Appendix L

Initial Fact Sheets

Compost Sampling Guideline
Using Compost for Erosion Control and Revegetation
Incentives to Purchase Dairy Compost
Using Organic Matter to Improve Sports Fields
Using Compost in the Urban Environment
The sampling of compost is an essential aspect of process monitoring, quality control, marketing, labeling of product and regulatory compliance. This sampling guide should be used to assess the quality of a finished product. By following these guidelines, the compost facility initiates the first step in participating in the US Composting Council’s Seal of Testing Assurance Program ("STA").

Please consult Test Methods for the Examination of Composting and Compost, Method 02.01-B online at http://tmecc.org/tmecc/ for original information related to this sampling guideline.

**MATERIALS**

- Front-end loader
- 15 cup-size compost samples per cut
- Sterilized sampling tool or glove
- Sterilized collection bucket(s) for cut areas
- 2, 5-gal sterilized mixing pails
- 2, 1-gal sample storage containers, (e.g., resealable plastic containers)
- 5% bleach solution
- Aluminum foil
- Newspaper, Butcher or Kraft paper
- Rigid shipping container, (e.g., cardboard box, etc.)
- Frozen ice packs
- Packing tape

**WHAT TO SAMPLE**

TMECC Method 02.01-B describes composite sampling to assess in-process compost and finished compost product. However, this sample guideline addresses the procedure for sampling a finished product.

A composite sample is a single sample composed of multiple, well-blended subsamples that, after thorough mixing, represents the traits of interest for an entire pile or windrow.

Select a screened pile or a finished windrow waiting to be screened. Avoid sampling from areas that are excessively wet, i.e., greater than about 60% moisture.

**WHERE TO SAMPLE**

Using a front-end loader, cut into the pile or windrow in at least 5 locations (figure 1). The 5 cuts must be randomly assigned and may be selected from either side of the windrow or pile. Cut into the entire depth of the pile and at least into half of the width of the pile. The cut should expose the middle of the pile from its natural base to its natural peak.

*Take all necessary precautions that the walls of each cut are stable to prevent the potential for collapse. Also, make certain the sampling area is well ventilated to avoid exposure to potentially harmful gases.*

**Figure 1.** Cross-sectional illustration of one cut-out from an inverted “V” compost windrow. Circles represent 15 uniformly dispersed grab samples. Avoid collection of samples from pile or windrow surfaces.
HOW TO SAMPLE

Collect 15 uniformly dispersed 1-cup samples from within one side of each of the 5 cut areas as illustrated in figure 1. Combine and thoroughly mix the 15 grab samples in the sterilized collection bucket. Repeat this process for each cut area.

In the 2 sterilized 5-gal mixing pails, combine all samples from the 5 cuts and thoroughly mix to make one composite sample. If balls form when mixing, the compost is too wet and should be partially air-dried prior to further mixing. Sample integrity is diminished and nitrogen loss should be anticipated when a sample is air-dried prior to shipping.

Quarter the composite sample by repeatedly dividing it in half until you have a 2-gal sample. Gently transfer the 2-gal sample into the 2 1-gal plastic resealable storage containers. Do not compact the compost samples.

SANITATION PROCEDURES

Use a sterilized sampling tool and collection bucket made of stainless steel, plastic, glass or Teflon® to avoid sample contamination. Sterilize all sampling equipment before sampling and between different windrows or piles. To sterilize, wash sampling tools with soap and water, rinse with 5% bleach solution and then triple rinse with fresh water.

Wear appropriate protective clothing and use care when handling bleach or any other chemicals.

SAMPLE PRESERVATION

After packaging samples in 1-gal containers, chill them to about 4°C (39°F). Separately wrap each chilled sample container together with an ice pack, using multiple layers of newspaper, butcher or kraft paper. Line the inside of a rigid shipping container and its lid with aluminum foil. The paper and foil will help to insulate the shipping container. Place wrapped samples in the shipping container, filling voids between the sample containers and shipping container walls and lid with crumpled newspaper, butcher or kraft paper. Seal the lid on the shipping container with packing tape. Send the shipping container by 1-day delivery to your selected laboratory for analysis.

