Using Compost for Erosion Control and Revegetation

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Dairy Compost Utilization

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E-354
08/05

What is compost?

Composting refers to biological decomposition and stabilization of organic materials by microorganisms under aerobic conditions (in the presence of oxygen). During the composting process, heat produced biologically under proper moisture and aeration conditions accelerates decomposition of raw material, followed by stabilization and well- managed curing of the product. The result is production of good-quality compost that is biologically stable, relatively uniform in appearance, free of most pathogens and weed seeds, and beneficial as a soil amendment material with essential nutrients for plant growth. Thus, compost from various feed stocks, including yard, manure and food- processing residuals and other organic materials, has been used to improve soil quality and productivity, as well as to prevent and to control soil erosion.

Erosion Control and Revegetation Applications

Soil erosion from construction sites can be as much as 10 to 20 times greater than that from agricultural lands. Research reports from academia, the EPA, state departments of transportation (DOTs) and other sources suggest that compost can be effective in controlling erosion from construction sites, including road rights-of-way, general construction and land development.

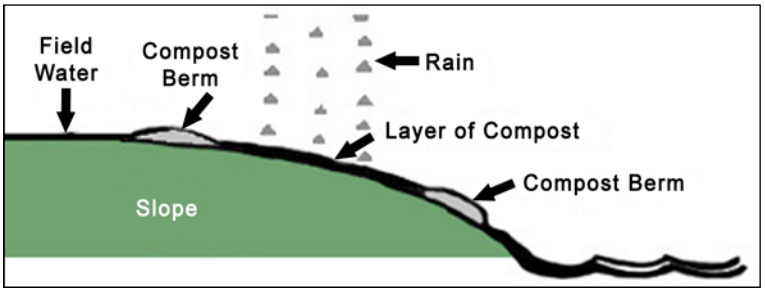

Figure 1. Compost filter berms and blankets (layers of compost covering the soil) for sediment and erosion control on steep slopes.

Fig. 1 illustrates the use of compost on a steep slope as immediate, temporary erosion and sediment control in filter berms and compost blankets on top of existing soil. Berms or filter socks manage storm-water run-on and retain sediment from above the slope, as well as retain runoff and sediment from the slope itself. The compost blanket controls slope erosion by reducing water-flow velocity and the volume of sediment coming off the slope.

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make every drop count

PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY
The preparation of this report was financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

Texas Cooperative EXTENSION
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Compost also can be incorporated as a soil amendment or a topsoil blend to improve soil structure. Both practices help establish a protective vegetation cover, which provides long-term erosion and sediment control. Due to compost's nutrient value and abundant organic matter, vegetation established in compost-amended soils grows healthier, faster. Such vegetation is better able to endure extreme climatic conditions, as compared to vegetation planted in soil that receives commercial fertilizer as its sole nutrient source.

But the characteristics that benefit vegetation also may create water-quality problems. Therefore, it is important to analyze nutrient (N, P, K and other micronutrients), pH and soluble salt content of compost before selecting and establishing its application rate for sediment or erosion control. Biosolids compost also should be analyzed for heavy- metal content. Lower-nutrient composts should be considered for use on nutrient- impacted areas. For example, a two-inch layer of compost weighing 1,500 pounds per cubic yard, applied over one acre, will equal an application rate of nearly 200 tons per acre. If such compost contains average-to-high nutrient concentrations, this application rate may be higher than nutrient requirements of the vegetation used for soil stabilization. These excess nutrients could lead to negative water-quality impacts. The blending of compost with wood chips in an erosion-control blanket may reduce the amount of nutrients applied per acre and slow their subsequent rate of release.

Storm Water Management Applications

Figure 2. Grass seed and compost being applied as a compost blanket for erosion control and revegetation of a road right-of-way.

New federal storm-water-permit requirements for general construction activities and for municipalities have placed much greater responsibility on construction contractors and on local governments to put in place effective erosion and sediment controls. At the same time, recent research demonstrates the effectiveness of several practices that use compost to stabilize soil, reduce suspended solids and sediment in runoff, reduce chemical loads, and delay runoff onset and volume. Guidelines and specifications for use of compost in erosion and sediment control applications can be found in the Texas Commission on Environmental Quality (TCEQ) reference document BMP Finder at *http://www.tnrcc.state.tx.us/water/quality/nps/nps_stakeholders.html#bmp%20finderD*.

