Food Waste Management: Proper and Convenient Disposal

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Anaerobic Digest. BioCycle.

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Introduction/Background

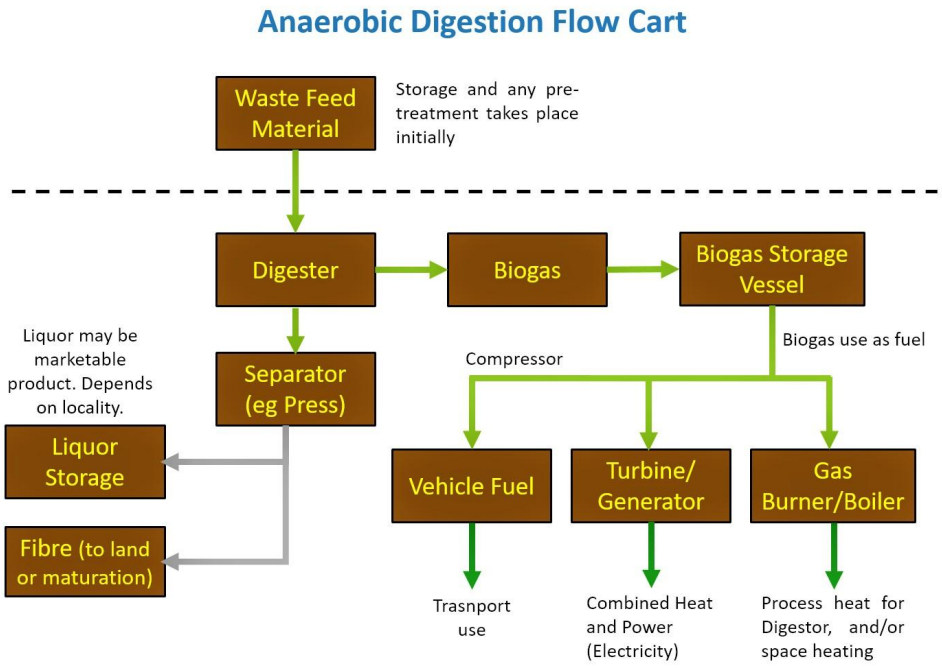
In most instances, when there is food involved, there is food waste. Food waste is biodegradable waste that consumers discard. Each year, 108 billion pounds of food is wasted in the United States. That equates to 130 billion meals and more than $408 billion in food thrown away yearly (*How we fight food waste in the US, n.d.).* Humans tend to dispose of large amounts of food without considering the damage it causes to the economy, climate, and environment. Food waste has become a part of our daily routine, starting not only from our homes but also from farms, restaurants, hotels, hospitals, jails, schools, and college campuses. The rise of industrialized cities and overpopulation, such as New York City, spelled an increase in food waste and management. According to the New York Times, New York City currently exports 85% of its waste to landfills, costing about 300 million dollars a year. New York City, in particular, has 7,200 men and women who go out in about 2,000 collection trucks and collect tons of residential waste and recyclable material to landfills (Burford & Moyer, 2014). The frequent routine of exporting wasted food to landfills builds up greenhouse gas emissions, leading to concern. When this is paired with the dozens of years in which food waste has been practiced, the damage to the economy and ecosystem grows. The current solution to food waste is composting and recycling. Composting, a form of recycling, is when organic material can be turned into a valuable product and is an organic fertilizer for farmers. If composting were used as a waste management, food waste would still be sent to a compost plant where it decomposes and releases gas, which won't help the problem of global carbon emissions.

The biodigester is a system model that will cut methane emissions while producing renewable energy in an efficient and eco-friendly manner. This machine will be able to decompose food, cooked or uncooked, including plate scrapings, leftover takeaway food, meat, fish, small bones, bread, dairy products, vegetable peelings, and fruit (*Food waste digesters*, 2022). With these dire needs, the benefits of conserving energy while converting organic waste into energy are an enormous positive. The incineration of food waste, which wastes energy and embodies 170 million metric tons of carbon emissions, can be waned considerably by following through with the method this product will provide.

