Composting NEWS

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Economics of 'green' compost used as a turf topdressing

WHEN assessing the value of compost in some applications, we must consider not only the physical chemical and biological benefits in general, but also the value it can lend to reduced chemical fertilizer, pesticide and irrigation costs. In some cases, these benefits are simply the 'icing on the cake,' extra benefits which help to secure the sale with new potential end users. In other cases, specific economic values can be assigned, and thus factored into the sale price of the compost. Obviously though, the value of some of these benefits are difficult to quantify (e.g. irrigation reduction). The example that follows, which outlines the use of compost as a turf topdressing, begins a dialogue on how to quantify the benefits of compost in a particular application.

Fertilizer

Most composters have avoided comparing their compost products to chemical fertilizer, since the cost of chemically-based nutrients are almost always cheaper on a weight for weight basis than those found in compost. Further, the nutrient content of composts can vary to some degree, based on feedstock variability, moisture content, etc., thereby making it difficult for the composter to guarantee the specific content of nutrients on a 'load per load' basis. Often, composters will provide the minimum, or the average, nutrient content values to end users and then work hard to create consistent products. However, composters can raise the innate value of their compost products, by promoting composts which possess a significant nutrient content (e.g. one per cent nitrogen by wet weight), especially if they are trying to service the turf management industry. This industry often utilises slow release nitrogen sources — a feature that all composts possess.

In contrast, modern agricultural production favours quick release nutrient sources (e.g. nitrogen in the form of sulfate of ammonia) that are typically much less expensive than their slow/controlled release counterparts (e.g. methylene urea) used in higher value turf management. The turf industry may spend two to two and a half times more money to purchase compound fertilizers that contain slow release forms of nitrogen, because they feed the turf over a longer period of time. This makes compost-based nitrogen sources a viable alternative to slow release chemical fertilizers. Although the composting industry is not going to sell compost into the turf market as a direct replacement for fertilizers, it could help composters gain additional value from compost sold for its innate content of slow release nutrients (nitrogen). So there's additional intrinsic value that can be attained from compost, if we can explain how it compares to slow release fertilizers.

Fertilizers can contain macronutrients and/or micronutrients. There are three nutrients typically considered to be macronutrients, namely nitrogen, phosphorus and potassium. These nutrients are needed by plants in larger quantities, than are the micronutrients (e.g. copper, iron, etc.). Most chemical fertilizers contain primarily 'N:P:K', whereas compost contains these three nutrients plus all of the micronutrients too.

Artificial fertilizer formulations vary depending on the end use of the product. Nitrogen (N) is reported as the percent Total Nitrogen, and the percent of the Phosphorus (P) and Potassium (K) are reported as diphosphorus pentoxide (P_2O_5) and potassium oxide (K_2O). A fertilizer containing 12 per cent N, 3 per cent P_2O_5, and 24 per cent K_2O for example, would be marketed as a 12:3:24 fertilizer. Nutrient content in fertilizers is reported on an 'as is' (wet) basis, but this is somewhat misleading, since granular fertilizers contain little if any water. The remainder of the fertilizer product is usually inert material, but may also contain one or more of the micronutrients.

Comparison of Compost and Chemical Fertilizer Nutrients

Fertilizers on the market today are sold with a guaranteed N:P:K value. For example, two newer fertilizer formulations used on sports pitches are 12-3-24 and 3-3-32, and they contain high quality, controlled slow release nitrogen sources. These products are often applied at a rate of 300 kg per hectare. At these rates, the 12-3-24 product provides:

- 36 kg/hectare of nitrogen*
- 9 kg/hectare of phosphorous
- 72 kg/hectare of potassium

*Calculation example: 300 kg/hectare fertilizer x 12% nitrogen fertilizer = 36 kg/hectare of nitrogen

The 3-3-32 product provides:

- 9 kg/hectare of nitrogen
- 9 kg/hectare of phosphorous
- 96 kg/hectare of potassium

Perhaps more common fertilizers used within the sports turf industry include a 12-6-6 or 12-3-9, used in the spring/summer, and 3-12-12, used in the autumn. These products contain quick release forms of nitrogen, and therefore, are much less expensive than the controlled release products (costing as little as £0.50 per kg). These products would also be applied at a 300 kg per hectare application rate.

