

Dissemination of Domestic Biogas Plants in Bangladesh - Current State, Problems faced and Barriers

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Abstract— The aim of this research is to evaluate the state of the dissemination drives for biogas plants in Bangladesh. The dissemination drive was initiated by a number of organizations long ago. For the last few years, Infrastructure Development Company Limited (IDCOL) established in 1997 is playing the central role for dissemination of biogas plants in concert with other stakeholders. The number of installations per year has risen significantly during the last five years. In this article, current state of success is assessed. As on December 31, 2012 total number of installed plants has reached 65,317. This article also identifies major barriers to dissemination and problems faced by the people. According to a report published by Institute of Fuel Research and Development (IFRD) under Bangladesh Council of Scientific and Industrial Research (BCSIR) which inspected 429 plants in 29 districts to evaluate the conditions of biogas plants installed by them. Among the installed plants 64.31% were found to be in operation.

Index Terms— Bangladesh, Barriers, Biogas, Biogas plants, Dissemination, Renewable energy

1 INTRODUCTION

1.1 Background

Bangladesh is predominantly an agrarian economy. Agricultural sector still dominates the economy accommodating major rural labor force. Traditionally biomasses have been used as fuel in rural communities but prevailing situation is putting huge pressure on already diminishing forest resources in Bangladesh. Bangladesh has limited proven natural gas reserve but for its energy need it hugely depends on imported fossil fuel. With the increase in the fuel price in the international market and reduction of gas reserve in the country, Bangladesh is forced to look for alternative sources of energy i.e., renewable energy resources. The government of Bangladesh has recently taken some renewable energy friendly policies to accelerate rapid dissemination of renewable energy technologies.

Although investment costs of renewable are generally higher compared to fossil fuel alternatives, this option becomes economically viable when all externalities (e.g. environmental cost, health hazards etc.) and lower operating cost are taken into consideration. Biogas mainly from animal and municipal wastes may be one of the promising renewable energy resources for Bangladesh. It is a potential source to harness basic biogas technology for cooking, rural and peri-urban electrification to provide electricity during periods of power shortfalls [1]. However with the agricultural base and cattle population

in Bangladesh, generation of biogas for use in cooking, lighting and generation of electricity looks promising.

Currently biogas is being used mainly for cooking and lighting purposes in rural areas. There have been some experiments on the use of biogas to generate electricity or drive irrigation water pumps.

1.2 Potential of biogas plants in Bangladesh

Traditionally, censuses on livestock in Bangladesh usually show the total number of cattle instead of household-wise number of cattle. It makes difficult to find out number of biogas plants that could be built. At least four cows are required in a household for the smallest size of plant with production capacity of 1.2 m³ which will be feasible. As on 30th June 2011, there were approximately 23.12 million cattle in Bangladesh and the annual growth rate is 0.3% [2].

However, a feasibility study in 2005 carried by SNV (Netherlands Development Agency) shows that as per the 1996 census by Bangladesh Bureau of Statistics (BBS), holdings with 3-4 heads was 2,111,498 and with holdings with 5 heads and above was 952,872 [3]. So, the total number of plant that could be built as per SNV report was 3,064,370.

2 STATE OF DISSEMINATION

Major organizations like Infrastructure Development Company Limited (IDCOL), Grameen Shakti (GS), and BCSIR are currently engaged in dissemination of domestic biogas plants in Bangladesh.

2.1 Infrastructure Development Company Limited (IDCOL)

IDCOL a government owned company, established in 1997 is playing the central role for dissemination of biogas plants in Bangladesh. In 2006, IDCOL launched a large scale extension program on domestic biogas plant through 30 partner organizations. Starting from 2006 to December 31, 2012, they have so

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far constructed total 26,311 biogas plants all over Bangladesh. IDCOL is promoting biogas plants of sizes 1.2 m³, 1.6 m³, 2 m³, 2.4 m³, 3.2 m³ and 4.8 m³ both for cattle and poultry owners. Biogas plants of size 2.4 m³ are most common. Table 1 shows

TABLE 1
SIZE, CATLE/BIRDS REQUERED AND COST OF BIOGAS PLANTS FINANCED BY IDCOL.

Plant Size (m ³)	No of Cattle/Bird	Total Cost (Tk.)*	Subsidy (Tk.)
2.0	4/300	33,000	9,000
2.4	6/350	35,000	9,000
3.2	8/450	39,000	9,000
4.8	12/700	45,000	9,000

* Exchange rate as on January 2013, Tk. 1 = US\$ 0.012

the costing and cattle requirements for different sizes of plants.

