Executive Summary

WERF

Cost effective, sustainable alternatives to landfills for managing food waste

Sustainable Food Waste Evaluation (OWSO5R07e)

The Central Issue

According to the United States Environmental Protection Agency (U.S. EPA, 2011) over 34 million tons of food waste are generated annually in the United States – almost all of this food waste is landfilled. This research describes and compares the economic and environmental costs and benefits of five different food waste management methods. The data indicate that landfilling is typically the least economical practice. Viable alternatives that need to be tailored to a specific location include co-digestion in anaerobic digesters, co-generation of heat and power, composting, and mixed waste recovery. These processes have the benefit of producing energy, heat, and/or valued soil amendments.

Context and Background

There is a growing recognition that, given the organic nature of foods scraps, and the changing mission of wastewater "treatment" facilities into "water resource recovery centers," municipalities will want to consider all viable options when determining how best to capture, process, recover, and beneficially use the large food waste resource. This research takes a holistic look across public agency boundaries and explores ways to connect with existing wastewater infrastructure to achieve broader sustainability goals. It analyzed the relative capital and operating costs, carbon footprint, space footprint, labor demands, diesel fuel demand, electricity demand, and water demand of five options for managing food scraps generated from residential sources.

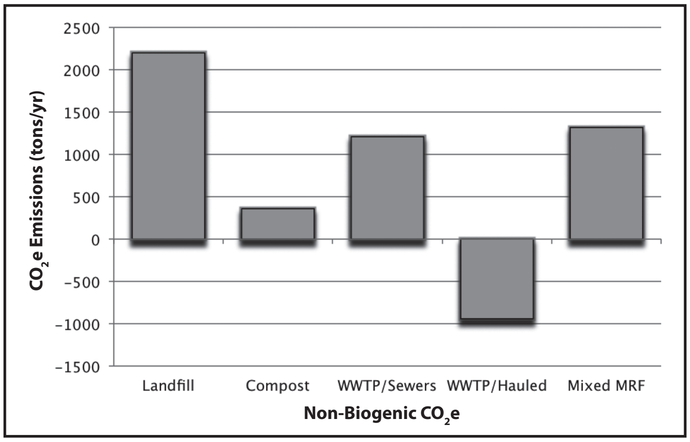

Figure 1. Comparison of the carbon footprint (as CO_2e) from food waste management options.

Food waste can be managed to recover energy.

Findings and Conclusions

The comparative estimated costs – highest to lowest – for the five alternatives in this study are:

Mixed Material Recovery Facility	$9,360,000
Landfill	$9,000,000
WWTP/Hauled	$8,600,000
Composting	$7,230,000
WWTP/Sewered	$5,170,000

The comparison of carbon footprints from the food waste management options is shown in Figure 1.

Using landfills to dispose of food waste had the highest carbon footprint and was very costly, while curbside collection of source-separated food waste hauled to a wastewater treatment plant (WWTP) operating with anaerobic digestion had the lowest carbon footprint and an intermediate cost. Utilizing a food waste disposer in the residence and sewering it to a WWTP operating with anaerobic digestion was the least costly, and had an intermediate carbon footprint. Composting had both a relatively low cost and carbon footprint. Separating food waste from other solid waste at a mixed material recovery facility (MRF) and then hauling it to a WWTP was not a viable alternative by comparison. Note this analysis was not tailored to a specific location and is meant as a comparison for general guidance regarding sustainable food waste management alternatives.

Management and Policy Implications

To fully capture resources and achieve broader sustainability goals, planners and utility managers need to take a holistic look across conventional public agency boundaries and explore ways to connect and integrate systems and existing infrastructure. The most common practice, such as the landfill disposal of residential food waste, may not be the best practice from either economic or environmental perspectives.

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Sustainable Food Waste Evaluation

Related WERF Research

Project Title	Research Focus
LCAMER: An Assessment Tool for Managing Cost-Effective Energy Recovery from Anaerobically Digested Wastewater Solids: Version 2 (OWSO4R07hT)	The LCAMER (Life Cycle Assessment Manager for Energy Recovery) tool compares the relative life-long merits of one energy recovery system to another for wastewater treatment plant application. It was updated in 2012 with new technical and economic information. LCAMER can be used in the planning to recover heat and power from biogas produced through co-digestion of food waste with biosolids.
Co-Digestion of Organic Waste Products with Wastewater Solids (OWSO5R07)	Evaluates co-digestion of organic waste such as food waste with wastewater solids in anaerobic digesters at lab, pilot, and full-scale to increase biogas production at wastewater treatment facilities. This project includes: ■ A plan for identification of potential organic wastes (including fats and grease). ■ Parameters to assess co-digestion operational stability. ■ An economic model of co-digestion.
State of the Science on Biogas: Treatment, Cogeneration and Utilization in High Temperature Fuel Cells and as a Vehicle Fuel (OWSO10C10a)	Details four key areas related to energy recovery from biogas. ■ The wide range of technologies available to remove or reduce the contaminants in biogas to make it suitable for energy recovery. ■ CHP technologies that simultaneously generate heat and electricity from biogas. ■ High-temperature fuel cells and their application using of biogas as a fuel source. ■ Direct use of biogas in natural gas vehicles or sold to the natural gas grid.
Energy Efficiency in Wastewater Treatment in North America: A Compendium of Best Practices and Case Studies of Novel Approaches (OWSO4R07e)	Showcases many of the types of CHP systems addressed in the CHP-SET tool and elsewhere. Details the application of systems that recover heat and power from biogas, including the co-digestion of food waste with biosolids in anaerobic digesters.
Barriers to Biogas Use for Renewable Energy (OWSO11C10)	Overcoming the barriers to investing in biogas technologies, including co-digestion of food waste with biosolids, is detailed in this report, including: ■ Barriers that utilities face when considering biogas for heat or energy recovery. ■ Feedback on barriers from more than 200 utility participants across the U.S. ■ Strategies to help utilities overcome barriers to biogas use for renewable energy. ■ Recommendations to expand the production of renewable energy from biogas.

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