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Domestic energy-use pattern by the households: A comparison between rural and semi-urban areas of Noakhali in Bangladesh

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ABSTRACT

An explorative survey was carried out on rural and semi-urban households to find out the energy consumption pattern with respect to socio-demographic and geographic factors in Bangladesh by using stratified random sampling technique. The study revealed that 100% of the households used biomass, 98% kerosene, 61% electricity, 23% LPG and 5% candle in the rural areas. In the semi-urban areas, 100% of the households used electricity, candle and natural gas, 60% kerosene and 13% petrol. Households' mean expenditure for total energy was US$ 5.34 (SE, 0.43) with total income US$ 209.84 (SE, 6.69) month^{-1} in the rural areas, while it was US$ 6.20 (SE, 1.35) in the semi-urban areas with the total income US$ 427.76 (SE, 24.19) month^{-1}. This study may be a useful baseline information to energy policy makers in Bangladesh.

1. Introduction

Households, especially in the developing countries, contribute significantly to the total energy consumption of a nation. Several factors, such as, socio-economic, demographic, geographic and dwelling characteristics of the households determine the households' energy requirements (Pachauri, 2004; Rao and Reddy, 2007). These factors are usually different in rural and urban areas. So, the total energy use patterns in rural and urban areas are different. About 77% of the populations in Bangladesh live in the rural areas and they need energy for their domestic use like cooking, crop processing, lighting, agricultural industries, social welfare and commercial activities (BBS, 2006). This is why energy economy is directly interrelated with households' energy using pattern in developing countries (Pokharel, 2004). However, Bangladesh faces severe crisis in biomass, oil and coal for energy (Asaduzzaman et al., 2010; GOB, 2008a). The generation of electricity and its distribution is significantly lower than the demand. Up to 2005, only around 38% of the population at national level and 14% at rural level in Bangladesh had access to electricity (GOB, 2008a). In this perspective, development of the energy resources both for rural and semi-urban areas in Bangladesh is important (Barnes et al., 2011). Understanding the differences in energy use patterns by the households between rural and semi-urban areas will contribute to the energy planning and policy, which will be critical to the development of the energy resources in Bangladesh.

Different authors reported the variations of the energy use between rural and urban areas in the South and Southeast Asia. The dominance of biomass fuel for the major end-use, cooking was found at the rural households, in contrast to the dominance of fossil fuel (e.g., LPG—Liquefied Petroleum Gas) in the urban areas in India, Nepal and Sri Lanka (Heltberg, 2004; Rao and Reddy, 2007; Reddy, 2004; Reddy and Srinivas, 2009; Wijayatunga and Attalage, 2002). They also concluded that household energy preference and consumption pattern should be understood with the influence of economic condition, family size, sex and age distribution of the households members, age of the holdings, nature of the occupation, education attainment of the principal wage earner and of the family members and the frequency of cooking. Heltberg (2005) also confirms the same factors for household fuel choice at both rural and urban areas of Guatemala. However, strategies for enhancing biomass energy use for both rural and urban households was suggested by Samson et al. (2001) for the Philippines. Notwithstanding this, an energy expenditure structure of the households and its comparisons between rural and urban area is not comprehensively and concretely discussed in most of the above studies.

Kennes et al. (1984) studied on the supply and demand of the biomass energy and its interrelationships with 9 socio-economic

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groups of Bangladesh. They found biomass as scarce energy resources, which were used up to the physical limits and often beyond sustainable long run ecological limits. They also found that crisis of the biomass energy was felt differently by the different socio-economic groups, as the biomass resources were not allocated uniformly. Bala et al. (1989) found woodfuel as the dominant source of energy for cooking in an electrified village of Mymensingh district, Bangladesh. The studies of Kennes et al. (1984) and Bala et al. (1989) are still important and citable because of their validity even after around two decades in Bangladesh, in terms of socio-economic effects on the energy use. (Sarker and Islam, 1998), Miah et al. (2003) and Jashimuddin et al. (2006) found that traditional biomass energy contributed to the major rural energy supplies in different rural areas of Bangladesh. In the rural areas of Bangladesh, biomass provides household energy contributing to an essential role for almost 75% of the people (FAO, 2009). Asaduzzaman et al. (2010) acting as the World Bank group, conducted two countrywide surveys on rural energy realities focusing on rural households and the other on village microenterprises and rural growth centers eliciting information on energy-using behavior, characteristics, market structure for energy and the macro-level dimensions of supply and demand of biomass. Asaduzzaman et al. comprehensively confirm high level of reliance of the rural households on biomass fuel indicating it a scarce energy resource in Bangladesh. Their study also confirms cooking as a major end-use of biomass fuel and firewood as a superior cooking fuel in Bangladesh. Asaduzzaman et al., therefore, confirm the most findings of the above noted studies in rural Bangladesh. Nevertheless, most of these studies lacked a comprehensive comparison of the energy-using pattern and its expenditure between rural and semi-urban households. In this perspective, the key research question concerns what is the variation of the energy-using pattern between rural and semi-urban households in Bangladesh. To answer this research question, a study was undertaken to assess the energy utilization pattern and its influencing factors in the rural and semi-urban areas of Noakhali Sadar Upazila[1] of Noakhali District, Bangladesh. It is expected that the findings of the study will be important for the appropriate energy policy and planning at the household level in Bangladesh.

