INNOVATIVE CONCEPTS FOR COMPOST

FILTER BERMS AND EROSION CONTROL

Department of Environmental Quality
Pollution Prevention Bureau
March 2002

Table of Contents

Compost

For the past ten years, the use of compost in environmental applications and markets has been increasing at a steady rate. Most people are aware that the use of compost is an effective way to improve plant growth but not environmental applications. They include slope stabilization and erosion control, compost filter berms, storm water filtration, and vegetation establishment. These beneficial uses of compost can increase healthy plant production, help save money, reduce the use of chemical fertilizers, and conserve natural resources.

[1]

What Are Benefits of Using Compost?

Soil Enrichment:

- Adds organic bulk and humus to regenerate poor soils.
- Helps suppress plant diseases and pests.
- Increases soil nutrients content and water retention in both clay and sandy soils.
- Restores soil structure after reduction of natural soil microbes by chemical fertilizer.
- Reduces or eliminates the need for fertilizer.
- Combats specific soil, water, and air problems.

Pollution Remediation:

- Absorbs odors and degrades volatile organic compounds.
- Binds heavy metals and prevents them from migrating to water resources or being absorbed by plants.
- Degrades, and in some cases, completely eliminates wood preservatives, petroleum products, pesticides, and both chlorinated and non-chlorinated hydrocarbons in contaminated soils.

Pollution Prevention:

- Avoids methane production and leachate formation in landfills by diverting organics for composting.
- Prevents pollutants in stormwater runoff from reaching water sources.
- Prevents erosion and silting on embankments parallel to creeks, lakes and rivers.
- Prevents erosion and turf loss on roadsides, hillsides, playing fields and golf courses.

Economic Benefits:

- Results in significant cost savings by reducing the need for water, fertilizers, and pesticides.
- Produces a marketable commodity and a low-cost alternative to standard landfill cover and artificial soil amendments.
- Extends municipal landfill life by diverting organic materials from the waste stream.
- Provides a less costly alternative to conventional bioremediation techniques.

Technical Parameters:

Customizing a compost mixture include maturity, stability, pH level, density, particle size, moisture, salinity, and organic content, all of which can be adjusted to fit a specific application and soil type.

Innovative Uses of Compost:

Filter Berms:

Overview: Silt fence…. a sediment-trapping practice utilizing a geotextile fence, topography and vegetation….has been used for erosion control slopes and around the edges of construction sites for years. While it is not the only method accepted slopes….and is often combined with other measures as the severity of slopes increase….it is the accepted standard for environmental of silt and sediment. Silt fence is used on nearly 100 percent of construction projects in the U.S., but there are some inherent problem with its use. First, it does not work as well as originally thought. Second, it has to be removed when the job is completed. Compost, when properly installed in long filter berms, has been shown to work better than silt fence in keeping both suspended and settleable solids out of water sources [2] moving on the surface.

Benefits: Compost and organic soil mulches instead of more conventional methods sediment control are numerous. Probably the two greatest benefits of using compost as a soil mulch in sediment control is its immediate effectiveness and second, its ability to bind and degrade specific contaminants. Compost that are stable in nature, possessing significant amounts of humic acids, have the ability to bind nutrients and heavy metals, as moisture passes through the product layer. Organisms found within compost have the ability to degrade organic contaminants such as hydrocarbons found in petroleum based materials. The ability to bind contaminants is exhibited when using organic soil mulches in construction of filter berms.

Aside from its effectiveness, another excellent benefit of using compost in sediment control instead of silt fencing is that in many instances it does not have to be removed from site after the job is completed. The filter berm can be left to degrade over time, it can simply be

knocked down or spread out, or it can injected with wildflower seed for a more aesthetic appeal for the construction site.
In addition, the natural contoured slope of the berm doesn't create an obstructive barrier to wildlife.

Filter Berm and "Compost Blanket" Combo: When a filter berms are used in combination with slope protection via a layer of compost or compost mulch (compost blanket), minimal erosion can be expected. Filter berms reduce the speed of water flowing on a given slope, which reduces the speed of soil particles tumbling down. Overall displacement of other soil particles is reduced.

Soil particles are normally round and roll easily once displaced by water. As they gain speed and momentum, they displace other soil particles which channel together in faster moving water, creating small rills. Rills lead to channels and channels lead to gullies. A layer of compost or composted mulch applied to a slope acts like a "wet blanket" or "wet deck of cards" scattered randomly over the surface that prevents the soil from rolling or gaining momentum.

A secret of success in the field is making sure that water is not able to get under the blanket at the top of the slope. If water gets under the layer of compost, and if the slope is steep, you can expect erosion and the compost or compost mulch will float away. However, by having a filter berm at the top of the slope and keeping the compost layer continuos over the "shoulder" of the slope, the water will hit the slope and ride all the way to the bottom on top of the blanket of organic materials. Because organic materials are more flexible, lighter, and absorb more water than soils in general, they also aid in helping water infiltrate into the [3]
soil underneath. For vegetation establishment, this is crucial to new seedling germination.

