other creatures

Cleaning & Sanitizing

- Dispose of wastewater daily away from production areas
- Label all cleaning products "Harvest Equipment Only"
- Require workers to wear waterproof aprons, rubber gloves and goggles when cleaning and sanitizing
- Update written Farm Cleaning Record daily

Washing Produce

with chlorine solution

½ tsp. bleach (5.25%) in 6 gallons of water = 5 ppm
Use chlorine test strips to determine chlorine content

- Start with potable water - pH of between 6 and 7.5
- Use pH test strips to determine pH
- Change water in the dump tanks at least daily
- Change water when chlorine content < 5ppm
- Rinse produce with potable water prior to packaging
- Not all produce needs to be washed!

Washing Produce

- **Water must be potable or microbially safe**
- **Clean and sanitize wash tanks, tubs and food contact surfaces regularly**
- **Chlorine will not sterilize produce**

Use of Chlorine on Organic Produce

source: Trevor Suslow, UC Cooperative Extension Specialist, UC Davis, tvsuslow@ucdavis.edu

- Organic growers, shippers, and processors may use chlorine within specified limits
- All forms of chlorine are restricted materials as defined by existing organic standards
- California Certified Organic Farmers (CCOF) recently modified the threshold to permit 10 ppm residual chlorine measured downstream of the wash step
- Growers certified by other agencies should check with their certifying agent

PEROXYACETIC ACID

$H_2O_2 + CH_2COOH \rightleftharpoons H_3COOH$

Hydrogen Peroxide — Acetic Acid — Peroxyacetic Acid

- Break-down products: acetic acid, O_2, CO_2, H_20
- Permitted dosage (FDA):
  - Cleaning surfaces 85 – 300 ppm
  - Contact with food 85 ppm maximum
    - Typical rates 30-35 ppm

Peroxyacetic Acid (PAA) - Advantages

- Less impacted by organic matter and soil
- Low foaming
- Very good biofilm penetration
- Very good on molds and spores

Peroxyacetic Acid - Disadvantages

- More expensive than hypochlorite at effective dose
- Corrosive to soft metals and skin
- Strong, pungent odor of concentrate and dilute forms (worker discomfort & safety)
- Varied activity against fungi
- Prolonged exposure may cause product damage
  - build up of acetic acid in water
  - may cause sliming, browning, translucency
- Need to monitor water turn-over closely

Storage of Packaging Materials

- Boxes, bags and other materials used for packaging should be kept:
  - In a dry location
  - Off the ground
  - Pest-free

To Maximize Produce Quality

- Harvest during the coolest part of the day
  - To minimize water loss
- Shade the harvested produce in the field
  - Covering harvest boxes with a foam-backed reflective pad reduces heat gain
- If possible, move the harvested produce into a cold storage unit as soon as possible
  - For some crops, such as berries, tender greens and leafy herbs, even 1 hour in the sun is too long

Postharvest Processing & Storage

- Provide sanitary and hygiene facilities and an area for smoking, meals, breaks and personal item storage for employees away from processing and storage areas
- Use a potable water source for processing and use ice made from potable water
- Wash, rinse and sanitize storage facilities

To Maximize Produce Quality

- Do not load refrigeration rooms beyond their cooling capacity
- Do not compromise high quality produce by commingling it with damaged or decaying product
- Only use cleaned and sanitized packing or transport containers
- Store produce at the proper temperature (see Tables 10.1 and 10.2)

Postharvest Ethylene Effects
(see Table 10.1 & 10.2)

- Do not store ethylene-producing fruits (apples, apricots, pears, cantaloupe) near ethylene-sensitive crops. Ethylene damage symptoms include:
  - Yellowing or loss of green color in cucumbers, kale, spinach and broccoli
  - Yellowing and leaf drop in many Asian greens
  - Softening and off-flavor development in peppers, summer squash and watermelon

Transporting Produce

- Ensure that vehicles have not carried sewage, manure or hazardous materials
- Clean and sanitize vehicles that have carried live animals or harmful substances
- Keep pallets, scales, carts, & forklifts clean

Good Sanitation and Postharvest Handling Practices

- Growing produce takes a lot of effort
- Following good sanitation and postharvest handling practices also takes a lot of effort
- Start with the easy stuff, like cleaning & sanitizing your harvest bins
- They will:
  - Will improve your profitability
  - Will increase your customers' satisfaction with your produce

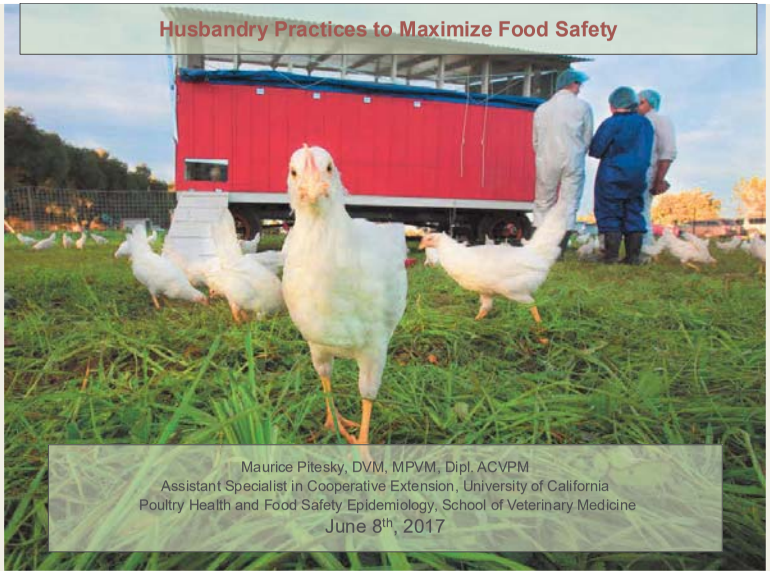
Small Farm Handbook, 2nd Edition

Table 10.1. Examples of postharvest requirements for selected vegetables and melons

