Composting To Reduce The Waste Stream

Composting yard, garden, and some food wastes where they occur reduces the waste stream and creates a valuable soil amendment.

Composting saves both transportation and disposal costs, and provides an environmentally sound way to manage wastes.

Composting transforms organic waste into a soil-like material called compost. Compost can enrich the soil used for gardens, lawns, and house plants. Reducing the waste stream is part of the solution for solid-waste disposal problems. Composting yard, garden, and some food wastes where they occur reduces the waste stream and creates a valuable soil amendment.

Yard waste is a prime candidate for composting. Yard wastes make up approximately 20 percent of the residential waste stream. Traditional yard waste disposal methods have long been environmentally unsound and are becoming increasingly expensive. Composting saves both transportation and disposal costs, and provides an environmentally sound way to manage wastes.

Composting is the biological decomposition of organic matter. While decomposition occurs naturally, it can be accelerated and improved by human intervention. An understanding of the composting process is important for producing a high-quality product and preventing operating problems.

Microorganisms and invertebrates that decompose yard and food wastes require oxygen and water. Products of the composting process include soil-enriching compost, carbon dioxide, heat, and water. The heat produced increases the temperature in the compost pile from near-ambient temperature to as high as 160° F. The increased temperature results in increased water evaporation. The conversion of carbon in waste to carbon dioxide results in a reduction in both the weight and the volume of the pile. Nitrogen, contained in yard waste is necessary for microorganisms to carry out decomposition efficiently.

Decomposers

Decomposers are the microorganisms and invertebrates that accomplish composting. Naturally occurring microorganisms complete most of the chemical decomposition in the material being composted. These microorganisms include bacteria, molds or fungi, actinomycetes, and protozoa. Tiny invertebrate animals such as mites, millipeds, insects, sowbugs, earthworms, and snails, are the primary agents of physical decay. They break up waste debris and transport microorganisms from one site to another. The ease with which organic materials are composted depends on the type of decomposers, the type of organic material being composed, and the composting method used.

Factors Affecting the Composting Process

All natural organic material eventually decomposes. The length of the composting process depends on a number of factors: carbon and nitrogen contents of the material, amount of surface area exposed, moisture, aeration and temperatures reached during composting.

Carbon-to-Nitrogen Ratios

When combining organic materials to make compost, the carbon-to-nitrogen (C-N) ratio is important. Microorganisms in compost digest (oxidize) carbon as an energy source, and ingest nitrogen for protein synthesis. The proportion of these two elements should approximate 30 parts carbon to 1 part nitrogen by weight. Given a steady diet at this 30:1 ratio, microorganisms can decompose organic material quickly.

Most materials available for composting do not fit this ideal 30:1 ratio, so different materials must be blended to meet the ratio. Woody materials are very high in carbon. However, green wastes, such as grass clippings, fresh weeds, kitchen refuse, and manure, contain relatively high proportions of nitrogen. Proper blending of carbon and nitrogen helps ensure that composting temperatures will be high enough for the process to work efficiently.

Surface Area/Particle Size

Microbial activity occurs at the interface of particle surfaces and air. The surface area of material to be composted can be increased by breaking it into smaller pieces, or by other means. Increased surface area allows the microorganisms to digest more material, multiply faster, and generate more heat.

Aeration

Aeration replaces oxygen-deficient air in the center of the compost pile with fresh air. Rapid aerobic decomposition can only occur in the presence of sufficient oxygen. Regular mixing of the pile, referred to as turning, fluffs up the material and increases its porosity. Turning enhances aeration in a compost pile.

Moisture

Microorganisms can utilize only those organic molecules that are dissolved in water. A moisture content of 40 - 60% provides adequate moisture without limiting aeration. The "squeeze" test is an easy way to gauge the moisture content of composting materials. The material should feel damp to the touch, with just a drop or two of liquid expelled when the material is tightly squeezed in the hand. If the pile becomes too wet, it should be turned and re-stacked. Adding dry material, such as straw or sawdust, can also remedy an excess moisture problem. If the pile is too dry, it can be watered with a trickling hose.

Temperature

Heat generated by microorganisms as they decompose organic material increases compost pile temperatures. Pile temperatures between 90 and 140 (32° - 60° C) indicate rapid composting. A temperature probe or a soil thermometer, can be used to keep track of pile temperatures.

(Taken from: Composting to Reduce the Waste Stream, N. Dickson, T. Richard, R. Kozlowski. Northeast Regional Agricultural Engineering Service Publication NRAES-43. 46 pages.)

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