Pattern of Energy Consumption- A Case Study among the Rural Population of Dhemaji District of Assam

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ABSTRACT

With a huge population of the country living in rural areas, it's not easy to acquaint them with safe, easy and convenient energy sources. Though non-commercial sources of energy are not so convenient to use, yet people prefer them owing to various demographic and socio-economic factors. A huge number of population, particularly from rural areas still deprive of the modern electronic grids which are convenient to use and both energy and time saving. In India, more than 700 million people don't have access to modern energy sources for the daily domestic usage as cooking activities, lighting and other productive activities. Availability of fuels and accessibility to them for domestic activities is becoming more difficult day by day for the poor people who are still outside the access of modern energy system. The energy consumed in the rural area are mostly non-commercial which commands a huge amount of hardship and time of the women. The energy used in rural areas does not enter the organised market place, therefore no accurate data is obtained on the supply pattern and energy consumption in rural areas. India is on third place immediately after China and Japan with regard to the relative energy consumption of various energy sources. There are a various factors that influences the fuel mix pattern and the energy consumption pattern. Therefore, this paper attempts to analyse the household energy consumption pattern at a micro level. The study comprises of 60 households of the rural villages of Dhemaji district of Assam.

Keywords

Fuel-mix, Energy Consumption, Households

INTRODUCTION

Energy plays a vital role in human living. The basic requirement of subsistence living in the form of cooking, lighting and transportation is fulfilled through energy. A huge share of energy is consumed in domestic sector. The rural household mainly used fuel wood, crop residuals, dung cake, kerosene and biogas at the earlier ages, but as people civilised they opted for the commercial sources also. The households use most of its energy in lighting and cooking. The energy use pattern varies among the people who belong to different socio-economic and regional groups. The change in the energy consumption pattern by the households in cooking and also in lighting is predominant while the national scenario is looked at.

Energy is termed as the fuel of economic progress. Energy bears importance in developments like health, education, family welfare and urbanisation etc. It is a primeto sustain economic growth and energy mix is an indicator which shows sustainable development of a region or a country. According to 2011 census, in India, the ratio of commercial energy sources to non-commercial is 72:28. But still, factors like price hike of the commercial fuels like kerosene and LPG and their severe inflation hit the poor hard who constitute a greater proportion of our country and thereby influences energy consumption ratio. With 68.84 percent population still living in the rural areas with the minimal household amenities, it is difficult for India to emerge as a powerful nation in energy consumption scenario.

REVIEW OF LITERATURE

Revelle (1980) conducted a study on the energy consumption pattern of rural India. He found that the people mostly use the traditional sources of fuel mainly fuelwood and dung cake and the commercial sources gained a little importance. The main reason behind negligence of the commercial fuels is the lower income of those people. But it also argues that the Indian scenario can be transformed to a developed one only by increasing the energy consumption and introducing technologies which consumes less energy.

Kayode et al. (2009) analysed the household energy consumption pattern in Nigeria with the aim toprovide an appropriate analysis of the factors that contribute to household energy demand. The study is conducted using primary as well as secondary sources of data. The study showed that the sample households spent only 27 percent of the expenditure on energy out of the total expenditure.

The study reveals that no difference is there in fuel consumption sources among the high income group and only efficiency can influence their fuel use choice. It also found that income is not only responsible factor that determines energy consumption. They found a positive association between location, age, educational status and expenditure on energy.

Francis (2011) made a study on household energy consumption and its problems in Kanyakumari district of Tamil Nadu by taking a sample of 200 households. It is found that both traditional and commercial fuel are used by them but use of traditional fuels are decreasing as people prefer the commercial energy sources (from a use of 2 percent to 45 percent in the study period). He found that socio-economic background of people is the most important factor in influencing the energy consumption sources of people. The study also observes that non-availability plays an important role in influencing energy consumption pattern.

Dash (2013) analysed the impact of income on the pattern of household energy consumption in the urban area of Bhubaneshwar by using both primary and secondary data. The study was conducted by dividing the people into three income groups- low income group (LYG), middle income group (MYG) and high income group (HYG) and studied their pattern of consumption of energy in cooking and lighting. The study shows a positive relationship between energy consumption pattern and income of the households. Since the study is done to analyse the income and energy consumption pattern of the urban households, so it leaves a scope for further studies to show the relationship among the other variables also.