Laboratories that follow TMECC protocols must be approved through the STA program. A list of participating laboratories is available online at http://tmecc.org/sta/

WHEN TO SAMPLE

This is an end-process sampling so only material that is ready for market should be tested. According to STA program requirements, sampling frequency should be based on a facility's production capacity.

- 1 to 6,250 tons – sample once per quarter
- 6,250 tons to 17,500 tons – sample once per 2 months
- 17,500 tons and above – sample once per month

For more information concerning the Marketing Dairy Compost project or the STA program, please contact Cecilia Gerngross by email (cecilia@tamu.edu) or phone (979.458.1138).

Educational programs of Texas Cooperative Extension are open to all people without regard to race, color, sex, disability, religion, age, or national origin.
WHAT IS COMPOST?

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

COMPOST FOR EROSION CONTROL

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 compost can be effective in controlling erosion and managing storm water from construction sites, including road rights-of-way, general construction and land development.

Figure 1 illustrates the use of compost as immediate, temporary erosion and sediment control in filter berms and compost blankets on top of existing soil on a steep slope. The 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 of the slope.
Compost can also be incorporated as a soil amendment or 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. It is better able to endure extreme climatic conditions compared to vegetation planted in soil that receives commercial fertilizer as a sole nutrient source.

The same characteristics that benefit vegetation may also create water quality problems. Therefore, it is important to analyze the nutrient (N, P, K and other micronutrients), pH and soluble salt content of the compost before selecting and establishing its application rate for sediment or erosion control. Biosolid composts also require analysis for heavy metals. 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 the compost contains average to high nutrient concentrations, this rate of application may be higher than the nutrient requirements of vegetation used for soil stabilization. This could lead to negative water quality impacts. The blending of compost with wood chips as an erosion-control blanket material may reduce the amount of nutrients applied per acre and their rate of release.

STORM WATER MANAGEMENT APPLICATIONS

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

![Figure 2. Grass seed and compost being applied as a compost blanket for erosion control and revegetation of a road right-of-way.](image-url)
DEPARTMENT OF TRANSPORTATION APPLICATIONS

The use of compost in erosion and sediment control has been extensively applied and studied in the stabilization of highway rights-of-way during construction or maintenance. In 1997, a survey of trends in using compost for road side applications revealed nearly 70 percent of the nation’s DOTs were either experimenting with or routinely using compost. Some of the uses listed by these DOTs were:

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

In Texas, the DOT 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 (Figure 2), and as filter berms to control erosion and sedimentation from low volume runoff (Figure 3). Recent projects utilize filter socks rather than berms as socks have a greater ability to withstand concentrated flows and retain sediment (Figure 4). In other applications, 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 3. Grass seed and compost being applied as a filter berm in a city park waterway to control runoff and sedimentation.

Figure 4. Compost and wood chip mixture applied in a mesh casing as a filter sock to control runoff and sedimentation.
The Texas DOT (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 1058, Compost). Compost is also used by TxDOT in the form of filter berms for erosion and sedimentation control (TxDOT Special Specification 1059, Compost/Mulch Filter Berm). A one-time use Special Specification is available from TxDOT regarding the 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 must be Seal of Testing Assurance (STA) Program certified.

For TxDOT contracts, the CMT should consist of 75 percent topsoil blended with 25 percent compost on a volume basis. For ECC, 50 percent untreated woodchips are blended with 50 percent compost by volume. When used as GUC, 100 percent of the material should be compost. The compost filter berm will be a combination of 50/50 compost and wood chips. Table 1 provides general physical requirements for compost to be used for TxDOT contract work. For a detailed description of all the requirements, see TxDot Specifications 1058 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 1058*.

