Agricultural and Biosystems Engineering @ Iowa State University

Using Compost for a Safer Environment

Project Results – Uses & Application Methods

Results of the research described on this website are potentially applicable to several practical questions concerning use of compost roadway embankments in particular or on construction sites in general.

Blanket Applications vs Incorporation ?

- *Vegetation Growth* - Until recently, the primary use for compost in road construction was as a soil amendment on embankments where native soils were poorly suited for plant growth. When used for this purpose, composts were often incorporated into the underlying soil (using a disk or power tiller) to obtain a firmer seed bed than offered by the relatively coarse-textured composts alone.

  To assess the erosion and runoff performance of the composts, however, all compost treatments for the purpose of this study were applied as 2- or 4-inch blankets rather than incorporating them into the underlying native soil. This was done to insure that test data reflected the performance of the composts themselves, and not the performance of an uncontrolled mixture of compost and soil.

  Surprisingly, despite the lack of compost incorporation, end-of-season harvesting and weighing showed average yields of planted vegetation on areas treated with blanket applications of any of the three composts were statistically equivalent to average yields obtained from areas treated with topsoil.

  While the results of a two- season study at only one location are too limited to conclude that incorporation is never necessary (it is likely that there are soil or weather conditions for which incorporation provides superior growth) they indicate that there are a variety of composts and weather conditions for

- Blanket applications of all three composts produced as much planted vegetation as test areas treated with topsoil.
- Tests conducted at average rainfall intensities of nearly 4 inches per hour did NOT cause significant down-slope movement of the compost blankets.
- Weed suppression exhibited by the composted areas, is believed to be due largely to the blanket applications.

- 2-inch blanket applications of compost provided essentially the same

which incorporation is not essential. In these situations, the costs of compost use can be reduced through blanket applications.

- *Compost Stability* - At the time the project was first begun, highway designers and the ISU researchers feared that blanket applications of compost on steep roadway embankments might be washed to the bottom of the slope by intense rainfall, and that disking or roto-tilling the compost into the underlying soil would probably be necessary to prevent this.

  Tests conducted at average rainfall intensities of nearly 4 inches per hour, however, did NOT cause significant down-slope movement of the compost blankets. The high infiltration and water holding capacities of the composts significantly reduced runoff, effectively stabilizing the compost blankets on the slope.

- *Weed Suppression* - The weed suppression exhibited by the composted areas, is believed to be due largely to blanket applications. Had the compost been tilled or disked, viable weed seeds in the underlying soil would have been brought to the surface, promoting rapid emergence and growth of weed species, and adding to competitive stresses on the desired cover crop species. Here again, blanket applications appear to offer a way to offset some of the costs of compost use by subsequently reducing the cost of roadside weed control.

- *Runoff & Erosion* - The reduced runoff and erosion exhibited by the compost-treated areas also are thought to be due, in good part, to the relatively coarse texture and large particle size of the composts. Although space and time limitations did not permit side-by-side testing of blanket and incorporated compost applications, had the underlying soil been mixed into the compost it is believed that infiltration and storage capacity of the composts would have been reduced, thereby increasing runoff and erosion.

Application Depth ?

- Project results generally indicated that 2-inch blanket applications of compost provided nearly the same performance as 4-inch applications in

performance as 4-inch applications.

- The 3 composts performed equally well with regard to runoff reduction and vegetation growth.

- All of the composts did a good job of resisting erosion and retaining metals and nutrients, but yard-waste outperformed the other two composts in in this regard.

- Despite good performance with regard to runoff and erosion reduction, Iowa DOT officials have expressed reservations about using yard waste compost along public roadways due to its visually undesirable content (twine, plastic, etc.).

- Since none of the composts were more resistant to rill erosion than compacted subsoil, composts should not used in locations that receive concentrated flows (point discharges) of runoff water.

terms of runoff, erosion, and vegetation growth. Since the costs of acquiring, transporting, and applying compost will increase with the application depth, there appears to be little reason to apply more than 2-inches.

Compost Type ?

- Although the three composts that were tested originated from quite different types of organic byproducts, all performed well in terms of runoff reduction and growth of vegetation.

  Based on total erosion and chemical pollutants contained in runoff during a 30-minutes storm, the yard waste compost provided the best results. At the same time, this material also was the least visually attractive of the three composts and, for this reason, Iowa DOT officials have expressed reservations about using yard waste compost along public roadways. Plastic bags, twine, and other visually undesirable components picked up during yard waste collection, were primary concerns of the highway designers.

  It is important to note that the supplier of the yard waste compost used in this project (Des Moines Metro Solid Waste) can produce a screened yard waste compost of significantly higher quality. The ISU researchers purposely chose to use yard waste compost receiving minimal post-process screening. Since many small composting facilities do not have screening equipment, the unscreened material was believed to be more representative of the quality of yard waste compost available throughout Iowa.

Recommended Uses

- Despite their differing origins, physical characteristics, and nutrient and metal content, blanket applications of all three of the composts that were tested produced runoff and erosion control results that compared favorably with traditional practices that have long been considered to be very effective. As such, compost treatments appear to provide another useful storm water and erosion management tool for highway designers and others who are responsible for pollution control on construction sites where large amounts of soil are

temporarily disturbed.

- Since transporting and applying composts add to project costs, their use is most easily justified under difficult construction conditions requiring immediate erosion and runoff control AND the ability to support growth of vegetative cover. Examples might include:
    - projects completed too late in the growing season to establish vegetation;
    - projects where temporary periods of abnormally wet or dry weather delays establishment of vegetation, thereby interfering with erosion control;
    - areas with poor quality soils that do not support vigorous vegetation growth; or
    - steep or wet locations that are difficult to reach with the heavy equipment needed for topsoil applications, but that can be blanketed with compost using a compost blower truck.

- While composted areas were more resistant to rill erosion than areas treated with topsoil, none of the composts were significantly more resistant to rilling than compacted subsoil. In light of this vulnerability, care should be exercised when using similar composts to insure that they are not placed in locations that receive concentrated flows (point discharges) of runoff water. If compost blankets are placed adjacent to drainage ways or on fore slopes that receive concentrated runoff from traffic lanes, they should be protected with compost berms, silt fences, hay bales, or similar measures that diffuse or divert the runoff before it reaches the blankets.