GAPs Educational Program

- Introduction to Produce Safety
  - Who is responsible for ensuring safe produce?
  - Costs, causes and outcomes of foodborne illnesses
  - National GAPs Program and FSMA
    - USDA Group GAPs Food Safety Program
  - Farm Food Safety Plan
- Land Use Risk Assessment
- Water
- Waste (Manure and Compost)
- Wildlife and Domestic Animals
- Worker Health and Hygiene
- Produce Storage, Transport
  - and Traceability
What Does Produce Safety Mean to You?
Who is Responsible For Ensuring Safe Produce?

FARMERS
Grow, Harvest, Handle and Pack Produce Safely

DISTRIBUTORS
Store, Handle, and Transport Produce Safely

RETAILERS and RESTAURANTS
Store, Handle, and Prepare Produce Safely

CONSUMERS
Store, Prepare and Consume Produce Safely

Everyone must identify produce safety risks and take corrective action!
The Cost of Foodborne Illnesses in the US

Mean cost of illness for foodborne illnesses acquired in the United States ($2013) from 15 leading pathogens, by type of cost

Outbreaks and Illnesses Due to Food Commodities

Outbreaks and Illnesses Due to Food Commodities, 2002-2011
Causes of Foodborne Illnesses in the US From Produce (2002-2010)

- Salmonella
- Norovirus
- E. coli
# Causes and Outcomes of Foodborne Illnesses in the US

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Natural Habitat</th>
<th>Minimum Infectious Dose</th>
<th>Worse Case Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norovirus</td>
<td>Humans</td>
<td>&lt;10</td>
<td>Vomiting Diarrhea</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>Animals/Humans</td>
<td>&lt;10–10^{11}</td>
<td>Reactive arthritis</td>
</tr>
<tr>
<td><em>E. coli</em> (STEC)</td>
<td>Animals/Humans</td>
<td>&lt;10-100</td>
<td>Kidney failure</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>Animals/Humans</td>
<td>10-100</td>
<td>Death Miscarriage</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Humans</td>
<td>10-100</td>
<td>Jaundice Liver disease</td>
</tr>
</tbody>
</table>
Growth of Bacteria Under Optimal Conditions

At optimal growth conditions, most bacteria double every 20 minutes.

<table>
<thead>
<tr>
<th>Time</th>
<th>Bacteria Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 minutes</td>
<td>One bacterium</td>
</tr>
<tr>
<td>20 minutes</td>
<td>Two bacteria</td>
</tr>
<tr>
<td>40 minutes</td>
<td>Four bacteria</td>
</tr>
<tr>
<td>60 minutes</td>
<td>Eight bacteria</td>
</tr>
<tr>
<td>12 hours</td>
<td>One trillion</td>
</tr>
</tbody>
</table>
Challenges Associated With Fresh Produce

- Once pathogens are introduced onto the produce they are difficult to remove
- Bacteria can multiply rapidly
- Infectious doses of bacteria and viruses may be low
- Produce is often consumed raw
- Internalization of pathogens into the produce tissue can occur
How Does Produce Safety Affect You?

1. You are responsible for providing a safe product to the public.

2. Buyers have heightened expectations of you.

3. Produce safety will affect your profitability and your bottom line.
National Good Agricultural Practices Program And USDA GroupGAP Food Safety And Audit Program
National GAPs Program and USDA GroupGAP Food Safety and Audit Program

• National Good Agricultural Practices (GAPs) Program
• Differences between FSMA and GAPs
• USDA GAPs Audit Verification Program
• USDA GroupGAP Food Safety Program
  o Is USDA Group GAPs for You?
  o Requirements for an USDA GroupGAP Food Safety Program
  o GroupGAP Quality Management System
  o GroupGAP Audit System
• Preparing for an USDA GAPs Inspection
• Importance of a Farm Food Safety Plan
  o What is a Farm Food Safety Plan?
National Good Agricultural Practices (GAPs) Program

- Established in 1999 to address on-farm food safety hazards associated with fruits and vegetables funded by USDA and FDA
- Collaborators in 34 states
- Voluntary program that provides guidelines and educational materials for ensuring safe on-farm practices
- Market-driven
USDA GAPs Audit Program

• Certification is **NOT** federally mandated, but may be required by your buyer/market
• On-site inspection required during harvest/activities
  - Cost depends on farm size and proximity to inspector
  - Ex: Auditor’s cost: $92/hour (preparation, audit and travel time)
  - May require unannounced follow-up inspection
• Entire farm or specific crops can be certified
• Requires a *farm food safety plan*
• Certification is valid for 12 months
USDA GroupGAP Food Safety Program

• Established in 2016
• Makes the audit process accessible for small and middle-sized producers
• Allows for varied farm practices and different crops
  o One shared farm food safety plan
Is USDA GroupGAP for You or Your Growers?

