Pre-Consumer Food Waste Diversion at Monona Terrace

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EXECUTIVE SUMMARY

The establishment of a pre-consumer food waste composting project at Monona Terrace was a great success. Due to a special set of circumstances, diverting pre-consumer food waste from the landfill to an off-site composting project reduced waste management costs, avoided methane production, and empowered the staff of Monona Terrace.

The Director of Operations for Monona Terrace, Gregg McManners and the General Manager of Monona Catering, Patty Lemke, both took part in the planning stages and established strong support for the project at the executive level. The Executive Chef, Matt Reichard was the direct overseer of the project and played a key part in introducing the project and enabling the employees to take ownership in its success.

After only nine months of implementation, the project has diverted 11.4 tons of food scraps that saved $1,473 and avoided 9.7 tons of CO₂ equivalent.

The analysis revealed that for each pound of food transported to a composting facility, emissions from transportation will be offset by methane avoidance if the site is within 0.1 miles. This assumes a diesel truck with a fuel mileage of 6 miles per gallon. An equation is provided in the conclusion to aid future projects.

It is important to note that without partnering with We Conserve, an environmental stewardship initiative at UW-Madison, the project would have increased waste management costs. Also, Monona Terrace will continue the project in collaboration with the University of Wisconsin-Madison and We Conserve past the grant period.

KEY TERMS

CO₂ Equivalent: A metric developed by the United States Environmental Protection Agency to equate greenhouse gas emissions. Landfilling produces large amounts of methane that is 20 times more effective at trapping heat than CO₂. The equivalence eases carbon footprint tracking efforts.
Pre-consumer food waste: Food scraps generated in the preparation of meals. A sign of acceptable scraps can be seen in Appendix B. Food waste that has been served is not considered in this report.

**PROJECT DESCRIPTION**

This project was carried out to assess the feasibility of pre-consumer food waste composting as a means of landfill diversion for organizations and businesses interested in such endeavors. The economic, social, and environmental impacts of kitchen scrap composting are considered to offer a well-rounded assessment of feasibility.

Food wastes represent the single largest component of municipal solid waste reaching landfills and incinerators in the United States. Diverting this material from landfills saves space and reduces emissions of methane. Reducing landfill contributions should follow a food waste recovery hierarchy (U.S. Environmental Protection Agency, 2010) shown in Figure 2 below. This project dealt specifically with meal preparatory waste which could not be used for other purposes.

![Food waste recovery hierarchy provided by U.S. EPA.](image)

This project outlines the process of implementing a project and follows the experiences of Monona Terrace Community and Convention Center in Madison, Wisconsin that produces approximately 600 pounds of pre-consumer food waste each week. Over eight months, approximately 62,000 full meals were served or 1,937 meals per week.
TIMELINE

JULY

First meeting with Director of Operations of Monona Terrace, General Manager of Monona Catering, and Executive Chef of Monona Catering

Project guidelines and leadership set: kitchen scraps to be collected in bins without bags to reduce waste, pick-up of waste to occur once weekly, Executive Chef to oversee project directly

Meeting with Executive Chef

Determined acceptable food wastes, bin location, and instruction sign size, design, and content

Visit to composting site with Executive Chef

AUGUST

Executive Chef instructs staff to separate waste following guidelines determined in July

A set of instructional signs are posted and bins are put in convenient locations in the kitchens (see Appendix B for picture of sign).

Food waste collection, transportation, and composting begins

SEPTEMBER – APRIL

Project is self-sufficient; bins are picked up on a weekly basis

PROJECT PROCEDURE

The food waste was collected in 55-gallon bins that were placed in key locations in the kitchen with signs posted above them. The sign can be seen in Appendix B. It outlines in picture and bilingual format wastes to go into the compost bin and wastes to go into the trash bin. Each week, the food materials were picked up and transported by the University of Wisconsin-Madison Physical Plant. These trips serviced several pick-up locations including the Wisconsin Union and University of Wisconsin Hospital. Individual trips for Monona Terrace were not made, reducing the mileage per ton of food transported greatly.
After pick-up, the bins were hand washed by Monona Catering employees, a process applied to all waste bins regardless of contents.

**ANALYSIS**

**ENVIRONMENTAL**

Food scrap tonnage was calculated using the estimated weight of each bin collected: 100 pounds, determined by weighing the amount of food scraps needed to fill a quarter of the 55 gallon bin and multiplied by four, and the number of bins collected each week, reported by Campus Waste and Recycling.

The CO\textsubscript{2} equivalent (CO\textsubscript{2}E) is a metric used by the United States Environmental Protection Agency to equate greenhouse gases. Composting the waste in an aerobic environment nearly completely eliminates methane production; one ton of food composted mitigates 0.86 tons of CO\textsubscript{2}E. This value is used to determine the amount of CO\textsubscript{2}E avoided based on the weight of compost collected (Visse, 2004).

