

Composting

What Is Composting?

Composting is the controlled **thermophilic** (130°-150°F) **decomposition** of organic materials such as leaves, grass, and food scraps by various organisms. Composting can be divided into three types: backyard, or home, composting; vermicomposting; and heat-based composting.

Home composting is the natural degradation of yard trimmings, food scraps, wood ashes, shredded paper, coffee grounds, and other household organic waste by naturally occurring microscopic organisms. **Vermicomposting** is the natural degradation of similar household organic waste using naturally occurring microscopic organisms and the digestive process of earthworms. Heat-based composting is performed by municipal or commercial facilities that increase the rate of degradation using high temperatures.

Varying amounts of heat, water, air, and food produce different qualities of compost as a final product. Heat-based compost differs from compost produced at ambient temperatures (e.g., a forest floor or home composting) because high temperatures destroy both weed seeds and pathogens. Composts produced by all three systems are crumbly, earthy-smelling, soil-like materials with a variety of beneficial organisms.



Key Points

- Composting is the controlled decomposition of organic materials.
- There are three methods of composting: home or backyard composting, vermicomposting, and heat-based composting.
- Invertebrates and microorganisms in compost are key to the breakdown of the organic materials into a rich soil-like product.
- Quality compost is the result of the proper mixture of carbon and nitrogen sources and adequate amounts of moisture, oxygen, and time. Certain food items should be avoided when home composting.
- More than 67 percent of the waste produced in the United States (including paper) is compostable material.
- Compost is a valuable product that can be used as a soil amendment, mulch, or even to decontaminate natural habitats, storm water, and brownfields.
- Composting helps divert a large portion of America's organic trash from landfills and combustion facilities.

Worms—A Composter's Best Friend

Vermicomposting is a method of composting using a special kind of earthworm known as a red wiggler (*Eisenia fetida*), which eats its weight in organic matter each day. Vermicomposting is typically done in a covered container with a bedding of dirt, newspaper, or leaves. Food scraps (without added fats) can then be added as food for the worms. Over time, the food will be replaced with worm droppings, a rich brown matter that is an excellent natural plant food. Vermicomposting requires less space than normal composting methods, and is therefore ideal for classrooms, apartments, and those in high-density urban areas.

Composting in Action

An easy way to understand all the factors that go into composting is with a hands on demonstration. A school can provide the perfect medium for these demonstrations. Classes could start a composting bin using food scraps from the cafeteria and yard trimmings from ground maintenance. Depending on the scope of the project, the compost could then be sold to the community in addition to being used on the school campus. Tour a local composting facility, if composting cannot be done at school. For more information on how to start a school composting project, go to the Cornell University composting Web site at http://compost.css.cornell.edu/composting_homepage.html or use these suggested activities to get you started:

- Start a compost pile or bin in the school or as a class experiment.
- Try using compost in place of chemical fertilizers, pesticides, and fungicides. Use compost made by the school or buy it from municipalities or private companies.



The decomposition of organic materials in composting involves both physical and chemical processes. During decomposition, organic materials are broken down through the activities and appetites of bacteria, fungi, and various invertebrates that will naturally appear in compost, such as mites, millipedes, beetles, sowbugs, earwigs, earthworms, slugs, and snails. These microorganisms and insects found in decomposing matter need adequate moisture and oxygen to degrade the organic materials in the most efficient manner.

How Does Composting Work?

Compost contains both carbon and nitrogen sources, which can be simplified as browns (e.g., leaves, straw, woody materials) and greens (e.g., grass and food scraps), respectively. Adequate sources of carbon and nitrogen are important for microorganism growth and energy. The ideal ratio is 30 parts brown to 1 part green. Odor and other problems can occur if the ratio or any of the factors discussed below are not right.

The browns and greens can be mixed together to form compost in a backyard bin or in a municipal compost facility. Whether the composting is done on a small scale or large, the composting process is the same. To encourage decomposition throughout the pile, the compost should be kept moist and turned periodically.

What Are the Benefits of Composting?