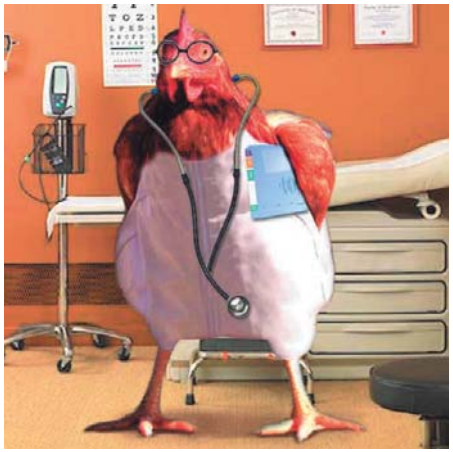
Product	Harvest quality	Storage		Shelf life (days)	Ethylene sensitivity	Observations
		°F	% RH			
Artichoke, globe	size, tender bracts	32	95	14	low	sprinkle lightly
Asparagus	bracts at tip closed	36	95	14	low	stand in water
Basil	fresh, tender leaves	55	95	7	moderate	stand in water
Beans, lima	seeds developed, plump	40	95	7	moderate	sprinkle lightly
Beans, pole and snap	crisp pods, seeds immature	40	95	7	moderate	sprinkle lightly
Beets, bunched	firm, deep red roots	32	95	14	low	sprinkle, cut tops
Broccoli	firm head, buds not open	32	95	14–21	high	sprinkle; ice
Brussels sprouts	firm sprouts	32	95	21–28	high	sprinkle; ice
Cabbage	crisp, firm, compact head	32	95	30–180	high	sprinkle lightly
Cantaloupe melon	stem separates; rind color	36	95	14	moderate	ice
Carrots, topped	tender, crisp, sweet roots	32	95	28–180	high	sprinkle; cut tops
Cauliflower	compact, white curds	32	95	14–21	high	sprinkle
Celery	crisp, tender petioles	32	95	14–21	moderate	sprinkle; ice
Corn, sweet	plump tender kernels	32	95	7	low	ice
Cucumber	crisp, green, firm	50	95	10	high	sprinkle lightly
Eggplant	seeds immature; shiny, firm	50	95	10	moderate	
Endive, escarole	fresh, crisp, tender leaves	32	95	14–21	moderate	sprinkle lightly
Greens, leafy, and herbs	fresh, crisp, tender leaves	32	95	10–14	moderate	sprinkle lightly
Honeydew melon	waxy, creamy colored, heavy	45	90	21	high	
Lettuce	compact head, crisp, tender	32	95	21	high	sprinkle lightly
Onions, dry	firm bulbs, tight necks	32	65	30–180	low	
Onions, green	crisp stalks, firm white bulbs	32	95	10	moderate	sprinkle; ice
Parsley	crisp, dark green leaves	32	95	21	high	sprinkle; ice
Peas	tender, green, sweet pods	32	95	7–10	moderate	sprinkle
Peppers, chili	firm with shiny appearance	45	95	14	low	
Peppers, green	firm with shiny appearance	45	95	14	low	
Potatoes, early crop	well-shaped tubers, defect-free	50	90	14	Low	if washed, dry well
Potatoes, late crop	well-shaped tubers, defect-free	45	90	60–180	moderate	if washed, dry well
Pumpkin	hard rind, good color, heavy	55	65	30–160	moderate	
Radish, with tops	firm, crisp, dark green leaves	32	95	14–21	Moderate	sprinkle; ice
Rutabagas	roots firm with smooth surface	32	95	60–120	low	cut tops; sprinkle
Spinach	dark green, fresh, crisp leaves	32	95	10	high	sprinkle lightly
Squash, summer	firm, shiny fruits, right size	45	95	10	moderate	
Squash, winter	hard rind, corked stem, heavy	55	65	60–120	moderate	allow cut stems to heal
Tomatoes, green	firm, jelly present, light green	55	90	21	high	
Tomatoes, ripening	firm, uniform coloration	50	90	14	high	avoid temperatures <50°F
Turnip	firm, heavy roots	32	95	60–120	low	cut tops; sprinkle
Watermelon	crisp, good flesh color, heavy	55	90	14	high	

Table 10.2. Examples of postharvest requirements for selected fruits

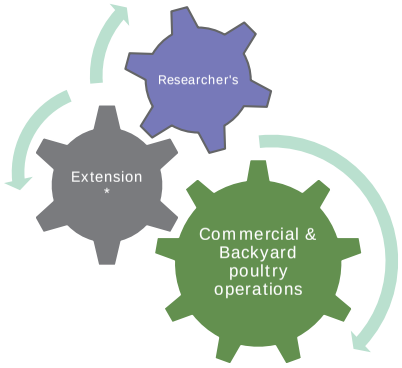
Product	Harvest quality	Storage		Shelf life (days)	Ethylene sensitivity	Observations
		°F	% RH			
Apple	crisp, color typical of variety	32	95	90–180	high	varieties differ a lot in postharvest life
Apricot	firm, well colored	32	95	7–21	moderate	
Avocado	% dry matter, % oil, size	41	90	14–28	high	varieties differ a lot in chilling sensitivity
Banana	finger size, color	55	95	7–14	moderate	
Blueberry	blue color, firmness	32	95	14–21	low	
Carambola	yellow skin color	40	95	14–21	moderate	
Cherimoya	firmness, skin color	55	95	14–21	high	
Cherry, sweet	fruit color typical of variety	32	95	7–14	low	
Cranberry	fruit color	36	95	30–60	low	
Currant, gooseberry	firm, color typical of variety	32	95	10–21	low	
Date	color, sugar content	32	75	180–360	low	
Fig	firm but near ripe, skin color	32	95	7	low	
Grape, table	color typical of variety, sugar	32	95	14–90	low	gray mold ends life
Grapefruit	skin color, sugars-to-acid ratio	55	95	30–40	low	
Guava	skin color, firm	45	95	14–21	moderate	varieties differ a lot
Kiwifruit	firmness, soluble solids	32	95	120–150	high	
Lemon	juice content	45	95	30–120	moderate	
Lime	juice content, skin color	50	90	21–50	high	
Litchi	red skin color, soluble solids	36	95	14–28	moderate	
Loquat	fruit color typical of variety	32	95	14–28	low	
Mandarin	peel color, sugars-to-acid ratio	41	95	14–28	low	
Mango	skin color, shape for variety	55	95	14–21	moderate	
Nectarine	skin ground color, firmness	32	95	14–28	moderate	
Olives	color (green or black)	45	95	14–28	low	harvested olives are processed
Orange	skin color, sugars-to-acid ratio	41	95	30–60	moderate	
Papaya	skin color	55	95	14–21	High	
Passion fruit	skin color change	45	90	7–14	moderate	
Peach	skin ground color	32	95	14–28	moderate	
Pear, Asian	firm, skin color of variety	32	95	30–120	moderate	
Pear, European	firmness, skin color	32	95	30–120	High	
Persimmon	skin color	32	95	14–28	High	
Pineapple	skin yellowing; "eye" flatness	50	95	7–21	moderate	
Plum, fresh prune	skin color typical of variety	32	95	10–30	moderate	
Pomegranate	size, skin color	45	95	60–120	low	
Prickly pear cactus	firm, jelly present, light green	41	95	14–21	low	
Quince	skin ground color changes	32	90	30–90	low	
Strawberry	fruit color	32	95	7–10	low	
Tamarillo	peel and pulp color	41	90	14–28	low	
Tamarind	pulp and shell brown, brittle	68	75	14–28	none	keep 6 months at 41°F



