Using Compost to Establish New Landscapes

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Dairy Compost Utlization

Establishment of a healthy landscape involves more than selecting plants that will thrive in the intended location and climate. Dedicating substantial effort towards soil and landscape preparation will ensure that turf and other ornamental plants are better prepared for long-term healthy growth.

Typically in a newly constructed home or business landscape, the surrounding soil is severely disturbed and often, the subsoil and construction debris are mixed with or completely replace the original top soil. Ornamental plants and turf grasses planted in these disturbed soils may perform well in the short term due to abundant watering and fertilization, but they frequently decline with time when heat and drought stress become prevalent. Turf grass, perhaps is the single most important plant established in a new urban landscape due to the large area it occupies and its ability to protect the soil surface from erosion. Installation of sod following construction of a new home or business is an effective way to quickly protect soil that was severely disturbed and degraded by the construction process.

The aesthetic value and environmental protection of vegetation, however, is only as good as the landscape in which it is planted. Thus, the best time to amend and/or improve your landscape is before establishing any ornamental plants or turf grass. By incorporating organic amendments prior to vegetation establishment, soil properties such as organic matter, water holding capacity, fertility and buffering capacity can be enhanced. Dairy manure compost is one type of organic amendment that can be utilized to improve the soil.

Following construction of a new home or business, many times little effort is put towards landscape preparation, particularly the soil. Mixing dairy manure compost in the landscape prior to establishing vegetation, will enhance soil properties and prepare turf and ornamental plants for healthy growth.

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 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.

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Table 1. Recommended characteristics of an organic matter source, specifically compost

Parameter	Optimum Range	Considerations
Moisture Content	40-50%	Material clumps when excessively wet and is dusty when excessively dry making application difficult.
Color	Dark brown to black	Feedstock sources such as rice hulls, sawdust, yard waste or manures should be fully composted.
Odor	No foul odor	Material should have an earthy smell.
Organic Matter	≥ 25%	Source should have no more than 75% ash content.
C:N Ratio	≤ 25:1	If C:N is too high, plants show nitrogen deficiency.
pH	6 - 8.5	
Heavy Metals	low	
Salinity Level	low	Lab should test for both salt level and salt type.
Particle Size	⅜ - ½ to incorporate ⅛ - ¼ to top dress	Contaminants such as rock or other debris can damage mowing equipment in topdress material.
Nutrient Content	low to medium	Nutrient content varies. Establish application rate from soil nutrient requirements, specifically nitrogen and phosphorus, and the corresponding nutrient content of the organic matter source.

APPLICATION OF COMPOST

Application rates of compost will vary depending on nutrient content of the compost and the soil. The nutrient concentrations can vary widely from one manure compost to another as noted in Table 2. Thus, 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.

Once an application rate is determined, it is best to incorporate the compost 4 to 6 inches into the soil for best results. Because most vegetation established in landscapes will be permanent, (ie. turf grass), this will be the only opportunity to amend your landscapes surface and subsoil.

BENEFITS OF ESTABLISHING LANDSCAPES WITH DAIRY MANURE COMPOST

Scientists at the Texas A&M Agricultural Research and Extension Center in Dallas evaluated soil characteristics and plant performance following three dairy manure compost application rates (2, 4 and 6 lbs per ft^2) to construct new landscapes. Assuming an average density of 1,100 lbs per cubic yard, these rates are equivalent to applying compost at ½, 1 and 1-½ inches, respectively, to the surface of the soil. The compost was then incorporated or mixed into the soil at a 3 inch depth. Given the nutrient content of the dairy manure compost, all three applications supplied large amounts of N, P, and K to the soil.

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

Compost Type	Dry Matter	Nitrogen (N)	Phosphorus (P_2O_5)	Potassium (K_2O)
	%	lbs/ton		
Dairy Manure	**70 (58-80)**	**16 (11-23)**	**18 (6-31)**	**21 (8-48)**
Beef Manure	65 (54-72)	10	22	28
Poultry Litter	30 (22-36)	18 (11-25)	31 (11-52)	17 (10-21)
Municipal Solid Waste	40	24	15	6
Yard Trimmings	38	26 (6-84)	9 (2-23)	9 (1-65)

Water infiltration and moisture content. Water infiltration in the silty clay soil at Dallas was significantly increased by application of dairy manure compost 18 months after application. Consequently, rainfall and irrigation water infiltrated the compost-amended plots more quickly reducing the possibility of loss due to runoff or evaporation. This suggests that soil moisture levels following rainfall or irrigation would be elevated in the compost-amended plots, especially in the subsoil where water was able to infiltrate more easily.