The cattle farm owners are using biogas mostly for cooking and lighting, whereas layer chicken farm owners having over 6,000 birds are encouraged to use biogas for generating electricity as well. Table 2 shows plant capacities and hours of

TABLE 2
CAPACITY OF BIOGAS PLANTS (COW DUNG BASED) FOR COOKING (SOURCE: IDCOL)

Number of Cattle	Daily Requirement of cowdung (kg)	Productin Capacity (m ³)	Hours of Operation
4	30-35	1.2	2-3
5	40-45	1.6	3-4
6	50-55	2.0	4-5
7	60-65	2.4	5-6
10	80-85	3.2	6-8
14	120-130	4.8	10-12

operation of cooking stoves for small scale farmers rearing 4 – 14 cattle.

Fig. 1 shows year-wise number of installed biogas plants under IDCOL program.

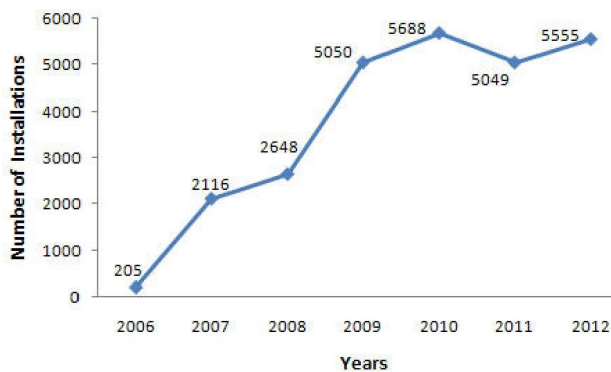


Fig. 1 Year-wise installations by IDCOL

It shows a continuous rise in the number of installations marking the success of this current drive. However, a slight drop in number is observed in 2011. This is due to the prolonged rainy season in 2011 which restricted the construction of biogas plants.

2.2 Grameen Shakti (GS)

Grameen Shakti a private company launched its biogas program in 2005. They have constructed around 7,000 biogas plants in the country under their own program. Recently, Grameen Shakti is providing technical and financial support for the generation of electricity using biogas.

GS also works as a partner organization of IDCOL for construction of small family size biogas plants i.e. 1.6 - 4.8 m³ of gas production per day. They have so far constructed over 11000 biogas plants as partner organization under IDCOL's program.

2.3 BCSIR

Under various programs BCSIR has been engaged in the installation of 22,334 domestic biogas plants across the country. Institute of Fuel Research and Development (IFRD), BCSIR has started a biogas dissemination project called "Mitigation of Carbon Emission and Extension of Alternative Energy usage through dissemination of Biogas Plant and Improved Cook Stove" funded by Climate Change Trust Fund, Climate Change Unit under Ministry of Environment and Forest. IFRD is to disseminate 2800 domestic biogas plants in seven districts by seven agencies.

3 OVERALL PROGRESS IN DISSEMINATION

As on 31 December 2012, a total of around 65,317 biogas plants

TABLE 3

ORGANIZATION-WISE INSTALLATIONS

Organization	Number
IDCOL	26,311
BCSIR	22,334*
GS (outside of IDCOL)	7,000**
NGOs and Others	9,672
Total	65,317

*This figure does not include BCSIR's latest ongoing project

**Approximate figure

have already been installed in Bangladesh. Table 3 shows the number of domestic biogas plants installed by major organizations in Bangladesh as of December 2012.

Fig. 2 shows the total numbers of biogas plants installed in each five year period starting from 1981 up to 2010. We ob-

serve a rapid growth from 1995. It may be attributed to the rise in price of kerosene and fire woods.

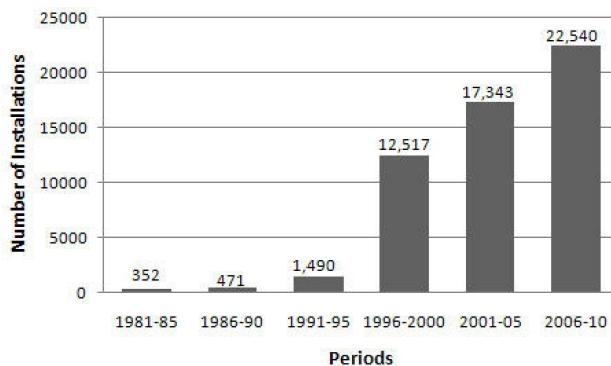


Fig. 2 Five-yearly installations of biogas plants in Bangladesh

Furthermore, due to the increased participation of woman in development activities in the rural areas, finding time for collection of branches of tree, twigs and leaves became difficult. These are the major reasons for farmer turning to biogas plants as an alternate source of energy. The Fig. 3 shows cumulative number of biogas plants from 1985 to December 2012 in Bangladesh.