As a method of handling the large amount of organic waste created in the United States each day, composting makes good environmental sense. Instead of throwing organic materials away, they can be turned into a useful resource.

In addition, many organic wastes are not ideally suited for disposal in combustion facilities or landfills. Food scraps and yard trimmings tend to make inferior fuel for combustors because of their high moisture content. Decomposition of organic wastes in landfills can create methane, a greenhouse gas that is environmentally harmful because it destroys atmospheric ozone.

Because yard trimmings and food scraps make up about 24 percent of the waste U.S. households generate (EPA, 2003), backyard or home composting can greatly reduce the amount of

waste that ends up in landfills or combustors. In addition, compost is a valuable product that can be used as a soil additive for backyard gardens and farm lands or in highway beautification and other landscape projects.

The benefits don't end there—composting also makes good economic sense. Composting can reduce a community's solid waste transportation, disposal, and processing costs. In many communities, residents pay for each bag or can of trash they put out for pickup. If a household is composting, it will most likely put less in trash cans and will pay a smaller trash bill.

In backyards and on the community level, interest in composting has increased rapidly over the past several years. Yard trimmings programs constitute the large majority of composting operations in the United States. In these programs, community members place their yard trimmings in a separate bag or container at the curb, which is collected and taken to a municipal composting facility. These facilities create large amounts of compost, which, in many cases, is sold back to community members. People can also purchase compost created by private composting companies.

While composting increases the rate of natural organic decomposition, it still takes months for compost to mature. If compost is used while it is still "cooking," the high temperatures could kill the plant life on which it is spread. In addition, using compost before it is ready can encourage weed growth because the high temperatures of the pile have not had a chance to kill any potential weed seeds.

What Are Some Emerging Trends in Composting?

A large amount of organic waste is created by institutions, restaurants, and grocery stores—perfect for compost. Across the country, many of



What Are the Challenges Associated With Composting?

Creating quality compost requires the right mix of materials and attention to moisture, particle size, and temperature. Too little moisture will slow the decomposition, but too much can create odor problems. To avoid attracting pests and rodents, composters should monitor the food scraps put in the compost pile. Meat scraps, fats, and oils are difficult items to compost, attract pests, and should be kept away from the compost pile, and thrown away instead.

What Can Go Into a Composting Bin?

This list is not meant to be all inclusive. Some food products should not be included because they can attract pests or compromise the quality of the compost.

Materials to Include

- Fruit and vegetable scraps
- Tea bags
- Wool and cotton rags
- Coffee grounds with filters
- Grass/Yard clippings
- Leaves
- Egg shells
- Sawdust
- Fireplace ash
- Nonrecyclable paper
- Vacuum cleaner lint
- Fish scraps

Materials to Exclude

- Meats
- Dairy foods
- Bones
- Fats
- Pet excrement
- Diseased plants
- Grease
- Oils (including peanut butter and mayonnaise)

these businesses are participating in pilot projects to compost their food scraps and soiled paper products. These businesses can not only provide a valuable component of compost—organic material—but also can reduce their waste disposal costs significantly.

Compost is also being used as an innovative technology to clean up land contaminated by hazardous wastes, remove contaminants from

storm water, facilitate reforestation, and restore wetlands and other natural habitats. Compost has been used to restore soil that is contaminated with explosives, munitions wastes, petroleum, fuel wastes, and lead and other metals. In addition, various biodegradable tableware and dishes have been developed; in particular, cups and plates made with a cellulose-based vegetable polymer.

Additional Information Resources:

Visit the following Web sites for more information on composting and solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA, Office of Resource Conservation and Recovery site on composting: <www.epa.gov/compost>
- Cornell University composting site: <http://compost.css.cornell.edu/composting_homepage.html>
- U.S. Composting Council Web site: <www.compostingcouncil.org>

To order the following additional documents on municipal solid waste and composting, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <www.epa.gov/epawaste/inforesources/pubs>.

- *Innovative Uses of Compost Erosion Control, Turf Remediation, and Landscaping* (EPA530-F-97-043)
- *A Collection of Solid Waste Resources* on CD-ROM