Cost Comparison: Application of mulch/compost material as a filter berm costs in the range of .80 to $2.00 per linear foot. There no additional costs for removal and disposal and the compost berm provides more organics to the soil. Application of standard silt fence is $1 to $3.50 per linear foot, which does not include the additional cost of maintenance and the removal and disposal of used materials (roughly $1 to $2 per linear foot). In the Brownwood DOT Texas District, the same maintenance engineer indicated that he might be interested in using the compost/mulch filter berm to reduce maintenance and removal costs, [4]
even if the initial cost is higher.

Field Reports: Successful projects were completed with the Virginia Department of Transportation, Ohio EPA, Columbus, Ohio, used the concept on a Wal-Mart construction

[5]
site, Sun City, South Carolina and SWACO Landfill, Columbus, Ohio (See Appendix A).

Developing Specifications: Approved compost should be a decomposed, weed-free-organic matter source. It should be derived from yard trimmings, source separated organic residuals (i.e. food waste) or wood/bark. The product particle size may vary widely, and it shall possess a pH 5.5 to 8.0 and moisture content of 35 to 55 percent….Apply compost layer approximately three feet over the top of the slope or overlap it into existing vegetation. Parallel to the base of the slope or other affected areas, construct a two-foot high by three-foot wide berm of compost. In extreme conditions (i.e. 2:1 slopes), a second berm shall be constructed at the top of the slope or silt fencing shall be installed in conjunction with the compost berm. For normal slopes, filter berms measuring one foot high by two feet wide may replace normal silt fence requirements.

Issue and Roadblocks: The lack of awareness about compost filter berms and compost blankets is a leading roadblock to rapid future development. Training and education are critical to moving compost forward. As a result, active research and development field demonstration projects can provide the assistance for momentum.

Recommendations: Silt fencing isn't actually specified in many erosion control bids. Instead, the contractor has to submit an erosion control or water discharge plan that calls for some recognized method to reduce erosion. Silt fence, because it is so common, is the leading tool used to respond. Even though a material such as compost may not be specified, it can be approved as an acceptable alternative if it is proven on a local basis. Recommend that the Montana Department of Transportation (MDOT) Research and Development run an experimental test project this summer. Afterwards, an alternative specifications can be made available thorough handbook and permitting guide revisions.

Erosion Control:

Overview: Highway construction is a major factor behind erosion and subsequent nonpoint source pollution. Not only has compost demonstrated high performance in preventing or minimizing runoff, but its nutrients and organic content have overcome difficult growing conditions and established vegetation, which ultimately provides the best erosion control. Although a relatively new concept, however, a promising application for compost.

Benefits: Research has shown that compost can often outperform conventional slope stabilization methods, such as hydroseeding and hay/straw mulching. Compost and compost blends typically are placed on up to a 2:1 slope at an application rate three to four inches. This compost layer absorbs the energy of the rainfall which causes the movement of soil particles and a substantial volume of moisture as well as reduces its flow velocity, improving percolation rates. Typically a screened compost is used to build the filter berms

on construction sites and gradual slopes, whereas a coarser mulch is used on more severe slopes. This allows water to pass through the filter berm, catching the sediment, but not allowing blowouts to occur because of the more excessive flow.

Cost: Applications of erosion control compost in Texas's demonstration project…. .75 to $2.00 per square yard (depending on the depth); application of erosion control blanket….$1.25 to $3.50 square yard (depending on the slope). Furthermore, in the case of their demonstrations, there has been no additional cost due to the need for [6] maintenance follow-up. In one scenario in Texas, discussed in the Biocycle magazine, January 2000, it would have cost $30,000 for the standard method of topsoil, seeding and an erosion control blanket, compared to approximately $17,000 for compost.

Field Reports: California, Maine and Texas have completed successful demonstration projects and implemented specifications afterwards (See Appendix B)

Developing Specifications: For erosion control, organic content must be 40-60percent (dry mass) and particle size must be less than three inches, with 70 percent less than two inches. Soluble salts must be no more than 15mmhos/cm and pH must be 5.5 to 8.0. Compost must contain at least 65 percent recycled materials. In addition**,** see Maine and Texas specifications enclosed, however, Texas specifications are more conducive to Montana.

Issues and Roadblocks: Education is a key factor with implementation and expansion for the use of compost for erosion control in highway projects.

Recommendations: Compost and mulch aren't actually specified in many erosion control bids. Instead, the contractor has to submit an erosion control or water discharge plan that calls for some recognized method to reduce erosion. Even though a material such as compost may not be specified, it can be approved as an acceptable alternative if it is proven on a local basis. Implement demonstration projects as it is much easier to use compost when personnel involved are familiar with the concept.

Method of Use and Application: The compost application rate may vary depending upon severity of slope, soil or compost characteristics. It is important to consider the end use of the slope. For example, if landscaping of the slope will occur at the end of construction, use fine to medium compost (3/4 inch minus of coarse). Application of a 3-4 inch layer of compost on the soil surface will effectively control soil erosion on a slope of up to 45% for a period of one to three years. Thick layers are appropriate for steeper slopes: engineers have used up to 12 inches in other states. Coarse compost with varying particle size is recommended for steeper slopes.

