# Economics of Using Composted Dairy Manure

*Dairy Compost Utilization*

A variety of soil amendment products and potential nutrient sources provide flexibility for agricultural and horticultural systems. However, comparing the cost and value of these different soil amendments is not as simple as it might seem. Dairy manure compost, for example, supplies not only the major nutrients (nitrogen, phosphorus and potassium) but also a broad range of secondary nutrients, micronutrients and organic matter. These plant nutrients have an economic value, which can be utilized to estimate compost value for comparisons with traditional fertilizer materials. Organic matter applications, such as dairy manure, can also improve soil's water and nutrient holding capacity, reduce erosion and reduce fluctuations in soil pH.

Nutrients in compost products are more stable and typically released gradually over three or more years; whereas inorganic fertilizers are generally formulated to release nutrients within a year of application. Thus, a realistic assessment of compost value requires at least a three-year time frame. Also, since compost nutrient ratios and release rate may not be optimal for crop needs, some supplemental inorganic fertilizer (particularly nitrogen) may be necessary.

The following information provides steps to determine the economic feasibility of utilizing dairy compost as an alternative or a supplement to inorganic fertilizers.

## STEP 1: UNDERSTAND NUTRIENT REQUIREMENTS AND AVAILABILITY

Soil nutrition specialists price nutrients on a per pound of nutrient basis; thus, dairy compost can be valued based on nutrient content. Before using dairy compost or any soil amendment, obtain a nutrient analysis of the material from the supplier or a local testing laboratory. Knowing the nutrient content will be valuable in determining application rates. A local County Extension Agent will be able to provide information on obtaining such analysis. Compost releases its nutrients slowly (over several years) as the material decomposes, while inorganic fertilizers typically release everything in one year. Table 1 presents nutrient availability from dairy manure compost over a three year period.

Table 2 presents basic costs associated with purchasing, transporting and applying dairy manure compost. Combine this information with table 1 to determine the initial value and cost of utilizing dairy manure compost.

**Table 1. Estimated nutrient availability from 1 ton of dairy manure compost**

| Nutrient | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| | | lb | |
| N | 9.38 | 4.69 | 2.34 |
| $P_2O_5$ | 12.20 | 6.10 | 3.05 |
| $K_2O$ | 15.90 | 7.95 | 3.98 |

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PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY
The preparation of this report was financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

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**Table 2. Estimated costs related to the purchase, transportation and application of compost**

| Service | Price |
|---|---|
| Compost FOB | $10 per ton |
| Application | $2 per ton |
| Transportation | $2.50 per loaded mile |

## STEP 2: DETERMINE SPECIFIC NUTRIENT REQUIREMENTS

In addition to determining the nutrient content of the dairy manure compost, it is equally important to obtain a soil sample analysis of the intended application site. With the soil sample results, a local County Extension Agent can provide nutrient recommendations for a given crop or advise which nutrients are critical for a specific growing season.

With this information, you can estimate the costs associated with meeting specific nutrient requirements. Table 3 presents a cost analysis of utilizing inorganic fertilizer to meet specific requirements and since compost mineralizes over several (three) years, the cost analysis in Table 3 is evaluated over a three-year period.

## STEP 3: DETERMINE APPLICATION RATE

Information about your soil and the compost discussed in Steps 1 and 2 provide a means to determine the application rate for composted dairy manure that would best meet nutrient needs of your desired crops. The selected rate typically satisfies the smallest of the NPK requirements (usually P) for an entire three-year cropping period. The analysis will also reveal whether there is anything about the compost that would require a lower rate of application, such as pH or salt content.

Once the compost application rate is determined, an inorganic fertilizer application may be recommended (primarily N) to maintain the best nutrient balance for your crops over the three year period.

