RESEARCH REVIEW JOURNALS
Volume-04
Issue-06
June-2019

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com[Peer Reviewed Journal]

Cooking Fuel Utilization Pattern of Rural Households

[*1]Mahto Purnima and [2]Dubey Dr. (Mrs.) Viraj

[*1]*Research Scholar, Barkatullah University, Bhopal (India)*
[2]*Professor, Sociology, Maharani Laxmi Bai College, Bhopal (India)*

ARTICLE DETAILS

Article History
Published Online: 12 June 2019

Keywords
Cooking fuel, Biomass, LPG, energy consumption, household income, family size etc.

[*]**Corresponding Author**
Email: purnima_jpm[at]yahoo.co.in

ABSTRACT

India is predominantly an agriculture nation with a large population living in rural areas and one among the faster emerging economies. Household energy is key factor to achieve social as well as economical goals for sustainable development. It is obvious to note that rural population is not having access to adequate amount of clean cooking fuels. Energy demand is growing rapidly in all sectors including household energy for cooking and lighting. A vast variation in cooking energy access among urban and rural end users is apparent. A large percent of rural homes in India continue to use biomass fuels such as wood, crop residues and dung cakes as the primary cooking fuel. Use of Liquefied Petroleum Gas (LPG) for cooking is nominal among all income categories. Data on daily consumption of cooking fuels (Kg/month) were collected from 29 respondents out of 345 households in village Taku. The daily consumption of these fuels was converted in MJ (Mega Joule).These data were analysed in SAS 9.3 software. Household energy consumption is measured through ANOVA. This paper reveals the energy carrier options and combination of fuels used for cooking in village Taku [Kesla Block, Hoshangabad District, MP].

1. Introduction

This study was conducted at Taku village situated in tribal Kesla Block under Itarsi Tehsil of Hoshangabad district of Madhya Pradesh. The village geographical location of latitude 22.7441^0 N and longitude 77.7370^0 E. Forest cover of the state is 94,690 km^2, which is 30.71% of the total land area dense forest constituting 13.57% and open forest 11.22%, community forest also covers a large area [IFSR 2011]. Village Taku, [Kesla Block] is situated in state dense forest zone where agriculture, cattle rearing and farm related activities are major livelihood options. Hence, access to biomass and agricultural waste is easier that provided an opportunity to assess energy utilization pattern by various households under different income categories and family sizes.

Indian urban people have more access to modern energy options while rural people mostly relying on various biomass energy sources. Rural population across India is facing formidable challenge to have access to modern energy carrier for cooking and lighting. Only 10.3% of the rural households use modern energy carriers like LPG, kerosene, biogas as primary cooking fuels and rest of the households relying on traditional biomass fuels. Geographically India is very diverse country and household energy access varies from region to region.

Cooking and lighting are the most essential end uses of the household energy for comfortable living and sustainable development of society. The urban and rural household energy used for cooking in India shows the apparent dichotomy in utilization patterns. The urban population uses modern energy carriers for household energy requirement whereas, rural population rely on various biomass energy sources. About 74.3 % Indian population [Census of India 2011] lives in rural areas. Majority of rural population is earning livelihood through farming, animal rearing and farm related various activities. These unorganized occupational prospects results in lower household income, consumes more productive hours and leads to versatile household fuel choices. Rural Indian population mostly relies on biomass for cooking and heating [TERI 2013]. Rural population across India is facing formidable challenge to have access to modern energy carrier for cooking and lighting. Use of LPG for cooking by rural population is not so commonly practiced due to several constraints. Only 10.3% of the rural households use modern energy carriers like LPG, kerosene, biogas as primary cooking fuels and rest of the households relying on traditional biomass fuels. Geographically India is very diverse country and household energy access varies from region to region. The dependence on fuel wood for the purpose of cooking fuel is 78.6 percent. Fuel wood, crop residues, twigs and dry leaves are common energy sources for cooking meals in rural areas.

2. Review of Literature

Misra, N.M. (1988) in a pilot study of fuel consumption in rural areas, identified three categories of villages, namely, (a) villages surrounded by the forests, (b) villages nearer to the forest, and (c) villages away from the forest. The study indicated that firewood was their major cooking fuel in all the villages. In some distant villages, away from the forests; however, a small quantum of agricultural wastes was used and no family was found to use dung cakes as fuel.