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle Size</td>
<td>95% passing 5/8” sieve, 70% passing 3/8” sieve</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td>Pass in accordance with TMECC Method 04.06</td>
</tr>
<tr>
<td>Soluble Salts</td>
<td>≤ 5.0 dS/m (≤ 10.0 dS/m accepted for CMT)</td>
</tr>
<tr>
<td>pH</td>
<td>5.5-8.5</td>
</tr>
<tr>
<td>Maturity</td>
<td>80%</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>25-65% (dry mass basis)</td>
</tr>
<tr>
<td>Stability</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>Pass in accordance with TMECC method 07.01-B</td>
</tr>
</tbody>
</table>

The Bosque River and Leon River watersheds are home to over 165 of Texas’ dairy operations. In an effort to more effectively utilize dairy manure and halt the steady decline of water quality, the Texas Water Resources Institute (TWRI) and Texas Cooperative Extension (TCE) are working to market dairy compost. Incentive payments are available to both public and private sectors for participation in this environmentally friendly program.

**PUBLIC ENTITIES**

Through the Composted Manure Incentive Program, the Texas Commission on Environmental Quality (TCEQ) offers an incentive payment that is available for all Texas state agencies, local governments, cities, counties, regional planning agencies, special districts, school districts, and universities. These entities can employ the dairy compost for erosion control and landscaping purposes, which help to improve water quality throughout Texas.

The incentive payment offers $4 per cubic yard of dairy compost purchased from TCEQ-approved compost facilities. A list of participating compost facilities can be accessed at [http://compost.tamu.edu](http://compost.tamu.edu).

Entities wishing to participate in the incentive program must comply with the guidelines set forth by the Composted Manure Incentive payment:

- Total cost of compost, shipping and application must be a minimum of $6.67.
- The Purchase Notification Form and Grant Application Form must be faxed to TCEQ no later than one week following compost delivery.
- Accurate records should also be kept to ensure proper and efficient use of the dairy compost.

**PRIVATE ENTITIES AND INDIVIDUALS**

Through the Dairy Compost Utilization Project, private producers, such as individual landowners, outside of the Bosque River Watershed and within the Upper Leon, Cross Timbers or Hamilton-Coryell Soil and Water Conservation District (SWCD) are eligible to receive a $3 per cubic yard rebate. Baggers and retail distributors of compost are also eligible to participate in the program.

Private purchasers of dairy compost follow the same TCEQ incentive payment guidelines; however, additional specifications must also be followed in order to ensure proper use of the program and its benefits:

- Land application of compost requires a Texas State Soil and Water Conservation Board certified Nutrient Management Plan.
- Apply for a rebate on a maximum of 4,000 cubic yards of compost.
- Complete a pre and post compost use assessment survey.
CREATING A SUCCESSFUL SPORTS FIELD

One of the keys to establishing a successful sports field is the selection of a good quality soil for the rootzone. Unfortunately, the majority of high school and city park sports fields are currently constructed on native type soils, which may contain excess clay or sand.

Clay soils can compact, which impedes drainage and infiltration of water and causes a reduction in nutrient uptake and root growth. Additionally, compacted soils increase potential for player injury and increase the amount of nutrients, pesticides and water required to properly maintain a quality turfgrass stand. While a good aeration program will help alleviate soil compaction problems, the addition of organic matter in conjunction with aeration is the best method to correct such problems associated with heavy clay soils.

While soils high in clay content are a major problem for growing good turfgrass, soils high in sand content also can be a problem. Although sandy soils are less likely to compact and have better water infiltration and percolation rates, these soils still require an organic matter source to maintain an optimum playing field. Organic-matter deficient, sandy soils have little nutrient and water holding capacity. Increasing this capacity through the addition of organic matter will reduce the amount of fertilizer and water required to maintain healthy turfgrass on the field.

SOURCES OF ORGANIC MATTER

There are many organic matter sources for use on sports fields such as peat, rice hulls, sawdust, composted manures and yard trimmings. Table 1 provides an outline of recommended characteristics to consider when selecting an organic matter source.