Transportation was also considered with a few assumptions. The food waste pick-up at Monona Terrace was integrated into a pre-existing food pick-up route that services the campus area. The additional mileage was calculated to be one mile for each pick-up. This value is used in the “integrated route” values shown in the results section. Had route integration not been available, the transportation would cover 14 miles.

The compost was collected in a two-cubic yard truck with an estimated fuel mileage of six mpg. There are 22.2 pounds of CO\textsubscript{2} emitted for each gallon of diesel used (U.S. Environmental Protection Agency, 2005). Given that 53 trips were made throughout the grant period, it can be estimated 0.83 tons of CO\textsubscript{2} were emitted via transportation without route integration. Accounting for route integration, this value slips down to 0.06 tons of CO\textsubscript{2} emitted annually due to transportation.

To err on the conservative side, this report neglects savings from fewer dumpster pick-ups.
ECONOMIC

Wages paid to wash the bins were estimated to be $3.75 per bin, given that each bin requires 15 minutes to wash with soap and water and the hourly wage is $15.00 per hour. However, this time would be spent washing the bin regardless of contents (waste or food scraps), so this cost is ignored in this analysis.

The transportation of the food scraps was provided by the University of Wisconsin-Madison that charges $3.50 per mile. The round trip distance between Monona Terrace and the composting site is 14 miles. Due to route integration, this value dropped to one mile round trip, reducing the cost from $49 per trip to $3.50 per trip. This cost was paid for in part by the grant and in part by the We Conserve program of UW-Madison. The costs are calculated in the results to serve as a planning tool for other organizations.

RESULTS

The economic and environmental aspects of this project are addressed from the viewpoint of the Monona Terrace.

Economic Impact:

1. Cost of bin cleaning and waste transportation
2. Savings from lower tipping fees

Environmental Impact:

1. CO₂E avoidance from composting materials
2. CO₂ contributions due to transportation of waste

Social Impact:

1. Project implementation process
2. Employee attitudes
3.

ECONOMIC IMPACT

The following values were provided by Gregg McManners of Monona Terrace. They represent the costs and savings seen by Monona Terrace.
Table 1. The costs and savings associated with separating food waste at Monona Terrace.

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>$/bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of bin washing</td>
<td>$15.00/hour</td>
<td>-$3.75 (N/A)</td>
</tr>
<tr>
<td>Avoided Pick-Up Fees</td>
<td>$160/dumpster</td>
<td>+$3.33</td>
</tr>
<tr>
<td>Avoided Tipping Fees</td>
<td>$50.01/ton</td>
<td>+$3.13</td>
</tr>
<tr>
<td>Net</td>
<td></td>
<td>+6.46</td>
</tr>
</tbody>
</table>

It is important to note that this grant and We Conserve paid for transportation, which was first estimated to be $11.39/bin without route integration or $0.80/bin with integration.

Bin counts began after the initial collection period and started on September 23, 2010 and were tallied through April 28, 2011. The total number of bins counted was 228, resulting in an estimated savings of $1,473 not accounting for transportation. Accounting for route integrated transportation, the savings would be $1,290. Without route integration, the total cost of the project would be approximately $1,124.

The weekly and cumulative bin values can be found online at www.mononaterracecompost.weebly.com or in Appendix A.

ENVIRONMENTAL IMPACT

The CO₂E avoidance was 9.8 tons over nine months not considering transportation. With route integration 9.7 tons of CO₂E were avoided. This value would have decreased to 8.9 tons CO₂E without route integration.

SOCIAL IMPACT

THE PROCESS

WASTE STREAM

Pursuing a composting project begins with determining the waste stream. Food waste generation at Monona Terrace fluctuates wildly from no weekly waste to half a ton of waste the next week. Over a period of nine months, 11.4 tons of waste was collected, which is an average of 633 pounds each week.
SITING

Once the waste stream is identified, the site must be selected. Monona Terrace’s waste was included in the turned-windrow composting program at the West Madison Agricultural Center. The DNR provided this project a permit in order to handle up to 500 cubic yards of waste including food at any one time. It was feasible to include the waste from Monona Terrace in this project. For a listing of compost sites, see the Wisconsin DNR page. (http://dnr.wi.gov/org/aw/wm/faclists/WisLic_SWCompost_byCnty_withWaste.pdf)

TRANSPORTATION

Transportation needs and costs vary widely and should be considered on a case-by-case basis. It is important to note that integrating routes with other projects can lead to significant savings. In the case of Monona Terrace, a price differential of $10.59 per bin would have been realized when comparing route integration to individual transportation between the Terrace and the composting site.

The pick-up frequency at Monona Terrace varied from every other day to once in ten days. Communication between the kitchen and transportation staff helped eliminate unnecessary pick-ups.

COMPOSTING COSTS

The West Madison Agricultural Research Station sells the finished compost to offset the cost of managing the many wastes it handles. No composting charges were applied to Monona Terrace as a result. This may not be the case for other sites.

ADMINISTRATIVE SUPPORT

Support from management is a key element to success. From the beginning of the Monona Terrace project, top management showed support for alternative waste management techniques and set the tone for how the project would be managed. At the first meeting, the administration made known the goals of the project and also shared key decisions.

