Livestock Mortality and Butcher Waste Composting: Rutgers Recommended Practices

Bulletin E347

Cooperative Extension

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Proper disposal of on-farm mortalities and butcher residuals is a challenge for New Jersey farmers. The ability to convert these losses and "wastes" to a nutrient-rich resource and reuse them can help to improve and renew their soils. From a broader perspective, the ability to compost butcher residuals will be an important component in rebuilding small scale meat processing infrastructure in New Jersey. Like the rest of the country, New Jersey has experienced a sharp decline in butcher and slaughter plants since the mid-20th century. The consolidation of slaughtering plants has severely curtailed the ability of smaller scale livestock farmers to process their meat. New Jersey consumers are increasing their demand for locally raised meat in a way that uses less fossil fuel. They are also interested in buying meat from farmers they know and are familiar with the methods used to raise and process their livestock. On-farm small-scale slaughter facilities and mobile slaughter units provide farmers with the ability to process their animals and, and when under USDA inspection, bring their meat to market. The trend to reverse the consolidation of US livestock production has many social benefits: promoting the viable use of farmland and open space, creating community connections between farmers and consumers and reducing energy inputs into raising, processing and transporting our food to market.

Compost Bed

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This practice will have a beneficial economic impact for farmers in New Jersey. Rather than pay fees to a rendering company to dispose of slaughter residuals or normal mortalities, they will now be able to capture this nutrient-rich resource through biological decomposition in a static compost pile. Additionally, they can reuse this organic matter on the farm, which will eliminate the need to transport materials off the farm and reduce the use of fossil fuel. Consumers who buy meat products from local farmers are investing money back into their communities and the State. This practice is regenerative and organically responsible use of farmland, which is supportive of livestock farmers. Agricultural lands comprise much of the countryside of New Jersey where cultivated or open land surrounds rural towns, villages, and regional centers. By allowing commercial farm owners to engage in on-farm disposal of normal livestock mortalities and butcher wastes, the State can help maintain viable livestock operations, strengthen the agricultural industry in New Jersey, and assist efforts to retain productive farmland.

Regulations

A. The owner or operator of a farm who is engaged in the disposal of normal livestock mortalities and/or butcher waste shall comply with the provisions of this section and relevant or applicable State and federal rules and regulations including but not limited to the following:
   1. The Water Pollution Control Act, N.J.S.A. 58:10-1 et seq;
   2. The Recycling Regulations, N.J.A.C. 7:26A-1;
   3. The FDA Food Safety Modernization Act, H.R. 2751;
   4. The NJ Flood Hazard Area Control Act, N.J.S.A. 58:16A-50

B. The New Jersey Department of Agriculture Director of the Division of Animal Health must be notified of diseases that are dangerous to animal health, as

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enumerated in N.J.A.C. 2:2-1.1. The Director will then provide an acceptable means of disposal.

C. Routine burial as outlined in this document only applies where sporadic, individual mortalities occur.

D. In situations involving catastrophic mortality losses, such as whole herd or flock disposal due to disease or catastrophic events, contact the New Jersey Department of Agriculture Division of Animal Health at 609-671-6400 immediately for additional information and instructions.

E. Animals exhibiting signs of neurological disease before death should be reported to the New Jersey Department of Agriculture Division of Animal Health at 609-671-6400 for autopsy and proper disposal.

F. Records on normal mortality burial(s) and composting activities must be maintained.

G. Composted mortality and butcher waste must also have been generated on-site, pursuant to N.J.A.C. 7:26A-1.4(a)2. Carbon sources may be brought on site, pursuant to N.J.A.C. 7:26A-1.4(a)3.

H. Written notice of the operation must be made to the New Jersey Department of Environmental Protection, Division of Solid & Hazardous Waste, Bureau of Recycling & Planning, P.O. Box 414, Trenton, NJ 08625-0414, the host municipality and the host county, prior to the start of operations. Specifics regarding the written notice of an exempt operation that includes a certification is found at N.J.A.C. 7:26A-1.4(b)5.

