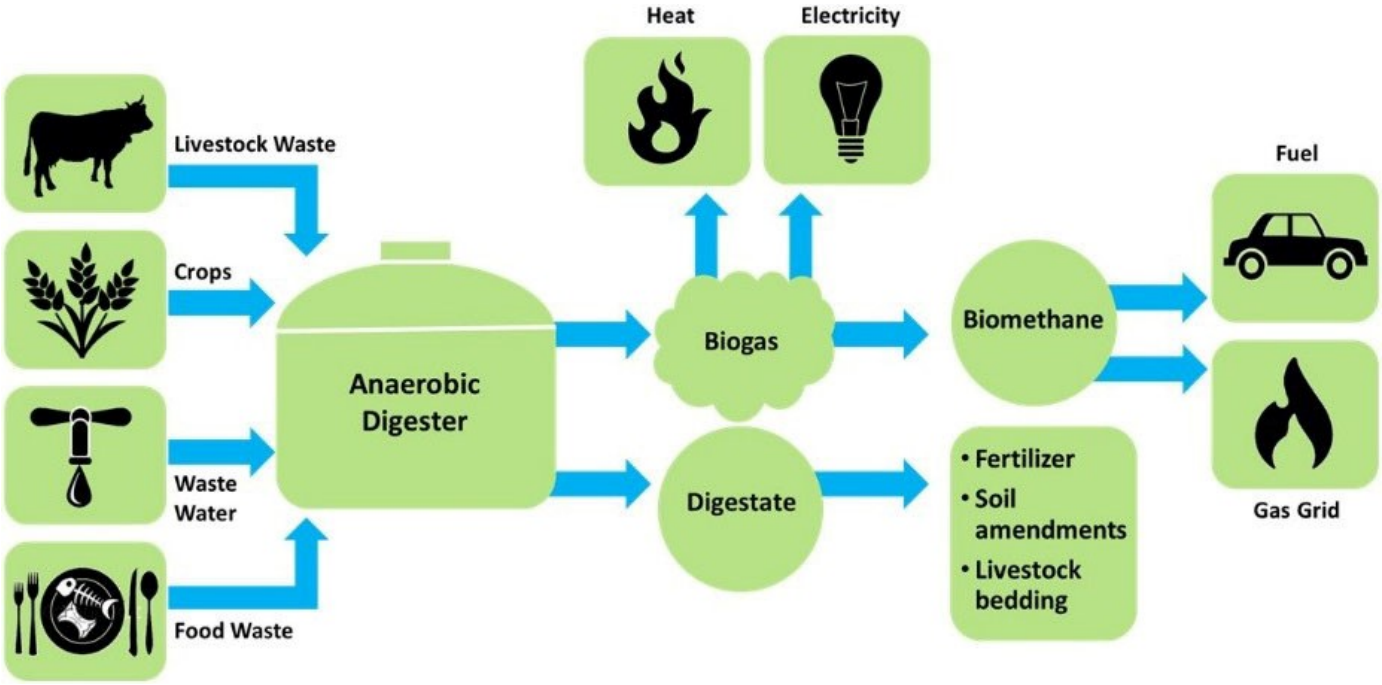
Biogas as a Sustainable Energy Alternative

Why in News?

India is exploring biogas as a sustainable alternative to fossil fuels.

How Biogas is produced?

- **Biogas –** It is a renewable fuel that's produced when organic matter, such as food or animal waste, is broken down by anaerobic digestion that is by microorganisms in the absence of oxygen.
- **Input Feedstock -** A wide variety of waste material including animal manure, municipal rubbish or waste, plant material, food waste or sewage can be used.
- **Output -**The yield of anaerobic digestion contains both energy (gas), and valuable soil products (liquids and solids).



- **Composition of Biogas -** Biogas contains roughly 50-70 % methane, 30-40 % carbon dioxide, and trace amounts of other gases.
- **Digestate -** The liquid and solid digested material is used as a soil amendment.
- **Co-digestion** - Mixing multiple wastes in the same digester, can help increase biogas yields.
- **Bio CNG** - Biogas is purified and compressed to make Bio-CNG with more than 90% of methane content.