A compost possessing a typical nutrient ratio of 0.8-0.3-0.6 (percent nitrogen to phosphorous to potassium, on a wet weight basis) with a 37 per cent moisture content (remember that most dry fertilizers are near zero percent moisture), and applied at 62 cubic metres per hectare (a typical 6 mm topdressing rate), will provide:

- 210 kg/hectare of total nitrogen - approximately 21 kg/hectare of available nitrogen (typically estimated at 10 per cent availability the first year)
- 79 kg/hectare of total phosphorous - approximately 12 kg/hectare of available phosphorous (typically estimated at 15 per cent availability the first year)
- 157 kg/hectare of total potassium - approximately 126 kg/hectare of available potassium (typically estimated at 80 per cent availability the first year) during the first year of application.

Using this example, you can see that using compost at a common topdressing application rate can often provide enough nutrients to replace a typical application of chemical fertilizer!

Fungicide

Research has shown that many composts possess disease (fungal) suppressive properties. Various Ohio State University (USA) research studies completed throughout the 1980s and 1990s (various references), primarily spearheaded by Dr. Harry Hoitink, have even identified the specific modes in which suppression occurs. Commercial labs in the US are now testing compost for microbial populations in order to help predict disease suppression.

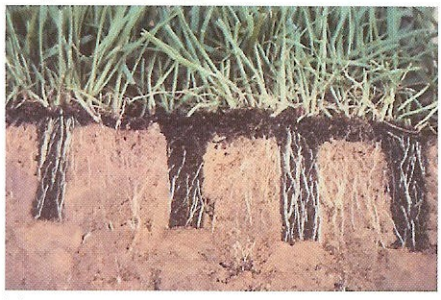
It is also important to understand that compost provides "preventative" disease control, and not "curative" control. Further, biological controls are also often less predictable than chemical products. Chemical fungicides, however, are not always effective either. All pesticides sold in the UK must be registered through DEFRA. Although specific disease suppression claims cannot be made by compost producers, without proper registration, DEFRA allows the following to be stated "This product is not a pesticide. However, it contains low levels of naturally-

occurring soil micro-organisms which may help to suppress soil-borne populations of some plant diseases." Although specific claims cannot be made, research and practical experience has shown that the use of disease suppressive composts could replace, or reduce, the use of fungicides in many turf maintenance scenarios.

Specific chemical fungicides can work as either preventatives or curative, and some possess both properties. Fungicides can be costly to apply, with preventative fungicides such as Myclobutonil and Fenaramol costing £450 to £750 per hectare (we are using £600 per hectare in the example below as a realistic average price). There can be a huge variation in the cost of different fungicides, based on application rate, product type, mode of action, etc. However, the cost figures above, estimate the two fungicides used at a 6 to 8 litre per hectare application rate, at a price of £75 to £100 per litre.

It should further be noted that all fungicides have a specific period of time in which they are effective 'in control', typically being a two to four week period, whereas compost may provide its preventative disease control for months at a time, under the proper conditions.

Topdressing



Many composters market their end products as turf topdressings, which are used on golf course fairways, sports pitches and even home lawns. Topdressings physically improve the soil structure, improving drainage and aeration, and may also be used to incorporate organic matter. This application has developed into an excellent niche market for compost, especially since there is little competition against compost in these markets (except for more expensive sand-based topdressings developed for golf tees and greens). It should be understood that neat compost (unblended) is not a true replacement for the sand-based topdressings used on golf course greens, or in applications where the topdressing will be used to physically (structurally) fill in deep divots. However, compost can be an ideal topdressing for large area applications (golf fairways and sports pitches) where the cost of sand-based topdressings may preclude its usage. Furthermore, many composters are now blending their composts with industry standard sands to create high value topdressings that possess fertilizing and disease suppressive properties from the compost. Green composts can be considered as alternatives to peat and topsoil in standard sand-based topdressings.

In the golf industry, sand-based topdressings cost approximately £25 to £32 per tonne, delivered, and similar products used to construct tees and greens (using less expensive sand) costs approximately £15 to £20 per tonne, delivered. Compost may be sold at a price of say £16 to £17 per cubic metre, delivered. One tonne of sand-based topdressing is the same approximate volume as one cubic metre of compost, since compost possesses approximately half the bulk density of a sand-based topdressing. Typically, in sports pitch topdressing applications, sand-based topdressings are applied at a 3, 6 or 12mm application rate, depending upon the requirements of the project and available funds.

