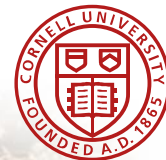




Produce Safety

ALLIANCE



Cornell University



Module 3: Soil Amendments

Learning Objectives

- Identify potential routes of contamination associated with soil amendments
- Explain soil amendment handling practices that may reduce risks
- Identify key strategies such as composting or application intervals to reduce risks
- Describe corrective actions that may be utilized if a soil amendment presents a risk
- Identify recordkeeping tools for monitoring and managing soil amendment handling, application, and proper use





What Is A Soil Amendment?

- Soil amendments are any chemical, biological, or physical materials intentionally added to the soil to improve and support plant growth and development
- May reduce soil erosion and sediment runoff
- Many different types of soil amendments are available
- Soil amendments can present produce safety risks
- Assessing risks and implementing GAPs can reduce risks





Soil Amendments & Food Safety Risks



- Biological soil amendments, especially those that include untreated (raw) manure, pose significant microbial risks
- Synthetic (chemical) soil amendments can also impact food safety, if not prepared and applied properly
- Risks should be assessed when selecting and applying all soil amendments on produce fields



Assessing Your Risks

- **What type of soil amendments do you use?**
 - Raw manure, composted manure, chemical, etc.
- **What crops receive soil amendments?**
 - Fresh produce or agronomic crops
- **When do you apply them?**
 - Days to harvest, time of year
- **How do you apply them?**
 - Incorporated, injected, surface applied
- **How much and how often do you apply them?**
 - Excessive application can lead to environmental impacts





Chemical Soil Amendments

- **Minimal risk of human pathogens**
 - Cannot be considered 100% safe
 - Synthetic fertilizers, minerals
- **Can pose chemical risk to humans**
 - Be sure workers are trained to apply properly and use personal protective equipment
 - Follow all application instructions
 - Proper labeling and storage





Human Waste & Biosolids

- Human waste is prohibited for use on produce crops, unless it meets the EPA regulation for biosolids (40 CFR part 503)
- Untreated human waste may contain pathogens, heavy metals, or other contaminants
- May not be accepted by produce buyers
- Management of biosolids not discussed because use is infrequent in fresh produce production



Pre-Consumer Vegetative Waste

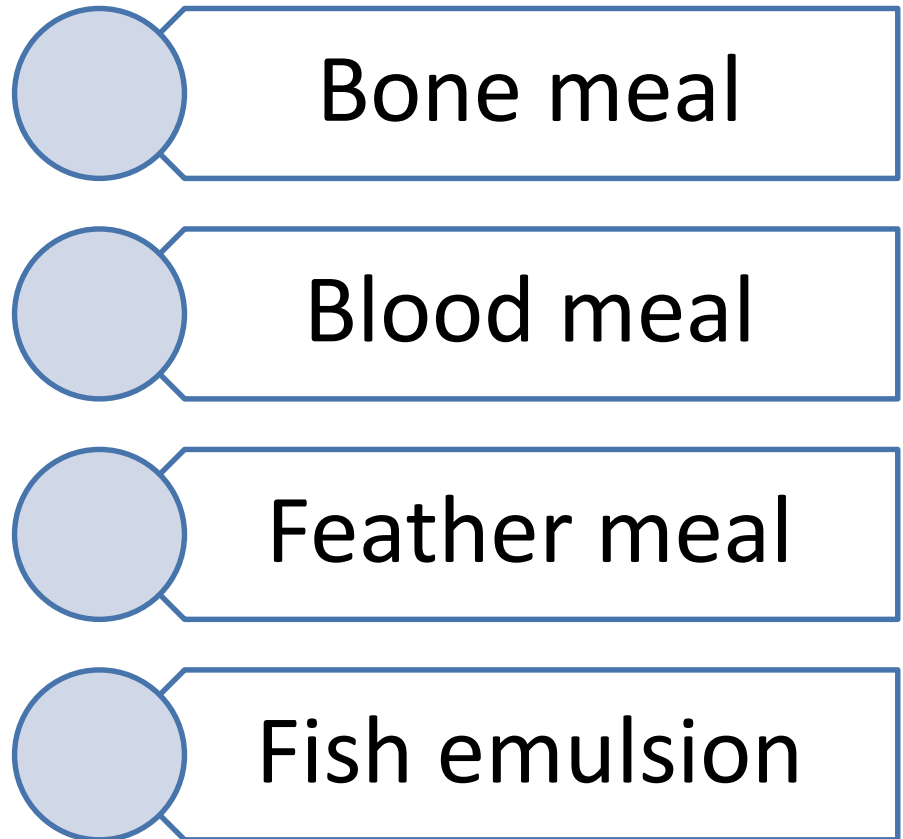
- Should not be considered zero risk and may contain:
 - Chemical hazards
 - Physical hazards
 - Biological hazards
- Examples include:
 - Produce food preparation waste
 - Out of date vegetables
 - Food products removed from their packaging