Department of Transportation Applications

Figure 3. Grass seed and compost being applied as a filter berm to control runoff and sedimentation in a city park waterway.

Compost has been used extensively for erosion and sediment control in the stabilization of highway rights-of-way after construction or maintenance and such use has been thoroughly studied. In 1997, a survey of trends in using compost for road-side applications revealed that nearly 70 percent of the nation's DOTs were either experimenting with or routinely using compost. Some of the compost uses listed by these DOTs included

- Mulch or top dressing
- Erosion control blankets for steep slopes
- Filter berms to control sediment movement (similar to silt fences)
- Hydroseeding (seed, water and compost mixed and sprayed on ground to establish vegetation)
- Wetlands mitigation
- Bioremediation (composted organic matter used to break down pollutants into simpler, safer forms)
- Filter socks (mesh socks containing compost or mulch material)

The Texas Department of Transportation (TxDOT) has used composted dairy manure, feedlot manure, chicken litter, cotton gin burs, yard trimmings, and municipal biosolids as compost blankets for hydroseeding road rights-of-way to control soil erosion from steep slopes (Fig. 2) and as filter berms to control erosion and sedimentation from low- volume runoff (Fig. 3). Recent projects have used filter socks rather than berms, because socks have a greater ability to withstand concentrated flows and to retain sediment (Fig. 4). Another applications at a West Texas municipal landfill uses compost produced from a mixture of poultry manure, sawdust and other wood residuals to control erosion, as a soil amendment and to create a vegetated cover over closed landfill cells.

Figure 4. Compost and wood-chip mixture applied in a mesh casing as a filter sock to control runoff and sedimentation.

TxDOT accepts high-quality compost, such as dairy manure compost, for use in compost-manufactured topsoil (CMT), in erosion-control compost (ECC) and as general- use compost (GUC) (TxDOT Special Specification 161, Compost). TxDOT also uses compost in the form of filter berms for erosion and sedimentation control (TxDOT Special Specification 1059, Compost/Mulch Filter Berm). TxDOT may issue a one-time-use Special Specification for use of filter socks. TxDOT requires all compost to be sampled and tested according to the Test Methods for Examination of Composting and Compost (TMECC) and certified according to the Seal of Testing Assurance (STA) Program.

For TxDOT contracts, CMT should consist of 75 percent topsoil blended with 25 percent compost on a volume basis. For ECC, 50 percent untreated woodchips should be blended with 50 percent compost by volume. One hundred percent of the material used as GUC should be compost. A compost filter berm should combine 50 percent compost and 50 percent wood chips. Table 1 provides the general physical requirements for compost to be used for TxDOT contract work. For a detailed description of all requirements, see TxDOT Specifications 161 and 1059 at *http://www.dot.state.tx.us/des/landscape/compost/specifications.htm*.

Table 1. Physical and chemical requirements of compost utilized in TxDOT Special Specification 161*.

Property	Requirements
Particle Size	95% passing 5/8" sieve, 70% passing 3/8" sieve with TMECC Method 02.02-B
Heavy Metals	Following pass in accordance with TMECC Method 04.06: Arsenic (As), Cadmium (Cd), Copper (Cu), Lead (Pb), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se) and Zinc (Zn)
Soluble Salts	≤ 5.0 dS/m (≤ 10.0 dS/m accepted for CMT) with TMECC Method 04.10-A
pH	5.5 – 8.5 with TMECC Method 05.05-A
Maturity	80% with TMECC Method 05.05-A
Organic Matter Content	25–65% (dry mass basis) with TMECC Method 05.07-A
Stability	≤ 8 with TMECC Method 05.08-B
Fecal Coliform	Pass in accordance with TMECC method 07.01-B

*TxDOT Specification 1059 defines placement and use of compost as a filter berm. Such compost must still meet guidelines outlined in TxDOT Specification 161. See TxDOT Specification 1059 for additional requirements.

Produced by Agricultural Communications, The Texas A&M University System
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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas Cooperative Extension, The Texas A&M University System.
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