Questions?



What is Extension?



Mission Statement:
Using UC Research capabilities to help deliver healthy food systems, environments and communities

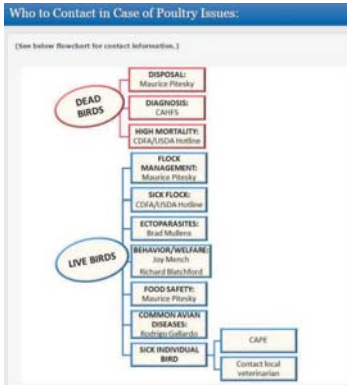
- 200 locally based CE advisors and specialists
- 57 local offices
- 130 campus based CE specialists
- 9 research and extension centers
- 700 academic researchers

http://ucanr.edu/

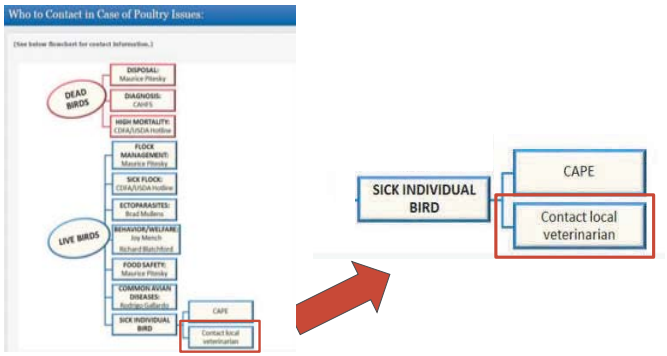
* Extension specialists, researchers and Farm Advisors

New UCCE Poultry Website

http://ucanr.edu/sites/poultry/



Need a Veterinarian Who Works with Poultry???



Currently we have over 20 veterinarians in 15 California counties

What is the UC Davis Pastured Poultry Farm?

Innovation, Research and **Outreach** hub for:

- Pastured poultry and free-range commercial poultry producers
- Researchers/educators
- Auditors and other stakeholders

Our focus in on pastured and free-range systems

Our goal is to improve these systems using practical technology, research and outreach

Why do we need a pastured poultry farm?

Farmers want to know about:

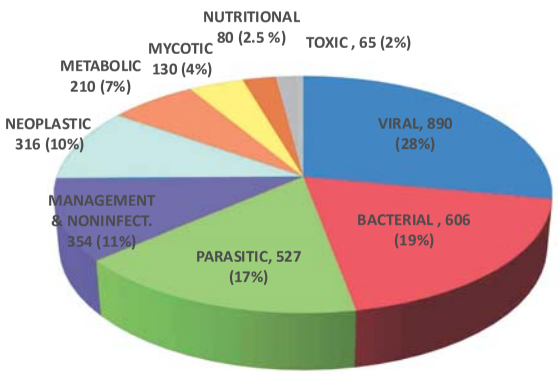
Food safety
Regulations
Production
Physiology (molting etc)
Welfare
Genetics
Coop design
Equipment
Diseases
Sustainability

Retailers want to make sure that the small farms they contract with are producing healthy food in a sustainable fashion

Disease Transmission

Biosecurity: A set of management practices designed to help reduce the introduction and spread of disease-causing organisms onto and between farms.

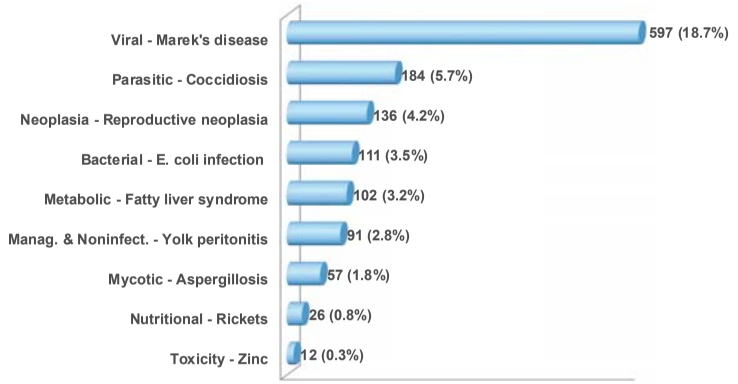
2001-2011 Frequencies and Percentages of Diagnoses by Etiological Types



TOTAL = 3178 DIAGNOSES

Senties, (2012)

2001-2011 Top Backyard Poultry Diseases



Senties, (2012)

So How Do We Prevent Exposure to Those Diseases? There Is No Silver Bullet…

- Need to use a **combination** of management practices to maximize efforts.
- But keep in mind that it is impossible to eliminate risk completely.

Most poultry diseases do not have a cure making prevention key!

Personal Protective Equipment (PPE)

- Our clothes, glasses and shoes can carry disease-causing agents so wear some type of PPE to reduce the probability of bringing in disease onto and out of the farm.
- PPE include:
  - Hairnets.
  - Coveralls and disposable coveralls for visitors.
  - Rain boots and disposable plastic boots.
- Applied hand sanitizer to our hands before entering the coop area too.

Wildlife

Knowing what you are up against can help you determine what tools and strategies to use and therefore maximize your efforts.

