

# **Biogas production**

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# What is biogas?

- Biogas is produced after organic materials (plant and animal products) are broken down by bacteria in an oxygen-free environment, a process called anaerobic digestion.
- Biogas systems use anaerobic digestion to recycle these organic materials, turning them into biogas, which contains both energy (gas), and valuable soil products (liquids and solids).
- Anaerobic digestion already occurs in nature, landfills, and some livestock manure management systems, but can be optimized, controlled, and contained using an anaerobic digester.
- Biogas contains roughly 50-70 percent methane, 30-40 percent carbon dioxide, and trace amounts of other gases include small amounts of hydrogen sulphide, siloxanes and some moisture.
- The relative quantities of these vary depending on the type of waste involved in the production of the resulting biogas.
- The liquid and solid digested material, called digestate, is frequently used as a soil amendment.

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- Some organic wastes are more difficult to break down in a digester than others.
- Food waste, fats, oils, and greases are the easiest organic wastes to break down, while livestock waste tends to be the most difficult.
- Mixing multiple wastes in the same digester, referred to as co-digestion, can help increase biogas yields.
- Warmer digesters, typically kept between 30 to 38 degrees Celsius (86-100 Fahrenheit), can also help wastes break down more quickly.
- After biogas is captured, it can produce heat and electricity for use in engines, microturbines, and fuel cells.
- Biogas can also be upgraded into biomethane, also called renewable natural gas or RNG, and injected into natural gas pipelines or used as a vehicle fuel.
- The United States currently has 2,200 operating biogas systems across all 50 states, and has the potential to add over 13,500 new systems.

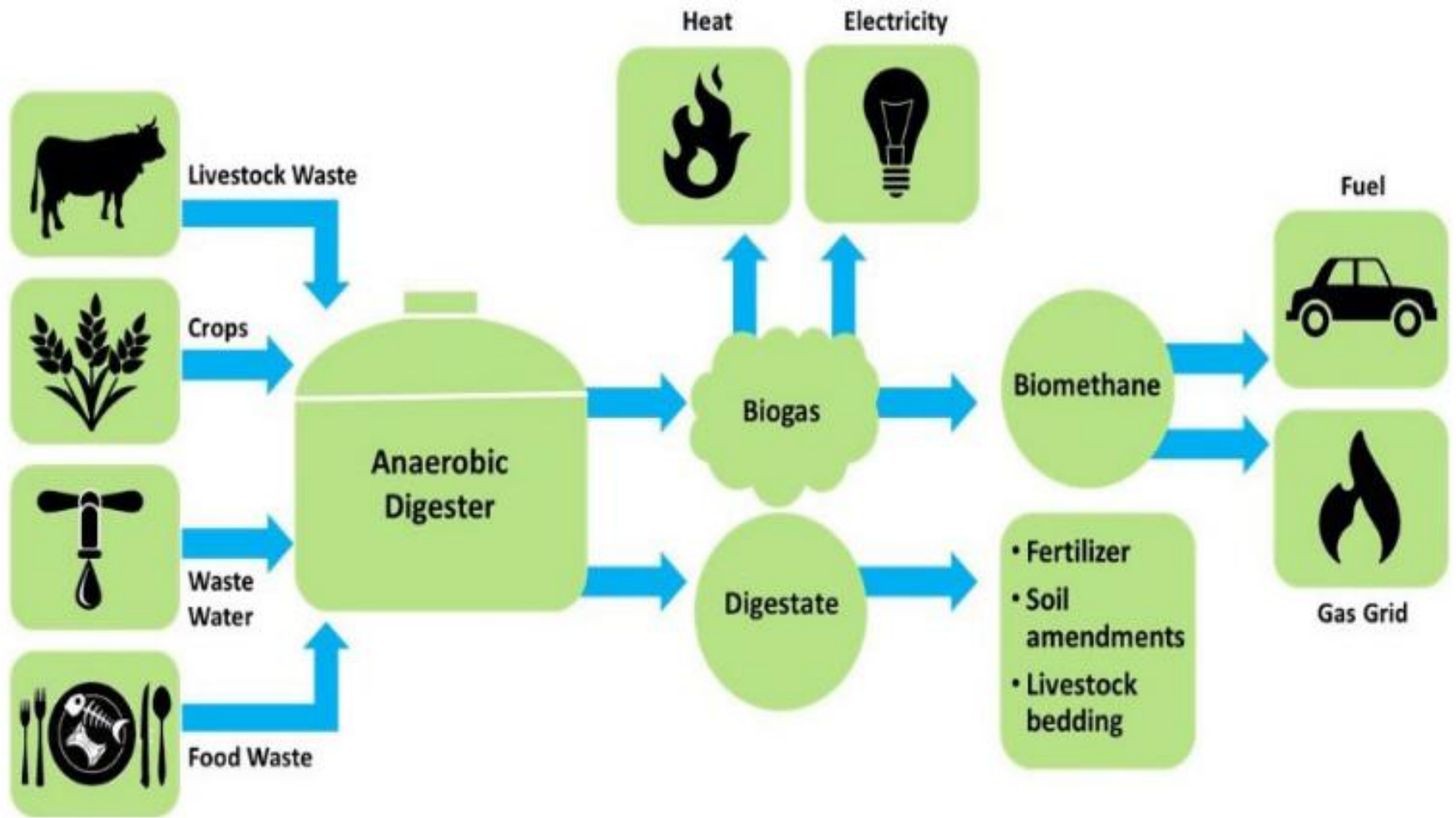


Figure 1: Anaerobic digestion process (Graphic by Sara Tanigawa, EESI).

## Substrates Required in Biogas Production

Animal Wastes	Dung and urine of cattle, buffalo, goat, sheep, slaughterhouses
By-products	Tobacco waste, bagasse, bran
Aquatic plants	Algae, water hyacinth
Crop Residues	Straw, fodder, weed, crop stubble, sticks of cotton and jute
Forest Residues	Branches, leaves, twigs, bark
Urban solid waste	Paper, domestic waste
Human waste	Night soil

# Advantages of Biogas

- Biogas is a safe, cheap, renewable source of energy.
- The use of [biogas](#) is environment-friendly.
- With little to no processing, biogas can be burned on-site to heat buildings and power boilers or even the digester itself.
- Biogas can be used for combined heat and power (CHP) operations, or biogas can simply be turned into electricity using a combustion engine, fuel cell, or gas turbine, with the resulting electricity being used on-site or sold onto the electric grid.
- Renewable natural gas (RNG), or biomethane, is biogas that has been refined to remove carbon dioxide, water vapor, and other trace gases so that it meets natural gas industry standards.
- RNG can be injected into the existing natural gas grid (including pipelines) and used interchangeably with conventional natural gas.
- Natural gas (conventional and renewable) provides 26 percent of U.S. electricity, and 40 percent of natural gas is used to produce electricity.
- Like conventional natural gas, RNG can be used as a vehicle fuel after it is converted to compressed natural gas (CNG) or liquefied natural gas (LNG).
- The residue left after the production of biogas can be used as manure.