

A Study on Domestic Energy Consumption in Rural, Semi-urban and Urban Sectors of Jorhat District: Assam

Reeta Sarmah*, Dikshita Bhattacharyya**

* *Mechanical Engineering Department, Jorhat Engineering College,
Jorhat-785007, Assam, India*

** *Mechanical Engineering Department, Jorhat Engineering College,
Jorhat-785007, Assam, India*

ABSTRACT

A study was conducted to analyse the domestic energy consumption pattern of rural, semi-urban and urban sectors of Jorhat district of Assam. The data collected regarding domestic energy consumption and domestic fuel technology in rural, semi urban and urban households were analysed. The per capita kerosene consumption was found to be 0.372 GJ per year and that of fuel wood per capita was found to be 10.101 GJ per year. Per capita electricity consumption was estimated at 0.0029 GJ per year in rural domestic sector. The per capita consumption of kerosene, fuel wood, LPG and kerosene was found to be 0.451 GJ per year, 0.762 GJ per year, 1.986 GJ per year and 0.578 GJ per year respectively in semi- urban sector. In the urban sector, kerosene consumption was found to be 0.221 GJ per year and that of LPG and electricity was found to be 2.321 GJ per year and 0.983 GJ per year respectively. Use of fuel wood in urban sector was found to be nil.

Keywords: *Rural energy, per capita consumption, fuel wood, kerosene, LPG, electricity*

1. INTRODUCTION

The domestic consumption of fuel occupies a large share in the national energy consumption in India. The non commercial and traditional sources of energy namely, fuel wood, dung and agricultural residues constitute the main sources of domestic energy in rural India, catering to the needs of about 80 per cent of the households despite the availability of the commercial sources of energy[1], fuel wood occupies a major position catering to the needs of about 56 per cent of the rural households[2].

The energy situations in India is varied in nature with varied physical and socio-economic scenarios[3]. For this, special understanding appears to be a basic approach towards evolving area specific rural energy strategies[4,5].

Majority of the rural people in Assam which is situated in the north-eastern part of India, rely basically on fuel wood collected from nearby forests

or fields as cooking fuel. Kerosene is used as household lighting fuel as the constant availability of electricity is very poor in rural areas. The large scale consumption of fuel wood causes the rapid depletion of forest resources. Although rice is the main crop in Assam, a huge amount of rice residues go waste due to lack of awareness of the rural masses about proper utilisation of these as domestic fuels. Twelve villages were sampled in Jorhat district of Assam to study the domestic energy consumption pattern.

The semi- urban people use fuel wood, kerosene and LPG as cooking fuels and kerosene and electricity as space lighting fuels. The semi urban people buy fuel wood that come from the rural areas. Almost all people have to keep kerosene as an alternative for lighting as electricity failure is a regular phenomenon in these areas.

LPG is the main cooking fuel in urban sector of Assam and electricity is the main space lightning fuel. Kerosene is kept as an alternative in some households to use for lightning purposes whenever there is a power cut or load shedding. The urban masses use electricity to run some household electrical appliances and it is also used for cooking in some households.

As not much studies have been conducted in the line of domestic energy consumption in the north eastern part of India[7], an attempt is made through this paper to compare domestic energy consumption in rural, semi-urban and urban sectors of Jorhat district of Assam.

2. MATERIALS AND METHODS

A stratified random sampling technique was used for selecting households as sample units. Based on the existing infrastructural facilities such as the condition of roads, availability of electricity, transportation, marketing facilities, LPG agencies, educational facilities, medical facilities etc., the three sectors were identified on the basis of the distance required to traverse to avail these facilities, the three sectors in which 0-7 kilometre represents the urban sector, greater than 7 kilometre represents

semi-urban sector and greater than 15 kilometre represents rural sector. Sample of 450 households were chosen for rural households, 245 for semi urban households and 215 fir urban households.

The domestic energy sources and consumption pattern were obtained from every household through a questionnaire. The survey data were collected at two levels- the sector and the household. The data were collected through personal interview. Approximately 30 minutes time was taken in filling up the questionnaire for each household.

Two end uses mainly for cooking and space lightning were considered in the three sectors. The information on cooking was sought on the type fuel and amount consumed per day per household. Data regarding consumption of fuel wood and kerosene per day per household, unit of electricity consumption per month per household and the number of LPG cylinders consumed per household per month were collected from the sampled families.

Based on the feedback received the data were modified into standard forms. The calorific value of fuel wood with 20% moisture content (air dried) is 15 MJ per kg and that of kerosene is 44 MJ per kg[4,7]. Also, calorific value of LPG is 35.2 MJ per cubic metre. 1 kW of electricity is equivalent to 3.6 MJ.

