Food and Beverage Manufacturers Are Well-Positioned to Produce (and Use) Renewable Natural Gas

Guidehouse, The Coalition for Renewable Natural Gas

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This article is Part 1 in a series on how Renewable Natural Gas (RNG)[1] can help unlock environmental and economic benefits across the US economy. It focuses on the food and beverage sector's ability to use RNG produced from their own waste, following circular economy principles,[i] to reduce their greenhouse gas (GHG) emissions.

Food waste accounts for a large portion of global GHG emissions and local, state, national and international initiatives have been launched to reduce its overall impact.[2] One of the solutions included in those initiatives is the use of anaerobic digestion technology to capture biogas and produce RNG; compared to other organic feedstocks, food waste yields the most RNG output per ton-of-waste. Food waste can also play a key role in supporting a company's sustainability goals, as shown below in the example of Beam Suntory's Booker Noe distillery in Boston, Kentucky. RNG will be produced and used at the facility to shrink its emissions, while also creating local jobs.

Food Waste Drives Climate Change

Food production accounts for a third of global greenhouse gas (GHG) emissions.[ii] Contributing to these emissions are high levels of waste; for example, in the US an estimated 30-40% of total food supply (pre- and post-consumer) is not consumed, and instead is disposed of in landfills, burnt at a waste-to-energy facility, or composted. Food and beverage manufacturing and processing companies in the US generated 40 million tons of pre-consumer food waste in 2019.

Food waste produces GHG emissions in two ways:

1. The production of food is itself emission intensive, so producing food that is ultimately wasted effectively increases GHG emissions across the food system
2. Uncontrolled decomposition of food waste (for instance in landfills) releases methane, a powerful GHG

States and municipalities have been implementing landfill diversion rules to reduce this emission source, and instead use the waste for composting or energy production. In California, for instance, SB1383 requires that 75% of organics be diverted from landfills by 2025; in Hennepin County, Minnesota, large commercial and businesses are required to recycle their food waste to avoid it going to landfill; and in New York State, businesses producing two tons per week or more of food waste are required to divert it from landfill if alternative processing can be found within a certain distance.

Food and Beverage Waste: From Risk to Resource

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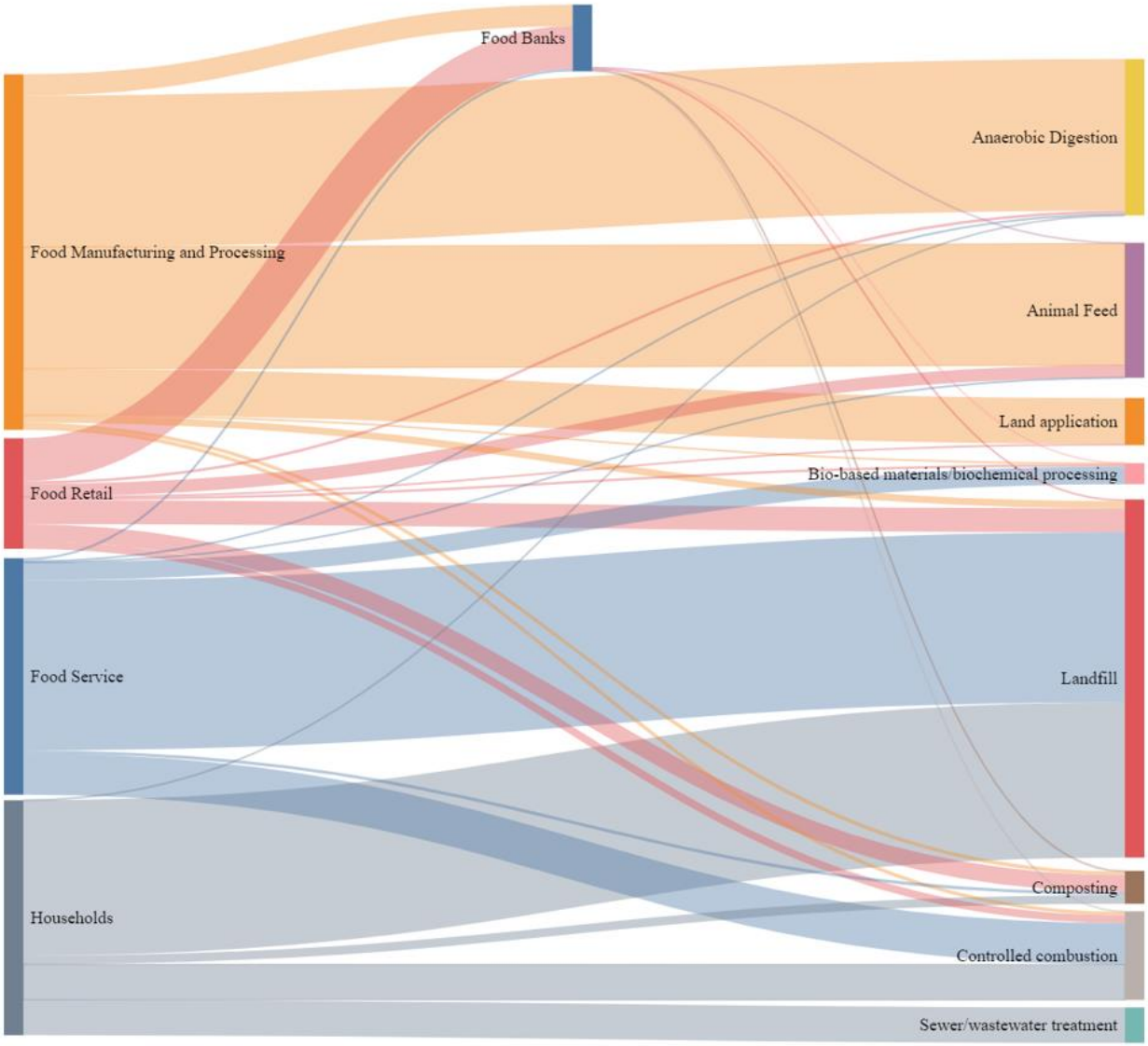
[1] RNG, also known as biomethane, is a commercially available, low carbon fuel derived from the decay of bio-based wastes in anaerobic environments. RNG is chemically identical to, and can be used interchangeably with, conventional natural gas. RNG is currently mostly utilized in transportation end uses, but it has the potential to reduce GHG emissions in other sectors, as well.

