

# Management Guidelines for Composting Swine Mortality in Mississippi

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Animal death is a normal process in producing livestock. It is important that producers use all possible management practices to prevent death loss of animals. Lowering death loss in a production system can improve economic return as well as reduce the cost of mortality disposal.

In Mississippi, approved methods of swine mortality disposal include rendering, incineration, burial (restricted to permitted landfills), or composting. The Mississippi Board of Animal Health must approve the method you use for mortality management. A certificate of compliance will be issued for each farm once the Board of Animal Health has granted approval.

Composting swine mortality is an effective method of mortality disposal. Composting is a natural biological process where bacteria and fungi convert organic material into a stable organic product. Proper compost management reduces odor and speeds up the compost process.

Conditions that must be controlled in the composting process are the material mix (carbon to nitrogen ratio), moisture content, porosity (amount of oxygen throughout the mix), and temperature.

Mortality is composted in two stages, primary and secondary composting. The primary stage has a high rate of biological activity, results in rapid decomposition, and creates high temperatures in the compost material. Secondary composting occurs when you move the primary composted material. Moving the compost material from the primary bin into another

compost bin increases the oxygen level and redistributes the moisture content of the material, allowing biological activity to complete the compost process. The secondary compost has lower temperatures and biological activity, but it cures the compost to a nutrient-stable product.

Using compost is an effective way to improve plant growth. Composting reduces water volume while preserving nutrients for use by crops either on the farm or transported for use off the farm. Compost enriches the soil, which can reduce erosion and nutrient runoff, prevent soil compaction, and help control disease and pest infestation in plants. This reduces the use of chemical fertilizers while conserving natural resources.

## Objectives of Composting Mortality

The objectives of composting mortality are to dispose of dead animals effectively and safely by producing a reusable stable organic product you can apply on pasture or cropland to conserve natural resources.

## How To Get Started Composting Mortality

1. Contract growers need to notify the company of their intentions to compost mortality. You may need to consider company policy and/or procedures before developing a mortality compost system on your farm.

2. Existing operations need to gather the following information:
  - Type of operation (such as farrow to finish, farrow to wean, nursery, finish)
  - Average number of animals for each stage of production
  - Average mortality (number and weight) per year for each stage of production
  - Number of acres you own and location of property lines
  - Proposed location of compost facility
  - Type of equipment intended for mortality transport (front loader, skid)
  - Intended use of cured compost
3. New or expanding operations must provide the same information, but percent mortality will be based on mortality estimates.
4. Contact the Natural Resources Conservation Service (NRCS) or a private agriculture engineer for design assistance.
5. Check with your local NRCS office to find if you qualify for any cost share help that may be available.
6. After developing the mortality compost facility design and operating plan, submit the plan to the Mississippi Board of Animal Health for approval and a certificate of compliance.
7. Find a long-term source of sawdust or other carbon source.
8. Build the compost facility.
3. Stainless steel composting thermometers with a 3- or 4-foot long stem (to check internal pile temperatures).
4. Water source available (in the event moisture needs to be added to compost pile).
5. Electrical outlet and/or lights.

## General Requirements (Regulations and Permit)

The Mississippi Board of Animal Health regulates disposal of animal mortality. It must approve the compost facility and management of mortality. Once approval has been granted, a certificate of compliance will be issued by the Board of Animal Health.

The Mississippi Department of Environmental Quality (MS-DEQ) may also be involved with mortality management because of the possibility of polluting air or water. Changes in existing MS-DEQ permits may be required.

1. The compost facility must be designed, built, maintained, and managed to provide a way to dispose of carcasses that will prevent spread of disease and must be approved by the Mississippi Board of Animal Health.
2. Do not dispose of dead swine, offal, or any parts of any dead swine in any manner other than an approved method (incinerator, compost, rendering facility, or permitted landfill).
3. Failure to comply with approved methods of mortality disposal will result in the farm's being quarantined.
4. Locate the compost facility at least 300 feet from the property line and 1,000 feet from the nearest occupied dwelling not owned by the producer.
5. Locate the compost facility outside of wetlands or the 100-year flood plain and at least 100 feet from private wells, 200 feet from public wells, and 100 feet from flowing or intermittent streams, lakes, or ponds.
6. Composting must be done on concrete to allow access in bad weather and prevent contamination of surface and groundwater.
7. Use weather- and rot-resistant materials to build the compost facility.