Soil Compaction. Soil resistance measurements in the upper 8 inches were significantly reduced with the addition of dairy manure compost—especially with the highest rate of 6 lb per ft^2. Reduced penetration resistance in soil can increase root length by making it easier for roots to expand into the soil. Soil resistance is influenced by soil moisture, especially in clay soils like those in these study plots. It is likely that increased subsoil water content in the compost-amended plots reduced soil resistance measurements.

Soil Fertility. One of the greatest advantages of dairy manure compost is that it is a safe source of nearly all the essential plant nutrients, including some (Fe, Zn, Cu) that are frequently limiting in calcareous soils typical of the Blacklands Resource area. Continued availability of essential plant nutrients in compost-amended soils is one of the reasons it makes sense to use a large application of compost when initially establishing urban landscapes. As the compost organic matter continues to mineralize over subsequent growing seasons, there will continue to be an elevated concentration of plant available nutrients in the compost-amended soils, which reduces the need for subsequent fertilization.

Plots at the Texas A&M Agricultural Research and Extension Center in Dallas compared various rates of dairy manure compost to establish landscapes of turfgrass and perennial and annual ornamental plants.

Soil Phosphorus. Consequently, the continued source of plant nutrients provided by compost can also potentially pollute water quality. Phosphorus is the primary nutrient of concern because excessive soil P can reduce surface water quality when soluble and particulate

forms of P reach surface water bodies. Dairy manure compost applications significantly increased soluble P in the soil in the Dallas Study. The plant available P in the upper 3 inches of compost-amended plots exceeded the critical P level (45 mg per kg) for soils, demonstrating that even modest applications of dairy manure compost can supply adequate P. Large dairy manure compost applications (more than 6 lb per ft^2) may actually add excessive P to the soil. Consequently, large repeated applications of dairy manure compost should be avoided because they can elevate soil P to levels that increase the risk of surface water quality degradation.

Dr. Cynthia Mckenney of the Texas A&M Agricultural Research and Experiment Station at Dallas discusses the use of dairy manure compost to establish newly constructed landscapes at the center's annual turf and ornamental field day.

Ornamental Plant Response. In general, the annual and perennial plants demonstrated positive responses to dairy compost applications. Out of all ornamental plants evaluated, Lantana had the greatest response to compost, followed by Pentas (Egyptian Star flower) and Dwarf Burford Holly. Their was sufficient evidence in the plant growth indicators to conclude that incorporation of dairy manure compost into the soil when establishing an urban landscape improved subsequent establishment and growth of ornamental plants.

Turf grass Response. Dairy manure compost significantly increased Bermuda grass color and quality ratings during the first year after application and also increased turf density during the later part of the growing season. The greatest effect on turf color, density, and quality ratings occurred during the second year after application, but the effects were still visible after 3 years, especially for color and quality ratings. In the absence of additional supplemental fertilization, Bermuda grass growth was significantly increased by dairy manure compost. The large effect of dairy manure compost on Bermuda grass ratings was mostly due to the large amount of N, P, K and micronutrients supplied by the compost.

CONCLUSION

Based on the data, there was ample evidence to conclude that amending an urban soil with an abundant amount of dairy manure compost prior to installing ornamental and turf plants will improve the long-term performance of those plants. Turf grass benefits, for example, persisted 3 years after application with no additional fertilization. The increased performance is probably due to greater levels of soil fertility, including major and minor essential plant nutrients, and improved soil physical properties, such as increased water infiltration and reduced soil compaction. Large repeated applications of dairy manure compost should be avoided to prevent excessive accumulation of soil phosphorus. However, given proper soil test results, an application of 2 to 4 lbs per ft^2 dairy manure compost (equivalent to ½ to 1 inches) is a very effective way to create and sustain a high-quality urban landscape.