Chakraborthy, D. et al. (1989)undertook a micro level study on the 'Demand for Energy in Rural Economy'. It was pointed out that 90% of the existing energy sources in the rural settlements of the developing countries are of non-commercial energy such as firewood, cattle dung, crop residues and human energy. Perhaps, the consumption patterns in each of these will vary from place to place, based on the utilization capacity of the people concerned. However, they have

concluded that the practice of energy management in rural areas is nevertheless a part of the national energy system as a whole.

Santosh, R. et al. (1997) made an extensive survey of rural energy in 10 blocks of Madhya Pradesh and concluded that rural areas have always been ignored in improving the efficiency of existing lighting and cooking systems. The fuels used for cooking are largely firewood; dung cakes, agricultural residues and kerosene, but some households also use LPG and electricity.

Shrivastava, L. et al. (2012) studied the level of access to energy in rural India. They found that about 22% of urban households depend on firewood for cooking, another 22% on kerosene and about 44% on LPG during 2004-2005. Around 75% and 10% of rural households depend on primitive fuels like firewood and dung-cake, respectively for cooking and about 44% do not have connections to electricity in their homes. The consumption of energy reflects varying levels of ease with which energy resources, biomass in particular, are available according to the size of households. Climatic factors and cultural differences reflected in demand for cooking and water heating energy. Better availability of biomass resources at a local level can boost energy consumption at household level owing to different levels of forest cover.

TERI (2013) reported that the household sector is one of the largest users of energy in India, accounting for about 30% of the total energy consumption (excluding energy used for transport). About 75.9% of rural households and 17.6% of urban households rely on firewood as primary cooking fuel in spite of the modern energy. While supporting around 16% of the world population, India's share in world energy use is low at only 4.2%. Firewood was the primary cooking fuel for 75.9% of rural households in 2009-2010. Consumption of firewood in 2003/04 was 205.71 Million tonnes of oil equivalent (MTOE), and the projected consumption for 2031/32 is 106.39 MTOE. Liquefied petroleum gas (LPG) was the primary cooking fuel for only 12.1% of rural households as compared with 64.6% for urban households in 2009-2010.