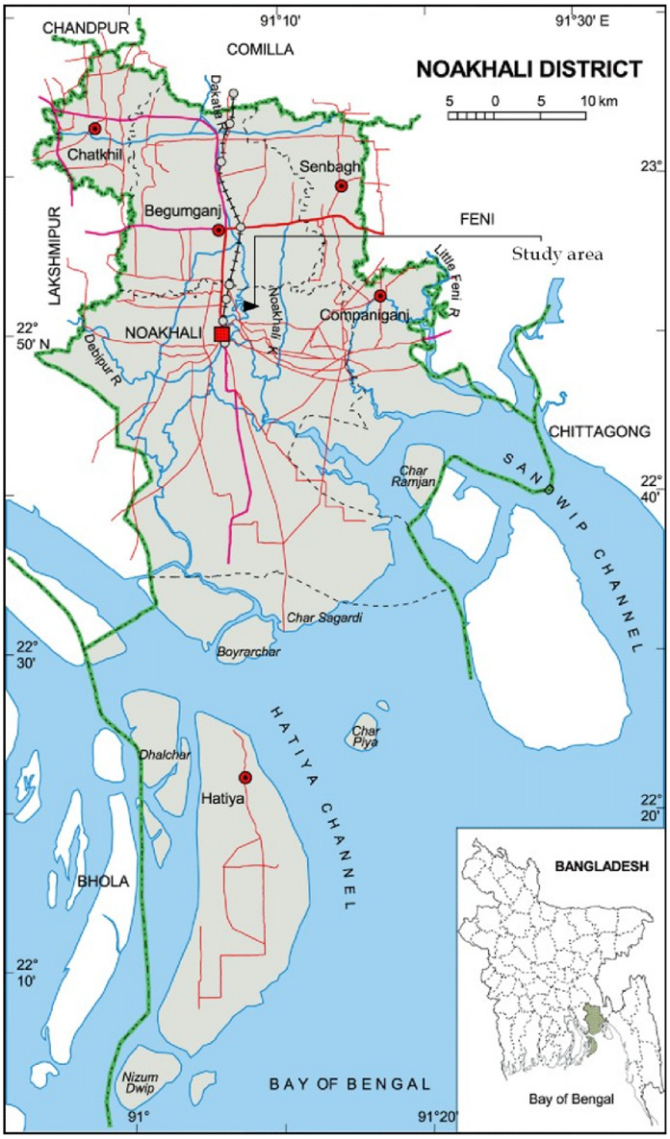

Fig. 1. Study area in Noakhali district of Bangladesh.

2. Materials and methods

2.1. Description of the data source

The study was carried out at Noakhali Sadar Upazila of Noakhali district, located between 22°31″ and 22°48 ′North latitude and between 90°46 ″and 91°17 ′East longitude, with an area of 1072 km^2 (Fig. 1). The Noakhali Sadar Upazila consists of 13 Union Parishads[2], 186 Mauzas[3], 73,333 households and 172 villages and semi-urban area of this Upazila consists of 9 Wards[4] and 36 Mahallas[5] (BBS, 2006). It has a total cultivated land of 229,385 hectares (ha) and fallow of 92 ha with the total population 65,1620, where 75,956 (12%) live in the semi-urban areas. Males and females constitute almost the same percentage (50%) among the total population. Muslim constitutes the major part, 93%, Hindu 6% and others 1% among the total population in the areas (BBS, 2006). Average literacy rate is 30% in the Upazila. Main occupations included agriculture 30%, agricultural laborer (who works in the other agricultural lands) 17%, wage laborer 3%, commerce 12%, service 19%, transport workers 2%, fishing 1% and others 16% (BBS, 2006). Among the peasants, 21% are landless, 41% marginal, 21% small, 14% intermediate and 3% rich. Per capita net cultivated land is 0.09 ha.

Majority of the respondents were male, 68% in the rural areas and 93% in the semi-urban areas. Although females are the major energy users at the household level evident by many literatures, most women in the present study tended to be reluctant to talk to outsiders. So, we approached male heads of the selected households for data collection. But, the present study is unable to explain the causes of variation of the number of female respondents between the rural and semi-urban areas. To remove the gender bias, our data collection team composed of at least two local volunteers (ages between 19 and 55 years) where at least one was female. While collecting data from the male heads, female volunteers also cross-checked the data with the female adults of the households. However, most of the respondents in the rural areas were illiterate, and below the graduate level in the semi-urban areas.

[1] Local government unit under a district in Bangladesh.
[2] Local government unit under an Upazila in Bangladesh.
[3] Smaller units of Union Parishads mainly used for land demarcation.
[4] Local government unit under a municipality.
[5] Smaller unit of Ward.