What About At Night?

- We used motion sensor cameras to monitor wildlife during the day and at night.
- Good to keep nocturnal wildlife in mind (ie. opposums, raccoons).

Shade/Shelter Structures

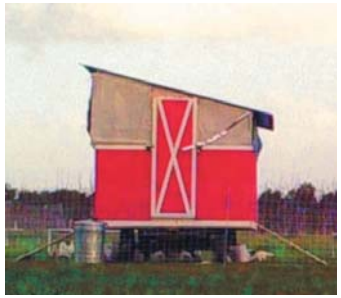
- Birds can go underneath for shade.
- Offers protection from predators.
- For instructions on how to build, visit:

http://ucanr.edu/sites/poultry/files/236853.pdf

Google Forms For Data Capturing

- We used Google Forms to capture data on husbandry, production, disease status, wildlife etc.
- Detailed instructions on how to set one up available on our website at: http://ucanr.edu/sites/poultry/files/229442.pdf

Predator Repellent Tape



- Relatively inexpensive from $7 (150ft) to $27 (100ft).
- Easy to use/install.
- Attach to 6-8in. string and hang around farm.
- Hang strategically in trees, at eye level for ground predators and around enclosures.
- Can potentially scare your birds so they should placed farther away from flock.
- Humane; flashes in all directions in the sun and makes a noise as it flaps in the wind.
- Need to move it to different locations regularly so wildlife wont get acclimated.
- Reviews vary.

Coyote/Fox Decoy

Also, remember fencing!

- $30-$67.
- Also, easy to use/install.
- Humane.
- Must be moved around to be effective (consider changing position daily); birds can start to catch on.
- May be why some reviews are poor, not being used properly.
- Need about one decoy per ¼ acre.

Restrict Access to Feed

- If rodents and other wildlife can't access feed, they will go somewhere else.
- Bungee cord makes the lid hard to take off.
- Make sure to clean up spilled
- No waste feeder: Didn't see waste but birds may have a hard time adjusting to the design if you start with this design mid-flock.

(Facebook pic, 2016)

(My Pet Chicken Blog, 2016)

Important Differences

Mice

- Mainly vegetarian
- Shy; tend to avoid contact with humans
- Not adequate swimmers
- Can drink water less frequently
- Nest site ~10ft. to 30ft. from food source
- Conservative behavior; tend to follow the same tendencies (ie. same feeding routes)

Rats

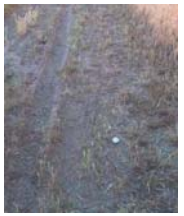
- Eat a wider range of foods, such as eggs, birds, small animals
- Curious, less shy
- Good swimmers; willing to swim in order to reach food or harborage
- Require water daily
- Nest site ~50ft. to 100ft. from food source
- Will change behavior if find better food or shelter

Traps

- Place along the high-traffic spots and along potential runways (ie. walls, beams).
- Should move them around since rats can change routes regularly.
- Rats tend to avoid traps with another rat inside so need to clean them out after one capture.
- Mouse traps can be checked every two-weeks; mice will still go into the trap even if there's mice inside.
- Check them regularly and keep good records of how many rodents have been captured to make sure they are working and to assess how severe the infestation is.
- Rat infestation trickier to asses since they are harder to trap.
- So need to actively look for signs of them (ie. feces, chewing marks, burrows, fur, tracks).

Electric Fence

- Portable electric fence help with husbandry and predator control
- Will have to make sure it has good charge and that it is working regularly.
- Walk along the fence once a week.
- Keep the pasture low around the fence to keep the fence circulation going.



Quarantine Pen

- Quarantine new birds for at least 30 days.
- Isolate sick appearing (ie. lethargic, droopy eyes) birds away from the flock.
- Instructions on how to build this specific sick pen available at:

http://ucanr.edu/sites/poultry/files/236853.pdf

Buffer Zone Around Pasture Fence

- Buffer zone between fencing and pasture can help make weak spots/signs of entries more visible and tell you about nearby wildlife.
- Good habit to walk along the perimeter of the fence.

Questions?

Worker Health and Hygiene

Jennifer Sowerwine
Asst. Cooperative Extension Specialist, UC Berkeley

UC ANR Workshop: Food Safety Basics for Urban Farmers
June 8, 2017

Materials developed by UC Berkeley, UC Cooperative Extension Fresno/ Sacramento & Small Farm Program.
Funding from USDA, NRI & BFRDP & ANR.

USDA United States Department of Agriculture
National Institute of Food and Agriculture

Workers are a potential source of contamination

Some outbreaks associated with infected workers

Date	Produce	Pathogen	# of cases	Produce origin
1987	raspberries	Hepatitus A virus	92	United Kingdom
1990	strawberries	Hepatitus A virus	53	United States
1994	green onions	Shigella	72	CA
1996	leaf lettuce	E. coli 0157:H7	49	United States
1997	strawberries	Hepatitus A virus	250	CA
1997	green onions	Cryptospordium	55	United States
1997	basil	Cyclospora	341	United States
1998	green onions	Hepatitus A virus	43	United States/CA
1999	parsley	Shigella	486	United States
2003	parsley	enterohemorrhagic E. coli	77	United States

How to Minimize Risk of Contamination from Workers?

Practice Good Health and Hygiene

Avoid handling produce when you are sick!

Diarreah

Runny nose, cough, sneeze

The average sneeze travels up to 8 feet!

Assign workers other duties while they are sick or send them home

Wash your Hands!!

Proper Handwashing

- Proper handwashing: Hands must be washed before work, and after using restroom, smoking, coughing, handling garbage, money & breaks.
- 20 seconds

Page 6

Wash, not wipe

Anti-bacterial gel does not kill viruses!

Hand washing is best

Provide Worker Hygiene Training

- Everyone who helps on the farm is trained in and must follow good hygiene practices.
- The training takes place at least once a year and is documented.
- Do follow up training during growing season

Who needs to be trained?

- All employees
- Temporary workers
- Relatives who help
- Wife, husband, children
- Volunteers
- Visitors/U-Pick customers
- EVERYBODY!