Project Description

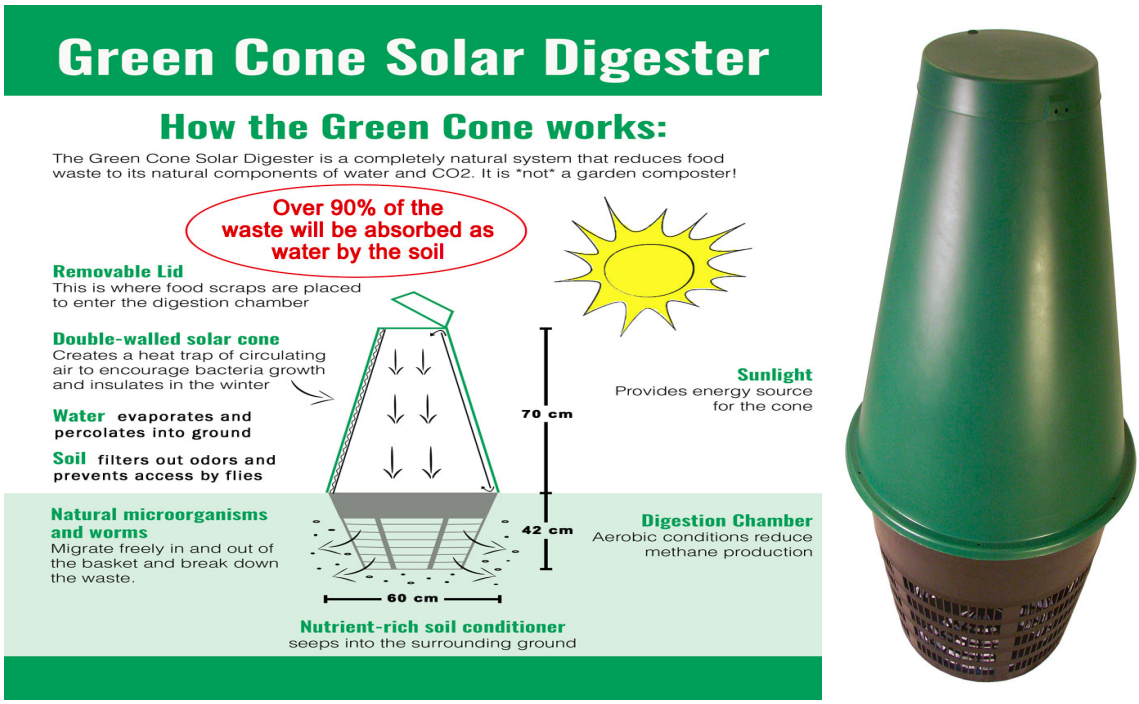
Anaerobic Digestion Process

To compartmentalize waste, the biodigester utilizes aerobic digestion. Anaerobic digestion can be divided into several stages. First, waste feed material, such as numerous organic wastes, is used as feedstock for co-digestion. Then, without the presence of oxygen, anaerobic digestion breaks down organic wastes such as animal manure, wastewater biosolids, and food scraps using a solvent combination comprising chemicals and enzymes (*Industrial Uses for Wasted Food*, n.d.). This yields two results: biogas and digestate. Biogas is a gas combination composed of methane (CH4), carbon dioxide, and hydrogen sulfide. Biogas, like natural gas, may be used for several purposes, such as power generation, cooling system operation, and heat distribution (*Fact sheet: Biogas: Converting waste to energy*, n.d.). During the digestion process, residual digestive waste known as "digestate" is generated, which includes both liquid and solid components and is split and treated separately for various uses. Components of the digestate can be utilized as compost, animal bedding, nutrient-rich fertilizer, a basic soil conditioner, or as an ingredient in bio-based goods such as bioplastics.



Farms are where food waste in the supply chain starts. Crops can be affected by pests, diseases, and environmental factors such as weather, soil, water availability, extreme weather events, and natural disasters. However, due to anaerobic digestion, the feedstock's nutrients are mineralized. A crop can use mineralized nutrients easily and fast. The digestate solids' nutritional value will vary depending on the feedstocks, digester type, management, and solid-liquid separation method. Digestive waste solids may be mixed with other waste and compost for fertilizer.