OBJECTIVES OF THE STUDY

- To analyse the fuel mix pattern in rural households of the study area.
- To identify the factors that determines the households energy consumption pattern in cooking, lighting and transportation.

METHODOLOGY

The study is mainly based on primary data collected from 60 rural households of Dhemaji district through a structured questionnaire. To know the pattern of energy use of the sample households, a recall period of one year from the date of survey has been considered. However, the necessary secondary data has been collected from various sources including journals, government reports and websites.

ANALYSIS AND INTERPRETATION

Pattern of Gross Energy Consumed:

The sample households are found to use different fuel sources for different purposes. The pattern differs from household to household and also for different purposes of use and. The amount of energy consumption by the sample households in case of cooking, lighting and transportation is discussed in terms of quantity (MJ) and money value. The study examines the consumption pattern of gross energy and its components- fuelwood, LPG, electricity, kerosene and petrol. The domestic energy consumption pattern of the sample household is calculated with the help of standard conversion factor of fuel use into energy units in MJ.

Table 1: Activity-wise Gross Energy Consumption by the Sample Households (Per Month)

Activity	Gross Energy (MJ)	Money Value	%age to Total Energy	%age to Total Money Value
Cooking	95723.23	16401.87	80.08	36.14
Lighting	11520.35	9377.33	9.64	20.66
Transportation	12289.21	19600	10.28	43.20
Total	112532.79	45379.2	100	100

Source: Primary Survey

The gross energy consumed by the sample household is 112532.79 MJ per month amounting to RS. 45379.20 per month. The highest amount of energy is consumed by the household sector in cooking followed by transportation and lighting. In cooking they consume 95723.23 MJ of energy while in transportation, 12289.21 MJ energy is consumed and in lighting it is 11520.35 MJ. In terms of expenditure on fuel, highest amount of expenditure is made in transportation followed by cooking and lighting.

The activity wise consumption of energy shows that cooking is the predominant energy consuming activity in the household sector. Since, cooking is the most important need for human survival, it consumes 80.08 percent of the total energy consumption by the sample households, and the transportation sector is next to cooking which consumes 10.28 percent of gross energy. Lighting stands out to be the third energy consuming activity consuming 9.64 percent of the total energy consumption. The study found that per unit cost of energy is highest in transportation followed by lighting and cooking.

Fuel wise Gross Energy Consumption of the Sample Households

The energy content of different fuel varies and therefore, consumption also differs in different sources of fuel consumed. The different forms of fuel sources used in the sample area are fuelwood and LPG for cooking, electricity and kerosene for lighting and petrol in transportation. The fuel wise gross energy consumption of the sample households is depicted in table 2.

Table 2: Fuel wise gross energy consumption of the sample households (per month)

Fuel	Gross energy (MJ)	Money Value	%age to Total Energy	%age to Total Money Value
Fuelwood	79408.13	7240	66.43	15.95
LPG	16315.09	9161.87	13.64	20.19
Electricity	410.67	5556.67	3.38	12.25
Kerosene	7476.35	3820.67	6.25	8.42
Petrol	12289.21	19600	10.28	43.19

Source: Primary Survey

Out of the total energy used (in terms of MJ) fuelwood constitutes 66.43 percent and thus it is the major fuel used by the sample households. Petrol is the next important fuel, accounting for 10.28 percent of the total energy used. LPG is consumed less compared to the other two fuels, i.e., 9.47 percent of the total energy used. Kerosene accounts for 6.25 percent of the total energy used by the households. Electricity forms 3.28 percent of total energy used in the sample area.

The share of fuelwood is found to be maximum due to its easy availability and economy. Most of the households are found unaware of these kinds of energy. Along with fuelwood, the sample households use LPG in combination. Most of the households use to have a LPG connection but they mostly use fuelwood for cooking and other allied activities. Since fuelwood is easy to avail and even at zero cost for some and a lower cost for some others, therefore, though fuelwood consumption is highest in the sample area in terms of quantity but the money value of firewood is less. In case of fuelwood and LPG, the money value spent on Fuelwood is lower, which is 15.95 percent compared to 20.19 percent in LPG. Petrol commands the highest gross expenditure by the sample households as per unit cost of petrol is highest among all other fuel sources.