The yearly energy consumption was found from conversion from the per day energy consumption. For winter season i.e. from November to March, 40% excess of the daily fuel wood consumption was added in the calculation of annual consumption rate as most of the rural households consume low quality fuel wood for warming up. The energy consumption in a household was added to obtain annual energy consumption rate of a sector.

LPG is commonly used as a cooking fuel in semi urban and urban areas. Data collected on number of cylinders per month per household were

converted into energy. One LPG cylinder for domestic use contains 14.2 kg of fuel and this converts to 624.8 MJ of energy. Finally, yearly consumption of LPG in cooking was found out.

As most the sampled rural households were unelectrified, the kerosene serves the purpose of space lighting in these households. In semi- urban sector, the people keep kerosene as an alternative for space lighting when whenever there is a power cut or a power failure. Some of the urban people use kerosene for cooking purposes. Data on volume consumption of kerosene per household were converted into yearly energy consumption. Finally, the energy consumption for the three sectors was taken.

Data collected on unit electricity consumption in kWh per month in the households of rural, semi urban and urban sectors were converted into MJ (1 kWh = 3.6 MJ) and then the annual electricity consumption per household was estimated. The pattern of yearly electricity was obtained by adding total households for each sector.

3. RESULTS AND DISCUSSIONS

3.1 Rural Domestic Sector

Table-1 depicts per capita per year domestic energy consumption in rural, semi rural and urban sectors. Fuel wood serves the purpose of cooking in 100% of rural households, kerosene and electricity are used for space lightning in rural households. The annual energy consumption in rural sector for cooking with fuel wood was found to be 57,737.32 GJ and per capita per year consumption to be 10.101 GJ. The yearly energy consumption from kerosene in this sector was estimated at 2126.35 GJ and per capita per year consumption was found to be 0.372 GJ.

TABLE 1: Comparison of Domestic Energy Consumption in Rural, Semi urban and Urban sectors of Jorhat District, Assam

Item	Rural	Semi urban	Urban
Distance from the town	>15 km	>7 km	0-7 km
Population	5716	2465	2130
Use of kerosene	2126.35 GJ per year (0.372GJ/capita/year)	1111.72 GJ per year (0.451 GJ/capita/year)	470.73 GJ per year (0.221 GJ/capita/year)
Use of fuel wood	57,737.32 GJ per year (10.101 GJ/capita/year)	1878.33 GJ per year (0.762 GJ/capita/year)	NIL
Use of LPG	NIL	4895.49 GJ per year (1.986 GJ/capita/year)	4943.73 GJ per year (2.321 GJ/capita/year)
Use of electricity	16.5764 GJ per year (0.0029 GJ/capita/year)	1424.77 GJ per year (0.578 GJ/capita/year)	2093.79 GJ per year (0.983 GJ/capita/year)

3.2 Semi urban Domestic Sector

The annual consumption of fuel wood in cooking in semi-urban sector was estimated at 1878.33 GJ and per capita per year consumption has been 0.762 GJ. About 30% of the semi urban people use fuel wood as their cooking fuel. Also, some of the households keep fuel wood for use when there is a shortage of LPG supply.

Most of the semi-urban people in semi urban sector rely on LPG for cooking and they collect LPG cylinder from the local agencies or from the town agencies. The annual LPG consumption in this sector was estimated at 4895.49 GJ and per capita per year consumption was found to be 1.986 GJ.

As the semi urban sector is completely electrified, electricity is used as prime lighting source. Most of the households use electrical gadgets and appliances. The people of this sector keep kerosene in stock to meet the need of lighting in regular power cut. The annual kerosene

consumption was estimated at 1111.72 GJ and per capita per year at 0.451 GJ. The yearly electricity consumption was found to be 1424.77 GJ and per capita per year consumption to be 0.578 GJ.

3.3 Urban Domestic Sector

The urban people do not use fuel wood in cooking. LPG serves as main cooking fuel in this sector. Kerosene is used by some of the households for water heating. This consumption of LPG was estimated at 4943.73 GJ annually and per capita per year consumption was estimated at 2.32 GJ.

Electricity is the prime lighting source in this sector. Besides lighting, the urban people use electricity in many electrical appliances. In this sector, annual electricity consumption was found to be 2093.79 GJ and per capita per consumption to be 0.983 GJ. The yearly consumption of kerosene was estimated at 470.73 GJ and per capita per year consumption was 0.221 GJ.

Figure 1 depicts domestic energy consumption of different fuels in GJ/capita/year in the three sectors under study.