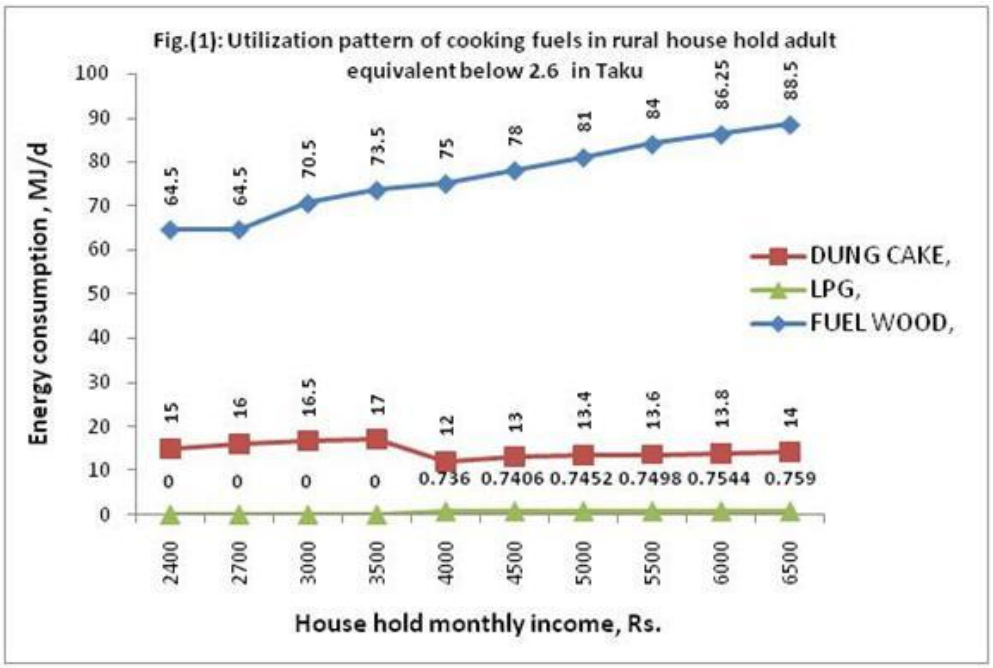
3. Methodology

Data on daily consumption of cooking fuels (Kg/month)were collected through personal interaction with randomly selected 29 respondents out of 345 households in village Taku. The daily consumption of these fuels was converted in MJ (Mega Joule). Methodology adopted for determining energy consumption for different cooking fuel sources was as follows: The daily energy consumption for each category of cooking fuel was determined by multiplying the quantity consumed in kg by the calorific value of the respective fuel. The calorific values of the fuel used are: Fuel wood / wood chips - 07 MJ/kg, Dung cake - 07 MJ/kg. The standard weight of domestic LPG cylinder was considered 14.2 kg for calculation of LPG consumption. The utilization Period of one LPG cylinder for household purpose was recorded and analyse per day LPG used by dividing weight of LPG cylinder (14.2 kg)from the number of days used. The calorific value of the LPG has been taken as 46 MJ/kg. The amount of LPG consumption was calculated by using formula.

$$LPG\ consumption\ per\ day = LPG\ Used\ (kg) \times calorific\ value\ of\ LPG\ (MJ/kg) \quad \ldots (1)$$

4. Results and Discussion

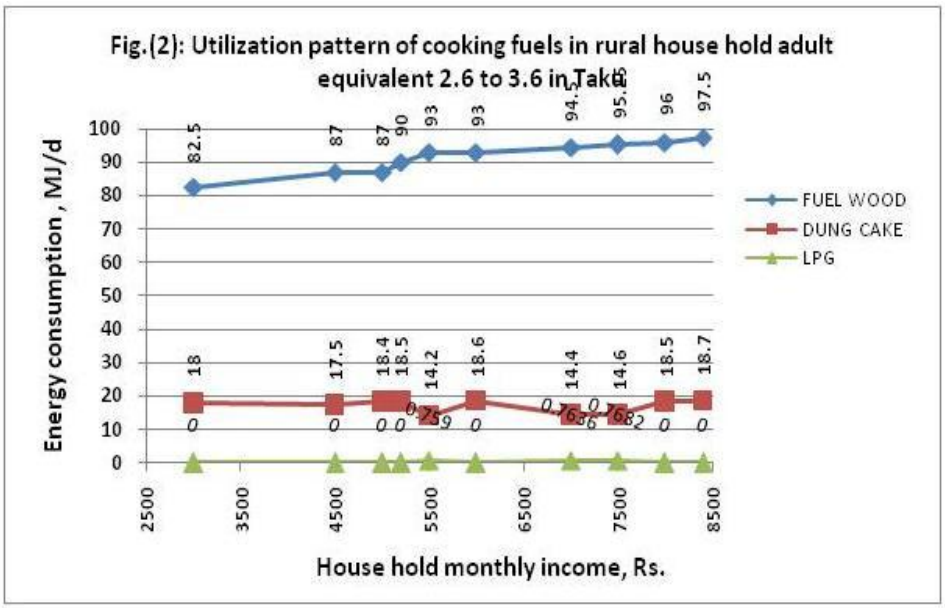
Cooking fuel utilization pattern in small family size (Adult Equivalent) of village Taku, is shown in Fig 1. Utilization of biomass (fuel wood and dung cake) for cooking is common among all the respondents whereas, 40% of the respondents had no LPG connections.



The consumption of energy derived from fuel wood and dung cake varied between 64.5-88.50 MJ/d 14-15 MJ/d respectively. Variation in consumption of LPG is very nominal and ranged between 0.736-0.759 MJ/d. The consumption of