Personal Hygiene Training

All workers must:

- Take shower and wear clean clothes daily
- Wear clean, un-ripped gloves (nitrile are best)
- Take off gloves before using toilet & eating lunch
- Wash hands for 20 seconds after using toilet and before returning to work
- Not eat, chew gum, use tobacco, spit, urinate or defecate while in growing/processing area
- Use toilet and handwashing facilities regularly and properly.
- Keep clean, cut nails; tie long hair back.
- Not wear necklaces or rings or dangling jewelry.
- Eat and smoke away from food handling area.
- Not use product containers for personal use.
- Avoid wearing field clothes (especially shoes and boots) in packinghouse

Provide Training in Illness and Accident Prevention and Response

Training to all workers in illness prevention and response is provided and documented

Hand injury & gloves

- Wounds on hands must be covered with a bandage PLUS a glove.
- Gloves must be kept as clean as bare hands
- Broken gloves are not safe and should not be used.
- New gloves should be used after bathroom visits

If someone is injured...

- If injured (including cut/nosebleed, etc), workers must treat wound immediately.
- Any contaminated product is discarded.
- All contaminated surfaces and tools disinfected.
- Clean contaminated containers
- Everyone on farm knows location of 1st aid kit.

Keep Your Workers healthy!

- To avoid heat exhaustion, drink 2 quarts of water per person/day. Especially when hot! Use single use cups
- Shade is required. Breaks in shade.
- Monitor employees for symptoms of illness and for wounds.
- Sick workers that show signs of diarrhea, vomiting, fever, jaundice or infected wounds should not handle produce.

Provide Clean Potable Drinking Water

- Clean drinking water is available always and water source documented.

Post Signs that Reinforce Good Hygiene

- Signs are posted in field and packing area instructing workers when and how to wash hands

No eating/drinking in food handling areas

- Monitor compliance

Post signs!

Create Separate Area for Personal Use

- Eating
- Breaks
- Smoking
- Storage of personal items

To avoid cross contamination in field and packing area!

Provide Proper Field Sanitation Units

- Toilets & handwashing facilities are provided with TP, single use towels and garbage can with lid.
- Wash hands after EVERY use of toilet & apply new gloves if using.
- Everyone follows these rules.
- Field sanitation units are accessible for servicing in the event of a spill or leak.
- Continue to monitor use

Clean Toilets

- Toilets within 5 min walk are required. 1 per 5.
- Toilets are screened, and have self closing doors.
- Spot clean as needed with 409 or other cleanser.
- Wash with water and 409 when needed (at least 1x/month)
- Must have toilet paper, handwashing station, covered trash.
- Remove trash as needed.
- Keep record of cleaning and when unit is serviced.
- Keep records for 2 years.

Good Toilet and Handwashing Station

See Handwashing sign

Handwashing Station

- Handwashing station is next to toilet.
- Water for washing is drinking water quality.
- Soap, paper towel and trash can with lid required.
- Waste water does not cause unsanitary conditions.
- Handwashing container is cleaned and sanitized weekly or as needed with properly labeled scrub brush.
- Cleaning and resupply record are maintained.

What is correct? What is missing?

What is missing?

What is correct? Missing?

What is missing?

Summary

- Develop a health and hygiene policy for your farm
- Keep workers healthy
- Send sick workers home
- Provide Training in:
  - Good health and hygiene practices
  - Handwashing
  - Accident and illness prevention
- Put up signage for handwashing instruction
- Provide clean restroom and handwashing stations and SOP for keeping them clean
- Monitor workers to ensure compliance

5. Worker Training and Instruction Record

Name of Farm:_____

Manager Responsible:_____

Training Material (Please see Food Safety Manual for content of Worker Training).

Worker Name	Date of Training	Type of Training - Health and Hygiene - Accident and Illness Prevention - Pesticide Worker Safety - Pesticide Handler Training	Name of Trainer(s)

University of California
Agriculture and Natural Resources

Visitor/Volunteer Food Safety Policy

1. **Hand Washing & Hygiene**: Have clean and cut nails. Hands must be washed before beginning or returning to work and after the following activities: using the restroom, smoking or tobacco use, taking breaks, eating, handling trash containers, handling money, coughing and sneezing, shoveling manure/compost and after applying sunscreen. Hands are washed with soap and water, for 20 seconds and dried with disposable towels.

2. **Field Hygiene**: never spit, eat, smoke, drink chew gum in the field or packing area. Use garbage cans for trash. Always use designated toilet facilities and wash hands thereafter. Tie back hair, keep all glass containers away from field. Avoid using product containers (harvest bins) for personal use. Return tools after use.

3. **Hydration:** To avoid heat exhaustion, drink lots of water frequently (2 quarts per person/day especially when hot). Take breaks in the shade when necessary.

4. **Illness and Injury Prevention**:
    a. Know where the first aid kit is
    b. Anyone suffering from a contagious disease, and with temporary illness (diarrhea, nausea, vomiting or excessive sneezing/runny nose) are advised to stay at home.
    c. Anyone who gets a cut or has a nosebleed while working must stop immediately, contact your supervisor and have it treated.
    d. Wounds are immediately cleaned, treated, bandaged and covered with rubber glove as soon as possible.
    e. Discard any product that is contaminated with bodily fluids and disinfect any tools, surfaces or containers immediately.
    f. Report and record all accidents, illnesses or injury immediately.

5. **Glove Use:** If using gloves, wash hands and dry thoroughly before and after they are removed for 20 seconds with water; replace when ripped or worn out.

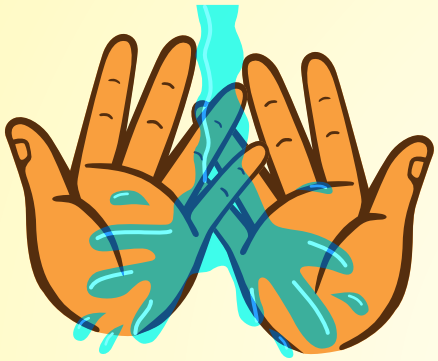
6. **Designated areas**: Only eat, smoke, drink, and chew gum in areas designated for these activities. Put all personal belongings in designated area.

7. **Good Agricultural Practices**: Follow all standard operating procedures outlined in the farm manual related to pre and post-harvest checklists, cleaning & sanitizing, good hygienic practices, and avoidance of cross contamination.

