

Good Practice Brief

Lighting up Lives - Biogas from Poultry Litter as a Sustainable Energy Resource

Summary

The poultry industry plays a key role in the Bangladesh economy, and particularly in the rural economy. However, it also poses a huge threat to the environment as approximately 2.3 million tons of poultry manure and 0.2 million tons of litter (faeces with bedding material) are produced daily from a total of 42 million chicken i.e. the number of birds alive at any given time in the country (Waste Concern, 2005). Improper management and utilisation of manure and the inappropriate disposal of litter may contribute to environmental degradation, and ultimately be detrimental for human and animal health.



A joint effort of communities, NGOs and government agencies resulted in the design of eco-friendly biogas plants, which make use of available poultry litter to provide a cheap source of energy to rural households, with positive economic, environmental and health returns.



This good practice illustrates how biogas generated from poultry litter can be an effective source of energy for communities in rural areas. It is estimated that the available poultry litter in the country would suffice to establish about four million biogas plants in rural areas, thereby contributing to increased energy supply.

The context

According to a report by Waste Concern in 2005 (*CDM Project Potential in the Poultry Waste Management Sector in Bangladesh*)¹, about 0.2 million tons of litter (from broilers) and 2.3 million tons of manure (from layers) were generated by poultry farms producing about 10,200 tons of methane gas and 214,000 tons of carbon-dioxide.

Traditional ways of litter/manure disposal are not feasible on a large scale in Bangladesh since there is limited land available for dumping manure/litter and for organized composting. Further, only a few fish farmers buy poultry waste to grow algae in fish ponds. Against this backdrop, the Bangladesh Association for Social Advancement (BASA), a non-government organization, recognized that there is a good opportunity for developing biogas plants by making use of the available manure/litter from poultry. Methane gas can be produced for use as cooking fuel at the household level, and the manure from slurry can be used in agricultural fields.

Technology

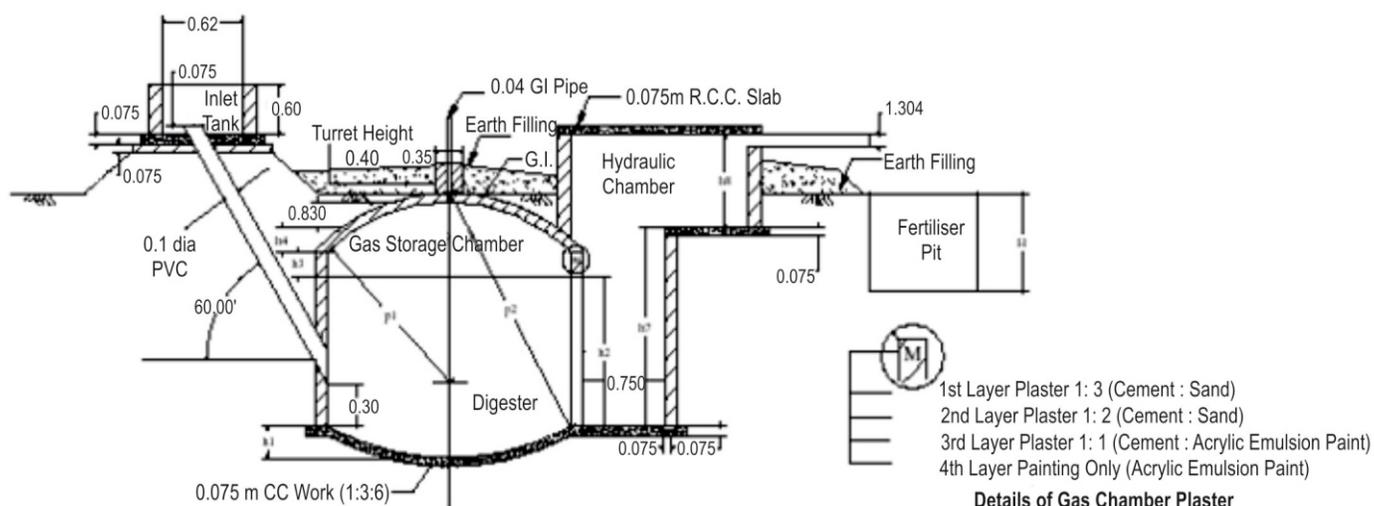
Two designs of a fixed dome biogas plant were promoted – one using cattle dung and human excreta,

and the second using poultry droppings. Each design has 6 sizes ranging from 1.2 to 4.8 cubic meters. While smaller plants provide cooking gas to single households, larger plants are linked up to an average of seven to nine households.

Institutions involved

In order to promote the construction of biogas plants in rural areas, BASA established a partnership with the Infrastructure Development Company Limited (IDCOL), which was established in 1997 by the Government of Bangladesh as a non-banking financial institution (NBF) with the objective of bridging the financial gap for developing medium and large-scale infrastructure and renewable energy projects. IDCOL provides Taka 7,000 as an investment subsidy, to households who install biogas plants as per the specifications and standards set by IDCOL, irrespective of the size of the plant.