Non-Manure Based Soil Amendments of Animal Origin

- Should be processed to eliminate pathogens or must be considered untreated biological soil amendments of animal origin





The Value of Manure

- Increases soil tilth, fertility, and water holding capacity
- Sound nutrient management and waste utilization for those with animal production or partnering with other farms who have animals
- Widely available and cost effective





Pathogens in Animal Manure

- All manures can carry human pathogens
- Some animals tend to be reservoirs for certain pathogens
- Many things can affect animals shedding pathogens in their manure
 - Age
 - Rearing practices
 - Diet
 - Season
 - Environmental conditions





Untreated Soil Amendments

- Untreated biological soil amendments of animal origin are considered high risk since they have not been treated to reduce or eliminate pathogens
- All of the following soil amendments would be considered untreated:
 - Raw manure
 - ‘Aged’ or ‘stacked’ manure
 - Untreated manure slurries
 - Untreated manure teas
 - Agricultural teas with supplemental microbial nutrients
 - Any soil amendment mixed with raw manure





Reducing Soil Amendment Risks

- Selection
- Treatment
- Application Timing
- Application Methods
- Handling and Storage
- Recordkeeping





Composting as a Treatment

- Composting is a controlled biological process that decomposes organic matter and reduces pathogens
- Temperature is the primary method of pathogen reduction for thermophilic composting; however, chemical and biological factors also contribute
- Only a composting process that has been scientifically validated ensures pathogen reduction
- Process monitoring and recordkeeping are critical to ensuring the compost is adequately treated



Properly Composted Manure

- **High temperatures are maintained by;**
 - Manipulating the compost pile inputs (feed stocks)
 - Proper carbon to nitrogen ratios
 - Initial C:N ration of between 25:1 and 40:1
 - Moisture percentage
 - Aeration






Going the Extra Step

- Cure compost
 - Leave finished compost in an undisturbed pile for at least 2 months.
 - Remember
 - Keep curing or finished compost away from ‘active’ compost piles.
- **Best practice: store, cover or apply finished compost immediately following curing stage.*****
-



Composted Manure

(lower risk)

- Substantially reduces microbial pathogens
 - Finished product will yield a valuable soil amendment, with few pathogens, if composted properly.
 - **Safety Considerations**
 - Compost temperature not monitored
 - Failure to properly turn compost pile
 - Finished compost contaminated by nearby manure piles
 - Curing finished compost
- 



Composting Options

Must use a scientifically valid process:

1. Aerated static composting: aerobic, minimum 131°F (55°C) for 3 days, followed by curing with proper management to ensure elevated temperatures throughout all materials
2. Turned composting: aerobic, minimum of 131°F (55°C) for 15 days, minimum 5 turnings, followed by curing
3. Other scientifically valid, controlled composting processes



Properly Composting Manure

- Two popular methods
 1. In-vessel or static aerated pile system
 - Temperatures must be maintained of at least 131 °F for 3 days



Aerated Bay Compost System. URI Peckham Farm, September 2010.



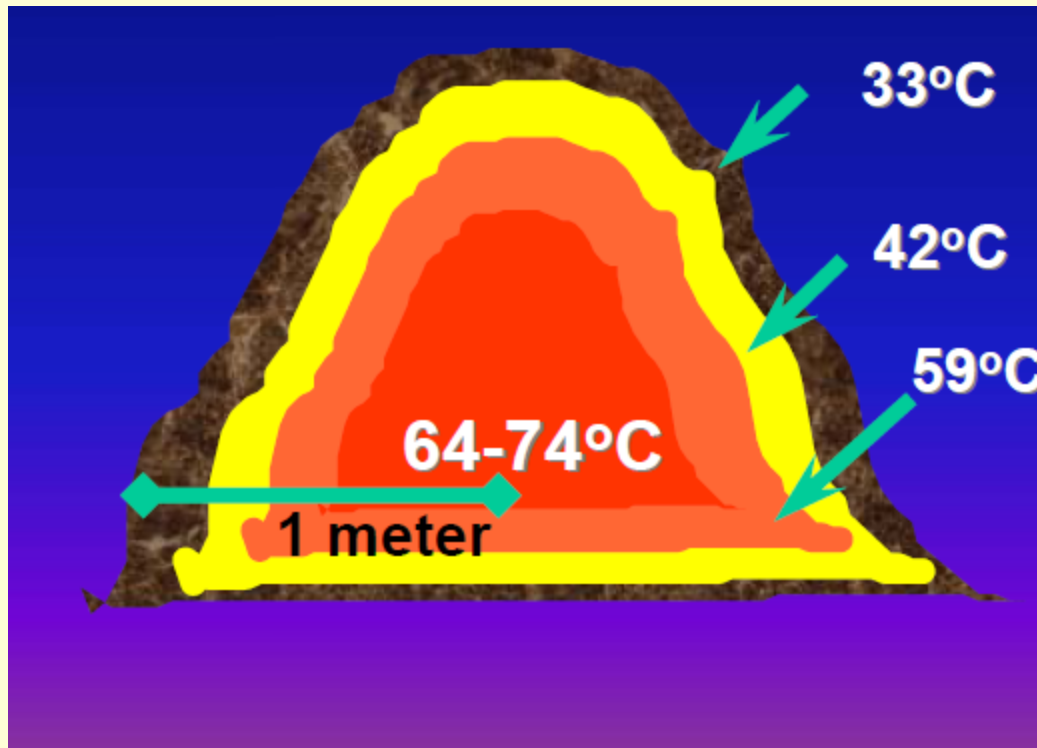
Forced aeration. A powered blower will force air through this pipe to the compost pile. A slotted wooden floor will cover the aeration pipe.