- Are you a member of a group or can you create a group?
- Are you willing to share responsibility for implementing food safety practices?
- Are **ALL** Group members willing to implement GAPs?
- Will your buyer(s) accept USDA GroupGAP Food Safety Program?
Requirements for an USDA GroupGAP Food Safety Program

• Requirements:
  o A “Group” of farms and Group Leader
  o Quality Management System (QMS)
  o A farm food safety plan
  o Annual internal and external audit of QMS and farms
GroupGAP Quality Management System (QMS)

- Establishes a system for ensuring that **ALL** group members are in compliance with the GroupGAP Food Safety Program
- Modeled after ISO 9001
- Records of the group and group activities (i.e. distribution or transportation plan)
USDA GroupGAP Audit System

• Internal audit of QMS and each producer location
• External audit process
  o USDA annual QMS audit
  o USDA annual GAPs external audits
    - Representative of group members’ production practices and crops
    - Number audited = √ of member farms
      4 farms = 2 audits; 16 farms = 4 audits; 25 farms = 5 audits, etc.
• Application fee of $736 (8 hours of USDA staff time)
• Inspection costs $92/hr
Preparing for an USDA GAPs Inspection

- Have all documents in one location and organized
- Conduct a walk-through of the farm and structures before the inspection date
  - Do what you say you are doing!
- Let all workers know that you will be having an inspection for USDA GAPs Food Safety Program
- Remember that the inspector is a visitor to your farm
IMPORTANCE OF A FARM FOOD SAFETY PLAN
What is a Farm Food Safety Plan?

- A set of written standard operating procedures (SOPs) that a grower implements to prevent or reduce food safety hazards

- Plans begin at the field and follows the path of the produce to the point where it is purchased

- Plans include:
  - Who should do it?
  - What should be done?
  - How should it be done?
What is a Farm Food Safety Plan?

- Plans should include:
  - Policies
  - Procedures
  - Records (logs)
  - Risk assessment and maps
  - Flow chart of how produce flows through your operation

- Do what you say and only say what you plan to do!
Food Safety Starts on the Farm!
Land Use Risk Assessment

- Assess potential food safety hazards on the farm
- Map your farm and risks around it
- On-farm risk assessment for irrigation water
- Risk assessment for using raw manure
Assess Potential Food Safety Hazards on the Farm

- Consider on- and off-farm hazards
- Consider the major routes of contamination
- Prepare a map of each field
- Target your management strategies to reduce identified hazards
On-farm Risk Assessment for Irrigation Water

Identify risk factors:

- Live stock operations
- Manure piles
- Cull piles
- Wildlife
- Flood potential
Risk Assessment For Using Raw Animal Manure

Consider prior land use and adjacent land use

- Follow National Organic Program (NOP) guidelines for manure application
Water

- Human pathogens and pests associated with water
- On-farm water usage
- Factors that influence produce contamination by water
- Pre-harvest water (Agricultural Water)
  - Risk Levels Associated With Agricultural Water
  - Water Quality Assessment
  - Pre-Harvest Water Quality Standards for Ohio
  - Interpreting the Results of a Water Test
  - On-farm Management Recommendations for Irrigation Water
- Flood Water
  - Guidelines for Flood-affected Crops
Water

• Post-harvest water
  o Microbial Water Standards
  o Wash Water Conditions
  o Guidelines For Using Sanitizers for Washing Produce
  o Guidelines For Using Chlorine-based Sanitizers
  o Documentation Guidelines For Using Sanitizers
  o Cleaning and Sanitation of Contact Surfaces
    - Examples of food containers and other food contact surfaces
  o Four Step Cleaning and Sanitizing Procedure
    - Pre-rinse
    - Wash/clean
    - Rinse
    - Sanitize (Rinse)
Human Pathogens Associated With Water

