Thank you for participating in SowBridge 2008-09

To start the presentation, advance one slide by pressing enter or the down or right arrow key.

To see any of the rest of the materials on this CD, click on the title of the resource.

LPES Curriculum Lesson 51 Mortality Management.pdf
MDA Composting Animal Mortalities Guide.pdf
PIH Composting.pdf

How Do You Dispose of Mortalities?
- Incineration
- Render
- Burial
- Land Fills??
- Composting

Composting - A Natural Way to Recycle
- Cost effective
- Environmentally sound
- Destroys pathogens
- Easy to accomplish

Definition
- COMPOSTING - is the biological decomposition of organic material under controlled conditions to a state where storage, handling, and land application can be achieved without adversely affecting the environment.
Microbiology Lesson 101

What do microbes need to grow?
- Air for aerobic growth
- Moisture
- Temperature
- Food/Nutrition

Limits on Growth

- Nutrient Balance - Carbon:Nitrogen ratio
- Temperature
- Moisture
- Air Quality/Porosity

Carbon Nitrogen Ratio

- Typical Carcass: 5
- Recycled Secondary: 30-50
- Sawdust: 140

**Target**: 30

- Too LOW C/N
  - NH₃
  - Other odors
  - Low decomposition rate
  - Low temperature

- Too HIGH C/N

Carbon Sources/Bulking Agents

<table>
<thead>
<tr>
<th>Source</th>
<th>Optimal Carbon Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycled Paper/Cardboard</td>
<td>Wood Shavings/Chips</td>
</tr>
<tr>
<td>Sawdust</td>
<td>Chopped Soybean Stubble</td>
</tr>
<tr>
<td>Peanut Hulls</td>
<td>Recycled Paper/Cardboard</td>
</tr>
<tr>
<td>Corn Stover</td>
<td>Leaves/Yard waste</td>
</tr>
<tr>
<td>Hay</td>
<td>Poultry Litter</td>
</tr>
<tr>
<td>Rice Hulls</td>
<td>Compost</td>
</tr>
<tr>
<td>Straw</td>
<td>Manure (Horse, Sheep, Swine)</td>
</tr>
</tbody>
</table>

- Solid, Dry, High Straw/Sawdust
- Caution- Sharp/Foreign Material

Source: National Pork Producers Handbook

Moisture

- Swine Carcass: 65%
- Recycled Secondary: 40-50%
- Sawdust: 20-50%

**Target**: 55%

- Too LOW Moisture
  - Low decomposition rate
  - Low temperatures

- Too HIGH Moisture
  - Putrid odors
  - Flies

Porosity

**Goal:**
- Achieve good oxygen flow into the pile.
- Maintain oxygen level above 5%.
- Avoid over cooling pile due to too much air infiltration.

**Target**: 40%

- Too LOW Porosity
  - Low decomposition rate
  - Low temperatures
  - Odors

- Too HIGH Porosity
  - Low decomposition rate
  - Low temperature
Temperature

Achieve high rate of decomposition
Highest Rate: 110°F - 150°F

Destruction of most pathogens, insects, and weed seed
3 days T > 55°C (131°F)

Guidelines for Dead Animal Composting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ideal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon/Nitrogen Ratio</td>
<td>30 - 25-40</td>
</tr>
<tr>
<td>Initial Moisture Content (%)</td>
<td>55 - 50-60</td>
</tr>
<tr>
<td>Porosity (%)</td>
<td>40 - 35-50</td>
</tr>
<tr>
<td>Temperature (°F)</td>
<td>120 - 100-150</td>
</tr>
<tr>
<td>Pathogen Control</td>
<td>131°F, 3 days</td>
</tr>
</tbody>
</table>

Composting in a Biofilter System

- Cover Layer
- Intermediate Layer
- Animal Carcass

Windrow System Bin System

Composting Objectives

- Protect ground and surface water resources.
- Maintain air quality.
- Reduce risk of disease transmission.
- Control flies, vermin, and scavenging animal problems.

Composting Design Considerations

- Site Selection
- Type of Composting Facility
  - Static pile or Windrow without a roof
  - Bin composting under roof
  - Mini-composter

  “Type is - farm situation dependent.”

Dead Animal Composting

Primary Stage, No mixing Land Apply
Mix when moved
Recycled Compost (50% of total load)

Secondary Stage Storage Stage

Materials added in Layers
Bin Composting Systems -
Advantages
- Looks neat and “contained”.
- Risk of leachate is low.
- Eliminate scavenging animals.
- Lower Risk of water contamination.
- Compost moisture content is consistent.
- Many carbon sources/bulking agents can be used.

Bin Composting Systems -
Disadvantages
- High initial investment
  - Cost estimates of $1500 - $2000/bin
    - Minimum of 4 bins
      (2 primary, 1 secondary, 1 Storage)
  - Total start up costs of $6,000 - $7,500
- Note: Existing barns, sheds, etc. can be modified into bins very cost effectively.

Windrow or Static Pile Systems -
Advantages
- Lower initial cost in facilities
  - Total start up cost as much as 2/3 less than bins.

Windrow or Static Pile Systems -
Disadvantages
- Exposure to wind and rain.
- Increased risk of leachate.
- Scavenging animal control.
- Limitations on carbon sources/bulking agents.