**Table 3: Example nutrient recommendations following soil analysis and cost of using an inorganic fertilizer to meet nutrient requirements**

| | Soil Test Recommendations | Nutrient Cost | Year 1 Cost | Year 2 Cost | Year 3 Cost | Total Cost[1] |
|---|---|---|---|---|---|---|
| | lb/A | $/lb | $/A | | | |
| N | 300 | $.29 | $87 | $87 | $87 | $261 |
| $P_2O_5$ | 100 | $.23 | $23 | $23 | $23 | $69 |
| $K_2O$ | 300 | $.15 | $45 | $45 | $45 | $135 |
| Spreading | | | $3 | $3 | $3 | $3 |
| Hauling | | | 0 | 0 | 0 | 0 |
| Total | | | $158 | $158 | $158 | $474 |

[1] Excludes the per Acre Cost of an optional Nutrient Management Plan

## STEP 4: CALCULATE COST BENEFIT OF COMPOST AS A NUTRIENT SOURCE

Once nutrient recommendations and application rates are determined, a cost comparison can be developed. In this example, the per-acre cost of fertilizing coastal Bermudagrass at an agronomic rate with inorganic fertilizer alone to the cost of doing so with composted dairy manure supplemented by inorganic fertilizer is presented.

Table 4 provides a preliminary TAMU cost analysis for application of typical composted manure with the nutrient release rates shown in Table 1, along with the added cost of supplemental inorganic nitrogen applications in each of the three years. Because the transportation cost of compost is a significant part of its total cost, Table 4 provides three separate cost estimates representing the hauling cost at a distance of 10, 20, and 30 miles.

**Table 4. Estimated costs at 3 distances (10, 20 and 30 miles) of using dairy compost with supplemental inorganic fertilizer as a nutrient source for coastal Bermudagrass production**

| Year | Application Rate | Hauling Distance | Hauling Cost | Compost[1] | Supplemental Inorganic Fertilizer | Total[2] |
|---|---|---|---|---|---|---|
| | ton/A | miles | | $/A | | |
| 1 | 16 | 10 | $15.50 | $192 | $43.50 | $251.00 |
| 1 | 16 | 20 | $31.00 | $192 | $43.50 | $266.50 |
| 1 | 16 | 30 | $46.50 | $192 | $43.50 | $282.00 |
| 2 | 0 | | | | $65.00 | $65.00 |
| 3 | 0 | | | | $87.00 | $87.00 |

[1] Includes both cost of material and cost of application
[2] Excludes the per Acre Cost of an optional Nutrient Management Plan

Table 5 provides the net benefit or net saving of using compost as a primary nutrient source (at three different hauling distances) over a three year period. The net savings was calculated by subtracting the cost of utilizing compost supplement with inorganic fertilizer (Table 4) from the higher cost of utilizing inorganic fertilizer alone (Table 3). In this example, a combined program of compost and supplemental inorganic nitrogen fertilizer saves the producer approximately $40 to $71 per acre.

Note the cost of transportation is an important consideration. In this example, the cost of using the compost with supplements is equal to the cost of using inorganic fertilizer alone when the compost is transported 56 miles.

**Table 5. Estimated cost comparison of a compost & supplemental inorganic fertilizer program to an inorganic fertilizer alone program. Savings are presented on a per acre basis and are calculated over a three year period**

| Distance | Compost Cost[1] | Supplemental Fertilizer Cost | TOTAL[2] Compost & Supplemental Fertilizer | TOTAL[2] Inorganic Fertilizer Only | Savings from Compost |
|---|---|---|---|---|---|
| miles | | | $/A | | |
| **10** | $208 | $196 | $403 | $474 | **$71** |
| **20** | $223 | $196 | $419 | $474 | **$56** |
| **30** | $239 | $196 | $434 | $474 | **$40** |

[1] Includes cost of transportation and application of compost
[2] Excludes the per Acre Cost of a Nutrient Management Plan

## STEP 5: ESTIMATE THE ADDITIONAL VALUE OF COMPOST

The cost benefit estimated in Table 5 considers only the nutrient value of composted dairy manure. Dairy compost can provide economic benefits in addition to nitrogen, phosphorus and potassium. For example, compost applications can supply the soil and plants with secondary macronutrients and micronutrients. Also, water holding capacity of soil may be improved following the addition of organic materials, such as dairy compost, resulting in a decrease in irrigation costs. When mixed with a coarse mulch material, such as woodchips, dairy compost may also provide erosion control and support vegetation establishment, which may further reduce erosion. Finally, when utilized to establish landscapes, dairy compost may improve long-term performance of ornamental and turf plants.

If any of these additional benefits potentially provide a significant savings for your intended use, you may wish to experiment with composted dairy manure and determine the cost benefit for your particular application. A County Extension Agent can help with selecting a compost application rate to serve some of these purposes in addition to supplying nutrients.

For additional information on the use of compost, visit http://compost.tamu.edu.