- Waste food collected in bins without compostable bags
- Minimum pick-up frequency of once weekly for health and safety reasons
- Executive Chef oversees the project directly

**COLLECTION AND STORAGE**

The decision to wash bins was based on reducing waste regardless of cost; no analysis showed that washing the bins would be cheaper, though they already had bin-washing policies in place for all waste.

If bin washing is not a viable option, compostable bags are widely available and also vary widely in cost and quality. All other sites involved in the pick-ups used compostable bags and can be reached through We Conserve (www.conserve.wisc.edu).

**MANAGEMENT**

The Executive Chef’s office is located in the main kitchen, making him an ideal project manager. He knew how to train his multi-lingual staff and directed me to create signs focused on image-based directions instead of words. The signs were also printed in two languages and hung above the bins (see Appendix B). Bins were placed in key places that the Executive Chef knew wouldn’t disrupt the flow of the kitchen. His decisions eased acceptance and understanding and buy-in from the staff. He was happy to report that just weeks into the project, all employees understood and supported the composting project.

**EMPLOYEE ATTITUDES**

A short survey was conducted at the end of the project and revealed that only one employee had experience with a composting program prior to the project. No employees felt burdened by the new separation methods, and even felt excited to see how little food was going into the trash. If given the opportunity to end or continue the project, all responded they would continue because they like to see what a difference they can make in reducing landfill contributions. Some elected to comment that they are more inclined to compost because they feel it makes a local impact since the waste becomes compost just outside of their city. They also suggested that photos of the windrows be provided to show what happens after the food is collected.
PARTNERSHIPS

In the interest of building partnerships and sharing waste management practices, We Conserve also played a key part in the project. We Conserve staff orchestrated the pick-ups to be tied in with campus pick-ups to reduce transportation costs for both parties. When grant dollars would not continue to cover the cost of transportation, We Conserve established an agreement with Monona Terrace to continue the project and the partnership that had been formed. Relationships that sought to proactively solve problems like this were invaluable throughout the project.

CONCLUSION

It is clear from this analysis that the project at Monona Terrace avoids costs and harmful Green House Gas emissions. Throughout the nine-month period, Monona Terrace succeeded in avoiding $1,400 and 9.7 tons of CO₂E.

The keys to success are outlined below:

**Early administrative support and guidance:** Early meetings showed strong support for waste reduction that did not waver throughout the project. Upper management took an interest in the project’s success and recognized achievements.

**Appropriate project management selection:** The Executive Chef took an interest in the entire composting process and gained a firm understanding before instructing his staff. He appropriately detailed sign and bin needs and placement and was a positive force in fostering employee buy-in.

**Attention to employee culture and training needs:** Diversity is not lacking among the Monona Catering employees, and for many, English is a second language. To facilitate understanding, instructional posters focused on images instead of words and were printed in both English and Spanish.

**Partnerships with local projects:** Route integration for the transportation of the compost dropped the cost of the project tremendously. Without a partnership with We Conserve, Monona Terrace would have spent more to compost than to landfill the
waste. For those interested in developing a composting program, this is an especially important step.

This project also demonstrated that composting waste can effectively reduce CO$_2$E emissions with or without route sharing. Due to the short distance added to the route, transportation reduced avoided emissions by 2%. Without route integration, the trip distance would have increased from one to 14 miles, resulting in a theoretical loss of 9% of CO$_2$E savings.

If reducing CO$_2$ equivalent is the main objective for establishing a composting project, the following equation can help determine whether the transportation emissions would outweigh the savings from landfill diversion:

\[
Miles = \frac{0.86 \left[ \frac{lb \ CO_2}{lb \ food} \right] \times [lb \ food] \times (Fuel \ Mileage) \times \frac{miles}{gallon} \times 0.5 \ \frac{lb \ CO_2}{gallon \ combusted \ diesel}}{22.2}
\]

Miles represent the one-way distance that the food can be transported while maintaining a balance of CO$_2$ emitted from fuel combustion versus CO$_2$E avoided from composting.

0.86 is a constant developed by the U.S. EPA that represents the pounds of CO$_2$ equivalent avoided by composting one pound of food.

22.2 is U.S. EPA estimate of the pounds of CO$_2$ released per gallon of diesel combusted (U.S. Environmental Protection Agency, 2011).

0.5 factors in round trip transportation from the organization to the composting facility.

For example, for a diesel truck with a fuel mileage of six miles per gallon, one pound of food can be transported 0.1 miles away (0.22 miles round trip) to maintain a balance of CO$_2$.

In the case of Monona Terrace, 600 pounds of food waste were transported each week, resulting in an equivalent distance of nearly 70 miles if a round trip is taken (140 miles total).
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http://www.epa.gov/oms/climate/420f05001.htm

http://www.epa.gov/osw/conserve/materials/organics/food/fd-gener.htm#food-hier


Food Waste Collection at Monona Terrace

Weight Collected (lbs.) vs. Collection Event