## Equipment Required

You may already have some equipment needed to compost swine mortality on your livestock farm, but plan for the extra expense of equipment you need for composting before starting a mortality compost facility. These expenses include:

1. Skid loader, or tractor with front-end loader (to transport mortality, load and unload composting bins).
2. Solid manure spreader (to spread finished compost evenly on pasture or cropland).

8. You must have a roof over the composting facility to keep excessive moisture from accumulating. Excess moisture can lengthen the compost time or cause odors and leaching (runoff).
9. Manage the compost facility to dispose of the contents effectively, prevent leaching, and to control odors, flies, rodents, and other vermin.
10. Incorporate dead animals into the composting process within 24 hours of death and cover them with enough sawdust to prevent odor and keep out pets or wild animals.
11. Do not remove dead animals from composting until all flesh, internal organs, and other soft tissue are fully decomposed.
12. Apply cured compost to pasture or cropland at rates correct for nutrient levels to produce greatest crop yields. Apply it in a way that prevents runoff to surface waters.
13. You may need prior approval by the Mississippi Board of Animal Health and/or MS-DEQ (permit modification) to apply compost to other property.
14. The Mississippi Board of Animal Health issues to each person growing swine, for himself or others, a certificate of compliance with the provisions of the laws relating to disease prevention and these regulations.
15. The certificate will be numbered and will be valid until canceled or revoked by the Mississippi Board of Animal Health.
16. Violating any of these regulations is grounds for revoking, canceling, or suspending the certificate after notice and hearing.
17. Normally the compost facility needs to be designed for expected animal mortality based on current or estimated mortality rates. Consider mortality rates that are higher than normal and make arrangements accordingly.
18. In cases of catastrophic death loss, you may get emergency permits for disposal by immediately contacting the Mississippi Board of Animal Health. Contract growers must also immediately notify the appropriate company management.

## **Biosecurity of Mortality Compost**

Biosecurity is a major consideration when deciding where to locate a mortality compost facility.

Preventing disease transfer to growing productive animals is important for the economic stability of the operation. Careful and consistent attention to biosecurity can decrease the labor requirements of the compost facility as well as the overall swine production facility.

The main biosecurity concern with composting mortality is potential pathogen transfer from fresh mortality by transport equipment, workers, or scavenging animals back to the production area. After the animal is secured in the compost bin, the process of composting produces temperatures above 130 °F long enough to destroy pathogens.

In an ideal situation, separate labor and equipment would be used to transport mortality from the production area to the compost facility. If this is impractical, you must thoroughly clean and disinfect equipment used to transport mortality before using it in the production area. Workers handling or managing fresh mortality compost need to schedule this task separate from work in the production area. Post and practice strict biosecurity guidelines before workers re-enter the production area.

You must keep scavenging pets and wild animals from getting in the compost pile. If scavenging animals become a problem, install fencing. Keeping the recommended sawdust cover over the compost pile will normally prevent these problems. Also, good coverage of the compost pile with sawdust will eliminate fly incubation and will minimize the potential of odors.

## **Location of Mortality Compost Facility**

Careful compost facility site selection will help protect water quality, avoid complaints, and prevent nuisance problems. Plan site selection so traffic patterns associated with managing the compost facility are convenient and do not disrupt other management operations. When locating a compost facility, consider the farm residence and any nearby neighbor residences, as well as public roads or other animal production facilities that might be affected. The Mississippi Board of Animal Health requires the compost facility be located at least 300 feet from the property line or 1,000 feet from the nearest occupied dwelling not owned by the producer.

Although offensive odors are not generated if you properly manage the compost process, consider who might view mortality transport before deciding where to locate the compost facility. Transport of swine carcasses may not be an acceptable sight to neighbors or people traveling the roads. If possible, locate compost facilities downwind of nearby residences to prevent sawdust or any possible odors from fresh mortalities being blown toward neighbors. Consider strategic placement of vegetative screens.

Also think about traffic patterns required for transporting fresh mortality and sawdust, moving primary compost to secondary bins, and removing the finished compost from the compost facility. Build the compost facility in an area that does not interfere with other production tasks. Consider the locations of overhead power lines and underground utilities when selecting a site for the compost facility.

