



On-Farm Composting 101

Mindy J. Spiels, Regional Extension Educator, Livestock Manure Systems

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The word "compost" can bring to mind many different images. For some, it refers to a small backyard area where fall leaves, grass clippings, and food scrapes are piled together. Others think of dark, earthy-smelling mulch that is purchased from a garden center and used in flower beds and vegetables gardens. Still others imagine large windrows of organic materials that are turned on a regular basis. So, what exactly is compost? The correct answer is "all of the above."

Compost is an organically rich soil amendment produced by the decomposition of organic materials. The process of composting is a natural way of recycling nutrients from animal production. During the composting process, organic materials such as animal manure and livestock carcasses are broken down by microorganisms. The microorganisms consume oxygen and feed on the organic matter. Active composting generates heat, carbon dioxide (CO₂) and water vapor. The end product of composting is a dark, earthy-smelling material.

A correctly managed compost system has numerous benefits. Composting animal manure reduces the moisture, weight, and volume of the material making it easier to handle during transportation to cropland. Properly composted manure has few offensive odors and the high temperatures generated during the process kill fly larva. Therefore, composted manure can be stored with little or no odor or fly problems until a convenient time for producers to apply the compost to cropland. Applying

compost to cropland improves water holding capacity and air infiltration of the soil. Composting can kill weed seeds and pathogenic bacteria that are present in the original organic material. Unlike most inorganic commercial fertilizers, compost is a slow-release nutrient store. Plant nutrients are slowly released into the soil as the compost decomposes. Therefore, nutrients are available as the plants require them instead of in one intense application.



Compost facility at the Research and Outreach Center in Morris. There are seven bins, each bin is 12ft deep x 10ft wide with 6 1/2 ft. concrete side walls.

Almost all organic materials are capable of being composted but some do not belong in a compost pile. When composting is used for carcass disposal, carcasses of downer cows displaying signs of neurological disorders must not be composted. There is no evidence that

composting destroys prions, the abnormal proteins believed responsible for diseases such as Bovine Spongiform Encephalopathy (BSE), Chronic Wasting Disease (CWD) and Scrapie. Another potential drawback to composting is the loss of nitrogen. Composted manure typically contains 50% of the nitrogen of fresh manure.

The compost pile will require carbon-rich and nitrogen-rich materials. In general, carbon is found in brown, dry materials such as saw dust, wood shavings, and chopped straw. Nitrogen is most abundant in livestock manure and animal carcasses. It is not necessary to add inoculation cultures to start the composting process.

Carbon to nitrogen ratio (C:N), aeration, moisture content, particle size of the organic material, and temperature all affect the composting process. The proper compost mix will have a C:N between 20:1 and 40:1. This can be achieved by mixing approximately two parts carbon-rich materials to one part nitrogen-rich material. A minimum oxygen concentration of 5% is necessary to sustain aerobic composting. Frequent turning or stirring of the pile is necessary to achieve adequate aeration. The frequency of turning will depend on the size and type of compost pile and the equipment used for turning. Composting materials should be maintained within a range of 40 to 65% moisture. Too little moisture slows the process and too much moisture displaces air and leads to anaerobic decomposition of the material, which results in offensive odors. Optimum composting typically occurs when the particle size of materials range from 1/8 to 2 inches in diameter. Composting can occur at a wide range of temperatures. Ideally, the compost temperature should be between 110°F

and 150°F to destroy pathogens, weed seeds, and fly larva. The Minnesota Board of Animal Health (BAH) recommends two heat cycles of greater than 130°F to ensure pathogen destruction.

When the active composting process is complete, it should cure for up to one month. Curing refers to leaving the finished compost undisturbed to allow any final chemical and decomposition reactions to occur. Once curing is complete, the compost is ready for use.

For carcass disposal, the BAH requires the compost facilities be constructed on an impervious pad using rot resistance materials. It is recommended that the facilities be covered with a roof to maintain proper moisture. Compost facilities for manure must follow Minnesota Pollution Control Agency (MPCA) guidelines for stockpiled manure and manure compost sites. Temperature must be recorded daily. Some operations may be required to analyze compost for pH, moisture content, particle size, soluble salts, nitrogen, phosphorus, and potassium content.

For additional information on composting requirements in Minnesota, visit the BAH or MPCA websites: www.bah.state.mn.us or <http://www.pca.state.mn.us>. The Natural Resource, Agriculture, and Engineering Service (www.nraes.org), sponsored by Cooperative Extension of 14 member Land-Grant Universities in the Northeast, has a number of good publications that may also assist producers wanting to learn more about on-farm composting.