Share of Commercial to Non-Commercial Energy use

The main fuel sources used for different purposes can be categorised as commercial and non-commercial. The commercial sources of energy used in the sample households are kerosene, electricity, LPG and petrol. The only non-commercial energy used is fuelwood. Since, fuelwood used in the sample area is 66.43 percent of the total energy consumed by the sample households, so the non-commercial energy use is proportionately higher compared to the commercial energy sources.

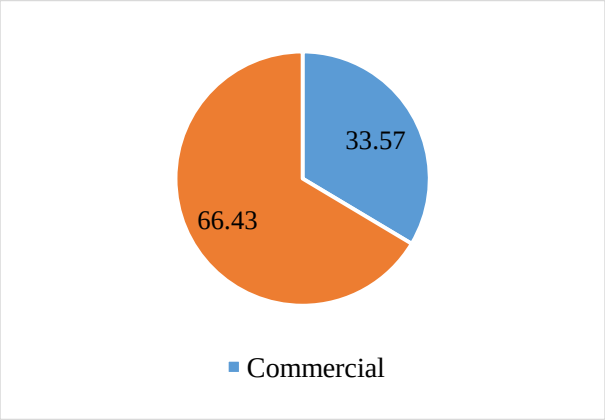

Figure 1: Type of Fuel Use

Source: Primary Survey

The sample households though use fuelwood the most, but some households also own a LPG connection also. The fuel mix pattern by the sample households shows the existence of fuelwood or LPG and both the fuel sources.

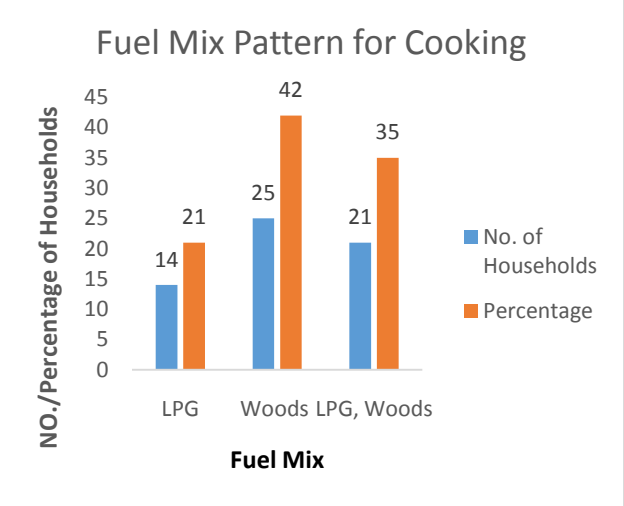

Figure 2: Cooking Fuel mix

Source: *primary Survey*

The fuel mix pattern of the sample households shows that the households use only one fuel mix pattern, i.e., firewood and LPG. Kerosene stove is not preferred by the households for cooking due to a smell felt in the food coke in the stove and the supply of kerosene by the fair price shops by the PDS is not sufficient to fulfil the cooking requirements. Only 35 percent of the households are found to use both the fuels. Still, 42 percent of the people use only fuelwood for cooking without a LPG connection in the household and only 21 percent of the sample households use LPG only. The households using LPG as their prime energy source are the government employees and businessmen. The wage earning group use fuelwood as their primary fuel source for cooking owing to their low purchasing power or the easy availability of fuelwood.

Energy Used in Lighting

Requirement of energy for lighting is next to cooking in the domestic sector. However, due to poor economic condition of some households and scarcity of fuels some of them deprive of using electricity. But, in the sample area, people consume 9.64 percent of energy in lighting by spending 13.17 percent on lighting out of their total spending on energy. In the study area, it is observed that electricity is mainly used for entertainment purpose when the spending of the electrified households are looked upon.

