Construct an Anaerobic Digester to Treat West Virginia University's Food Waste

Executive Summary

West Virginia University (WVU) should construct an anaerobic digester to dispose of the approximately 175 tons of food waste generated each year. Today, this waste is transported to a landfill 50 miles away, impacting the environment in a way that is not consistent with WVU's sustainability policy.

A digester, which uses bacteria to turn food waste into biogas, can reduce WVU's greenhouse gas emissions and other environmental impacts. In addition, faculty can use the digester to conduct research and teach sustainable practices that can be used throughout the state once students graduate. Further, prospective students often review a university's sustainability ranking in deciding where they will attend.

WVU's sustainability policy states "WVU will promote the use of sound sustainable principles and practices through learning, teaching, research, and facilities management from both an educational and operational perspective." Disposing of WVU's food waste using a digester instead of transporting it to a landfall will help WVU reach its sustainability goals.

Introduction

An anaerobic digester uses bacteria to turn organic material like food waste, sewage sludge, and animal manure, into valuable biogas (Figure 1). The biogas is then converted into electricity or renewable natural gas (Figure 2), which can then be used or sold.

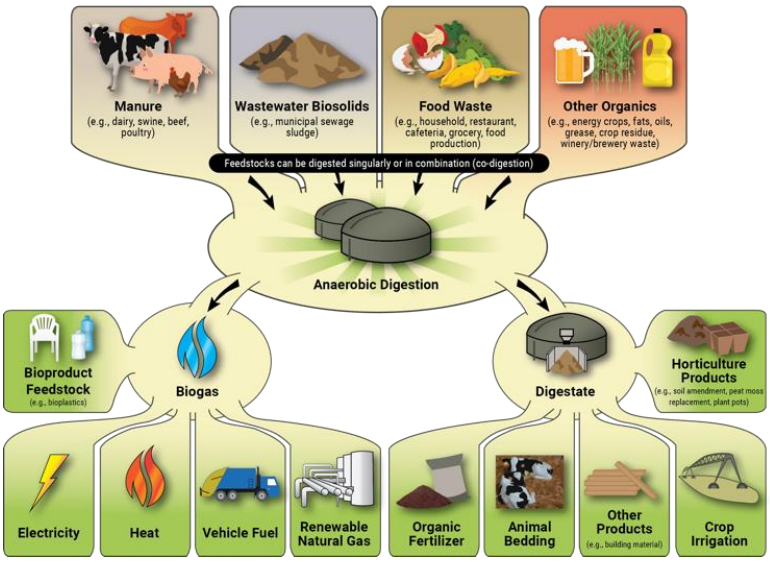

Figure 2: An anaerobic digester produces biogas, which can be converted into electricity and renewable natural gas.

Figure 1: An anaerobic digester converts food waste to biogas via biological processes.

Key Findings and Recommendations

- West Virginia University (WVU) generates approximately 175 tons of food waste each academic year
- Tipping fees, labor, and transport for landfilling cost the University over $20,000 each year
- Emissions from transporting and landfilling food waste could be reduced by implementing anaerobic digestion
- Anaerobic digestion also produces biogas, which can generate over $8,000 each year in revenue
- Landfilling food waste emits over 55 tons of CO_2 each year, while anaerobic digestion has negative net emissions of 15 tons per year

Many universities such as Michigan State University, Penn State University, and Dickinson College already use anaerobic digesters to treat their food waste. For example, the Michigan State digester annually treats 17,000 tons of organic waste from the Greater Lansing area, and the resulting biogas annually generates almost 3 million kWh of electricity. This results in less carbon emissions from landfilling organic waste and from generating electricity via fossil fuels. The digester is also used for academic research and to train digester operators throughout the state.

Anaerobic Digestion is the Best Option

Two ways to reduce the environmental impact of food waste at WVU are (1) anaerobic digestion and (2) composting. Each is better than the current policy of landfilling the food waste as they would reduce WVU's CO_2 emissions by 70 tons per year and provide economic benefits by avoiding the tipping fees (landfill disposal fees) associated with landfilling food waste (about $11,000 per year). Both would also improve WVU's sustainability branding and consequently recruitment.

Of the two alternatives, anaerobic digestion is preferred over composting because it is more effective in reducing greenhouse gas emissions and generating revenue via biogas production. Because anaerobic digestion converts food waste to biogas, which can then be converted into electricity or renewable natural gas, it generates revenue. While the capital investment for anaerobic digestion is around $320,000, the digester provides revenue from biogas (about $8,000 per year) such that the initial investment would be paid back in approximately 17 years. The electricity or renewable natural gas generated from biogas offsets emissions generated during conventional electricity or renewable natural gas production while also generating a valuable product. While composting does generate a product that can be used as a soil amendment, it does not generate energy and has greater greenhouse gas emissions than anaerobic digestion.

Next Steps

Should WVU decide to pursue use of an anaerobic digester, there are two options for installing one at WVU. Alternative 1 is for WVU to construct the anaerobic digester independently, perhaps funding it through grants from federal agencies like USDA and EPA. Having a digester on campus can promote research and enable external funding from research grants. Alternative 2 is for WVU to reach an agreement with one of the several companies that manage food waste. In this case, WVU would not pay any capital cost. Instead, a company would pay capital costs in exchange for keeping profits from tipping fees and the sale of renewable natural gas.

For More Information:

Kevin Orner, PhD, Assistant Professor, Civil & Environmental Engineering, West Virginia University, Kevin.Orner@mail.wvu.edu. A design report with details for the cost estimates provided in this document is available upon request.

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The views expressed in this policy brief are solely those of the researcher and are not necessarily those of West Virginia University.

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