Locate the facility in a well-drained area. An all-weather access road and work area (solid base of gravel or concrete) are required for loading and unloading the bins during all weather conditions. If a compost facility must be located on the lower part of a slope, build a terrace around the upper side of the compost facility to divert surface water runoff away or around the compost site. This eliminates surface water runoff contamination and improves access area working conditions.

## Management Procedures

Successful mortality composting depends on understanding compost principles, compost management, and attention to details. Listed below are guidelines to successful mortality composting. Composting swine mortality may be influenced by size of animals, temperature, carbon source, moisture content, and rate of mortality inclusion. Management adjustments may be necessary to fine-tune the mortality composting procedures for each individual farm.

A source of carbon is required on the farm and has to be available for use in the compost facility. Management procedures described in this publication are intended for using sawdust as the carbon source. You can use other sources of carbon, such as rice hulls, peanut hulls, and crop residues, but you may need to adjust compost management procedures from the ones described here using sawdust.

1. Store fresh sawdust in a dry area free from surface water runoff, but sawdust works best for compost at about 50 percent moisture content.
2. Fresh sawdust in a pile will shed water fairly well if you mound the pile, with no pockets or depressions.
3. You will need at least three bins (two primary and one secondary) for composting mortality, but the total number of bins and bin capacity depend on the rate of mortality of the production unit.
4. Start a primary composting bin by placing at least a 12-inch base layer of sawdust in the bottom of the bin (larger pigs may require an 18-inch base).

- This base will collect liquids that are released from the carcass decomposition, so an absorptive base layer plays an important role in preventing release of excess liquid. If liquids begin to leach out of the pile, place additional fresh sawdust on that area to absorb the liquids and increase the depth of the base when constructing new piles.

- This base also allows air and microbial action to occur below the carcass.

5. Place a single layer of pigs evenly spaced across the sawdust base.
6. Carcasses placed in the composting bins should not touch each other and should be 12 inches from bin walls.
7. It is very important to use enough sawdust so each carcass is covered on all sides with at least one foot of sawdust. Carcasses placed directly on concrete floors or against bin walls will not compost properly. You may group or place small pigs with less sawdust between carcasses, but do not stack pigs on top of one another. Keep 4 to 6 inches of sawdust between layers.
8. Never leave hooves, legs, ears, or snouts sticking out of the sawdust pile. Keep the surface of the pile shaped so the total carcass is completely covered.
9. Cover the top row of pigs with 2 feet of sawdust. This layer controls odor and insulates the pile to hold heat.
  - Measure the depth of sawdust cover to ensure adequate coverage. You may notice odors if you use an inadequate cover. The odors may attract scavenging animals.
  - Carcasses placed in warm sawdust begin composting more quickly. You can warm sawdust by placing extra sawdust over the top carcass layer. This lets the sawdust heat so you can bury the next carcass in warmed sawdust.
10. After a day or two, sawdust may settle around the carcass, so place more sawdust over the carcass to keep the 2-foot coverage.
11. Place carcasses in the primary bin within 24 hours of death.

12. When placing additional pigs in the compost pile, follow these steps:
  - Use the loader bucket to "wallow-out" a cavity in the prewarmed, 2 feet of sawdust cover over previously placed carcasses. Place the fresh carcass in this cavity.
  - Keep 6 to 12 inches of sawdust over pigs already in the pile.
  - Cover the new layer of pigs with 2 feet of fresh sawdust so you can create a new cavity for the next carcass.
13. Knowing the placement of the last pig in the primary compost pile is important for efficient use of the bin space. This probably won't be a problem if the same person places carcasses into the primary bin each time. Otherwise, record the location of last pig placement on the record sheet.
14. To reduce fresh sawdust requirements, use finished compost in place of fresh sawdust.
  - If finished compost is available, use it to cover the carcass for more heat and bacteria to start the composting process.
  - You can replace up to 50 percent of the fresh sawdust requirement with finished compost. Recycle rates above 50 percent may limit carbon availability, thus interfering with composting.
15. Monitor the temperature of the composting pile with a long-stem dial-type thermometer. Internal pile temperatures will reach 130 to 160 °F when composting is going properly.
16. Primary bins started in cold weather may not begin composting immediately. An extended compost time may be needed before you can turn the bin. If you use sawdust as recommended, the insulation effect is normally enough to minimize the effects of surrounding temperature. There is usually enough heat in active (not newly started) compost piles to continue composting through cold weather.
17. After the last carcasses placed in the primary bin have composted two months (at least 60 days) or longer, move the contents to a secondary bin.
18. If you compost breeding animals or large finished hogs, expect a longer compost time (90 days or longer).
19. Movement of the primary bin contents to the secondary bin provides mixing of moisture content and adds oxygen to the material so the compost will "cure" properly.
20. After the pile has composted another two months (at least 60 days) in the secondary bin, it will look like dark, granular, nearly black humus-like material with very little odor.
21. The finished compost of large animals will normally contain some bone fragments, but the bones will be dry, brittle, and easily crumbled.
22. Screen and recycle bone fragments through the compost if necessary.
23. Store the finished compost on the ground for recycling through the compost or apply it to pasture or cropland.
24. Mound the finished compost stack to shed water, with no pockets or depressions.
25. Keep the area around the compost facility mowed and free of weeds, brush, and trash.
26. Most problems in composting swine mortality arise when you don't use enough sawdust in covering carcasses.