Properly Composting Manure

2. Windrow composting system
 - Temperatures must be maintained of at least 131 °F for 15 days, during which time, the materials must be turned a minimum of five times.



Properly Composting Manure





Reducing Risks During Application

Steps you should take to reduce risks:

- Preferentially apply soil amendments containing manure to crops not intended for fresh consumption
- Maximize the time between application and harvest
- Do not contact the edible portion of the crop during application.
- Do not side-dress with raw manure
- Minimize risks to adjacent produce crops if you are field spreading manure





Minimum Application Intervals

- There are currently no application intervals for raw manure outlined in the FSMA Produce Safety Rule
- **Untreated Soil Amendments**
 - FDA is currently pursuing further research to support application intervals for raw manure
 - Raw manure must not be directly applied to the harvestable portion of the crop
- **Treated Soil Amendments**
 - Zero day application interval for compost treated by a scientifically validated process





PSR vs RI GAP

- **NOP recommended vs required**





Fresh or Raw Manure

■ Application Recommendations - NOP

- Incorporate into the soil (after harvest period) before the ground freezes

OR

- Incorporate into the soil
 - 120 days prior to harvest of product whose edible portion in direct soil contact OR
 - 90 days prior to harvest of product whose edible portion does **NOT** have direct soil contact

**Avoid growing root and leafy crops in the year that manure is applied to a field*





Handling Recommendations

- Designate specific equipment and tools for handling soil amendments
- Develop SOPs to clean and sanitize equipment and tools that contact soil amendments and fresh produce
- Direct traffic (foot, equipment) around soil amendment storage or processing areas to reduce the risk of cross-contamination





Storage Area Recommendations

- Minimize runoff, leaching, and wind drift to reduce contamination of crops, water sources, and handling areas by soil amendments
 - Cover piles
 - Build berms to prevent runoff
- Do not store in locations that are likely to experience runoff or areas that are close to water sources
- Keep raw manure and finished compost in separate areas to prevent cross-contamination
- Minimize animal access to compost piles





Worker Training

Workers who handle soil amendments, both treated and untreated, should:

- Understand SOPs for properly completing tasks which require managing raw manure or compost
- Make sure clothes, boots, and gloves are clean before handling produce
- Wash hands after handling





Recordkeeping: Soil Amendments

Soil amendments can introduce microbial risks, so you should document:

- Type and source of soil amendment
- Rates and dates of application
- Handling and sanitation practices used that reduce risks



There are a few records required for treated biological soil amendments of animal origin within the Produce Safety Rule

- Some details are outlined on the next few slides



Recordkeeping: On-Farm Composting

Key factors in the composting process must be documented. These may include the following steps depending on the process used:

- Time
- Temperatures
- Turnings
- Other processing steps





Recordkeeping: Soil Amendments Supplied by a Third Party

Documentation should be kept of:

- The name and address of the supplier
- What soil amendments were purchased
- The date and amount purchased
- Lot information, if available



Documentation must be collected from the supplier:

- To ensure the supplier has used scientifically validated treatment processes and monitoring during the production of the treated amendment (including compost)
- To ensure proper handling requirements have been met



Corrective Action Plan

- Outline steps that could be taken if soil amendments:
 - Pose a microbial risk to the crop
 - Were improperly treated
 - Accidentally contacted the edible portion of the crop
- Think of alternative market options
 - Processing markets that involve a “kill” step
- Document in your plan





Summary

- Soil amendments can introduce produce safety risks, especially those that contain raw manure
- To reduce risks associated with soil amendments:
 1. Apply untreated manure to non-produce fields
 2. Treat raw manure using a scientifically validated, controlled process
 3. Extend the time between application of raw manure and harvest
- Make sure storage areas do not contaminate fields, water sources, or packing areas
- Train workers who handle and apply soil amendments
- Develop sanitation steps for tools and equipment
- Keep records of soil amendment applications and treatments