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Biomass energy in Bangladesh: Current status and prospects

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ABSTRACT

Bangladesh has been experiencing several problems over the past few decades. These include over population, energy crisis and global warming, etc. Adequate amount of power generation in a sustainable way is an important issue for rapidly increasing population and economic development. Renewable energy can play an effective role to meet energy demand. Since it is an agrarian country, biomass is one of the potential renewable energy sources in Bangladesh. Agricultural crop residues, animal manure and municipal solid waste are the major sources of biomass energy in the country. This paper presents the scope, potential and technologies related to the use of biomass resources. The study also discusses the biomass projects undertaken by the government and non-government organizations, plans and strategies to promote biomass technologies in Bangladesh.

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1. Introduction

Bangladesh is one of the least developed and densely populated nations in the world. According to the reports of Bangladesh Bureau of Statistics (BBS)—2005, around 40% and 25.10% of the total population live below the upper and lower poverty lines, respectively. The rate of poverty in the rural areas is higher than the urban areas. In the rural areas, about 43.80% of people live below the upper poverty level, while 28.60% in the urban area [1]. Access to electricity is one of the essential preconditions for reduction of poverty, improvement of living standard, establishment of environmental sustainability and overall agricultural and socio-economic developments in the rural areas.

Currently, around 49% of the people in Bangladesh are connected to electricity grid. More than 70% of the people live in the rural areas, where only about 25% have access to electricity. As a part of the programs for developing living standard of rural people, the government has planned to electrify the entire country by the year 2020 [2]. According to the government strategy, the goal of this plan will be achieved through short, medium and long term programs for increasing electricity generation by using natural gas, coal, liquid fuel, nuclear energy and also renewable energy sources.

At present, production of natural gas in Bangladesh is about 1100 million cubic feet/per day, while about 3 million tons of petroleum products are imported every year. The commercial energy sources provide about 27% of the total energy consumption in the country, which are mainly used in industrial and urban areas. Industrial areas are mostly located in cities and the people in the cities are the consumers of commercial energy. Whereas, the majority of the rural people of the country have no commercial energy supply [3–6]. The percentage of population having access to gas is about 6%, primarily in urban areas. However, in recent years, due to the lack of exploration of new gas fields and depletion of present gas reserves, supply of natural gas has been in jeopardy [7]. Such a situation has restricted further installation of power generation plants using natural gas. Due to this concern, the government has planned to find alternative sources of fuel, other than gas and oil. According to the plan, liquid energy and coal will support significant portions of electricity generation. However, renewable energy is one of the promising fields that can be contributed to the diversification plan. In addition, due to the financial constraints, inaccessibility and low consumer density in many rural areas, the electrification through grid expansion may not be pragmatic. To reach the goal, renewable energy sources can play an imperative role for off-grid electrification.

Naturally, biomass is a potential source of energy in Bangladesh. The rural economy is plagued by slow growth rate, unemployment problem, deficient infrastructure and abject poverty. Currently, Bangladesh is the seventh most crowded countries in the world and biomass provides 73% of the total energy [8]. Biomass resources (such as wood, cow dung and agricultural wastes) available in rural areas are utilized as cooking fuel. In the rural areas, only 5% people use kerosene as fuel [9]. For the purpose of lighting the houses, most of the people in the village use kerosene based lamps.

Nowadays, biomass is being utilized to generate renewable energy in many countries of the world. Biomass covers about 50 exajoule per year of total primary energy demand of the world [10].

The generation of energy from biomass offers a number of advantages. The cost of biomass residues is low and the energy conversion efficiency is high comparing with other fossil fuel based generation techniques. Thus it reduces the ultimate cost of electricity. Besides energy, the technology also provides organic fertilizer, increases crop production, promotes a clean and green environment [11].

The paper is organized as follows. Section 2 discusses the energy scenario of Bangladesh and geographical supports for biomass production. Sections 3 and 4 describe the biomass resources in the country and energy potential from biomass respectively. Sections 5 and 6 present the available biomass to energy conversion technologies and available biomass related technologies in Bangladesh. Finally, the plans and promotion strategies undertaken by different organizations are mentioned in Section 6.

2. The Bangladesh scenario

2.1. Energy status and demand

The current population of Bangladesh is about 160 million and the country has an area of 147,570 km² [12]. Per capita electricity generation is an assessment of physical quantity of life and it is low in Bangladesh. Currently, per capita electricity generation is about 292 kWh/year. The demand for electricity is in all sectors of the economy including agriculture, industry and service sectors. Domestic and industrial sectors consume about 43% and 44% of electrical energy respectively, i.e. a total of about 87% of power consumption occurs in these two sectors [13]. Actual demand of electricity could not meet in the last few years due to insufficiency in maximum generation capacity. Table 1 shows the year-wise installed capacity and maximum generation of power plants. The total installed capacity was 5262 MW in FY 2007–08, which has increased to 8525 MW in FY 2012–13 with an annual increase of 10.34%. However, the maximum generation was 4130 MW in FY 2007–08, which has increased to 6350 MW in FY 2012–13 with an annual increase of 8.96%. The annual rise in maximum generation (8.96%) is lower than that of the installed capacity (10.34%) between the FY 2007–08 and 2012–13. This is mainly due to the less generation capacity of older power plants and shortage of gas supply.

The installed capacity and maximum generation were 8525 MW and 6350 MW respectively in August 2012, which is the maximum generation in the history of Bangladesh. It is approximated that the average generation capacity is around 6000 MW, while the actual demand is more than 7500 MW. Therefore, load shedding has increased. Within the reach of the national grid, Bangladesh is

Table 1
Year-wise installed capacity and highest generation in Bangladesh [14].

Fiscal year	Installed capacity (MW)	Maximum generation (MW)
2007–08	5262	4130
2008–09	5809	4162
2009–10	5978	4606
2010–11	6658	4890
2011–12	8100	6066
2012–13 (up to March)	8525	6350

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