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COMPOST FACT SHEET #6: Compost Pads

COMPOST FACT SHEET SERIES 2004/2005

*For these fact sheets and other
compost information:
<http://cwmi.css.cornell.edu/Composting.html>*

Fact Sheet #1

Marketing Composts and Meeting
Consumer Needs

Fact Sheet #2

Regulation and Certification of
Composts

Fact Sheet #3

Improving and Maintaining
Compost Quality

Fact Sheet #4

Testing Composts

Fact Sheet #5

Compost Bulking Materials

Fact Sheet #6

Compost Pads

Fact Sheet #7

Compost Equipment

Fact Sheet #8

Composting Liquids

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Selecting, Siting, Sizing and Constructing Compost Pads

The surface on which outdoor compost facilities operate is an important part of the composting process and can influence the quality of the compost that is produced. When working on some soils with easy-to-manage feedstock, an improved pad may not be needed, but in many situations some kind of pad may be advisable or even required.

It is important to first find out whether there are relevant state regulations and to what kinds of composting operations they apply. These may be rules promulgated by the state environmental agency, the state agriculture department or possibly by a local agency. Even if there are no pertinent regulations, if a site causes pollution or generates significant neighbor concerns, it may be shut down or the operator may be liable for damages. Thus good planning and implementation is important. The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has guidance and may provide technical and financial assistance for compost facilities on farms, including compost pads.

Why Build a Pad?

Pads have several purposes including water quality protection, providing a good working surface, allowing access through wet weather conditions and preventing the mixing of soil into the compost when it is turned. In dry conditions, most soil types provide a good working surface, but many will be problematic after a storm event or during spring thaw. Pads need to provide a solid working surface so that machinery can function throughout the year.

Siting & Sizing

An outdoor compost facility can be engineered so that it can be located on a wide variety of soils and sites. It is best to choose a site high on the landscape and



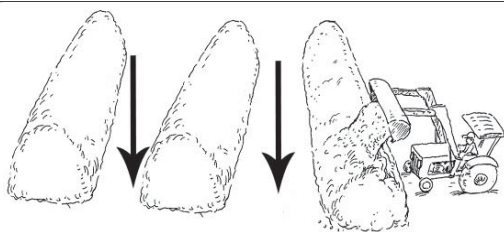


Figure 1. Pad slope graded to 2-4%.

well away from surface water bodies to reduce the chance that runoff from the site will enter surface water and reduce the chance that surface water will flow onto the pad. Moderate to well-drained, hard-packed soils with gentle slopes are well suited. A slope of about two percent is desirable to prevent ponding of water. Steep slopes are not satisfactory because of potential problems with erosion, vehicular access, and equipment operation. Compost windrows should run up and down the slope, rather than across, to allow runoff water to move between the piles rather than through them (see figure 1). The initial site preparation will usually require grading and may require surfacing (as discussed below).

Siting is very important to help avoid neighbor issues. Compost processing can generate odors (though these should be minimal in well-run operations), and odor is likely the main reason neighbors may complain about the operation. Determine the dominant wind direction, and if most air flow is directed toward populated areas, look for another site. In New York State, permitted compost facilities need to be at least 200 yards away from the closest dwelling. They cannot be sited in a floodplain or wetland, or where the seasonal high groundwater is less than 24 inches from the ground surface, or where bedrock lies less than 24 inches below

A hedge row can be planted to help shield the facility from the road and may help filter the air between the compost piles and neighbors.

the ground surface, unless provisions have been made to protect water quality (see text box below for URL for relevant NYS Part 360 rules). Composting of organic materials on the farm where they are generated is exempt from the regulations, as are some other facilities. Check the rules to determine whether a facility is covered under the regulations. NRCS also provides guidance for compost facilities (see text box on pg 4 for URL for relevant NRCS Guidelines).