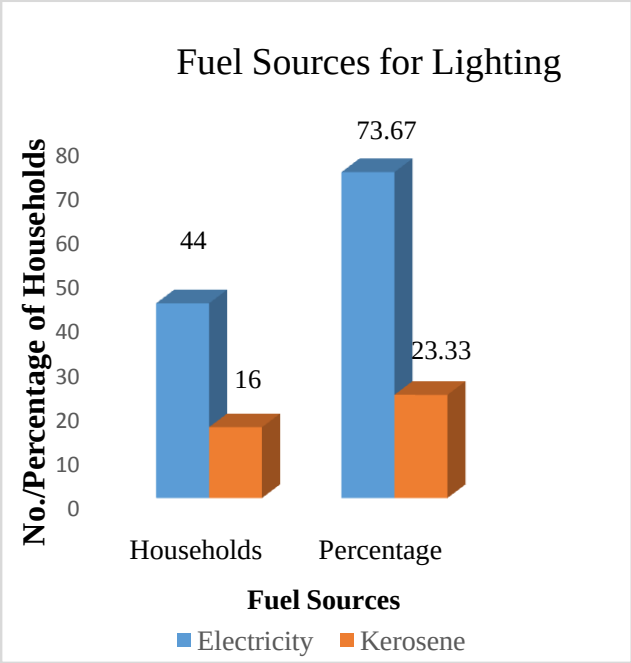

Figure 3: Lighting Fuel Sources

Source: *Primary Source*

23.33 percent of the households don't even have an electricity connection and they only use kerosene as the primary lighting source. Though the sample households are electrified, yet they also depend upon kerosene at the time of power cuts which is a severe problem in that area.

Fuel use for Transportation

Along with cooking and lighting, transportation is also a vital need in domestic sphere of the household. Humanbeings cannot confine themselves in the same locality. Often, people move to nearby villages, towns or cities to satisfy their requirements. Where some people enjoy the modern facilities of transportation, some others can't even afford the minimum facilities for movements in certain rural areas. Therefore, the traditional means are followed by the households where a need is felt and the privileged ones use the public transportation facility.

In the studied area, only 23.2 percent people own a vehicle of their own for transportation. They possess mostly two wheelers and some of them possess a four wheeler which they basically use for business purpose.

Table 3: Gross Energy consumed in Transportation

Fuel	Gross Energy (MJ)	Gross Energy (lit)	Money Value	Percentage to Total Energy	Percentage to Total Money Value
Petrol	12289.21	280	19600	10.28	43.19

Source: *Primary Survey*

In transportation, the gross energy consumed is 12289.21 MJ per month by the sample households and in litres, a total of 280 litre is consumed. The total consumption of energy for transportation is 10.28 percent of total energy consumption by the sample households, and in its monetary terms, its 43.19 percent of the total expenditure incurred on energy amounting to ₹ 19600.

In the study area, the surveyed households are also stratified regarding the primary occupation of the household head. The fuel mix pattern that is observed showed that the people earning more use to have the LPG connection, yet not all of them use it for all the cooking activities. Some of them also use fuelwood as a proxy to LPG to save it. In lighting they severely face the problem of power cut though some of them have electricity connection.

In the study it is observed that there exist variation in the energy use pattern among the households regarding the fuel mix pattern and lighting. But in terms of

transportation, most of the people does not own their own vehicle and depend on public transportation whenever the distance is more. They cover the short distances either by walking or on bicycle. There are various socio-economic factors that are responsible for such variation. Household income and education of the head of the family played a very important role in the selection of the energy source in the household. Age and sex of the household head also matters to a great extent as the older people as well as the male counterpart care little about the drudgery of the women in collecting fuelwood and then cooking in it. Sometimes, the size of the household also influences the fuel selection. If the household size is big, then people may prefer the easy or modern fuel sources otherwise they stick to the traditional non-commercial fuel sources. Apart from this, the price of fuel also bears important in the fuel use. Though all others factors favours the use of a modern fuel source, yet the price of the fuel leaves a great impact on the fuel choice.

CONCLUSION AND SUGGESTION

Energy consumption is an important element for living a quality life. Poor energy consumption acts as a hurdle in the socio-economic development of the households. Commercial source of energy is used in the study area only in lighting basically while in cooking, it is negligible. The inefficient burning of fuel wood will lead to an alarming situation causing health problems and rapid depletion of the forest with its adverse repercussion on environment. To make the picture suitable, people should be made aware of the different programmes initiated by the government of their betterment and they should be also acquainted with the energy saving modern gadgets both for cooking and lighting. In this regard, the local bodies can be of greater help as to make them understand the ill effects of using the traditional sources and the ways and importance of using commercial sources. People should develop their thinking ability and should understand that the conservation of energy is equally important as using the modern clean energy sources. Here, as the low purchasing power of the households' acts as a hindrance in using expensive commercial sources of energy, therefore, low cost eco-friendly sources of energy is to be popularised.

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