When possible, the compost layer should be horizontally tracked, especially on heavier soils, so water does not move freely between the compost-soil surfaces. Tracking it will incorporate the compost into soil surface to some degree. In order to prevent rill information, compost should be applied to cover the entire exposed soil surface and the layer should extend approximately 3 feet over the top of the slope or mesh into existing vegetation.

Best results will be achieved if a sediment fence is used at the base of the slope in conjunction with the compost. If used, the sediment fence fabric should be laid on the soil surface with the lip facing the slope. A 1.5 foot wide berm of compost should then be applied to the base of the sediment fence and over the fence fabric lip. This will act as a prefilter for the fence. By applying the compost over the fabric lip, digging a trench to bury the fabric will be avoided and so will the associated costs. Alternately, a compost berm (mound) may be placed at the base of the slope in lieu of the fence. The berm may be up to 2 feet high by four feet wide, depending upon the severity of the slope. Another alternative to the fencing or berm is to construct a toe by excavating a shallow ditch at the base of the slope and backfilling it with crushed stone or gravel.

Prior to the application, the exposed soil should be horizontally tracked (compacted) with a tracked bulldozer, not smoothed. The compost can also be efficiently applied through a blower truck which can apply the product both up and down a sloped area or it can be applied and graded by bulldozing it up or down a sloped area. It is also feasible to apply compost by dumping it down a slope in bulk quantities, then spreading it with a tractor pulled grading blade, or by hand using large rakes (depending upon the size of the project). On excessively unstable soils or wet soils, compost should be applied using a blower type apparatus. An excavator or backhoe may also be used. In recent years though, blower trucks are the preferred method for application. Dry compost should not be applied in windy conditions. Once spread, moisture should be applied over the layer of dry compost for compacting purposes.

Blower Trucks : Blower trucks have emerged in recent years to eliminate safety risks and accessibility problems associated with hand applying organic materials to steep slopes and in delicate areas.

The various blower trucks operate in a similar manner. A feed belt brings material into a hopper, where air pressure sends it through the hose. The operator has a remote control to adjust the speed of material flow to the hopper and the air pressure level. These controls are manipulated according to material coarseness, size, and moisture, as well as type of application and length of hose being used. Air pressure may be higher and feeding speed slower for heavier mulch, with the reverse true for lighter compost. Of course, speed also is decreased when working around delicate plants. Finally, the further you blow, the slower you have to run it so there isn't too much product in the hose too quickly, causing it

to clog.

Two manufacturers of blower trucks are indicated below, however, others can be located at Biocycle Magazine web site under equipment and systems category on the pull-down menu (www. Biocycle.net).

Express Blower, 750 Chambers Street, Eugene, Oregon 97402, 1-800-285-7227. The cost of their equipment ranges from $126,000 to $300,000 depending on the size of the truck and options.

Peterson Pacific Corporation, 29408 Airport Road, Eugene, OR 97402, 541-689-6520. The cost of their equipment ranges from $240,000 to $300,000 depending on the size of the truck and options (See Appendix E).

Summary

The implementation of a research and development project for filter berms and erosion control utilizing compost will assist the State of Montana to meet the mandate of the Integrated Waste Management Act (IWMA) 75-10-803 which the 1991 state legislature passed. This shifted the Solid Waste Management Program toward a more balanced approach between the management of waste and the conversation of resources. The IWMA established a waste reduction goal of 25% by 1996 and it also adopted an integrated waste management policy which must be based on the following order of priority.

- Source reduction
- Reuse
- Recycling
- Composting
- Landfill disposal or incineration

In other words, those who manage solid waste in Montana are to implement source reduction, reuse, recycling, and composting prior to disposal or incineration. The Solid Waste Management Program must lead the way toward an integrated waste management approach. If the research and development project is successful, it will assist the state meet their 25% waste reduction goal as a result of increased markets for compost that will be diverted from solid waste landfills.

After successful completion of the research and development project for filter berms and erosion control, the program will lower the Montana Department of Transportation overall cost for these projects and assist the state in meeting the recycling goal. Finally, the concept will create additional jobs and provide additional markets for compost as there are thirty-three operating facilities throughout the state (See Appendix). Furthermore, compost

facilities will be able to purchase additional equipment to meet the market expansion and will be able to receive a tax credit for purchase of the equipment per Title 15 Chapter 32 Part 6 MCA. (See Appendix) ***It is a win-win situation for all parties!!!***

---

[1] US EPA, EPA530-F-97-043, October 1997.

[2] Biocycle Magazine, January 2001, Compost Filter Berms and Blankets Take on Silt Fence, pgs. 26-31.

[3] Biocycle Magazine, January 2001, Compost Filter Berms and Blankets Take on Silt Fence, pgs. 26-31.

[4] Biocycle Magazine, February 2001, Texas Makes Inroads with Highway Use of Compost, pgs 67-69.

[5] Biocycle Magazine, January 2001, Compost Filter Berms and Blankets Take on Silt Fence, pgs. 26-31.

[6] Biocycle Magazine, February 2001, Texas Makes Inroads with Highway Use of Compost, pgs. 67-69.