Study on making biogas plant from farm manure

Biogas is a mixture of methane and carbon dioxide, produced by the breakdown of organic waste by bacteria without oxygen (anaerobic digestion). The production of biogas at each plant depends on the amount of waste materials available for processing and the capacity of the biogas digester.

Objective:

Generally, a biogas plant is built for the purpose of producing biogas as fuel for cooking, fuel for vehicle and to generate electricity and heat.

The composition of biogas is shown in Table 1.

Table 1. Typical composition of biogas

Compound	Chemical Formula	Percentage (%)
Methane	CH_4	50-70
Carbon Dioxide	CO_2	30-50
Nitrogen	N_2	0-2
Hydrogen Sulfide	H_2S	0-1
Hydrogen	H_2	0-1
Water Vapor	H_2O	0-1

What are the benefits of biogas?

- Biogas systems make clean energy for household use. After an initial investment in the system, there is no need to spend money on fuel and no more smoke from wood or charcoal
- Cooking on biogas is quicker and easier than cooking with firewood
- Biogas systems kill the bacteria in livestock manure. A farm with a biogas system is a cleaner and safer place.
- Biogas systems produce excellent safe fertilizers for use on the farm
- Biogas systems can help in the fight against global warming by allowing us to burn methane.

How do we make biogas?

Biogas is made by fermenting organic waste in a **biogas digester.** The size of a digester can vary from a small household system to a large commercial plant of several thousand cubic metres. Farmers use cow dung to feed their biogas digesters.

Simple biogas digester design has been developed: the Chinese fixed dome digester. The fixed dome type has a lower gas storage capacity and requires good sealing if gas leakage is to be prevented. The waste is fed into the digester via the inlet pipe and undergoes digestion in the digestion chamber. The temperature of the process is quite important because methane-producing bacteria do their work best at temperatures between 30 – 40oC or 50 – 60oC. It takes from 2 to 8 weeks to digest a load of waste, depending on the temperature. The left-over slurry is removed at the outlet for use as a fertilizer.

If we are looking into building a biogas system we will need to decide on the size of the digester. This will depend on how much biogas you need to meet our daily cooking (and lighting) requirements, the availability and amount of livestock manure and water (water, number of cows, goats or other livestock), and the materials available on site (bricks, etc) for construction of the digester. A regular supply of water is essential for operation of biogas plants.