8. **Security**: Report any strange or suspicious activity and/or chemicals in or around the facility

Wash Your Hands!

¡Lávese Las Manos!

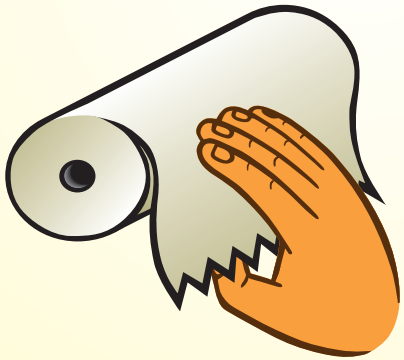


1 Wet Hands
Mójese las manos

2 Soap
Enjabónese

3 Wash for 20 seconds
Lávese las manos por 20 segundos

4 Rinse
Enjuáguese



5 Dry
Séquese las manos

6 Turn Off Water with Paper Towel
Cierre el grifo usando una toalla de papel

University of Nebraska Lincoln EXTENSION

Provided by University of Nebraska-Lincoln Extension in Lancaster County
and the Lincoln-Lancaster County Health Department

Lincoln Lancaster County Health Department

Bay Area Urban Farming Resource Guide

A list to get you started on your urban farming endeavors!

University of California Agriculture and Natural Resources

EDUCATIONAL & RESEARCH INSTITUTIONS

University of California Cooperative Extension
http://cealameda.ucdavis.edu/
(510) 670-5650
UC Agriculture and Natural Resources delivers healthy food systems, healthy environments, healthy communities and healthy Californians. UC ANR hosts the California Master Gardener Program: http://mg.ucanr.edu/ which has been extending UC research based information about home horticulture and pest management to the public.

UC ANR Urban Ag
http://ucanr.edu/urbanag
Are you interested in starting an urban farm? Seeking details on how to raise backyard chickens and bees? Looking for information on laws, zoning and regulations that relate to urban agriculture? We offer resources on small-scale production, including soil, planting, irrigation, pest management, and harvesting, as well as information on the business of farming, such as how to market urban farm products.

Berkeley Food Institute
https://food.berkeley.edu/
The Berkeley Food Institute seeks to transform food systems to expand access to healthy, affordable food and promote sustainable and equitable food production. We empower new leaders with capacities to cultivate diverse, just, resilient, and healthy food systems.

Growing Roots
https://growingroots.berkeley.edu/
growingroots@berkeley.edu
The long-term goal of the government-supported Growing Roots project is to support the economic and ecological viability of California beginning farmers and ranchers from diverse communities – whether urban, rural or peri-urban, or Latino, Southeast Asian, African or Caucasian. Offers in-depth, culturally- and regionally-appropriate workshops, develop and distribute educational materials and videos, host field days and farm tours.

Sustainable Agriculture Research & Education Program (SAREP)
http://asi.ucdavis.edu/programs/sarep
(530) 752-3915
asi@ucdavis.edu
SAREP is a statewide program within UC Agriculture and Natural Resources and is a unit of the Agricultural Sustainability Institute at UC Davis.
SAREP provides leadership and support for scientific research and education in agricultural and food systems that are economically viable, conserve natural resources and biodiversity, and enhance the quality of life in the state's communities. SAREP serves farmers, farmworkers, ranchers, researchers, educators, regulators, policy makers, industry professionals, consumers, and community organizations across the state.

GOVERNMENT GROUPS & AGENCIES

Alameda County Resource Conservation District
www.acrcd.org
(925) 371-0154
ACRCD and the USDA Natural Resources Conservation Service (NRCS) collaborate as the Conservation Partnership to serve as the lead conservation agency in Alameda County to provide technical and educational services for natural resource conservation and agriculture enhancement.

East Bay Municipal Utility District
http://www.ebmud.com/
1-866-403-2683
custsvc@ebmud.com
EBMUD provides high-quality drinking water for 1.4 million customers in Alameda and Contra Costa counties. Their WaterSmart gardener is your go-to resource center for outdoor water conservation, with incentives, tips, services, events, and more. EBMUD offers monetary rewards to community organizations who create publicly accessible community gardens or urban farm projects that demonstrate water conserving principles. These gardens are a great tool to help the public learn about ways to save water in the urban landscape.

Oakland Unified School District School Gardens Program
Grey Kolevzon, Garden Education Coordinator
(510) 776-5556
Grey.kolevzon@ousd.org
http://www.ousd.org/domain/100
OUSD Garden Education's goal is to establish and maintain a garden in every school. School gardens provide urban children access to nature and reflect each child's inherent right to access healthy, locally-produced food; understanding of food systems and the natural cycle; social, economic and health justice; hands-on alternatives to testing-based instruction; self-reliance and character-building opportunities; and connection to the local community.

Project Eat
http://projecteat.acoe.org/
(510) 670-4544
Project Eat aims to end health inequities and close the achievement gap in school communities.

Republic Services
www.republicservices.com
1 (877) 692-9729
Republic Services, Inc is the second largest provider of non-hazardous solid

waste collection, transfer, disposal, recycling, and energy services in the United States.

San Francisco Public Utilities Commission
www.sfwater.org
(510) 554-0761 Commission Secretary
(510) 554-3289 General Inquiries
Contact: Amy Dawson
adawson@sfwater.org
Refer to: Nancy Ceridwyn, Youth Education Program
The SFPUC is responsible for the storage, quality control and distribution of the area's drinking water, and is a longtime supporter of urban agriculture projects including The Garden Project, The Garden for the Environment, and the Sunol Ag Park.

StopWaste
www.stopwaste.org
(510) 891-6500
StopWaste is a public agency responsible for reducing the waste stream in Alameda County by helping local governments, businesses, schools, and residents reduce waste through source reduction and recycling, market development, technical assistance, and public education.

Waste Management
www.wm.com
1 (866) 909-4458
Waste Management partners with customers and communities to provide waste disposal and recycling solutions that create clean, renewable energy.

United States Department of Agriculture – Urban Agriculture
https://www.nal.usda.gov/afsic/urban-agriculture
Explore information and tools on urban agriculture, including the *Urban Agriculture Toolkit*.