Figure 1: IDCOL Biogas Plant Design



Source: IDCOL / SNV (2006) Implementation Plan. National Domestic Biogas & Manure Programme in Bangladesh IDCOL / SNV, Dhaka

The practice

The biogas plants were initially established in the districts of Gazipur and Tangail. BASA followed a systematic process, detailed below, to set up these plants:

Criteria for selecting households: Two types of households were considered-

- *Households with small sized poultry flocks (50-200 birds) and dairy farm owners having two to four cattle, with a long-term interest in setting up a biogas plant, because of regular availability of animal waste on their farms.
- *Groups of women who collectively own a sufficient number of poultry birds to justify the investment in a biogas plant and are willing to share both the investment costs, labour work and the outputs (methane gas and manure from slurry). These groups are expected to form co-operatives in the future so that they may function under certain by-laws/rules.

Awareness programmes: BASA organised a number of awareness programmes and information campaigns, both on the hazards of indiscriminate litter disposal as well as on the potential economic benefits of proper litter management (in terms of generation of biogas and clean energy).

Training and technical assistance: Once the households / group members realized the value of biogas plants from the various awareness programmes, BASA provided training and technical assistance to individual households and women's groups to both build and manage the biogas plant.

Economic aspects of biogas plants: The total cost for installing a biogas plant (including the cost for construction material and stove, mason charges and labour fees, etc.) varies according to the size of the plant. On an average, a small scale biogas plant (ranging in size from 1.2 to 2.4 cubic metres)

requires an initial investment of BDT 17,000. For a large scale biogas plant, the investment could go up to BDT 25,000. IDCOL provides a subsidy of BDT 7,000 for installing each biogas plant while the remaining amount is contributed by the plant owner or by BASA through its credit programme, wherein beneficiaries are required to repay the loan over a three year period.

Input requirements for biogas plant: About 34 kg of poultry litter (i.e. from about 350 poultry birds) and 68 litres of water (or 65 kg of cow dung from 5 - 6 cows / buffaloes and an adequate amount of water) are required daily for a 2.4 m³ biogas plant to function properly. About 80-90 kg of slurry is produced, which after drying can be used in agricultural fields as fertiliser. A 2.4 m³, biogas plant provides up to six hours of continuous gas supply daily that can be used for lighting and cooking.

Benefits from biogas

A biogas plant generates both monetary and non-monetary benefits, at both the household and at the community level. It is estimated that the monetary benefits generated by a biogas plant can offset the initial investment costs within five years.

Some household level benefits are detailed below:

- Improved sanitation where the biogas plant is connected to toilets
- Proper management of poultry litter
- Smoke-free environment inside the house when cooking
- Reduced drudgery, particularly for women, who do not have to spend time in collecting fire wood, straw, dry leaves for cooking and cleaning utensils. It is estimated that biogas usage saves approximately an hour of labour per day per family.

At the community level, a biogas plant reduces the emission of green house gases. For example, one plant of 2.4 m³ makes use of about 2.4 tons of biomass per year, thereby reducing the amount of carbon released from burning biomass. This also preserves forests, which are functional carbon sinks.

In spite of the benefits elaborated above, in the early stages, BASA found it difficult to convince farmers of the potential value of biogas plants, so much so that, in 2005, only one biogas plant was constructed in Gazipur District. In 2006, another ten were built and, by the end of 2008, BASA had managed to support households and groups of households to establish 41 biogas plants. Of these, 25 have been established by individual households and 16 by women's groups.

Limitations/ Constraints

In Bangladesh, biogas plants using poultry litter faced a setback in 2007 and 2008 due to outbreaks of avian flu. Around 60,000 poultry farms closed down and thousands of poultry birds were culled to contain the epidemic. The following are some of the limitations that need to be taken into consideration while up-scaling biogas plants:

- ✳ The majority of the rural population is still unaware about biogas plants.
- ✳ It takes time for a market for biogas products to develop.
- ✳ Despite the fact that biogas plants are largely bankable, some form of government support is necessary to promote their adoption either directly or through establishing public-private partnerships (since there is resistance of private companies to deal with smallholder farmers). The establishment of IDCOL by the government is a step in this direction, paving the way for similar initiatives that provide direct benefits to smallholder farmers.
- ✳ A number of exogenous shocks may affect the profitability / viability of biogas plants, including regular monsoon flooding and high water levels, outbreak of animal diseases etc.

On the whole, there are tremendous opportunities for the development of small-scale biogas plants in Bangladesh but a number of other institutional and economic constraints need to be

consistently addressed if a market has to develop for biogas using poultry litter. A beginning has been made by the government in the National Poultry Development Policy (2008), by which support from the government has been committed for any institution or individual, who takes up initiatives for the safe and eco-friendly utilisation of poultry litter. This policy commitment needs to be translated into sustainable action, such as improved information dissemination regarding the benefits of biogas plants, training based on the knowledge base and priorities of smallholder poultry rearers, particularly women, and availability of credit and loans for the construction of biogas plants.

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