Using Organic Matter to Improve Sports Fields

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Dairy Compost Utilization

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 root zone. Unfortunately, the majority of high school and city park sports fields are currently constructed on native type soils, which may contain clay or sand to a degree that affects the ability to grow and sustain quality turfgrass.

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.

Breckenridge High School employees apply inorganic nitrogen fertilizer to the football practice field after composted dairy manure was applied. Supplemental nitrogen is often required because the nutrient ratio in compost is rarely an exact fit for turfgrass needs.

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.

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

Parameter	Optimum Range	Considerations
Moisture Content	30-50%	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	A neutral to acidic pH is preferred as some common turfgrass diseases are associated with an alkaline pH
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.

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 sports field and selected compost product. Visit: http://soiltesting.tamu.edu for more information about laboratory analysis. 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 rate should typically 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% of total N in the first year with decreasing rates the following years. As a result, fast growing, high nutrient demand crops typically require some amount of supplemental inorganic fertilizer to achieve desired growth.

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 Waste	38	26 (6-84)	9 (2-23)	9 (1-65)

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.

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% range for heavy clay soils and a 10 to 20% range for sandy soils, depending on the type of sand used in construction.

A scarab mixes the dairy manure during the composting process to aerate the windrow which ensures proper composting.

Once turfgrass is established, adding significant amounts of organic matter to the soil becomes difficult and will require multiple years of application. 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 ⅛- to ¼-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 ½-inch may be appropriate.

Applications of organic matter can be made 1 to 3 times per year depending on the composition and quality of the product. Due to nutrient composition of dairy manure compost, it typically provides more phosphorus than the turfgrass requires. Thus, soil tests must be conducted prior to multiple compost applications in subsequent years.

Santo High School Football Field Improved with Dairy Compost

A Texas Cooperative Extension employee spreads compost on the Santo High School football field to help improve the field's playing surface.

The Fighting Wildcats of Santo High School, Santo, TX, implemented a sports field management plan in 2004 with the help of Texas Cooperative Extension to improve its football field. The plan included mechanical aeration of the football field, a top-dress application of dairy manure compost and inorganic nitrogen fertilizer, timely applications of irrigation and efficient weed control practices.

District employees uniformly applied dairy manure compost to the field's surface at a rate of 80 tons per acre. As the season progressed, the field received two additional applications of 20 pounds per acre of inorganic nitrogen fertilizer.

The treatments and timely maintenance combined to give the field better grass density, health, color, and overall appearance. Ray Hollis, Santos ISD maintenance supervisor noted that the football players liked the added cushion of the healthy turf stand, which helped when falling during play.

For more information on the Santo ISD Football field dairy manure compost demonstration, visit http://compost.tamu.edu/demos_palopinto.php.