The Green Cone Solar Digester is another promising innovation. The heat from the sun is used to boost the interior temperature and speed up microbial activity in this subterranean solar digester. The air chamber of the twin cones, in addition to providing insulation, facilitates passive airflow to continuously flow fresh air through the system, providing the oxygen ability to maintain aerobic conditions and aiding in the removal of undesirable smells (*Green Cone Solar Food Waste Digester & Composter*, n.d.). They are intended to perform successfully in both hot and cold climates, depending on the year of manufacture. As impressive as this is, its usefulness on a bigger scale must be addressed. The cone concept is fantastic for tiny gardens and parks, but it is not practical for everyday use due to its storage capacity limitations. Using the conventional anaerobic digester model is highly efficient because the solvent combination speeds up digestion, and more output is generated in one place than in a vast area of compost land. Overall, the anaerobic digestion capabilities thoroughly recycle trash and utilize greenhouse gasses as a biofuel, something the green cone does not do.



Green Cone Solar Food Waste Digester & Composter. Green Cone USA.

Feasibility

The price range of microbial anaerobic digestion is affected by its size or complexity. Although a bigger version of this will be challenging to construct, a more concise, community-based approach may be helpful. In response to initiatives to improve the capacity and infrastructure of anaerobic digestion in the United States, the Environmental Protection Agency (EPA) issued Executive Order 13985, titled "promoting anaerobic digestion in communities." This government incentive scheme is expected to cost $2,000,000 in total. The EPA will provide one to two grants for specified regions worth $50,000 to $200,000 (*EPA*, n.d.). Although the

budget is limited, the launch of government social initiatives like this should be increased to address the issue of food waste management in all areas, particularly those with socioeconomic difficulties. The implications of anaerobic digestion in the community can be possible with the help of government aid and initiatives that address food waste management issues.

Benefits to Using a Biodigester

The biodigester uses anaerobic digestion to break down waste, making it both environmentally beneficial and safe to use. Other benefits include

1. Digesting food waste on-site in 24 hours with no noise.
2. Significantly reduces the cost of disposing and managing food waste
3. Safely dispose of waste without sending it to the landfill, rivers, lakes, and fields
4. Eliminates the smell, mess, and pests from the trash bin
5. The biodigester will significantly reduce methane emissions by diverting food waste from landfill.
    a. Food waste is directly tied to greenhouse gasses, energy consumption, groundwater contamination, and landfill space.
    b. Food waste no longer has a chance to rot and release methane when it is placed into a biodigester.
6. Waste can be used for renewable fuel
7. Time and effort are saved
8. No self-monitoring required

The biodigester will initially be made available in restaurants, hotels, hospitals, jails, and schools in local areas. This is considering that they serve their meals in a buffet or cafeteria setting, which necessitates putting out more than is consumed. Philadelphia's Temple University claims that by installing three digesters on its campus, the university has reduced the cost of composting food waste by 40%. The equipment was planned to keep 13,000 pounds of food waste out of landfills each month (Conte, 2018).

The Possible Drawbacks

The biodigester releases biogas, which is a green energy source. This suggests that it can be used in a highly clean and secure manner to cook food and fuel automobiles. Although it is an excellent alternative to fossil fuels, the potential downside is that biogas is not a commonly used fuel. However, the worldwide distribution of biodigester will make biogas well known. Another disadvantage is the significant amount of expenditure required for this recycling technology. Extra-large tanks are needed, the receiving end must be checked frequently, and maintenance will be expensive. Compared to the costs of exporting waste to landfills, a biodigester will cost less and lead to a better result.

After Product Survey

A product survey toll will be utilized to evaluate the product's effectiveness after the objective of supplying a biodigester to locations has been accomplished. This will enable the widespread distribution and, if necessary, improvement of the innovation. A product survey tool is used to find out what customers think of a product.

