Composting on Small Farms

What is composting?
Composting is a natural process that recycles decomposed organic material into a rich soil known as “compost” or “humus.” It is “cured” or “finished” over a period of time by allowing the compost pile to sit and finish the decomposition process. Finished compost looks like soil (dark brown and crumbly) and smells like a forest floor. Once the compost is cured it can be sold for use in farming or gardening. Demand for finished compost has been increasing. Potential buyers of compost include landscapers, ornamental crop growers, vegetable growers, golf courses, sod farmers, and gardeners.

What are the benefits of composting?
Humus is more beneficial for soil than fresh manure. Compost can be stored and transported in ways that fresh manure cannot. It can improve soil structure, increase the water-holding capacity of sandy soils, improve drainage, reduce wind and water erosion, and promote growth of beneficial soil organisms. Composting not only reduces the weight and moisture content in the organic materials, it also destroys harmful bacteria.

How does composting work?
Composting strives to provide the best possible conditions (i.e., temperature, moisture, air, etc.) to encourage the decomposition of organic matter. Millions of bacteria, fungi, and other organisms break down the organic waste material to create the compost. Some bacteria thrive at lower temperatures (i.e., between 77°F and 108°F) and do most of their work at the beginning of the composting process. The heat they generate during this early stage of decomposition makes way for other bacteria and fungi that thrive at higher temperatures. A compost pile’s temperature is best assessed using a compost thermometer. In order to finish the compost and kill bacteria and weeds, all parts of the compost pile must reach a temperature of 131°F or more for at least three days. To ensure adequate composting, it is recommended to maintain the entire pile at 131°F or more for at least 15 days. You may also need to turn the pile frequently depending on the system you are using to compost. However, if the compost’s temperature rises above 140°F most of the beneficial bacteria will die.

Safety and Health
The greatest risks associated with composting are:
- Equipment-related injury—normal safety precautions apply.
- Spontaneous combustion—keep the compost pile moist and less than 12 feet high.
- Disease transmission—fresh manure can transmit diseases. Wear gloves and wash hands after handling manure, wash the containers used to transport manure, and clean the tools used to handle manure before using those tools on crops (or have a separate set of tools for handling manure.)
- Some people are sensitive to the mold and fungi found in the compost piles—individuals with asthma or weakened immune systems are encouraged to wear a dust mask or a respirator as a precaution when working with compost piles.

What are common compost systems?
Windrows: The most common way to build an on-farm composting system is through the use of windrows (see below). These long piles typically measure between 4 and 9 feet high and 10 to 18 feet wide. The length of the windrows can be as long as needed to accommodate the amount of organic waste to be composted. The windrows can be built using a front-end loader, tractor and manure spreader, or a dump truck. Mechanical mixing and aeration requires one of the following: a front-end or skid loader, a backhoe, a windrow turner, a tractor with a bucket, or a manure spreader. Breathable compost covers made from a
geotextile fabric can prevent excess rain from getting into the compost piles. If a cover is not used and the piles are exposed to rain, more frequent mixing will likely be needed.

**Passively Aerated Windrow:** With this system, the windrows do not need to be turned. Instead, the material to be composted is laid on a 6- to 9-inch bed of straw, peat moss, or finished compost material. Sections of perforated piping, 4 inches in diameter, are laid on top of the base perpendicular to the length of the windrow. The pipes need to extend out both sides of the windrows. Once the compost pile is constructed, a covering layer of peat moss or finished compost is added. This layer provides insulation and odor control.

**What is needed for good compost?**

1. **Ingredients:** Materials that can be safely composted are listed in Table 1. The best mixture of ingredients for efficient composting is a 30:1 ratio of carbon to nitrogen. Table 2 lists carbon and nitrogen sources.

<table>
<thead>
<tr>
<th><strong>TABLE 1: Composting Materials</strong></th>
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<tbody>
<tr>
<td>Materials acceptable for composting</td>
</tr>
<tr>
<td>Livestock manure</td>
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<tr>
<td>Garden waste</td>
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<tr>
<td>Some kitchen waste*</td>
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<tr>
<td>Lawn clippings</td>
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<tr>
<td>Leaves</td>
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</table>

*Vegetables, fruit, coffee grounds, unbleached coffee filters, tea bags, eggshells, bread.

2. **Moisture:** A well maintained compost pile will be moist—if you forcefully squeeze a handful of compost it should yield one to two drops of moisture. A moist environment will make sure that beneficial bacteria and fungi survive. If the incoming organic waste is too dry, water can be added to the pile. However, too much water can slow the composting process or result in a moldy pile. If a pile becomes too wet, mixing/turning the pile will help to dry it out.

3. **Oxygen:** Turning the compost pile (i.e., aerating) will help to make sure the oxygen content is high enough to prevent bad odors caused by fermentation. Insufficient oxygen also leads to lower temperatures and a slower decomposition rate resulting in incompletely composted material that can contain acids harmful to plants and soil.

4. **Size:** Ideally, your compost pile should contain a mix of particles that range between 1/8 inch and 2 inches. To achieve this mix, grind or shred the raw material. Sometimes simply turning the material will break it into sufficiently small particles.

**Additional Resources:**
- University of Minnesota Extension
- Virginia Cooperative Extension
- U.S. Environmental Protection Agency

This fact sheet is meant to provide basic information. For specific health concerns please contact your physician or veterinarian. Updated 2010.