China has the largest number of biogas plants, with an estimated 50 million households using biogas, mostly rural areas and small-scale home and village

plants.

What are the advantages of Biogas?

- Biogas offers a compelling solution to India's energy challenges by reducing dependency on fossil fuels, lowering energy costs, and providing significant environmental and social benefits.
- ***Reducing Fossil Fuel Dependence*** **-** India's energy sector is heavily reliant on fossil fuels, particularly coal, oil, and natural gas.
- Biogas brings an opportunity to diversify India's energy mix by providing a locally sourced, renewable alternative to fossil fuels.

A 100 TPD (tonnes per day) CBG plant produces enough CBG to replace approximately 41.24 million liters of diesel per year, offering a significant cost advantage over imported fuels.

- ***Decentralized Energy Source*** - In rural areas, where agricultural waste and animal manure are abundant, biogas can serve as a decentralized energy source.
- ***Waste Management*** **-** Conversion of organic waste into biogas not only provides a valuable energy source but also reduces the costs associated with waste disposal.

India generates 62 million tonnes of municipal solid waste per year, and 50% of it is composed of organic waste.

- **Combating Global Warming -** Biogas also helps mitigate methane emissions that would have otherwise escaped from landfills or manure lagoons.
- Using this methane as a fuel dramatically reduces its climate impact by converting it into CO2, which is up to 34 times less potent as a greenhouse gas.
- **Improving Air Quality** - biogas also plays a crucial role in improving air quality, especially in rural areas where traditional biomass cooking methods, such as burning wood or dung, are prevalent.
- **Carbon Savings** – 1 TPD CBG is comparable to planting around 5.02 million trees annually in terms of CO2 reduction, which would absorb the same amount of CO2 annually.
- **Lower Energy Cost** - The production of biogas heavily depends on locally available organic materials, making it less susceptible to external factors.
- This stability in production costs make it a predictable and affordable energy for consumers and businesses.
- **Additional Income** - Municipalities and industries that adopt biogas technology can generating revenue from the sale of biogas and organic fertilizers.
- **Clean Transport Fuel -** Compressed biogas (CBG) can be used as a substitute for compressed natural gas (CNG) in vehicles, offering a cleaner and often cheaper alternative to conventional fuels.
- The adoption of CBG in public transportation, commercial fleets, and agricultural

machinery can significantly reduce fuel costs, especially in regions where organic waste is readily available.

What are the challenges in Biogas production?

- **Ineffective Waste Management** - Poor collection, improper segregation, and inadequate waste transportation create barriers for utilising waste in biogas production.
- **Complex Technology** and infrastructure - The setup and operation of biogas plants require complex technology and specialized knowledge.
- **Competition with other energy sources** - Biogas competes in the energy market with other renewable energy sources such as wind and solar energy.
- **Economic Viability** - The economic viability of biogas plants strongly depends on various factors, such as energy prices, costs for plant construction and operation.
- **Regulatory Barriers** - The regulatory requirements and bureaucratic hurdles can complicate and lengthen the process of plant planning and implementation.

Government schemes for Biogas Promotion
• **Step Towards Sustainable Alternative Future (SATAT)** • It encourages entrepreneurs to set up CBG plants, produce & supply CBG to Oil Marketing Companies (OMCs) for sale as automotive & industrial fuels. • **Galvanizing Organic Bio-Agro Resources Dhan (GOBARDHAN)** • It aims to support villages effectively manage their cattle waste, agricultural waste/residue and all other organic waste. • Department of Drinking Water and Sanitation, Ministry of Jal Shakti is the coordinating department for GOBARdhan. • **Waste to Wealth Mission** – It aims at strengthening the waste management system in India by identifying and validating innovative technology solutions and models to achieve a zero landfill and zero waste nation. • It is spearheaded by the Office of the Principal Scientific Advisor to the Government of India (O/o PSA).

What lies ahead?

- To fully realize the potential of biogas, continued policy support, technological innovation, and investment in infrastructure are essential.
- Public-private partnerships, along with community involvement, can play a crucial role in scaling up biogas production and making it a mainstream energy source.

Reference

[The Economic Times | Biogas for energy independenc]

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