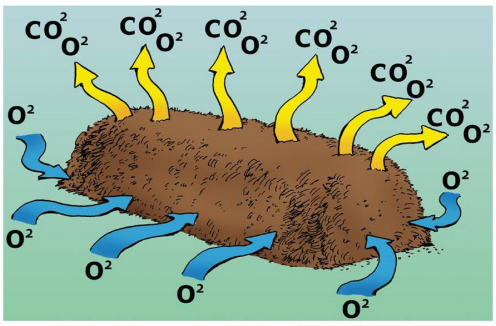
Definitions

"Batch" means the amount of butcher waste being composted in a given time period.

"Bins" means an open structure designed to contain compost and withstand the force of equipment used for compost movement. A typical bin is 6-12 feet wide and 5-8 feet deep.

"Burial" means a process by which carcasses are disposed of by excavating a pit or trench, placing the carcass in it, and covering it over.

Static Pile Aeration



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"Butcher Waste" means animal tissues, organs or bodily fluids which are by-products from livestock slaughter. They are also referred to as residuals.

"Composting" means the biological decomposition and stabilization of organic matter exposed to air and creating conditions of high temperature (104 – 140 F), resulting in a humus-like product.

"Container" means any portable device in which materials are stored, transported, treated, disposed of, or otherwise handled.

"Domestic Livestock" means cattle, horses, donkeys, swine, sheep, goats, rabbits, poultry, fowl and any other domesticated animal deemed by the State Board of Agriculture and the Department of Agriculture, in consultation with the New Jersey Agricultural Experiment Station.

"Floodway" means land, and the space above that land, which lies within the inner portion of the flood hazard area, and which is mathematically determined to be required to carry and discharge floodwaters resulting from the 100-year flood under certain conditions. The floodway always includes the channel and often includes land adjacent to the channel. The floodway is normally characterized by faster and deeper flows than the flood fringe, which is the portion of the flood hazard area outside the floodway.

"Large Animal" means animals which weigh more than 100 pounds.

"Leachate" means a liquid that has been in contact with or percolated through a porous solid and extracted dissolved and suspended material.

"Mesophilic Stage" means a stage of composting that begins when the materials are first heaped together in a windrow, static pile or bin. The temperature of the core begins to rise and microorganisms start to form colonies and multiply within the pile. During this stage temperatures reach 77° to 104°F.

"Normal Mortality" means a mortality which occurs routinely and is not the result of disease epidemic, inoculation, experimental treatment or farming disaster such as fire or suffocation.

"Owner" means the owner of record of the commercial farm.

"Small Animal" means animals which weigh 100 pounds or less.

"Static Piles" means piles of composting material that are not turned during the composting process. A typical static pile is sized the same as windrows, 8-12 feet wide by 6-8 feet high with a length as long as the batch requires.

Temperature 110-160 F

"Thermophilic Stage" means a stage of composting when the compost heats up reaching 140°. Harmful bacteria die off and the pile starts to breakdown rapidly. The compost pile should be damp and sufficient air should reach the core of the pile. This stage can last up to 3 months depending on materials and the type of method employed.

"USDA inspected premises" means the area where all activities are subject to the rules and regulations of the United States Department of Agriculture for Federal Meat Poultry or Import Inspection. This includes a slaughter facility, a mobile slaughter unit and the grounds immediately surrounding these facilities as well as the antemortum animal holding pens.

"Waters of the State" means all surface and ground waters in New Jersey but does not include closed system aquatic farms.

"Wetland" means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided, however, that the Department of Environmental Protection, in designating a wetland, shall use the three-parameter approach (that is, hydrology, soils and vegetation) enumerated in the 1989 Federal Manual as defined in this section. These include tidally influenced wetlands which have not been included on a promulgated map pursuant to the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq.

"Windrow" means a constructed elongated pile or row of composting material that can vary in size and spacing. A typical windrow is 8-12 feet wide by 6-8 feet high. Space between windrows can vary between inches and feet depending on spacing. When composting livestock mortalities or butcher waste the windrows are not turned or restacked until tissues are digested.

