

Diversification of Rural Energy Consumption Pattern in Bangladesh: A Case Study

P. K. Halder¹, N. Paul², Sabrin Arefin¹, K. M. Razwan Kabir¹, M. R. A. Beg³

¹Department of Industrial and Production Engineering, Jessore University of Science and Technology, Jessore-7408, Bangladesh

²Institute of Appropriate Technology, Bangladesh University Engineering and Technology, Dhaka-1000, Bangladesh

³Department of Mechanical Engineering, Rajshahi University Engineering and Technology, Rajshahi-6204, Bangladesh
E-mail: pobitra.halder@gmail.com

Abstract

Bangladesh is a developing country where rural energy need is one of the major threats for the country's economic development. This paper explores the energy accessibility and consumption pattern in a selected rural area in Bangladesh. Cooking and lighting are the major sectors for energy demand met by traditional energy sources. Biomass, primarily agricultural waste, cow dung, wood, and tree leaves covers the cooking energy demand. On the other hand, kerosene is the foremost commercial energy source for illuminating the area. Considering their environmental threats government of Bangladesh is focusing on renewable and environmentally sustainable technologies. The paper also illustrates the willingness of the villagers to pay for these technologies. Some of the villagers have already established domestic biogas plant and solar home system and enjoying better lighting and cooking facility.

Keywords: Energy access, biomass energy, renewable energy, poverty, cooking and lighting.

1. Introduction

Bangladesh is one of the low energy consumption countries in the world with an area of 147570 sq. km. Total population of the country is about 164 million of which almost 70% live in rural areas. As a developing country, sufficient modern energy is crucial for the economic and health issues for the country. However, per capita primary energy consumption rate in the country is still very low as accounts 205 kg oil equivalent [1]. In Bangladesh, about 60% of the total population has electricity access and only about 1.5 million households have natural gas connection for their energy need [2]. Moreover, almost 90% households in Bangladesh use biomass and rest use natural gas, LPG and biogas for cooking [3]. Only, straw, leaf and dried cow dung contributes about 51.20% of total cooking fuel and kerosene contributes almost 39.50% of total lighting energy in Bangladesh [4]. Household energy consumption is closely related with the economy and living standard of the country. However, there is huge gap between energy demand and supply in Bangladesh and this unsatisfied energy demand impedes the country's progress towards the vision 2021. This scenario is in acute stage in the rural areas where the people have no modern energy access. Only 20% of the people living those rural isolated areas in Bangladesh enjoy electricity facility. In addition, they have no gas connection yet. Bangladesh is a poor country where almost 53 million people live below the poverty line although the poverty declined by 19% during the last decade-and-a-half [5]. Therefore, people in rural areas lead a vulnerable life and unable to utilize commercial energy due to its higher price. Biomass resources such as wood, bamboo, twigs, wood shavings, sawdust, bark, roots, shell and coir of coconut, agricultural residues (paddy husk and bran, straw, jute stick) charcoal and cow dung are the main cooking energy sources used by almost 99% households in rural areas. On the other hand, kerosene and candle are the major sources used for lighting purpose. In this modern era, biomass is still the leading energy source in rural areas in Bangladesh due to poverty, lack of resources and effective energy policies. Traditional use of these biomass energy and kerosene causes hazard effects on user health and responsible for air pollution. Thus, rural people are willing to pay for switching to alternative clean energy sources like small scale biogas plant, solar home system etc. Government has already taken several initiatives to disseminate these technologies throughout the rural areas. Grammen Shakti, BRAC, RSF, Shrizony Bangladesh are the pioneer private organizations establishing these technologies to improve life standard and better health of rural populations. Moreover, the technologies are getting momentum and acceptance in rural areas. This paper

presents a privileged survey of a selected village namely, Abdulpur in Churamonkati union in Jessore district, Bangladesh. The paper also shows the socio-economic status as well as energy need and consumption pattern of the villagers of that rural area.