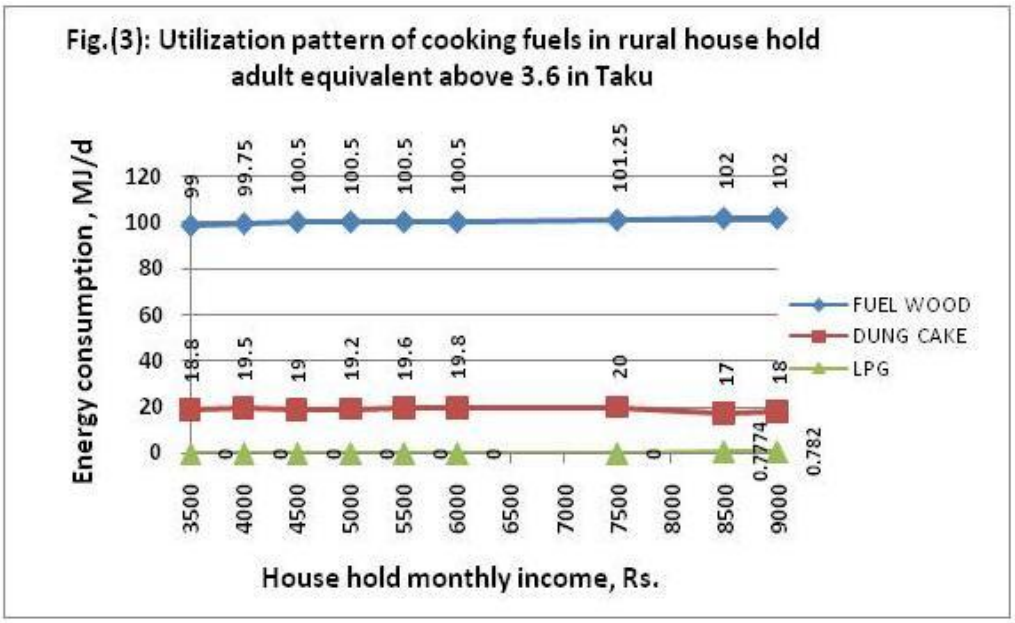
energy consumed through fuel wood increases with increase in house hold income from Rs. 2400-9000/- (Equivalent to 34-130 $) while it slightly decreases in case of dung cake.

Cooking fuel utilization pattern in medium family size (AE 2.6-3.6) of village Taku, is shown in Fig 2. The utilization of biomass (fuel wood and dung cake) for cooking is common among all the respondents whereas, only 30% of the respondents had LPG connections. It is evident irrespective of monthly household income that the consumption of fuel wood is increasing with the increase in family size (AE) and LPG consumption remained nominal in all income groups.



Consumption of energy derived from fuel wood and dung cake varied between 82.50-97.50 MJ/d14.60-18 MJ/d respectively. The variation in consumption of energy through LPG is very nominal and ranged between 0.759-0.768 MJ/d. The consumption of energy through fuel wood increases with increase in household income from Rs. 3000 - 8500/; however, the consumption of energy through dung cake does not have any impact of house hold income. The LPG is used by higher income households.

Cooking fuel utilization pattern in large family size (above 3.6) of village Taku, is shown in Fig 3. Utilization of biomass (fuel wood and dung cake) for cooking is common among all the respondents whereas, only 22% of the respondents had LPG connections.



Consumption of energy derived from fuel wood and dung cake varied as99 - 102 MJ/d and 17-20 MJ/d respectively. Variation in consumption of LPG is very nominal and ranged between 0.7774 -0.782 MJ/d. Consumption of energy through fuel wood increases with increase in household income from Rs. 3500 - 9000/; however, the consumption of energy through dung cake does not have any impact of house hold income. The LPG is used by higher income group.

5. Conclusion

- Village Taku, (Kesla block), of Hoshangabad district is surrounded by a dense forest and majority of respondents earn livelihood through agriculture and related activities. An ease of availability of biomass enables the respondents to depend on the fuel wood and dung cakes for cooking.
- The consumption of energy obtained from fuel wood and dung cakes varies from 64.50-102 MJ/d and 12.00-20.00MJ/day respectively. Fuel wood and dung cake consumption for cooking increased with the increased family size (AE).
- The energy consumption through fuel wood increases with increase in household income in all family size. The energy consumption through dung cakes has no effect of increase in household income. The LPG access is prevalent in high income households.
- However, the use LPG is not widely practiced by respondents and consumption of energy obtained from LPG is too low (0.736-0.782 MJ/day) in comparison of biomass energy which could be attributed to ease of biomass fuel availability and constraints in accessing the clean fuel for cooking.

Acknowledgement

Authors gratefully acknowledge the contribution and technical support of Dr. A.C. Saxena, Mechanical Engineer & Ex. Principal Scientist, I/c, Prototype Production Center, Central Institute of Agricultural Engineering, Nabi Bagh Bhopal-462 038, Madhya Pradesh, India.

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