Best Management Practices

Burial of Normal Mortalities

1. Farmers may bury their own domestic livestock on their own property not qualifying as wetlands or a floodway, as long as the burial does not cause odors, is at a sufficient depth to prevent wildlife or other animals from excavating the remains and is allowed per all other requirements such as local ordinances.
2. Call before you dig to ensure underground lines from municipal utilities are not damaged , 1-800-272-1000.
    a. Burial sites must be:
        i. Located outside of the floodway
        ii. A minimum of 100 feet from waters of the state
        iii. Covered with a minimum of 2 feet of soil within 48 hours
    b. Burial sites should be:
        i. Located a minimum of 100 feet from wells and sinkholes
        ii. At least 100 feet from property lines
        iii. Away from public view
    c. The bottom of burial sites should be:
        i. At least 2 feet above bedrock
        ii. At least 2 feet above the seasonal high water table
        iii. At least 2 feet above highly permeable soils.
    d. Identify sites on GIS maps or seek technical assistance from your local Soil Conservation District or USDA NRCS office to help determine the best burial site(s) on the farm.
    e. Burial sites shall be inspected by the farmer periodically to assure that the site is secure.
    f. Re-vegetate the area once the burial site is closed.

Cover the Pile Completely

Composting of Normal Mortalities

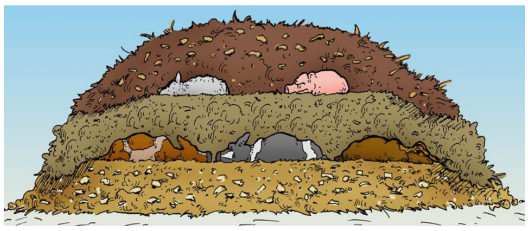
1. On-site composting will employ one of three methods:
    a. Windrows
    b. Static Piles
    c. Bins
2. Compost windrows, static piles or bins shall be constructed, maintained and sheltered such that compost

materials cannot be dispersed by wind and rain, and combustion and fire are prevented.

3. The following materials shall not be used in composting:
   a. Hazardous waste
   b. Treated or painted wood
   c. Municipal wastewater treatment sludge, biosolids or septic waste
4. Compost windrows, static piles or bins shall be:
   a. At least 50 feet from property lines.
   b. A minimum of 100 feet from waters of the state.
   c. Located outside of the floodway.
   d. 200 feet from any well or spring currently used as a drinking water source.
   e. 50 feet from caves and sinkholes.
   f Two feet above the seasonal high water table unless on an impervious surface such as concrete or asphalt.
   g. 50 feet from rock outcrops.
   h. 50 feet from intermittently flowing drainage swales or ditches.
   i. In an area with minimal slope to prevent runoff (1–2% slope recommended).
   j. At least 200 feet from adjacent residences.
5. Carbon Sources
   a. Wood chips
   b. Refused feed
   c. Spoiled silage
   d. Chopped cornstalk
   e. Nut hulls
   f. Straw/hay
   g. Brewery waste
   h. Leaves
   i. Shavings and sawdust

   Note: With the exception of wood chips, this material should not be used for the compost bed, but can be used to insulate and filter odor in the outer layers of the windrow or static pile.

Recipe for Small Animals



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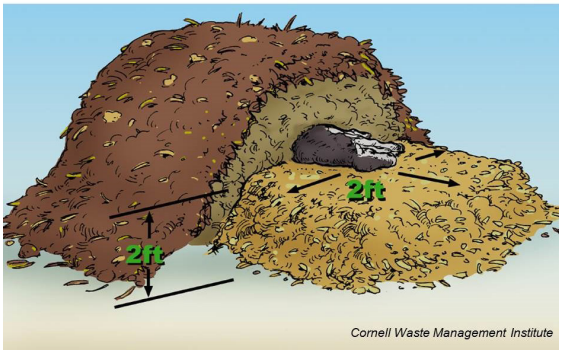
For young animals, layer mortalities with a minimum of 2 feet of co-composting material.