- Bacteria
- Viruses
- Protozoa
- Helminths
Pests Associated With Water

- Plant pathogens:
  - Water molds
  - Fungi
  - Bacteria
  - Foliar nematodes

- Weed seeds
On-Farm Water Usage

- Pre-harvest Practices
  - Irrigation
  - Agrochemical applications
  - Harvesting applications
  - Equipment cleaning

- Post-harvest Practices
  - Washing operations and practices
  - Cooling practices
  - Equipment cleaning

- Hand Washing, Health, and Hygiene
Factors That Influence Produce Contamination By Water

- Water quality
- Crop characteristics
- Irrigation practices
- Growing practices
- Harvesting practices
- Post-harvest practices
AGRICULTURAL WATER
THE QUALITY OF WATER VARIES DEPENDING ON THE SOURCE

HIGH RISK
LOW QUALITY

SURFACE WATER

GROUND WATER

CITY WATER

LOW RISK
HIGH QUALITY
Risk Levels Associated With Agricultural Water

High

- Ground water: *overhead* irrigation
- Municipal water: *drip* irrigation
- Surface water: *drip* irrigation
- Municipal water: *overhead* irrigation
- Surface water: *overhead* irrigation

Ground water: *drip* irrigation

Low

- Recycled water, hydroponics
Water Quality Assessment

- **Physical and Chemical**
  - Temperature
  - pH
  - Salinity
  - Turbidity

- **Biological**
  - Indicator microorganisms
Pre-Harvest Water Quality Standards for Ohio

- **Primary contact** recreational standards for irrigation water are recommended

<table>
<thead>
<tr>
<th>Indicator</th>
<th>OH Primary Contact (2017)</th>
<th>US EPA Primary Contact (2012)</th>
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</thead>
<tbody>
<tr>
<td>Fecal coliforms</td>
<td>Not recommended</td>
<td>Not recommended</td>
</tr>
<tr>
<td><strong>Generic <em>E. coli</em></strong></td>
<td><strong>126 CFU</strong>*</td>
<td><strong>126 CFU</strong></td>
</tr>
<tr>
<td>Enterococci</td>
<td>-</td>
<td>35 CFU</td>
</tr>
</tbody>
</table>

Colony forming units (CFU) based on a geometric mean of at least 5 samples

# Interpreting the Results of a Water Test

**Water Analysis Report**

**Date Reported:** 08/18/2015  
**Lab Number:** 15-2896  
**Sample I.D.:** Water  
**Hydrant Packin Ho**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Ideal Water Suitability</th>
<th>Your Results*</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td></td>
<td>Ideal pH Range: 6.5 - 7.5</td>
<td>6.5 - 7.5</td>
</tr>
<tr>
<td>Hardness (CaCO3 Equiv.)</td>
<td>ppm</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td>grains per gal.</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>ppm</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>ppm</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Sulfate (SO4)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Chloride (Cl)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>ppm</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>ppm</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>ppm</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>ppm</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>ppm</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>ppm</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Nitrate-Nitrogen (NO3-N)</td>
<td>ppm</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>ppm</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Electrical Conductivity (EC)</td>
<td>dS/m</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Barium (Ba)</td>
<td>ppm</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Fluoride (F)</td>
<td>ppm</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Free Chlorine (Cl)</td>
<td>ppm</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Total Chlorine (Cl)</td>
<td>ppm</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Total Coliform**  
CFU/100ml  365  
Comments

**E-Coli**  
CFU/100ml  <1  
**<1=Safe Water for Drinking or Post-Harvest Rinsing**

**Pseudomonas Aeruginosa**
Interpreting the Results of a Water Test

<table>
<thead>
<tr>
<th></th>
<th>CFU/100ml</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliform**</td>
<td>365</td>
<td>**&lt;1 = Safe Water for Drinking or Post-Harvest Rinsing</td>
</tr>
<tr>
<td>E-Coli**</td>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas Aeruginosa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Results must provide an actual count
  - Presence or absence is not acceptable
- Total coliform is not the same as fecal coliform
- Always use the generic *E. coli* count
- Keep ALL results and any other documents associated with the water test (i.e. emails)
# Frequency of Irrigation Water Testing for USDA GAPs Certification

