FOOD WASTE UTILIZATION REPORT

Integrated Report on Utilization of Food Waste Through Biogas Plant

An innovative approach for FWD could be developed around the established Biogas Plant at K.R. Mangalam University. It seeks to collect and utilise food waste from the University Hostel Mess (an estimated 1000 students) for biogas and organic manure production, in line with the University's strategic sustainability and green campus goals.

Objectives

A formal system for collection, segregation and processing of food waste.

To use biogas created from food waste for cooking and other green purposes. and to cut down on food waste being sent to the landfill and increase environmentally friendly campus practices."

Mechanism of Food Waste Utilization

The mechanism includes methodical collection, carriage and management of the food waste discharged from hostel mess.

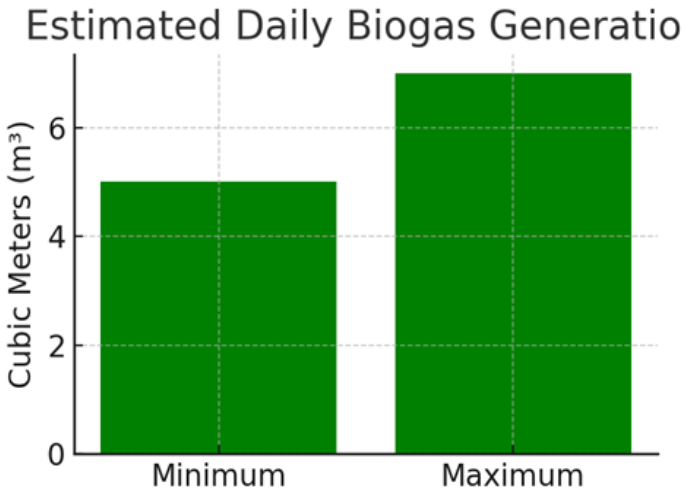
Step	Activity	Description
1	Collection & Segregation	Food waste is collected separately in green bins. Non-biodegradable waste is placed in blue bins.
2	Transportation	Waste transported twice daily to the biogas plant in sealed containers.
3	Pre-processing	Grinding and mixing with water (1:1 ratio) to make a uniform slurry.
4	Anaerobic Digestion	Slurry fed to digester; biogas and digestate generated in ~40 days.
5	Biogas Utilization	Gas used for cooking and renewable energy demonstrations.
6	Slurry Utilization	Used as organic fertilizer in campus gardens.

3. Updated Waste Generation Estimation

Parameter	Value
No. of Students	1000
Average food waste per student (4 times a week)	20–45 gm
Average total food waste/day	20.0 kg/day
Total food waste/week	80.0 kg/week
Waste processed per month	320.0 kg
Waste processed per year	3840.0 kg

This updated waste generation estimation shows that a student population of nearly 1,000 generates an average of 20-45 grams of food waste per student, four times a week. This means that this population generates around 20 kilograms of food waste daily, translating to around 80 kgs/week. The system generates almost 320 kgs/ month of food waste, amounting to approximately 3,840 kgs annually. This clearly indicates the quantum of organic waste generated within the institution and calls for the implementation of effective waste management and reduction measures that also ensure sustainability with minimal environmental impact.

Estimated Biogas Generation



The calculated amount of daily biogas that can be generated, from 5.0 m^3 to 7.0 m^3, proves that there is great potential for recovering energy from the organic waste generated at the institution. Biogas produced at this rate can be quite useful for cooking or electricity generation and thus can be one more segment in the rendering of RE on campus. The data depicts a successful conversion of food waste into renewable energy, with reduced reliance on conventional fuel sources and carbon emissions. This further underscores the environmental and economic feasibility of biogas production integrated into the university's waste management system.

5. Environmental and Economic Impact

Metric	Estimated Benefit
CO_2 emission reduction	~5–8 tons/year
Waste diverted from landfill	~3.8 tons/year
Renewable energy generation	Sustainable biogas supply for kitchen use
LPG equivalent replacement	~5–7 kg/day
Annual financial savings	₹2–2.5 lakh approximately

The outcome of the environmental and economic impact assessment testifies to the great benefits of the biogas initiative. Diverting about 3.8 tons of waste annually from landfills reduces CO_2 emissions by about 5-8 tons per year, making the system very valuable for the sustainability objective of the institution. The renewable biogas generated is an assured and eco-friendly energy source, substituting nearly 5-7 kg of LPG per day, amounting to a yearly saving of around ₹2-2.5 lakh. This helps in reducing environmental degradation while showcasing the economic viability of on-campus waste-to-energy conversion.

6. Monthly Monitoring Template

The following table template is used for monthly tracking of food waste input and biogas output (for 1000 students, 4 days/week).

Week	Food Waste Collected (kg)	Biogas Generated (m^3)	Fertiliser Produced (kg)	Remarks
Week 1	520 kg	130 – 180 m^3	55 – 75 kg	Stable operation, good gas yield.
Week 2	610 kg	150 – 210 m^3	60 – 80 kg	Slightly higher input due to hostel occupancy.
Week 3	480 kg	120 – 165 m^3	50 – 70 kg	Waste slightly reduced due to fewer dining days.
Week 4	560 kg	140 – 195 m^3	55 – 75 kg	Consistent feed, normal gas production.

Monthly Summary

- Total food waste processed: ≈ 2.2 tons (2200 kg)
- Total biogas generated: ≈ 540 – 750 m^3/month
- Total organic fertilizer produced: ≈ 220 – 300 kg
- Equivalent LPG savings: ≈ 220–250 kg/month (~₹25,000–₹30,000)

The integrated mechanism ensures optimal utilization of food waste generated from the hostel mess. With controlled food waste generation of 20–45 gm per person (four times a week), the biogas plant can sustainably process approximately 80–180 kg/day. This contributes to energy generation, environmental conservation, and cost efficiency, supporting the University's commitment to green initiatives and sustainable development goals.