COMPOST AS AN ORGANIC MATTER SOURCE

Composting is the biological decomposition of organic materials such as manure to a relatively stable endpoint. Fresh livestock manure is a mixture of urine and feces, varying in chemical and biological composition which is determined by the species of animal and their diet. Because bedding material is consequently harvested with raw manure during traditional collection practices, resulting compost contains additional components such as straw or sand. Biological activity, ventilation and heat generated during the composting process remove much of the moisture in raw manure, reduce odors, and kill most weed seeds and most disease microbes and parasites. In addition, composting reduces the total volume of manure by as much as 50 percent.
Composted manure can be a significant source of essential plant nutrients including nitrogen, phosphorus, potassium, calcium, magnesium and sulfur, as well as, micronutrients such as zinc, iron, copper and manganese. However the nutrient concentrations can vary widely from one manure compost to another. To determine appropriate compost application rates, it is important to obtain laboratory nutrient analysis of the production field and selected compost product. Table 2 shows the average and range in nutrient concentrations in composts made from different materials. The ratio of nutrient concentrations in a compost product is rarely an exact fit for crop needs. In particular, an application of compost that meets nitrogen requirements will often provide excess phosphorus. As a result, compost application rates should be determined based on crop phosphorus requirements and a phosphorus-free inorganic fertilizer should be utilized to complete crop nitrogen and/or potassium requirements.

Nutrient levels in compost are generally organic. Therefore, it is important to account for their slow release rate. Preliminary research using dairy manure compost in the production of warm-season grasses has indicated that nitrogen release rates are in the range of 30-35 percent of total N in the first year with decreasing rates the following years. As a result, fast-growing, high-nutrient demand crops such as corn typically require some amount of supplemental inorganic fertilizer to achieve optimum yields.

In addition to serving as a nutrient source, compost supplies stabilized organic matter, which is an important component of soils. Organic matter serves a special role in soils acting in the formation of very small soil clods, called aggregates, which improve soil structure and tilth, and increase water infiltration and water holding capacity. Organic matter also functions similar to clay in soils by increasing the cation exchange capacity, or the nutrient holding potential of a soil. Increasing soil organic matter with compost or other supplements is particularly important for maintaining soil quality in cropping systems where most of the above-ground biomass is removed, such as silage or hay.

**APPLICATION OF ORGANIC MATTER**

Two primary methods of adding organic matter to sports fields are soil incorporation and topdressing. Incorporation is the most effective method to improve poor quality soils as it provides direct improvement in soil structure, porosity and infiltration rates. Ideally, blend organic matter with soil off site to insure uniform mixing. On-site mixing can create “hot spots”, which are detrimental to plant growth. For best results, thoroughly incorporate 1 to 3 inches organic matter into 6 to 8 inches of soil prior to turfgrass establishment. Always consult a soil test and product analysis to determine exact rates as nutrient content will vary depending on product selection. Add enough product to increase organic matter content to a 2 to 5 percent range for heavy clay soils and up to 5 percent for sandy soils, depending on the type of sand used in construction.

Once turfgrass is established, adding significant amounts of organic matter to the soil becomes difficult. Topdressing with organic matter or a mixture of sand plus organic matter followed by aeration and dragging will help move organic matter into the soil over time. Ideally, apply a $\frac{1}{8}$- to $\frac{1}{4}$-inch layer of an organic matter source during each topdress application. Because cool season grasses are maintained at a higher cut, an application of up to $\frac{1}{2}$-inch may be appropriate.