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Testing Frequency</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal</td>
<td>Annually (by local authority)</td>
<td>• None on the grower part</td>
</tr>
<tr>
<td>Well</td>
<td>Once/growing season</td>
<td>• Chlorination followed by re-testing</td>
</tr>
<tr>
<td>Surface</td>
<td>Quarterly</td>
<td>• Change source&lt;br&gt;• Filtration and/or chemical treatment</td>
</tr>
</tbody>
</table>

- Send samples to a certified laboratory (see handouts)
- Take corrective action immediately
- Keep records of all water tests and corrective actions
On-farm Management Recommendations for Irrigation Water

- Know your water source
- Know your local watershed
- Maintain wells in good working condition
  - Well casing is secure and maintained
  - Pump is operating correctly
On-farm Management Recommendations for Irrigation Water

- Use drip (trickle) irrigation whenever possible

- For overhead irrigation
  - Use potable water
  - Water early in the morning to promote leaf and fruit drying
On-farm Management Recommendations for Irrigation Water

• For overhead irrigation:
  o Avoid irrigating prior to harvest

• Inspect irrigation pipes, lines and emitters for cracks or leaks
On-farm Management Recommendations for Irrigation Water

Protect the quality of your water

- Grass or sod waterways
- Vegetative buffer zones
- Berms
- Sand filtration
  - Slow vs. rapid
- Sanitizers
  - Chlorine-based
  - Ultra violet (UV) light
Flood Water

- High risk of exposure to contaminants
  - sewage
  - animal waste
  - pathogenic microorganisms
  - chemicals
  - toxins
  - heavy metals

- Large volumes increases risk
Guidelines for Flood-affected Crops

- Federal Food, Drug, and Cosmetic Act (FDCA)
- Direct contact with produce
  - Adulterated
  - No reasonable way to recondition
  - Should not enter the food chain
- Indirect contact with produce
  - May enter the food chain if there is a kill step (i.e. cooked)

Post-harvest Microbial Water Standards

• **Potable** water (no detectable *E. coli*) should be used for the following practices:
  o Washing produce
  o Cleaning equipment and surfaces
  o Cooling (water and ice)
To Wash or Not to Wash?

- Washing produce is NOT recommended
- Washing produce increases the risk of cross-contamination and pathogen infiltration
- Minimal handling and processing is recommended
Wash Water and Washing Conditions

- Use potable water
- Use a sanitizer in your wash water
- Maintain water temperature equal to or warmer than the produce pulp temperature
- For produce with stem scars hold for at least 4 hours prior to dunking
Wash Water and Washing Conditions

- Drying produce
  - in a clean area
  - on a clean and sanitized surface
  - use single use towels for fruit
Guidelines For Using Sanitizers for Washing Produce

• Use EPA registered products only
• Use recommended rates only
• Monitor sanitizer’s effectiveness
  - Concentration
  - pH
  - Temperature
  - Turbidity
  - Oxidation reduction potential (ORP)
Sanitizers For Wash Water

- Chlorine-based sanitizers
- UV light
- Other products labeled for food use
Guidelines For Using Sanitizers

- Change the water when quality is reduced or water is dirty and add more sanitizer.
Guidelines For Using Chlorine-based Sanitizers

- pH=7
- ORP>700
- Warm water
Documentation Guidelines For Using Sanitizers

- Keep accurate and current records of sanitation practices
  - Product
  - Application rate
  - Water temperature, pH, ORP
  - Date and time of application
  - Date and time of changing solution
Cleaning and Sanitation of Contact Surfaces

• **Cleaning/Washing**
  - The act of removing foreign material (i.e. dirt) from a surface through friction.

• **Sanitation**
  - The process of adding a disinfecting chemical to your clean surface to kill bacteria as opposed to physically removing it.