A few of the questions asked will include

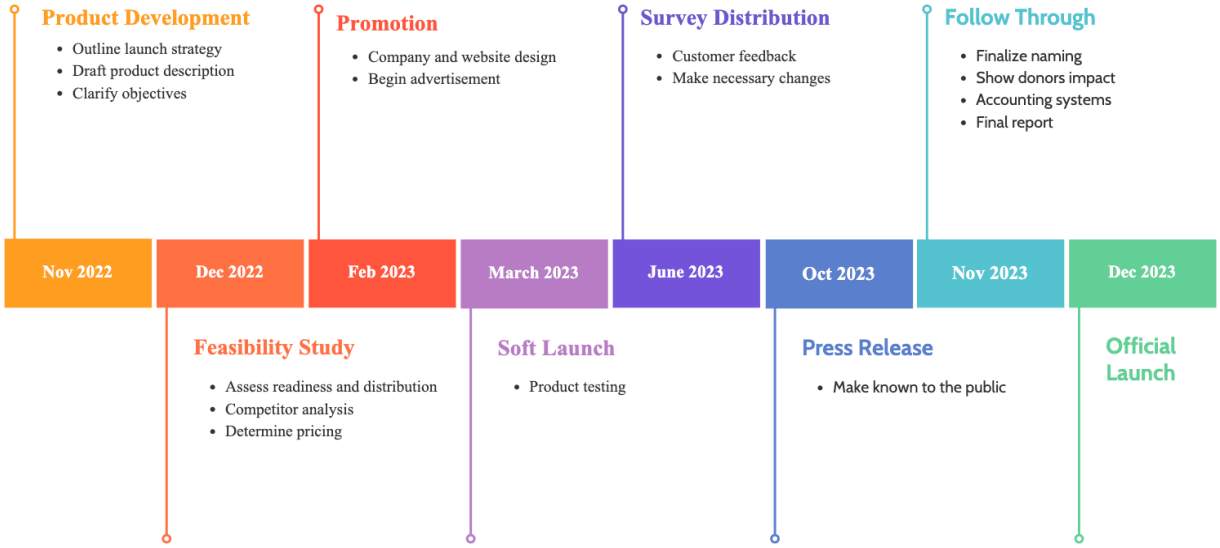
1. How often is the biodigester used?
2. What aspect of the biodigester makes it valuable?
3. How would you compare the biodigester to our competitors'?
4. What essential features are the biodigester missing?
5. What are you trying to solve by using the biodigester?
6. What other types of people/facilities could find our product useful?
7. How easy is it to use the biodigester?
8. How could we improve the biodigester to better meet your needs?

Credentials/About Us

- Suraiya Anisa- Sociocultural psychologist
- Tenzin Chokdup- Machine scientist
- David Ashby- Biologist
- Fatou Sohna- Ecologist
- Simone Smith- Financial Advisor

A sociocultural psychologist could employ their knowledge of human behavior in social contexts to the business. Their role is essential in the product's marketing, management, and sale. They will use their understanding of ethics to achieve high consumerism. A machine scientist such as Tenzin is reliable because he can give you the machine's inner workings. He will use his experience in computer science, systems engineering, and software development to construct the parts of the biodigester. Biologists and ecologists such as David and Fatou are needed to evaluate the effectiveness of biodigesters in protecting the environment. They have an understanding of the contribution that biodigester has to the environment and climate change. A financial advisor such as Simone focuses on consulting the team on implementing an environmentally friendly product using the funds and resources available. Simone will use her knowledge of market trends to ensure the product has high returns. The team has worked in many industries revolving around waste management and sustainability.

Timeline



The soft launch will start from March 1, 2023, to May 1, 2023. Then, a survey distribution will follow. The Gnatt chart such as the one below provides the possible timeline for the launch of the biodigestor.

TASK	ASSIGNED TO	PROGRESS	START	END
Trail 1 : Communities				
placement		10%	3/1/23	3/3/23
installation		10%	3/6/23	3/10/23
management		10%	3/11/23	4/28/23
schedule		35%	4/29/23	5/1/23
progress report		35%	3/1/23	5/1/23
Trail 2: Buiness Coperations				
Product development		1000%	11/1/22	11/30/22
Feasiblity study / promotion		10%	12/1/22	2/28/23
Soft launch		10%	3/1/23	4/30/23
survey/ press confress		35%	6/1/23	11/30/23
Official launch		35%	12/1/23	12/1/24
Survey	Anisa			
online questionaire		35%	6/1/23	11/30/23
instore volunteers		35%	6/1/23	11/30/23
text messanges		35%	6/1/23	11/30/23
phone calls		35%	6/1/23	11/30/23

Budget

A simple but preliminary calculation indicates that the construction cost of a microbial anaerobic digester will be $100,000 for each ton of feed material processed each day. The cost takes into account the following:

- Size
- Materials
- Spacing
- Construction

Overview

Food wastage is becoming a critical problem within society due to the negative impacts that revolve around it. A biodigester is an excellent solution to such a complex problem. The drawbacks of not using biodigesters aren't a great enough deterrent to not invest in them. Biodigesters are beneficial to the environment, the planet, and the economy. Investing in a biodigester will bring in more clientele. As a broader demographic continues to purchase this product, it is a step to preserving and protecting the planet.

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