Siting facilities well can also help to avoid water quality problems. A high water table may lead to flooding of the site which will make equipment access and operation more difficult. Flooding can also promote anaerobic conditions in the compost which may lead to malodors. A high water table or flow of surface water onto the site also increases the likelihood of leachate contamination of groundwater or nearby surface water. The shorter the distance leachate percolates through unsaturated soil, the less it undergoes natural biological and physical treatment. Moderate to good soil percolation rates are desirable to avoid standing water and to minimize leachate and runoff. Well-drained sites allow equipment to operate even in wet weather. County soil surveys that provide information on depth to groundwater, percolation rates, and soil types are usually available at the local office of NRCS.



Site preparation avoids rutting.

Surface water runoff from storms and snow melt should be diverted away from the site by using a diversion ditch, an interceptor berm or drain so that excess water does not come onto the compost pad.

Determining the size of a pad is tricky. It is never big enough! Plan for space for active windrows and for curing piles, storage of bulking materials, and possibly a sales area

NYS Part 360 Rules:
www.dec.state.ny.us/website/regs/ch4.htm#360

(for screening and bagging) and space to store equipment. The area required for composting depends on the volume and types of material processed, the size and shape of piles, windrow or in-vessel technology used, and the time required to complete the process. Static piles and turned windrow methods require more land than the more intensive forced aeration and in-vessel system methods.

To download a free copy of the Co-Composter model, visit <http://compost.css.cornell.edu/CoCompost.html>

To aid in planning, a user-friendly computer model created in Microsoft Excel, called “Co-Composter” was developed at Cornell University as a planning and management tool for composting facilities. It was designed initially for dairy farms, but can be applied in other situations as long as you know the weight and some characteristics of the feedstock. Co-Composter asks an extensive series of questions relating to either an existing facility or a planned facility. Information requested includes feedstock type and quantity, bulking/bedding material, equipment type and age, and time available. There are default values built into the model, providing average values for certain parameters to use when site-specific information is not available. Co-Composter generates a detailed logistical and economic analysis to help compost managers look at facility planning, equipment, efficiency and feasibility. It includes calculations of the area needed for the facility. In addition, there is a section in the On-Farm Compost Handbook NRAES-54 <www.nraes.org/publications/nraes54.html>, which provides guidance on pad size.

Pad Types

One consideration in selecting the type of pad to construct is longevity. Some materials like concrete or asphalt are long lasting, but may require demolition if no longer desired. Other considerations are cost and availability of materials. Cost will vary depending on what is available in different areas. Many farms and communities have gravel banks and mine them to build roads and hard surfaces. In Vermont there is a pad made of white marble because it was a by-

product from the local quarry. They paid only installation costs. Recycled asphalt is often available for trucking cost, and concrete millings generally cost less than gravel. New asphalt and concrete bear the highest costs. Local construction projects often need to dump excess asphalt and concrete at the end of a project. If your site is close enough, you may be able to take advantage. Some of the more common pad types include:

- **Filter Fabric and Gravel.** The combination of fabric and gravel makes a good working surface. A combination of sand and gravel can also make a good surface. Sand and gravel can be mixed or layered. In construction, place material with larger particle size in the layer above the cloth. Sand that is all one size can make an unstable surface as moisture conditions vary. Crusher run gravel with enough fines to bind the gravel into a smooth pad works well. A clean, poorly graded (all one size) rounded gravel will not compact very well. Fabric is available at farm implement and construction supply dealers. First the topsoil is removed from the surface. Then filter fabric is rolled out to cover the surface and 12"-18" of gravel are put on top of the cloth. The layers are then compacted and ready for use. The fabric is an important part of the pad. When gravel is spread out on soil without cloth, it works its way into the soil, particularly on soils containing a lot of clay. After years of use, additional gravel may be required to keep the surface in good shape. As you start using this type of pad you will tend to incorporate some gravel when turning, but as the pad settles, the amount incorporated will decrease.



Cloth and gravel pad.