• **You can not sanitize a dirty surface!**
Harvest Containers

- Different materials pose different levels of risk
Other Food Contact Surfaces
Four Step Cleaning and Sanitizing Procedure

- All re-usable surfaces that come into direct contact with produce should be cleaned and sanitized
  1. Pre-rinse
  2. Wash/clean
  3. Rinse
  4. Sanitize (Rinse*)

1. Pre-Rinse to Remove Dirt and Plant Debris

- Dirt and plant debris reduces the effectiveness of sanitizers
- Rinsing loosens and removes dirt and plant debris from surfaces including cracks and crevices
- Use potable water and high pressure to rinse
2. Wash/Clean and Scrub Surfaces

- Add a food-use detergent to the water
  - Use labeled rates
- Scrub surfaces to dislodge remaining soil and debris
3. Rinse to Remove Remaining Dirt and Detergent

- Rinse surfaces with potable water
- Rinsing removes and remaining visible dirt and plant debris
4. Sanitize to Kill Pathogens

- Use EPA registered products for food use only
- Use recommended rates only
- Pay attention to the contact time
- Use sanitizer appropriate for the surface type
  - Porous vs. non-porous
- May require a third rinse
Documentation Guidelines For Cleaning and Sanitizing Food Contact Surfaces

• Keep accurate and current records of sanitation practices
  o Item that was sanitized
  o Date and time of application
  o Product and product rate
WASTE
Waste

- Soil Amendments Are a Source of Foodborne Pathogens
- Types of Biological Soil Amendments
  - Risk Levels Associated With Soil Amendments
- Best Practices For Using Raw Animal Manure
  - Application Timing For Raw Animal Manure
- Methods For Producing Compost
  - Phases of Composting
  - Composting Guidelines
  - Best Practices For Using Compost
  - Best Practices For Storing Compost
Soil Amendments Are a Source of Foodborne Pathogens

• Pathogen transfer can be direct or indirect

• Human pathogens can survive in soil for an extended period of time

• Level of risk depends on the type of amendment
Types of Biological Soil Amendments

- Raw animal manure
- Raw plant material (green manure)
- Aged animal manure or plant material
- Composted animal manure or plant material
- Alternative amendments
  - Teas
  - Meals (fish or bone)
  - Vermicompost
Risk Levels Associated With Soil Amendments

High
- Aged (improperly or incomplete composted) animal manure
- Compost teas
- Raw green manure
- Meals and vermicompost

Low
- Composted plant material
- Composted animal manure
- Raw animal manure
Best Practices For Using Raw Animal Manure

• Avoid direct contact with produce (never side dress!)
• Incorporate into the soil
• Apply at time intervals that minimize potential for cross contamination
• Keep records of when and what was applied to the soil
Best Practices For Using Raw Animal Manure

• Prevent cross contamination of raw manure with fields, equipment and water sources
  o Cover piles or contain within a closed structure with a non-permeable floor
  o Physical barriers and adequate distances from water sources
Best Practices For Using Raw Animal Manure

- Safe distances from surface water
  - 100 ft sandy soil
  - 200 ft clay or loam soil
  - 300 ft if slope is >6%

- Safe distance from fields or handling sites - 400 ft

- Safe distance from well heads - 200 ft
Application Timing For Raw Animal Manure

- National Organic Program (NOP) standards are recommended

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Crop Examples</th>
<th>Days Before Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edible portion likely to contact manure</td>
<td>Root crops</td>
<td>120</td>
</tr>
<tr>
<td>Leafy greens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strawberries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edible portion <strong>NOT</strong> likely to contact manure</td>
<td>Brambles</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Tree fruit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pepper/tomato</td>
<td></td>
</tr>
</tbody>
</table>
Methods For Producing Compost

- Two methods
  - Static aerated
  - Turned (windrow)
Phases of Composting

170°F
131°F

mesophilic
thermophilic
maturation phase

1-3 days
10-100 days
10-100 days

10-100 days (pathogens killed)
Composting Guidelines

- Conditions are based in Federal Biosolid Law (40CFR503)

<table>
<thead>
<tr>
<th>Method</th>
<th>Temperature (°F)</th>
<th>Incubation Period (Days)</th>
<th>Turning Required?</th>
<th>Curing Time (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Aerated</td>
<td>&gt;131°F</td>
<td>≥3</td>
<td>No</td>
<td>45</td>
</tr>
<tr>
<td>Windrow</td>
<td>&gt;131°F</td>
<td>&gt;15</td>
<td>Yes (&gt;5 times)</td>
<td>45</td>
</tr>
</tbody>
</table>
Best Practices For Using Compost

• Store, cover or immediately apply compost following curing
• Protect compost from cross contamination
Best Practices For Using Compost