2. Survey area and methodology

A village named Abdulpur in Churamonkati union in Jessore district, Bangladesh was selected for the survey as shown in Fig. 1. Total households surveyed in the village are 59 of which 28 households are utilizing renewable and green technology. The total number of the inhabitants in the households surveyed is 312 of which 153 are accessing renewable energy with average family size of 5-6 persons per household.

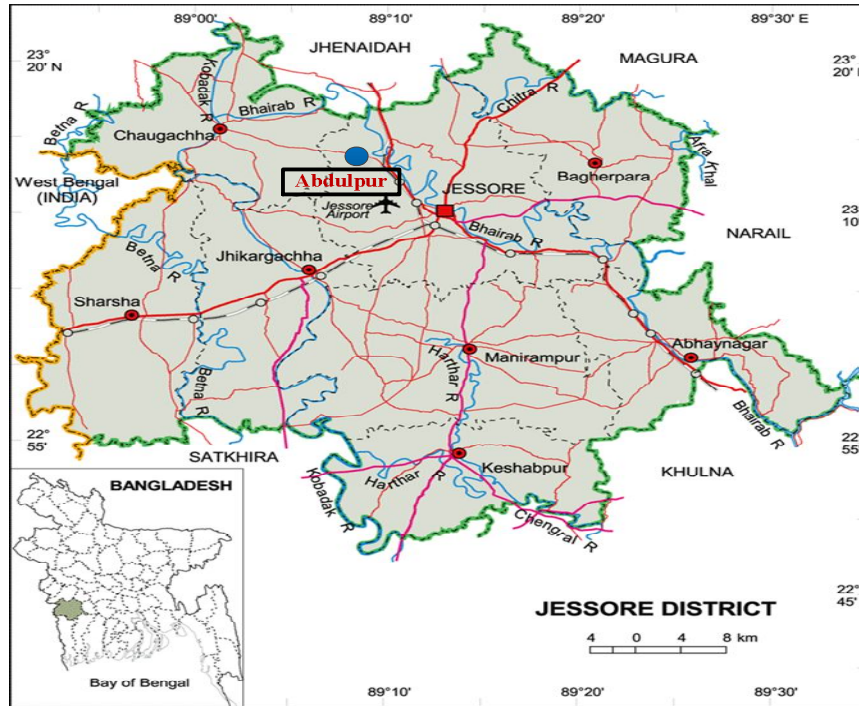


Fig.1: Geographic location of survey area

More than 75% of the respondents are educated in the village where 35.71% of them have at least higher secondary education and rest have primary and secondary education. Most of the households (almost 82%) in the village have very low and medium monthly income which indicates the poor economic situation of the village. About 25% of total households depend on agriculture as their primary income source whether almost 67.86% depend as secondary income source. All the data including socio-economic condition and energy need are collected from the peoples of the village through a comprehensive series of questionnaire. The whole procedure of this work is presented in Fig. 2.