- **Fabric and Sand.** These can work well especially on pads that need to avoid gravel in the completed compost but do not mind having sand in the completed compost. Of course, the sand will not be as durable as the gravel pad.
- **Lime Stabilized Earth.** Modification and stabilization of highway and airport pavement subgrades using lime is a well-established, time-tested practice in the United States. This technology may have applications in pad construction but has been tested very little. NRCS may be able to provide some guidance on this.
- **Compacted Soil.** Some soils are well enough drained that they can be compacted and used as a pad without adding gravel or other materials to make it more stable. This type of pad can be hard to work if precipitation rates are high, but can easily be eliminated if the pad is no longer needed.
- **Recycled Asphalt or Recycled Concrete.** Recycled materials are available in many communities and may be an economical alternative. Asphalt that is removed when roads are repaired is often collected until there is enough to reuse. Smaller communities rarely accumulate enough to reuse, therefore it becomes a waste product. Many highway departments are eager to find a disposal or reuse option. When put down in warm weather and rolled,

To access NRCS National Conservation Practice Standards go to: <http://www.nrcs.usda.gov/technical/standards/nhcp.html>.

Relevant sections include the Standards for: Composting Facility (317), Filter Strip (393), Nutrient Management (590), and Wastewater Treatment Strip (635).

recycled asphalt makes a good hard surface. If put down in cold weather the work is more difficult and the surface will not be smooth.

Recycled cement is old cement that has been removed from a site and milled to a size that resembles gravel. This may be a less expensive substitute for gravel when some material is needed to firm up sites and roads.

- **Paved or Poured.** Pads can also be constructed out of asphalt or concrete, usually at sites where soils are highly permeable or where groundwater levels rise too close to the surface. A paved site offers some advantages in terms of access, equipment operation, and groundwater protection, but these advantages must also be weighed against added costs, as well as difficulties in managing runoff. Such paved pads are relatively permanent structures requiring significant effort to remove if composting ceases. If you are considering a paved pad, think about how it could be used if no longer needed for composting, e.g., a slab for a building project.

Ground and Surface Water Protection

An important part of choosing a pad surface is deciding how to manage water.

Leachate, formed when water percolates through the organic material, can be harmful to ground and surface water, because it can deplete oxygen and may contain unacceptably high levels of nitrogen phosphorus or pollutants. An initial bed of carbonaceous, bulking materials underneath the compost pile can help absorb excess moisture and keep it in the windrow. If the compost site is at the bottom of a slope, berms can be built to divert runoff water around the pad.



Compost berm at Ohio State composting site. Collected runoff is treated in a wetland before disposal.

It is not difficult to compost outdoors in most climates; however, in climates with heavy precipitation it is best to keep finished product under cover to keep it from absorbing moisture. Commodity sheds, barns, compost covers and tarps work well.

When leachate is generated, some measures that can help prevent water pollution include:

- **Collection Lagoons.** Retention ponds can be constructed to hold runoff from normal operations as well as excessive runoff resulting from storms. Sand filtration of lagoon outlet waters can help to reduce pollutant loads. Discharge from a lagoon may require a permit even if passed through a sand filter. Lagoons need to be emptied before going into a wet season unless evaporation rate exceeds precipitation and runoff into the lagoon. Solids need to be removed periodically and can be put back into windrows for composting. The liquids can be used to irrigate appropriate field crops, to hydrate dry compost piles, or in some locations must be transported to a sewage treatment facility. Recovered solids often contain high moisture, so they may need to be dried out with carbonaceous material so they can efficiently compost.
- **Compost Berms/Compost Socks.** A berm of compost can be used to slow and/or control excess water from piles or storm events. A berm of finished compost 24" tall x 24" wide, triangular in cross section, and as long as needed down-slope of the pile and perpendicular to the slope will absorb moisture and help control leachate. Compost socks are long cloth tubes filled with compost. They are available in several diameters. There is specialized equipment that blows the compost into these tubes that are then tied off and laid or staked in place. They can be used as a berm and filter water before it goes into a lagoon, leach field or drain.

- **Tanks.** Leachate collection tanks can be buried below the pad surface. Grading of the pad can direct the leachate into the tank. When emptied, the liquid can be used to add moisture to the piles, irrigated on appropriate crops or disposed of at a sewage treatment plant. There needs to be a way to remove solids from the tank. If possible, solids can be mixed into suspension so that much of the solid material can be removed with the liquids. If solids are allowed to build up and the tank is not designed for easy removal, the tank could become useless. Solids can also be removed with a sewage collection truck. Be aware that these sediments are anaerobic and may have substantial odor.
- **Filter Strips.** A vegetated section of soil down-slope of the compost pad can help absorb nutrients and particulates that run off the pad surface. When possible, on unimproved surfaces, keep vegetation between the windrows as well to absorb additional leachate. NRCS has standards for filter strips for compost pads (see the box on page 4 for the web site).