- Keep compost certification on record
- Document when compost was applied
Best Practices For Storing Compost

• Store compost away from production fields, packing houses and processing areas
• Store compost down-hill of production fields
• Store compost away from water sources
WASTE OR SOIL AMENDMENTS

COMPOSTED MANURE CAN SIGNIFICANTLY REDUCE FOOD SAFETY RISKS

SAFE MANURE APPLICATIONS

- Never apply during the growing season
- Apply 90 to 120 days before harvest
- Incorporate it into the soil within 72 hrs of application
- Avoid run-off from piles into water supply

SAFE COMPOST CONDITIONS

- 131 to 170°F for 3 days (enclosed system)
- 131 to 170°F for 15 days (windrow system)
- turned 5X or more AND
- cured for 45 days AND
- covered while being stored
Wildlife

- Wildlife and Domestic Animals
- Best Practices For Using Domestic Working Animals
- Domestic Non-Working Animals
- Best Practices To Handle Animal Intrusions
- Best Practices To Deter Animal Intrusions
Wildlife and Domestic Animals

- All manure can carry pathogens

- **Domestic animals**
  - Livestock (cattle, sheep, goats, pigs, chickens)
  - Cats
  - Dogs
  - Rabbits
  - Horses

- **Wildlife**
  - Deer
  - Coyotes
  - Rabbits
  - Raccoons
  - Birds
  - Rodents
  - Insects (flies)
Best Practices For Using Domestic Working Animals

• Implement guidelines for how animals will be used and when they will be used

• Keep animals out of growing rows at least 7 days prior to harvest

• Do not house/ pasture draft animals and ruminants.

Best Practices For Using Domestic Working Animals

- Avoid handling the animals while handling produce
- Driveways should be >10ft wide and seeded with grass
Domestic Non-Working Animals

No domestic non-working animals in:

- Production fields
- Packing houses
- Processing facilities
- Vehicles used to transport produce
Best Practices To Handle Animal Intrusions

- Look for signs of intrusion or contamination prior to harvest
  - Tracks
  - Feces
  - Damaged product
Best Practices To Handle Animal Intrusions

- Flag or mark contaminated area
- Do not harvest contaminated produce
  - >5 ft radius
- Document the intrusion and corrective action
Best Practices To Deter Animal Intrusions

Deter animals by using:

- Physical barriers
- Noise makers
- Decoys
- Netting on structures
- Strings across open water sources
- Falcons
- Bait stations
Best Practices To Deter Animal Intrusions

• Remove culls and plant debris to deter rodent or small mammal infestations

• Minimize standing water, which is a drinking water source for animals
  o Repair leaking irrigation pipes, tape and emitters
  o Level land to avoid low lying areas
Best Practices To Deter Animal Intrusions

• Place rodent traps around buildings and near entrances

• You can place rodent traps inside the produce storage areas, but they DO NOT have to have food in them.

• Check traps regularly
WILDLIFE & DOMESTIC ANIMALS
PREVENT AND MINIMIZE ANIMAL ENTRY INTO FIELDS, PACKING HOUSES
AND STORAGE AREAS

DECOYS

FENCES

NOISE CANNONS
WORKERS
Workers

- Worker Health, Hygiene and Training
- Best Practices For Worker Hygiene
  - Worker Clothing Guidelines
  - Importance of hand washing
    - Using hand sanitizer
    - Examples and key components of handwashing stations
    - Options for Grey Water Disposal
  - Restroom Facility Guidelines
    - Best Practices for Restroom Usage
    - Recordkeeping for Restroom Facilities
- Signs and Symptoms of Illness
  - Plan in Place for Sick Employees
  - Injuries and First Aid
  - Recordkeeping illnesses and injuries
Worker Health, Hygiene and Training

- Everyone should be able to understand, identify and reduce produce safety risks on the farm!