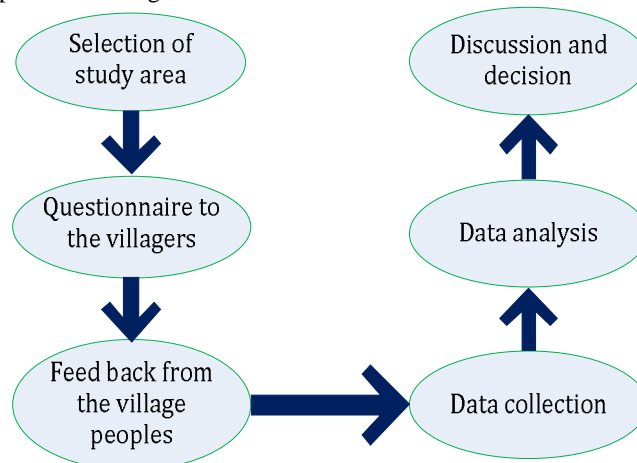


Fig. 2: Schematic representation of methodology

3. Energy status in survey area

3.1. Energy access ability

The villagers use cow dung cake, cow dung stick, jute stick and tree leaves for cooking purpose. Generally, they collect these biomass fuels from agricultural land, domestic cattle and trees around the house. On the other hand, lighting fuel kerosene is collected from nearby hat, bazar or market. However, the fuel collection is not easier for the villagers all the time as it depends on income, collection time and available own resources. Figure 3 represents the degree of fuel access of villagers depending on their income. About 40% of low income people collect easily from the field and other sources whether 45% of them found sometime difficult to collect as they have no enough money to buy or enough cattle for dung or enough agricultural land for residues. On the other hand, medium and high income group shows the higher percentage of easy collection for their available own resources like cattle, land and money. Nevertheless, high income group faces problem for collection due to lack of sufficient members or time.

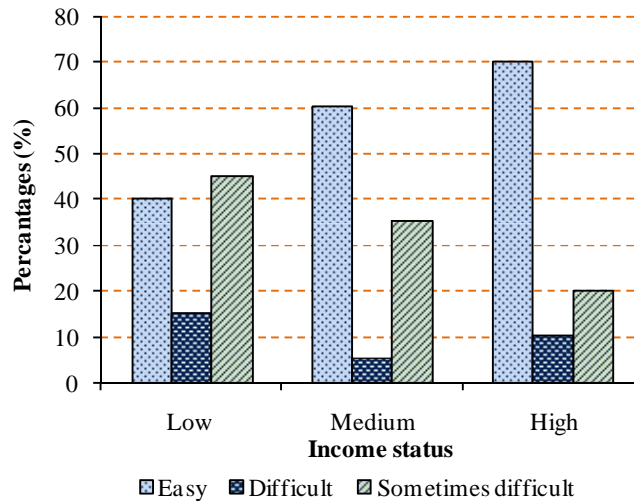


Figure 3: Fuel accessibility of various income groups in selected village

3.2. Reasons to change the energy consumption pattern

Now-a-days modern energy supply is the key indicator of industrial development as well as to change the lifestyle of human being in the world. As a part of digital Bangladesh the rural people of the country are intending to shift their energy consumption pattern into modern energy like solar, biogas etc. The primary energy consumption in survey area includes kerosene and biomass (wood, crop, dung) for lighting and cooking.

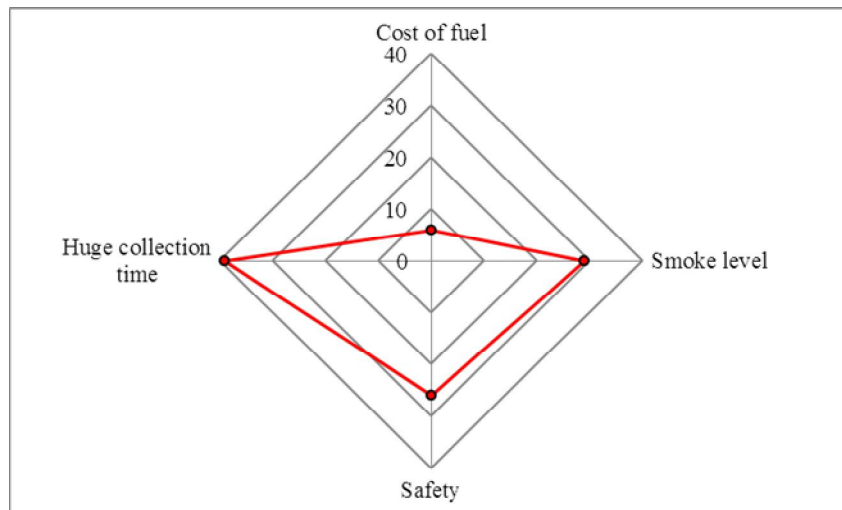


Fig. 4: Reasons for changing the current cooking pattern