Your Local Parks
Check with your local city Parks and/or Public Works Departments for community gardening resources and programs.

For questions on Public Health and Nutrition:
Alameda County Public Health Department
1000 Broadway, Suite 500
Oakland, CA 94607
(510) 267-8000 Phone
http://www.acphd.org/programs-and-services.aspx

For questions on Food Safety:
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, CA 94502-6577
(510) 567-6700
https://www.acgov.org/aceh/

For permitting of Approved Source Farms, Farmer's Markets Certification and Pesticide Regulation and Enforcement:
Alameda County Department of Agriculture
224 W. Winton Ave. Room 184
Hayward, CA 94544
(510) 670-5232 Phone
https://www.acgov.org/cda/awm/

The Alameda County Department of Agriculture / Weights and Measures promotes the Alameda County agricultural industry, protects the environment and the general public, and provides buyers and sellers a fair marketplace. We are the local enforcement authority for the California Department of Food and Agriculture and the California Department of Pesticide Regulation.

POLICY & ADVOCACY GROUPS

Berkeley Food Policy Council
http://ecologycenter.org/berkeley-food-policy-council/
The BFPC is a coalition of local organizers, activists, visionaries, and entrepreneurs who work towards promoting regional agriculture and community access to healthy food. The BFPC was established in 1999 and meets on a quarterly basis.

ChangeLab Solutions
http://www.changelabsolutions.org
(510) 302-3380
ChangeLab Solutions' Healthy Planning program is pioneering a new approach to public health advocacy. Explore our model policies, how-to guides, fact sheets, and other policy tools as well as resources, technical assistance, and trainings. We provide the tools to promote urban agriculture through land use policies, address liability concerns, negotiate with property owners, and encourage community participation

Eden Area Food Alliance
http://www.acfpc.org
(510) 909-4077
The resident-driven ACFPC advises local government on policy in order to establish an equitable and secure food system for the Eden Area community.

Food First
https://foodfirst.org/
info@foodfirst.org
(510) 654-4400.
Food First's mission is to end the injustices that cause hunger. We support activists, social movements, alliances, and coalitions working for systemic change. Our work—including action-oriented research, publications, projects and Food Sovereignty Tours—gives you the tools to understand the global challenges, build your local movement, and engage with the global movement for food sovereignty.

Oakland Food Policy Council
Shaniece Alexander, MSW, Council Director
salexander@oaklandfood.org
http://oaklandfood.org/
Food is our focus and policy is our tool, but we are nothing if not a gathering of the community first.

Santa Clara Food Systems Alliance
http://fsa-scc.squarespace.com/
scc.alliance@gmail.com
The Alliance is a collaborative of stakeholders concerned with issues of healthy food access, agricultural production and food distribution in Santa Clara County. The Alliance collaborates with stakeholders in our neighboring counties that share concerns about the same issues.

San Francisco Urban Ag Alliance
http://www.sfuaa.org/
The San Francisco Urban Agriculture Alliance (SFUAA) promotes the growing of food within San Francisco and the associated goals of our member organizations, through advocacy, education and grassroots action. Add yourself to their listserve.

SPUR
Oakland, SF, and San Jose
http://www.spur.org/
SPUR is a member-supported nonprofit organization.Through research, education and advocacy, SPUR promotes good planning and good government in the San Francisco Bay Area.

Sustainable Economies Law Center (SELC)
http://www.theselc.org
(510) 398-6219

SELC cultivates a new legal landscape that supports community resilience and grassroots economic empowerment. We provide essential legal tools so communities everywhere can develop their own sustainable sources of food, housing, energy, jobs, and other vital aspects of a thriving community. Check out extensive resources on Urban Ag Law here: http://www.urbanaglaw.org/

REGIONAL FOOD GROUPS

Center for Urban Education about Sustainable Agriculture (CUESA)
http://www.cuesa.org/
info@cuesa.org
(415) 291-3276
CUESA is dedicated to cultivating a sustainable food system through the operation of farmers markets and educational programs.

Common Vision
Michael Flynn
(831) 588-9914
info@commonvision.org
www.commonvision.org
Let's work together to ensure fresh fruit grows in every schoolyard.

Ecological Farming Association
https://eco-farm.org/
(831) 763-2111
info@eco-farm.org
The Ecological Farming Association (EcoFarm) is a non-profit educational organization whose mission is to nurture safe, healthy, just, and ecologically sustainable farms, food systems, and communities by bringing people together for education, alliance building, advocacy, and celebration. Popular for their annual Ecological Farming Conference.

La Mesa Verde
San Jose
https://valley-verde-ca.myshopify.com/
(408) 282-3110
La Mesa Verde (The Green Table) is a leadership network of urban gardeners who create access to healthy food, is a program of San Jose's Sacred Heart Community Service. The UCCE Master Gardener program is collaborating with Sacred Heart Community Service providing bilingual gardening courses for new home gardeners, visiting families at their home to offer individualized training & support and growing quality unique seedlings for La Mesa Verde to purchase at a reduced rate for families in the program.

LEAF
http://fremontleaf.org/
(510) 517-3219
FremontLEAF@gmail.com
LEAF is a volunteer organization bringing people together to grow healthy pesticide free food and to learn about environmentally sustainable gardening and ecological practices.

Valley Verde
https://valley-verde-ca.myshopify.com/
Valley Verde is a nonprofit organization that helps residents in Santa Clara County grow their own vegetables. We provide low income families with the knowledge and tools needed to grow and maintain their own organic vegetable gardens at no cost.
We sell gardening services and kits to individuals, organizations and businesses. Proceeds from sales are used to help more low-income families start their own organic vegetable gardens.

URBAN FARMS

Acta Non Verba: Youth Urban Farm Project
Oakland, CA
www.anvfarm.org
(510) 878-7235
info@anvfarm.org
ANV elevates life in the inner city by challenging oppressive dynamics and environments through urban farming.

City Slicker Farms
Oakland, CA
http://www.cityslickerfarms.org/
(510) 763-4241
City Slicker Farms empowers West Oakland community members to meet the basic need for healthy food for themselves and their families by creating organic, sustainable, and high-yield urban farms and backyard gardens.