Site Maintenance

Good housekeeping at the site is important. There should be no ruts, standing water or garbage on the site. Site perimeters should be mowed to avoid contaminating piles with weed seed that will blow in. Good maintenance keeps the operation running smoothly.



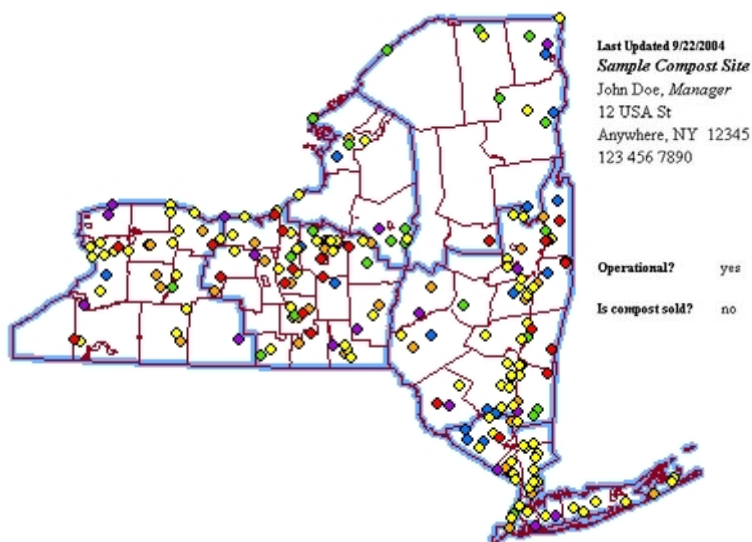
Cornell's compost site.

Acknowledgement

Thanks to Cornell Cooperative Extension, the NYS Energy Research and Development Authority, Empire State Development and the College of Agriculture and Life Sciences at Cornell for funding in support of CWMI compost work. Thanks also to the reviewers: Aldrich, Cornell University; Horvath, NRCS; Telega, Cornell University; Wright, NRCS. This fact sheet represents the best professional judgment of the authors and does not necessarily reflect the views of the funders or reviewers.

Maps of a database of NYS Compost Facilities can be accessed at: <http://compost.css.cornell.edu/maps/simple-search.asp> (see example below).

New York State Compost Facilities Search



Last Updated 9/22/2004
Sample Compost Site
 John Doe, *Manager*
 12 USA St
 Anywhere, NY 12345
 123 456 7890

Operational? yes
 Is compost sold? no

Compost Facility Search Results

Feedstocks	
Leaves	yes
Grass	yes
Brush and Branches	yes
Logs, Stumps other Wood	
Pre-consumer Food Waste	yes
Post-consumer Food Waste	yes

Composting Method? windrow piles
 Is compost free? yes
 If yes, to whom? residents

Option #2

Select a map to view facilities

- [All Compost Facilities](#)
- [Yardwaste Composts](#)
- [Manure Compost Facilities](#)
- [Foodscrap Compost Facilities](#)
- [Biosolids Compost Facilities](#)
- [Compost Research Farms](#)
- [Small Scale Compost Demonstration Sites](#)

Select a county from the list below

None Selected ▾

*Click "Submit" to send request

Submit

Composting Resources:

- Farm-Based Composting: Manure & More - <http://www.nraes.org/publications/nraes150.html>
- Natural Rendering: Composting Livestock Mortality & Butcher Waste:
 Fact Sheet - <http://compost.css.cornell.edu/naturalrenderingFS.pdf>
 Video - <http://www.nraes.org/publications/nraes163.html>
- Co-Composter: <http://compost.css.cornell.edu/CoCompost.html>
- Compost...because a rind is a terrible thing to waste (video) - <http://compost.css.cornell.edu/FoodCompostpr.html>

For other composting resources see the CWMI web site at: <http://cwmi.css.cornell.edu/Composting.html>