Applications of organic matter can be made one to three times per year depending on the composition and quality of the product.
Table 1. Recommended characteristics of organic matter sources.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Optimum Range</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>30-50%</td>
<td>Material clumps when excessively wet and is dusty when excessively dry making application difficult.</td>
</tr>
<tr>
<td>Color</td>
<td>Dark brown to black</td>
<td>Sources such as rice hulls, sawdust, yard waste or manures should be fully composted.</td>
</tr>
<tr>
<td>Odor</td>
<td>No foul odor</td>
<td>Material should have an earthy smell.</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>&gt; 25%</td>
<td>Source should have no more than 75% ash content.</td>
</tr>
<tr>
<td>C:N Ratio</td>
<td>≤ 25:1</td>
<td>If C:N is too high, plants may show nitrogen deficiency.</td>
</tr>
<tr>
<td>pH</td>
<td>6-8</td>
<td>A neutral to acidic pH is preferred as some common turfgrass diseases are associated with an alkaline pH</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td>low</td>
<td></td>
</tr>
<tr>
<td>Salinity Level</td>
<td>low</td>
<td>Lab should test for both salt level and salt type.</td>
</tr>
<tr>
<td>Particle Size</td>
<td>3/8 - ½ to incorporate 1/8 - ¼ to top dress</td>
<td>Contaminants such as rock or other debris can damage mowing equipment in topdress material.</td>
</tr>
<tr>
<td>Nutrient Content</td>
<td>low to medium</td>
<td>Nutrient content varies. Establish application rate from soil nutrient requirements, specifically nitrogen and phosphorus, and the corresponding nutrient content of the organic matter source.</td>
</tr>
</tbody>
</table>

Table 2. Average and range ( ) in nutrient values for various composts (McFarland, 2003; Risse, 2003; Brodie et al., 1996).

<table>
<thead>
<tr>
<th>Compost Type</th>
<th>Dry Matter %</th>
<th>Nitrogen (N)</th>
<th>Phosphorus (P₂O₅)</th>
<th>Potassium (K₂O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Manure</td>
<td>70 (58-80)</td>
<td>16 (11-23)</td>
<td>18 (6-31)</td>
<td>21 (8-48)</td>
</tr>
<tr>
<td>Beef Manure</td>
<td>65 (54-72)</td>
<td>10</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Poultry Litter</td>
<td>30 (22-36)</td>
<td>18 (11-25)</td>
<td>31 (11-52)</td>
<td>17 (10-21)</td>
</tr>
<tr>
<td>Municipal Solid Waste</td>
<td>40</td>
<td>24</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>38</td>
<td>26 (6-84)</td>
<td>9 (2-23)</td>
<td>9 (1-65)</td>
</tr>
</tbody>
</table>
WHAT IS COMPOST?

Compost is an organically rich soil amendment produced by the decomposition of waste materials from landscapes, animal feeding operations, municipal wastewater treatment facilities, and food industries. A properly composted product is dark colored and does not resemble the original parent materials. It is generally composed of 50 to 80 percent hemi-cellulose and lignin, which are stable and slow to decompose plant components. The remaining 20 to 50 percent are water-soluble compounds that soil microorganisms quickly break down. Fully decomposed materials do not tie-up plant nutrients when mixed with soil or produce any undesirable odors. Compost provides a slow release source of nutrients; hence, in the past it was called “black gold” by farmers.

BENEFITS

- **Environmentally sound method of recycling plant and animal wastes.** Composting urban yard waste diverts plant materials from municipal landfills, which may reduce homeowners’ utility fees. Composting animal wastes for urban uses removes manure from agricultural watersheds, which may improve water quality in certain impacted rivers and lakes.

- **Compost improves soil physical properties.** Organic matter is an essential component of soil. As compost decomposes in the soil, it releases organic molecules that bind soil particles together increasing soil aggregation. As a result, water and air infiltrate clay-textured soils more easily and sand-textured soils retain more plant available water. Accordingly, these effects improve the root zone environment.

- **Compost can serve as a slow release source of plant nutrients.** Plant tissues or animal manures used to produce compost inherently contain plant essential macro- and micro-nutrients. The composting process retains these nutrients, which are slowly released to plants during their life cycle as the compost decomposes in the soil.