Composting Recipe for Small Animals

1. Create a compost bed with 2 feet of carbon material (preferably wet – it can be bowl-shaped) using a chunky carbon source (woodchips are ideal) to allow air flow around the carcass.
2. Layer mortalities and cover with a minimum of 2 feet of carbon material above each layer to a maximum of 7 feet.
3. In dry weather, add water during pile construction and shape piles for moisture control.
4. Make sure that all animals are well covered to minimize odor, generate heat and to keep unwanted animals and insects out of the pile.
5. If leachate is visible, additional carbon material must be added.
6. Provide clear signage in the composting area.
7. Let sit for 4–6 months.
8. The pile must be insulated (covered with a layer of bulking material or finished compost)and a temperature of not less than 131°F (55°C) must be maintained throughout the pile for at least 3 consecutive days – monitored at 6–8 inches from the top of the pile.
9. Bones can be used to provide structure to the next pile.

Recipe for Large Animal



Composting Recipe for Large Animals

1. Create a compost bed with two feet of carbon material (preferably wet – it can be bowl-shaped) using a chunky carbon source (woodchips are ideal) to allow air flow around the carcass.

Composting Cow

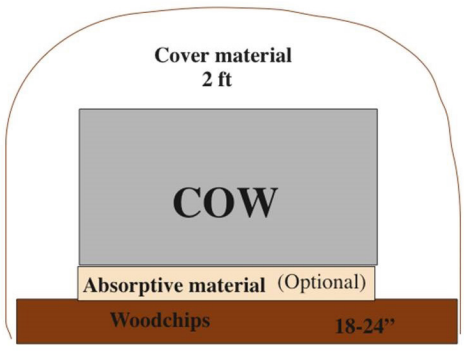


Photo by Craig Williams, Pennsylvania State University

2. Ensure the compost bed is large enough to allow for 2 foot clearance around the carcass.
3. In dry weather, add water during pile construction and shape piles for moisture control.
4. Lay the animal in the center of the bed.
5. Lance the rumen, stomach or intestines to avoid bloating and possible explosion.
6. Cover carcass and the entire bed with a minimum of 2 feet of chunky carbon material.
7. Make sure that all residuals are well covered to minimize odor, generate heat and to keep unwanted animals out of the pile.
8. If leachate is visible, additional carbon material must be added.
9. Provide clear signage in the composting area.
10. Let sit for 4–6 months.
11. The pile must be insulated (covered with a layer of bulking material or finished compost) and a temperature of not less than 131°F (55°C) must be maintained throughout the pile for at least 3 consecutive days, when monitored 6–8 inches from the top of pile.
12. Bones can be used to provide structure to the next pile.

Covering Carcass

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Cover carcass with dry, high-carbon co-composting material, like old silage, sawdust, or dry stall bedding (some semi-solid manure will expedite the process).

Butcher Waste Composting

1. All process wastewater generated (wastewater from the slaughter or butchering process) during the harvesting process must be collected and stored on site in a durable container with a tight-fitting lid. The process wastewater shall not be land applied. The process wastewater may be utilized during the composting of butcher waste as outlined below.
2. Space Requirements
   a. There are two calculators available for determining how much space is needed to compost butcher waste:
      1. **Co-Composter Model** is a Microsoft excel spreadsheet developed by Cornell University that provides mass and volume balances, area estimations for storage, active composting and curing and a cost analysis of alternate composting systems based on inputs entered by the user. It can be found at compost.css.cornell.edu/CoCompost.html. When calculating butcher residuals start with question #8 on the user input page.
      2. **Spartan Animal Tissue Composting (ATC) System Planner** is aMicrosoft excel application developed at Michigan State University that assists in designing a composting system using a static approach and gives the option of using either bins, windrows or static piles. The model calculates the amount of space needed for composting only. It does not take into account the curing or storage of raw materials. It can be found at msu.edu/~rozeboom/catrn.html.
   b. To use either of these calculators, the following information is needed:
      1. The weight and/or volume of by-products generated.
         a. Table 1 below shows the typical yield of retails cuts and by-products from cows, pigs and lambs. These percentages can be used or an average of actual weights or volumes from your operation can be used.
         b. Total Pounds to be Composted = Live weight – Retail cuts – Hide – Edible fats – Variety meats – ½ Bones – 3% Other
      2. The amount of carbon needed to be able to compost properly.
      3. Animal tissue density: successful animal tissue composting is accomplished by using 1 ft^3 of bulking material for every ½ to 15 lbs of tissue. However, if density is greater than 10 lbs/ft^3 then the addition of 1 ft^3 of bulking material for every 4 to 6 lbs. of tissue will work best.
      4. The type of composting system you plan to use.
         a. Windrow, static piles or bins and the approximate dimensions of the system.