Mini-composter System
- 6 inch bulking agent layer
- 36 inches high
- Dimensions 40 inches square
- Straw, manure, water mix,
  pig carcass (max 8 inch layer)
- Bulking agent layer

Dimensions
- 40 inches square
Mini-composter Systems

Advantages
- Handles small pigs and placenta
- Fast degradation due to carcass size
- Low cost

Disadvantages
- Ability to hold heat in cold conditions

Site Selection Objectives

- Protect ground and surface water resources.
- Maintain air quality.
- Reduce risk of disease transmission.
- Control flies, vermin, and scavenging animal problems.

Site Selection Guidelines

Water Quality

- Locate away from waterways and ponds.
- Collect/store or treat all runoff and leachate.
- Avoid flood-plains.
- Low permeability soil base maintained 3 feet above the high water table.
- Gravel/filter fabric base necessary for static piles or windrows without roofs.
- Divert all clean water away from the site.

Sizing the Compost Facility

Three Stages for composting mortality
- Primary (minimum of 2 units/areas)
- Secondary (minimum of 1 unit/area)
- Storage (minimum of 1 unit/area)

Compost Time
- based on the “largest animal” to compost

Composter Size
- based on “estimated daily mortality rate” and “size of largest animal”

Design Procedures

1. Determine the average daily weight of mortalities
2. Determine the “compost cycle” times for the largest carcass weight that will be composted
3. Determine the compost unit volumes for primary, secondary and storage stages
4. Determine the dimensions of the compost facility
5. Determine the annual sawdust (bulking agent) requirement

Swine Production & Death Loss Calculations

Total Pounds Death Loss/Year

\[
\text{Total Lbs Death/Year} = 8,385 \text{ lbs}
\]

Average Death Loss/Day:

\[
\frac{8,385}{365} \text{ days} = \frac{23 \text{ lbs death loss/day}}{}
\]
**Morality Size and Cycle Times**

<table>
<thead>
<tr>
<th>Mortality Size (lb)</th>
<th>4</th>
<th>10</th>
<th>50</th>
<th>100</th>
<th>220</th>
<th>350</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 1 bin (10 ft x 10 ft)</td>
<td><img src="image" alt="Graph showing morality size and cycle times" /></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Primary Cycle (days)**: 10 16 35 50 75 95 115 160 195
- **Secondary Cycle (days)**: 10 10 12 15 25 30 40 55 65

- **Note**: Secondary is 1/3 of Primary Cycle time, but not less than 10 days

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**Getting Started**

- Place 1 ft. of sawdust on the primary bin floor or area for the windrow. (More if animal > 200 lbs.)
- Place one layer of animals on sawdust, maintaining 2 ft. space from sides.
- Cover with minimum: **1 ft. fresh sawdust cover for piles or bins**

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**Loading & Monitoring**

- Place the animals one layer thick, maintaining ~ 1 ft. between large animals
- Small animals (< 20 lbs.) may be grouped
- Use a long stem (~ 3 ft.) dial type thermometer to monitor the temperature
- Temperatures will reach 130-150°F when composting well.

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**When Adding to the Pile**

- Hollow out an area in pile or layer in the bin.

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**When Adding to the Pile**

- Add new carcasses, maintaining separation between carcasses
  - Maintain 6” of sawdust between carcass layers.
  - 1 ft. of sawdust between large carcasses

- Re-cover with: 2 feet of bulking agent in piles or 1 foot in bins.
When the Pile is Completed

Continue adding until the bin is full or require height & length of windrow.
- Allow pile to compost for the recommended days after last animal is added.

When the Pile is Completed

- After completion of the primary cycle (timed and monitored after the addition of the last animal and/or largest animal) turn the contents into the second cycle
  - For animals > 600 lbs., place each in a separate pile
  - Monitor time of the secondary pile

When Pile is Completed

After composting in secondary area:
Storage of compost for at least 30 days is recommended before land application
May use up to 50% in new primary piles

Sawdust Management

- Keep sawdust relatively dry, 40-50% moisture is recommended.
- Sawdust will shed rainfall if mounded.
- Collect leachate and runoff for treatment in grassed filter area.
- During dry periods (like the summer of ’99), the windrow can become too dry allowing sawdust to blow off. Water will be needed to re-hydrate the pile.

Recordkeeping

- Keep daily records of loadings, sawdust added, and temperatures for the first batches to identify problems. *(recommended)*

Will composting increase the chances of disease spread on my farm?

- **In general, NO:**
  - Site the unit to minimize contact with animals
  - Keep runoff and leachate away from animals
  - Prevent rodents and scavenging animals with adequate cover & if necessary, fencing.
Advantages of Mortality Composting

- Long life of the facility
- Generally, no new equipment is needed
- Labor is < alternatives
- In many areas, carbon sources are inexpensive and available

Common Mistakes:

- Insufficient cover over the animals
- Lack of all season access
- Lack of scavenger control
- Sloppy loading
  - (Insufficient sawdust between the animals)
- Improper moisture content

Ohio Compost Survey - 1998

- 151 Producers Surveyed in Ohio:
  - Saved money 51%
  - Improved biosecurity 46%
  - Easy to Manage 68%
  - Exceeded your expectations 44%
  - Less successful than expected 0.6%

Thank You & Are There Any Questions?