[2] For example, local and state landfill diversion requirements, the US EPA's 2030 Food Loss and Waste Reduction Goal, and the United Nations' Sustainable Development Goals.

Food waste arises at every stage of the supply chain, from farm-to-table, and includes inedible residues as well as waste due to labor shortages, processing malfunctions, poor stock control, and other inefficiencies.[iii] According to the US EPA's food waste hierarchy, waste prevention strategies should always be prioritized, but some waste in the food supply chain appears to be unavoidable.[iv]

Not all food waste is equal – different types of food waste are better suited to different disposal options. Anaerobic digestion is currently the leading waste management option for food and beverage companies, partly because of the associated energy production.[v] According to the US EPA, 43% of food waste managed at manufacturing and processing facilities is treated using an anaerobic digester, but in the food retail, food service, and residential sectors, the proportion of food waste managed by anaerobic digestion is less than 1% (see Figure 1[vi]).

Figure 1 Food Waste Management flow diagram



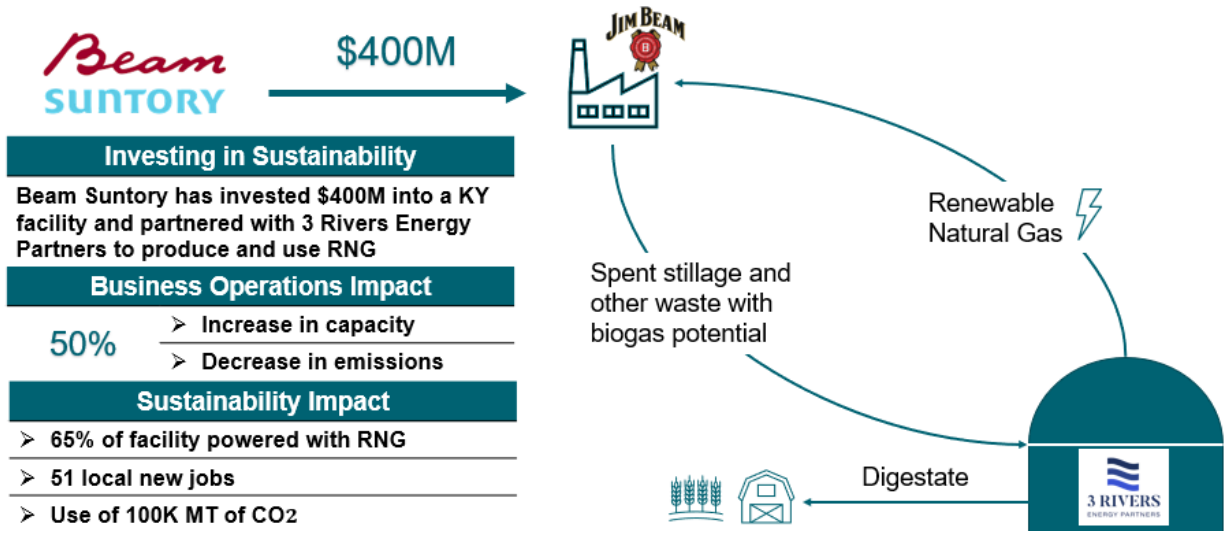
RNG Potential and Sustainability Impact

On a pound-for-pound basis, food waste has a higher energy-production potential than other feedstocks such as livestock manure, crop residue and wastewater.[vii] One ton of mixed food waste (including some pre-consumer and some post-consumer) would produce roughly three to four times the MMBTUs of, for example, one ton of dairy manure.[viii]

The production and use of RNG can support different parts of a company's corporate sustainability goals. Using RNG instead of conventional natural gas can reduce Scope 1 emissions and Scope 3 emissions under categories 3 (fuel-and energy-related activities) and 5 (waste generated in operations). RNG can also be part of a holistic ESG strategy, creating economic opportunities for rural communities, providing fuel security, and increasing the quality of local agriculture and waterways.

Jim Beam Case Study

Beam Suntory (a world leader in premium spirits with iconic global brands including Jim Beam and Maker's Mark) is investing $400 million in its Booker Noe distillery, which produces Jim Beam®, to expand production, while simultaneously shrinking the facility's environmental footprint. The investment is projected to increase capacity by 50%, while reducing the distillery's GHG emissions by the same amount by switching from conventional natural gas to RNG for 65% of the site's non-electricity energy needs.