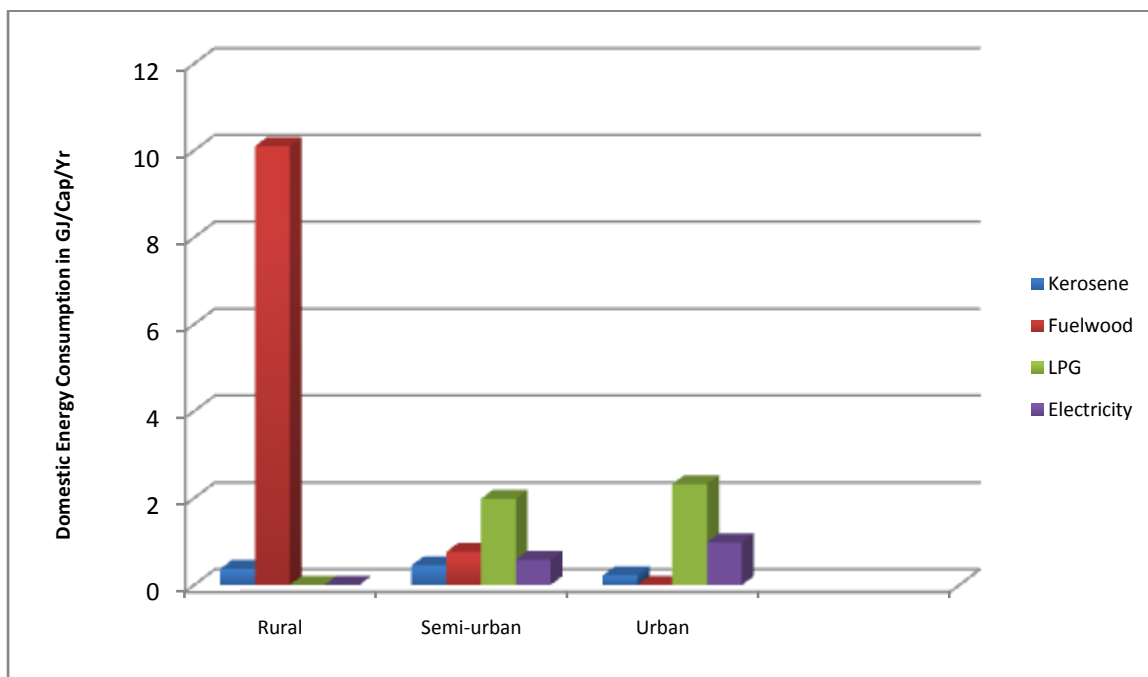


Fig.1: Comparison of Domestic Energy Consumption in Rural, Semi-urban and Urban Sectors of Jorhat District of Assam

4. CONCLUSIONS

A wide variations of domestic energy consumption pattern is evident in rural, semi urban and urban sectors of Jorhat district of Assam. Although the agricultural residues and animal dung are found in abundance in rural areas these are not used due to availability of forest fuel resources and the lack of awareness and technology

of using those as fuels. So, emphasis should be given to develop appropriate technology for proper utilisation of agricultural residues and dung. This will be helpful in minimising deforestation and upgrading quality of the rural life. Hence, there is a scope for energy conservation through appropriate use of untapped energy sources available in the rural areas of Assam.

REFERENCES

- [1] Advisory Board of Energy(ABE). 1985. The Energy Scene, Development of India, New Delhi, 71-92.
- [2] National Council of Applied Economic Research(NCAER). 1985. *Domestic Fuel Survey with Special Reference to Kerosene*. Vol. I and II. New Delhi: NCAER.
- [3] National Institute of Rural Development. 1989. *Integrated Rural Energy Planning with Special Reference to NE Region*. Guwahati: North-Eastern Regional Center.
- [4] Ravindranath, N.H., and Hall, D.O. 1995. *Biomass, Energy and Environment: A Developing Country Prospective from India*. London: Oxford University Press.
- [5] Bose, Ranjan Kumar; Puri Charu; and Joshi Veena. 1991. Energy profiles of three unelectrified villages of Uttar Pradesh of India. Biomass and Bio-energy. *The International Journal* 1(2): 99-109.
- [6] Mathew, T. 1987. North-eastern regional research paper. In *Rural Energy Planning for the Indian Himalaya*, 236-239. New Delhi: Willey Eastern Ltd.
- [7] Patel, R.C., and Karmachandani, C.J. 1984. Fuels. In *Elements of Heat Engines*, I: 136-138. S.I.: Acharya Bool Depot- Baroda.
- [8] Ms.S.Gowri, Mr. V. Harikrishnan. " Green Computing: Analysing Power Consumption using Local Cooling", *International Journal of Engineering Trends and Technology(IJETT)*, V15(3), 105-109 Sep 2014.