Replacement Values

The cost to use compost as a topdressing might be £1,023 per hectare, or £102.30 per 1,000 square metres, when applied at an approximate 6mm application rate (or 62 cubic metres per hectare). When considering the potential fertilizer and fungicidal benefits of compost, and its value as a replacement for sand-based topdressing (actually using a less expensive tee/green construction mix as the topdressing), the cost is only 50 per cent of a typical sand-based topdressing.

Relevant product costs are found in Table 1. They represent products used by many turf managers, and those which may be replaced if compost is used as a topdressing.

Table 1 – Relevant Product Costs

Product	General Costs	Area Costs
Sand-Based Topdressing[a]	£25 to £32 per tonne (estimated as £28.50 per tonne for economics)	£1,767/hectare or £176.70/1,000m^2
Sand-Based Tee/Green Construction Mixes	£15 to £20 per tonne (estimated as £17.50 per tonne for economics)	£1,085/hectare or £108.50/1,000m^2
Compost (used as Topdressing)[a]	£16 to £17 per cubic metre (estimated as £16.50 per metre for economics)	£1,023/hectare, or £102.30/1,000m^2
Fertiliser[b] (controlled release nitrogen)	£1.25 to £1.30 per kg (estimated as £1.27 per kg for economics)	£381/hectare, or £38.10/1,000m^2
Alternate Fertilizer (quick release nitrogen)	£0.50 per kg	£150/hectare, or £15.00/1,000m^2
Fungicide[c]	£75 to £100 per litre (estimated as £75 per litre for economics)	£600/hectare, or £60/1,000m^2
Seed	£5 per kg (Dwarf Perennial Ryegrass)	£833/hectare, or £83.30/1,000m^2

[a]Applied at 6mm, or 62 metres/hectare)
[b]Using earlier example, compost with a nutrient ratio of 0.8-0.3-0.6 applied at 6mm layer and an autumn 3-3-32 fertilizer applied at 300kg/hectare
[c]Using Myclobutonil (at 8 litres/hectare) or Fenaramol (at 6 litres/hectare)

A detailed cost comparison can be developed (Table 2) using these estimated cost figures. This comparison illustrates that a compost topdressing can fulfill the function of three products normally used in the management of high quality turf (a physical topdressing, with fertilizing and disease suppressive properties). These figures illustrate that compost used in a turf topdressing application may be able to fulfill a cultural and economic niche within the sports turf industry.

Going one step further, and using football pitch experience from the Northeastern region of the US, the use of compost as a sports pitch topdressing allowed the managers of the largest sports pitch venue in New England to reduce the amount of grass seed it used by two-thirds (Compost for turfgrass: multifaceted organic ally, Sports Turf Magazine, August 2005).

Dwarf Perennial Ryegrass is commonly used on sports pitches in the UK. At an application rate of 167 kg per hectare, the cost of treating a hectare would be £833. Even if the use of compost would decrease the application rate of grass seed by only fifty percent, that would further save the sports turf manager an additional £400 per hectare.

Obviously, different cost figures and application rates could be used within the economic comparison within this paper, based on specific project requirements. That said, it is obvious that significant cost savings can be obtained through the use of compost in the management of sports turf.

To determine how much money you or your customers could potentially save using compost, use the difference between the 'per 1000m^2' cost figures (for example in the example shown within this report, £289.90 - £143.95 = £145.95) and multiply it with the size of the turf area to be treated in 1000m^2 increments (e.g. for a 6,000 m^2 pitch, for the example used one would simply multiply 6 x £145.95, for a 8,000 m^2 pitch, multiply 8 x £145.95). Also, where appropriate, you can substitute the cost of the controlled release fertilizer products, with the quick release ones.

Table 2 – Cost Comparison on a 1000m^2 Basis

Product Costs	Sand-Based Topdressing	Compost used as Topdressing
Topdressing (using tee/green construction mix as the topdressing)	£108.50	£102.30
Autumn Fertilizer (controlled release nitrogen)	£38.10	£0
Fungicide	£60	£0
Total Costs	**£206.60**	**£102.30**
Grass Seed	£83.30	£41.65
Total Costs (with grass seed)	**£289.90**	**£143.95**

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