Beam Suntory's partner, 3 Rivers Energy Partners, will build an anaerobic digestion facility across the street from the distillery to process up to 650,000 gallons a day of spent stillage[ix] (a mixture including crushed grains, yeast and water left over from making bourbon), while creating local jobs. The biogas produced from the anaerobic digestion of this organic material will be upgraded to RNG, and then piped back to the Booker Noe facility to power the bourbon production facility – reducing emissions for the company.

This project is a prime example of integrating circular economy practices into a business model. Instead of disposing of spent stillage, it will be used as the feedstock for the anaerobic digestion system to produce RNG. The digestate, nutrient-filled material that is left after the anaerobic digestion process, will be used as a low-cost, high-quality fertilizer by local farmers. 3 Rivers Energy is investigating options for marketing the CO_2 from the RNG upgrading process for beneficial reuse.

A stillage-to-RNG project is also under way at the Jack Daniel's distillery in Lynchburg, Tennessee,[x] and in Scotland the makers of Glenfiddich have begun using biomethane made from distillery waste to fuel the brand's delivery fleet.[xi]

Conclusion

Anaerobic digestion is a powerful tool for managing food and beverage sector organic waste at every stage of the supply chain and provides opportunity for implementing circular economy practices. It is a long-term, environmentally friendly waste management option that enables the production of low carbon RNG. Furthermore, it represents a highly scalable solution that can be readily implemented across many food and beverage sector sites, delivering economic and ESG benefits across the industry and the communities where the industry operates.

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[i] Circular economy and waste management | European Biogas Association
[ii] https://www.weforum.org/agenda/2022/08/carbon-neutral-eggs-climate-food/
[iii] This article presents a list of the sources and potential solutions to tackle food waste at every stage of the supply chain: https://www.nrdc.org/bio/nina-sevilla/preventing-wasted-food-across-food-supply-chain
[iv] The food waste management hierarchy: https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy
[v] 42.6% of food waste from the sector is managed using anaerobic digestion. Ref: https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/food-material-specific-data
[vi] US EPA 2019 Wasted Food Report, linked at https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/food-material-specific-data
[vii] https://www.ieabioenergy.com/wp-content/uploads/2018/12/Food-waste_WEB_END.pdf
[viii] Based on industry interviews.
[ix] Quantity of stillage provided by Beam Suntory.
[x] https://biomassmagazine.com/articles/19447/rng-project-under-development-at-jack-danielundefineds-distillery
[xi] https://hexagonagility.com/news/glenfiddich-spearheads-the-use-of-renewable-natural-gas-rng-for-its-whisky-delivery