Dig Deep Farms
www.digdeepfarms.com
Hilary Bass, Executive Director, Community Events
hbass@acgov.org
(510) 614-3337
csa@digdeepfarms.com
Dig Deep Farms is providing healthy food, healthy jobs, and helping build a healthy community by delivering fresh local produce right to your doo

Eden Area Urban Farms
Rick Hatcher
(510) 909-4077
Eden Area Urban Farms provides consultation in areas of urban farm creation: Local laws and ordinances, planting development, soil management, animal husbandry; and Urban farming education: school gardens, community gardens, and agency-driven gardens.

Fertile Groundworks
www.fertilegroundworks.org
(925) 371-5615
Fertile Groundworks is a learning garden that provides organically grown and sustainable crops to help feed the hungry in Livermore.

Farms to Grow
Oakland, CA
www.farmstogrow.com
Farms to Grow, Inc. is a 501c3 nonprofit organization dedicated to working with Black farmers and underserved sustainable farmers around the country. Farms To Grow, Inc. is committed to sustainable farming and innovative agriculture practices which preserve the cultural and biological diversity, the agroecological balance of the local environment.

Garden for the Environment
7th Ave and Lawton St., San Francisco
http://www.gardenfortheenvironment.org/
info@gardenfortheenvironment.org
(415) 558-8246
Our mission is to provide practical skills for all San Franciscans to personally contribute to sustainability through urban gardens, farms, and food. Whether you are a new gardener or an experienced urban farmer, we have workshops for you in our nationally acclaimed teaching garden.

Grow Incubator
Oakland, CA
https://growincubator.org/
(510) 612-2260
Christine Hernandez
christine@growincubator.org
GROW Incubator is a space to collaborate, network, skillshare, and GROW. We are home to entrepreneurs, artists and activists, who are looking to build GrassRoots power in the Movement for self-determination. We're a community brought together by a shared passion for social justice.

International Rescue Committee
https://www.rescue.org/
Zack Reidman
Zack.reidman@rescue.org
(510) 852-8923

The International Rescue Committee is a global humanitarian aid, relief and development nongovernmental organization.

Planting Justice
Oakland, CA
http://www.plantingjustice.org/
(510) 290-4049
Since 2009 Planting Justice has built over 400 edible permaculture gardens in the San Francisco Bay Area, worked with five high-schools to develop food justice curriculum and created 20 green jobs for men transitioning from prison in the food justice movement. We believe that everybody deserves to be treated with respect and have equal access to food, jobs, and education.

Top Leaf Farms
http://www.topleaffarms.com/index.html
(831) 667-2376
farmtheroof@gmail.com
We offer consultation,design, installation, project management and operational services for highly productive Ecological agriculture systems for rural and urban - residential and commercial. We are currently offering very innovative solutions in Urban Rooftop Agriculture

Urban Tilth
Richmond, CA
http://www.urbantilth.org/
(510)232-0911
admin@urbantilth.org
Urban Tilth cultivates agriculture in west Contra Costa County to help our community build a more sustainable, healthy, and just food system. We hire and train residents to work with schools, community-based organizations, government agencies, businesses, and individuals to develop the capacity to produce 5% of our own food supply.

Veggielution
http://veggielution.org/
(408) 753-6705
info@veggielution.org
Veggielution Community Farm was created in 2008 to help people make healthy food choices and provide opportunities for connecting with the natural world. We are fostering a sustainable food system through our urban farm that engages the community by providing access to organic and local food, creates youth leadership opportunities, and develops creative solutions to environmental and social justice issues.

WOW Produce Farm / WOW Flower Farm
Oakland, CA
(510) 858-5068
http://www.gametheoryacademy.org/wow-farm/
The WOW Farm Youth Program uses urban farm spaces in West Oakland as production sites and classrooms for a business run by youth under the mentorship or experienced entrepreneurs, educators, and farmers. The business produces and delivers organically-produced root vegetables, leaf vegetables, herbs and flowers to local restaurants.

TRAINING OPPORTUNITIES

Bay Friendly Landscaping
http://rescapeca.org/
info@ReScapeCA.org
(510) 859-8026
ReScape California, also known as the Bay-Friendly Landscaping & Gardening Coalition, is an advocate and expert in the creation of sustainable landscapes for commercial, multi-family, and public spaces as well as single-family residences. ReScape California brings together a wide range of partners and acts as a credible, practical and flexible one-stop center for sustainable landscaping training, technical data, and resources.

East Bay Urban Farmer Field School
http://www.eastbayurbanfarmers.com/
(510) 637-9399
Hank Herrera
hank@c-prep.org
Over the past two years farmers from a dozen East Bay organizations have been addressing the complex and evolving needs of urban farming together through EBUFFS's innovative and cooperative training network. Monthly workshops at different farms address technical skills, community building, and leadership development. The EBUFFS pedagogy creates an environment that cultivates trust, confidence and community leadership with men and women of underserved communities. This helps to support the power of their respective community organizations.

Green Thumb Works
www.greenthumbworks.com
Sandra Neval-Lee
(510) 502-0992
Sandra@greenthumbworks.com
Sandra focuses on residential landscape horticulture in the San Francisco East Bay Area.

Sustainable Agriculture Education Association (SAEA)
http://sustainableaged.org/
SAEA promotes and supports the development, application, research, and exchange of best teaching and learning practices in sustainable agriculture education and curricula through communication, training, development, and collaborative activities for teachers and learners.

The Plant Exchange
http://theplantexchange.com/
info@theplantexchange.com
(510) 866-8482
The Plant Exchange is a twice-a-year free community event. The event encourages neighborliness, reuse, recycling, organic living, resource sharing, and information exchange. For all gardeners, landscapers, urban farmers, and outdoor fans from all 9 Bay Area counties.

USEFUL TOOLS

Cropmobster
https://sfbay.cropmobster.com/
CropMobster is an online community-based exchange system for the trade and exchange items within the food and agricultural space. CropMobster SF Bay is focused on providing a locally based community for hunger relievers, tackle food waste and build our "farm-to-fork" economy in the San Francisco Bay Area.

Co-Garden
Sunil Nair
(415) 915-GROW
Rsunil.nair@gmail.com
The Cogarden Platform promotes social interactions with food growing communities that inspires a transparent, equitable, and cooperative food economy.

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