### **Cured Compost Land Application Area**

You must have enough land area for final disposal of the finished compost. This must be part of your nutrient management plan and/or CNMP. Check your permit before constructing a compost facility to determine if a modification of the permit is required.

1. The finished compost will appear as a dark, granular, nearly black humus-like material with very little odor.
2. Get a laboratory analysis of the finished compost for nitrogen (N), phosphate (P<sub>2</sub>O<sub>5</sub>), and potash (K<sub>2</sub>O) to know the application rate.
3. Apply finished compost at agronomic rates for the crop you are growing.
4. Haul and spread finished compost as needed, using a conventional manure spreader.
5. Locate the land application area away from non-farm residences.

## Records

A logbook is required for a composting operation. Include these items in the logbook:

1. Date first carcass is placed in the primary compost pile.
2. Date, estimated weight, and location in the pile of each carcass placed in the primary compost pile. This will provide a record of death losses and will help determine mortality rate. It also may improve the efficiency of bin space.
3. Temperature readings of the compost pile (daily). This reflects how the compost is operating and lets you adjust management of the compost if the temperature range is not correct.
4. Amount of fresh sawdust on hand and how much you use.
5. Date you put the last carcass in the primary compost pile (allow at least 60 days before you transfer it to the secondary bin).
6. Date you transfer compost from primary to secondary bins.
7. Date secondary compost bin is completed (allow at least 60 days for secondary compost).
8. Date and amounts of finished compost you remove for land application or recycling through the primary bin.
9. Fields where you have applied mortality compost.

Composting swine mortality is not an exact science. It will require a management commitment to be successful. Many variables influence the success of composting. Management of the compost facility will require some additional time during startup. Once you have set a management routine and have gained some experience, it will take less time to manage the mortality compost facility. Remember, the best way to manage mortality is to prevent mortality.

## Agency Contact Information

### Mississippi Board of Animal Health

P.O. Box 3889  
Jackson, MS 39207  
1-888-646-8731  
[www.mbah.state.ms.us](http://www.mbah.state.ms.us)

### Mississippi Department of Environmental Quality

Office of Pollution Control / Environmental Permit  
P. O. Box 10385  
Jackson, MS 39289-0385  
601-961-5239  
[www.deq.state.ms.us/MDEQ.nsf/page/Main\\_Home](http://www.deq.state.ms.us/MDEQ.nsf/page/Main_Home)

### Natural Resources Conservation Service - Mississippi

Suite 1321, Federal Building  
100 West Capitol Street  
Jackson, MS 39269  
601-965-5196  
[www.ms.nrcs.usda.gov](http://www.ms.nrcs.usda.gov)

### Mississippi State University Extension Service

Animal and Dairy Sciences Department  
P.O. Box 9815  
Mississippi State, MS 39762  
662-325-3516  
[msucares.com](http://msucares.com)

## Emergency Situations

### Mississippi Department of Environmental Quality

Office of Pollution Control  
Emergency Services Division  
Southport Center  
2380 Hwy. 80 W  
Jackson, MS 39204  
601-961-5570

### Mississippi Emergency Management Agency

1410 Riverside Drive  
Jackson, MS 39202-1297  
601-352-9100 (24 hours)  
24-Hour Emergency Line: 1-800-222-MEMA (6362)  
[www.msema.org/index.htm](http://www.msema.org/index.htm)

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