- Before the growing season starts, *every worker and volunteer* should receive training on:

<table>
<thead>
<tr>
<th>Farm Policies</th>
<th>Hygiene</th>
<th>Health</th>
</tr>
</thead>
</table>
  | GAPs/GHPs SOPs | • Handwashing  
                     • Clothing | • Illnesses  
                          • Injuries |
Best Practices For Worker Hygiene

• Workers can directly or indirectly contaminate produce

• All workers and volunteers should:
  o Maintain personal cleanliness
  o Wear clean clothing
  o Remove or cover jewelry
  o Wash hands frequently and at designated times
  o Eat, drink, and use tobacco products in designated areas only
Worker Clothing Guidelines

In the field:

- Avoid handling raw manure before:
  - Harvesting
  - Sorting
  - Pruning (or other crop maintenance activities)

- Do not wear the same clothing that is worn to handle livestock
Worker Clothing Guidelines

In the packinghouse:

- Clean or change field clothes prior to entering packinghouse
- No hand or arm jewelry
- Use clean aprons, gloves and boots in packinghouse
Hand Washing - First Line of Defense!

Resident microorganisms on unwashed hands
WORKER HEALTH & HYGIENE
HANDS ARE ONE OF THE MOST CRITICAL OF ALL CONTROL POINTS

1. Thoroughly wet hands
2. Take an adequate amount of soap
3. Rub palms and back of hands, rub thumbs and interface fingers
4. Rinse well with running water. Dry hands thoroughly with paper towel

Wash your hands BEFORE AND AFTER:
- WORK
- EATING OR DRINKING
- SMOKING
- HANDLING FRUITS AND VEGETABLES
- USING THE TOILET
Areas on the Hands Most Often Missed During Hand Washing

- Back: Most Often Missed
- Palm: Often Missed
- Less Often Missed
Importance of Hand Washing

Unwashed hand

Washed hand
Using Hand Sanitizer

- Sanitizers are not effective when applied to visibly dirty hands.
- Sanitizers are **not** a substitute for soap and water.
Handwashing Stations

$435-$1100

$205

$20
Key Components of a Handwashing Station

1. Potable water with continuous flow
2. Soap
3. Single-use towels
4. Catch basin (for grey water)
5. Waste receptacle

What’s Missing?
Options for Grey Water Disposal

- Dump in grassy area or graveled area **AWAY** from field or handwashing station
- Utility floor drain, mop sink drain, or flush down toilet
- Water from farmer’s markets should be hauled away or managed according to the market’s guidelines
Restroom Facility Guidelines

- Permanent (house, office, etc.) or portable restrooms are acceptable
- Restroom access within a 10 minute walk of working area (including field)
- One toilet per 20 workers
  - >40 workers requires one toilet seat and one urinal
- Handwashing station available
- Restroom and handwashing supplies maintained and replenished regularly
Best Practices for Restroom Usage

- Train ALL employees on best restroom practices:
  - Use restrooms only!
  - Sit on toilet seat, do not stand on seat
  - Place used toilet paper inside the toilet, not beside the toilet or in a trash can
  - Report a problem immediately
Best Practices for Restroom Usage

Please use toilets provided in the field.

Por favor, use los baños disponibles en el campo.

Por favor, deposité el papel higiénico usado dentro del inodoro.

El papel higiénico no atora los inodoros.

Toilet paper will not obstruct toilets.

Please put used toilet paper in the toilet.
Location of Portable Restrooms

BAD Placement

GOOD Placement
Recordkeeping for Restroom Facilities

- Restroom facility SOP and recordkeeping should meet the needs of your farm
- Document and retain restroom cleaning and sanitation records:
  - Date
  - Time
  - Restock supplies
  - Clean facility
  - Additional notes
  - Signature
Signs and Symptoms of Illness

• Signs
  o Frequent restroom breaks
  o Weak or lethargic
  o Open wounds

• Symptoms
Signs and Symptoms of Illness

- Symptoms
  - Coughing/sneezing
  - Red eyes or nose
  - Jaundice
  - Sweating
  - Rashes
Have a Plan in Place for Sick Employees

• Send the employee home if they have the following symptoms:
  o Vomiting
  o High fever
  o Diarrhea
  o Persistent cough
Have a Plan in Place for Sick Employees

- Assign employee to a job that doesn’t involve:
  - Handling produce
  - Handling packing materials
  - Direct contact with other employees
Injuries and First Aid

- Have a first aid kit stocked and accessible:
  - On the farm
  - In the packinghouse
  - In field vehicles

- Monitor and restock supplies regularly
Injuries and First Aid

• Follow these steps for injuries that occur in the field:
  o Stop harvest
  o Administer first aid or call 911
  o Notify supervisor of injury
  o Mark or flag area where injury occurred
  o Dispose of any produce in contact with bodily fluids (vomit, blood, urine, etc.)
  o Make record of incident