Chunky Carbon Source and Meat Waste

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5. The length of time during which composting will occur.
    a. Typically this will take between 2–6 months occurring in 3 stages:
        - Mesophilic Stage
        - Thermophilic Stage
        - Mesophilic Stage
    b. The mesophilic stage starts when the materials are first heaped together. The temperature of the core begins to rise and microorganisms start to form colonies. This stage lasts 2–5 days.
    c. During the thermophilic stage temperatures of 104°F to 140°F (40°C to 60°C) must be reached and maintained for thorough decomposition and pathogen kill. The time needed to maintain the temperature depends upon the amount/weight of the residuals being composted. Compost will "sag" or settle.
    d. After this active, hot phase the compost must go through another mesophilic stage with temperatures of 77°F to 104°F (25° to 40°C) to finish the composting process.
    e. Bone degradation takes longer. It may take several compost cycles depending on compost management and duration. However, piles with bones can be used to provide structure to the next pile.

c. Additional Information compost.css.cornell.edu/CoCompost.html needed for Co-Composter Model:
    1. Density of flesh waste.
    2. Moisture content of flesh waste.
    3. Nitrogen content of flesh waste.
    4. Carbon to Nitrogen ratio (C:N) of flesh waste.

d. Additional information msu.edu/~rozeboom/catrn.html needed for Spartan ATC System Planner:
    1. An estimate of the number of months that will be required to start and complete the creation of a new batch.
    2. The length, width and height of the windrows, static piles or bins.

8. Space Required for Primary Composting
    a. A comparison of the pad size, including the working space needed for composting the butcher waste from processing one cow, one pig and one lamb is shown in Table 2.
    b. The total amount of space required for the entire composting process including the storage of raw materials, composting and curing is only estimated in the Co-Composter Model.
    c. Typically the total amount of space for the entire composting process is 1.5 to 2.5 times the areas required just for composting.

More information can be found at the Cornell Waste Management Institute, Department of Crop & Soil Sciences, cwmi.css.cornell.edu.

Layering Butcher waste

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Heat Coming off Pile

Photo by Craig Williams, Pennsylvania State University

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Natural Rendering: Composting Livestock Mortality and Butcher Waste. Cornell University, Ithaca, NY. compost.css.cornell.edu/naturalrenderingFS.pdf.

On-Site Composting of Routine Animal Mortality – Guidance Memo # 02-2009. Commonwealth of Virginia, Department of Environmental Quality.

Rules & Regulations Relating to Disease Control of Domestic Animals and Poultry. Chapter 211. Maine Department of Agriculture.

The Space it Takes: Footprint Calculator for Composting Butcher Waste. Cornell University, Ithaca, NY. cwmi.css.cornell.edu/spaceittakes.pdf

Table 1. Typical yield of retails cuts and by-products from cows, pigs, and lambs

	Cow		Pig		Lamb	
	lb.	% of live weight	lb.	% of live weight	lb.	% of live weight
Live Weight (wt)	1000		220		99	
Retail Cuts	420	42.0	123	56.0	35.2	35.6
By-products						
Hide	80	8.0			15.6	15.6
Edible fats	110	11.0	35	16.0	8.9	8.9
Variety meats	40	4.0	9	4.0	2.2	2.2
Blood	40	4.0	9	4.0	4.4	4.4
Inedible fats & meat scraps	45	4.5	17	8.0	22	22.2
Bones	135	13.5				
Other (stomach contents, shrink, etc.)	140	14.0	26	12.0	11.1	11.1

Table 2. Size requirements for composting pads

	Cow			Pig			Lamb		
Target Density (lbs/ft³)	4	5	6	4	5	6	4	5	6
Co-Composter (ft²)	13.4	11.3	9.6	1.7	1.6	1.5	1.3	1.0	1.0
Spartan ATC (ft²)	18.9	15.1	13	2.3	1.9	1.9	1.6	1.4	1.3

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