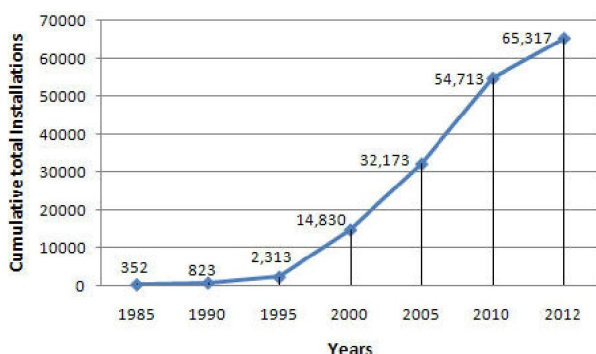


Fig. 3 Cumulative number of biogas plants installed in Bangladesh

4 BARRIERS TO DISSEMINATION OF BIOGAS TECHNOLOGY

Key barriers of biogas technology dissemination included uncertainties about post-warranty services, high initial costs, technical difficulties, scarcity of feedstock and the general reduction in the number of domestic animals, particularly cows. Inadequate gas production was one of the most common problems facing biogas users. As a result of inadequate gas supply, household's often resorted to use traditional cook stoves to meet their cooking needs [4].

Although large-scale plant production appears economically and financially feasible, several key issues must be addressed. First, it is unclear whether the subsidy culture that characterized past programs will create future difficulties. Second, it is likely that biogas plants will benefit better-off households

more than the poor [5]. Third, the number of potential plants is unknown. The daily amount of cow-dung required for cooking three meals a day is known, however reports conflict regarding the number of cattle owned by rural households [6]. Sometimes, the rainy season prolongs in Bangladesh and high water table limits the construction season to six to seven months per year. The idea of attaching the latrine to the biogas plant is not getting social acceptance among the rural people due to unawareness of health and environmental benefits.

5 PROBLEMS FACED AND REASONS FOR FAILURE OF SOME OF THE INSTALLED BIOGAS PLANTS

IFRD, BCSIR has inspected 429 plants in 29 districts to evaluate the present status of biogas plants installed by them. Among the installed plants 64.31% were found to be in operation, 21.80% were non-functioning due to lack of raw materials and rest 13.89% had some technical and other problems such as availability of natural gas, migration of the plant owners to other places etc. [7]. Frequent complaints have been pointed out in the IFRD report; such as masons not using good-quality raw materials during plant construction, incorrect plant dimensions. Some other technical problems, such as the cow dung not making into the digester and frequent breakdown of the mixing device. After-sales support was not adequate in many cases, and as a consequence the users stopped paying their monthly installments. Some also sold off their cows due to financial problems. As per this report, it may be concluded that 35.69% of installed plants are not functioning. If this finding is taken into consideration and considered as the case countrywide then the operating plants may amount to approximately 42,000.

6 FUTURE PROSPECTS

For the last three years, IDCOL has succeeded to build around 5,000 - 5800 plants per year. Unless the capacity of the partner organizations of IDCOL is increased significantly, it will take much longer time to realize the full potential biogas plants in Bangladesh. In November 2011, IFRD of BCSIR has taken up a project for setting up 2,800 new plants. If other organizations like LGED, DLS etc. having previous experience of running similar projects, also join this drive with uniform approach of design, construction technology and subsidy, then the process of dissemination will get a significant boost.

7 CONCLUSIONS

Technology behind biogas plants has now reached a matured stage in Bangladesh. A large number of technical personnel for construction and maintenance of domestic biogas plants have already received training over the past 30 years. Farmers are beginning to appreciate the manifold benefits from biogas plants. The role of IDCOL as the leading organization in the dissemination of biogas plants has been highly appreciated by all stakeholders in Bangladesh. It is right time to engage other government and nongovernment organizations who are working in this field with IDCOL to promote this technology at the rural level, so that the whole potential of biogas generation can

be realized and also the dependency on imported fossil fuel can be reduced.

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