• Workers with minor injuries that can be cleaned, bandaged, and covered may resume work.
Recording Illness and Injury

- Keep a record of illnesses and injuries

<table>
<thead>
<tr>
<th>Date</th>
<th>Employee</th>
<th>Event</th>
<th>Action taken</th>
<th>Date return to work</th>
<th>Signature</th>
</tr>
</thead>
</table>
| 7/20/2013 | Joe Smith | Cabbage field 1 Finger injury | • harvest stopped  
• supervisor notified  
• wound cleaned, bandaged, and gloved  
• Bloody produce thrown out | Same day | Jane Smith |
PRODUCE STORAGE, TRANSPORT AND TRACEABILITY
PRODUCE STORAGE, TRANSPORT AND TRACEABILITY

- Produce Storage Guidelines
- Produce Transport Guidelines
- Traceability
  - One Step Forward - One Step Backward Approach
  - Documentation Guidelines for Traceability
    - Establish a Coding System to Assist With Traceability
    - Methods of Keeping Track of Produce
      › Conducting A Mock Recall
Produce Storage Guidelines

• Produce should be stored at 40 F or below within 2 hours of harvesting
• Maintain temperature throughout the storage unit
• Verify temperature using an appliance thermometer
• Store produce in clean and sanitized containers
• Store containers off of the ground and away from the wall
Produce Transport Guidelines

- Inspect all vehicles prior to loading produce for:
  - peeling paint and rust
  - broken glass
  - leaking oil, gas or other fluids
  - foul odors

- Cover produce to prevent cross-contamination (or put in closed containers)
Produce Transport Guidelines

• Do not haul produce in vehicles used to haul:
  o compost or manure
  o animals
  o pesticides or other chemicals

• For refrigerated vehicles:
  o monitor temperature and humidity
  o inspect air conditioner
Traceability

• Why Traceability?
  o Provides greater visibility into a supply chain, thereby helping to be better prepared if something goes wrong.
  o Improves response time by all stakeholders if something does go wrong.
One Step Forward - One Step Backward Approach

• One step forward
  o Tracks when the product leaves the farm and where it goes

• One step backward
  o Tracks where the product was grown and when it was harvested
Documentation Guidelines for Traceability

- One step forward
  - What type of produce left the farm
  - Date produce left the farm
  - Amount of produce that left the farm
  - Where the produce went
Documentation Guidelines for Traceability

• One step backward
  o What was harvested
  o Harvest date
  o Where (field) the product was harvested
  o Who harvested the product
Establish a Coding System to Assist With Traceability

- Assign a number/letter to:
  - Produce (type and variety)
  - Field
  - Worker

<table>
<thead>
<tr>
<th>Crop Number</th>
<th>Variety</th>
<th>Field</th>
<th>Worker ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples = 01</td>
<td>“Honeycrisp” = 5</td>
<td>A1</td>
<td>9981, 6551</td>
</tr>
<tr>
<td></td>
<td>“Golden Delicious” = 4</td>
<td>A2</td>
<td>7431</td>
</tr>
<tr>
<td>Blueberries = 02</td>
<td>“Aurora” = 1</td>
<td>B1</td>
<td>4421</td>
</tr>
<tr>
<td></td>
<td>“Bluejay” = 2</td>
<td>B4</td>
<td>9981</td>
</tr>
<tr>
<td>Strawberries = 09</td>
<td>“Diamante” = 3</td>
<td>C2</td>
<td>2178</td>
</tr>
</tbody>
</table>
Methods of Keeping Track of Produce

- Containers or produce can be labeled
  - Barcoding
  - Stamps
  - Labels/tags
- Receipts (i.e. bill of landing)
- Grower/consignor numbers
Conduct A Mock Recall

• Required for USDA GAPs food safety audit
• A mock recall demonstrates the effectiveness of your traceability system
• Contact buyer and indicate that you are conducting a mock recall
• Provide buyer with **ALL** information on the produce that you are recalling
Conduct A Mock Recall

• Ask buyer for the following information:
  o How much product is remaining on location
  o How much was sold
  o How much was destroyed

• Record date and time of mock recall
Thank You!

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