- **Compost increases the nutrient retention capacity of the soil** Compost increases soil organic matter. Soil organic matter provides many cation exchange sites where plant nutrients are protected from being washed from the soil by rainfall or irrigation. The nutrients are held in the soil until they are utilized by the plant. Hence, compost increases the amount of plant nutrients retained in the soil root zone.
Compost suppresses plant diseases
Compost can control or suppress certain soil-borne plant pathogens such as Fusarium, Phytophthora, Pythium, and Rhizoctonia. The use of compost for disease control is theoretically sound, but its mode of action is poorly understood. Control of plant diseases by compost can be explained by five potential modes of action: (1) competition by beneficial microorganisms for space and nutrients; (2) antibiosis where beneficial microorganisms produce antibiotics that kill possible pathogens; (3) predation where beneficial organisms prey and feed on possible pathogens; (4) plant defense activation by elicitors in the composts; and (5) production of by-products in the compost that are detrimental to possible pathogens.

TIPS ON URBAN COMPOST USAGE

Compost quality depends on the feedstock used to produce it. Table 1 provides an outline of recommended characteristics to consider when selecting an organic matter source.

Table 1. Recommended characteristics of organic matter sources.

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<td>Color</td>
<td>Dark brown to black</td>
<td>Feedstock sources such as rice hulls, sawdust, yard waste or manures should be fully composted.</td>
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</tbody>
</table>

As stated in the table above, there are many factors to consider when selecting compost or an organic material. In order to achieve an effective compost application, the nutrient and salinity content and stability of the product and the soil type must be considered.
Product stability is important because compost products can vary widely in their degree of decomposition. A properly stabilized (C:N < 25:1) material prevents nutrient immobilization in the soil. If unstable compost (C:N ratio greater than 25:1) is added to the soil, soil microorganisms will temporarily tie up plant available nutrients in the soil, especially nitrogen, as they break down the unstable organic matter. In the short term, this nitrogen deficiency can cause severe yellowing of plants.

While several organic matter sources exist, not all provide plant essential nutrients as do most composted materials. Typically, composted animal manures have higher nutrient levels than other composted materials. However, understanding the nutrient and salinity content of your product is critical in achieving the maximum benefit from the material. Excessive nutrients, especially phosphorus, can tie up micronutrients in the soil, causing plant deficiencies. Such deficiencies can occur with repeated heavy applications of high phosphorus composts. Certain poultry litter composts may contain excessive salinity, which can be detrimental to seed germination, stunt plant growth and cause premature death.

Most soils can benefit from the addition of compost, but clay and sandy soils benefit more than loamy soils. Regardless of the soil type, it is important to begin with a laboratory analysis of the soil in order to determine pH, salinity, fertility levels, organic matter content and soil texture. The Texas Cooperative Extension’s Soil, Water & Forage Testing Laboratory, accessible by the Web at http://soiltesting.tamu.edu, can provide a soil analysis that identifies existing nutrient levels in the soil, recommends additional fertility requirements, and identifies potential salinity problems. If the soil already contains high levels of phosphorus and nitrogen, it is best to use low-nutrient compost, such as composted municipal yard trimmings.

**APPLICATION OF COMPOST**

Compost is most easily used as a topdress for lawns and professional turf or as a mulch for bedded areas. Applying compost to the surface of the soil will reduce the risk of nitrogen immobilization by soil microbes due to unstable organic matter (C:N > 25:1). The compost will continue to decompose slowly on the soil surface. Rain and irrigation water will wash nutrients and organic compounds into the root zone. During the next growing season, this organic matter can be safely mixed into the soil prior to planting.

If the compost is stable and of good quality (as indicated in Table 1), then incorporating the material is the most effective method of adding organic matter to the soil profile. Prior to application, kill any existing perennial weeds, such as Bermudagrass, with an appropriate herbicide. After two weeks or effective weed kill has been established, cultivate soil with a roto-tiller to remove annual weeds and rocks and breakup compacted areas. Apply a one to four inch layer of compost to the cultivated soil and incorporate to a depth of eight to 12 inches. Initially, determine nutrient content of soil and compost, and, if necessary, apply synthetic fertilizers to meet additional nutrient requirements of selected vegetation. Also, apply lime or other soil amendments at this time if necessary. Rake and level soil surface to establish a smooth, firm planting bed and finally, plant seeds or transplants directly into prepared soil.