Sources of Energy and the Pattern of Energy Consumption in the Household Sector

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Abstract

Energy is one of the fundamental needs in the functioning of any civilized society which is needed to improve better life style and socio-economic development of the country. The word 'energy' is derived from the Greek word 'energia' meaning 'capacity to do work'.Energy covers the entire range of energy resources such as primary, renewable and non- conventional. Energy is the very basis of modern civilization and without adequate quantities of energy mankind would not be able to enjoy a life style much different from fuel. With this back ground the following objectives have been framed for the purpose of the study: i) to study the sources of energy consumption among the sample households and ii) to analyze the pattern of energy consumption among the sample household sectors.

Sivakasi block consists of 56 villages. Out of 56 villages, there are only 30 revenue villages in the study area in 10 households each revenue villages were selected using proportionate random sampling technique to select the 300 households as respondents from these 30 revenue villages. Using random table number, sample respondents' households were selected proportionally based on the number of households in the revenue village. The paper ends with a conclusion.

Keywords : Sources of Energy, Pattern of Energy Consumption, Household Sector

Introduction

Energy is one of the fundamental needs in the functioning of any civilized society which is needed to improve better lifestyle and socioeconomic development of the country. The word 'energy' is derived from the Greek word 'energia' meaning 'capacity to do work'.Energy covers the entire range of energy resources such as primary, renewable and non- conventional.

Energy is the very basis of modern civilization and without adequate quantities of energy mankind would not be able to enjoy a lifestyle much different from the fuel. Energy resources comprise commercial resources and biomass resources. The commercial energy resources include natural gas, candle, petroleum products, coal, and hydroelectric, petroleum products such as diesel, kerosene, furnace oil, motor spirit, and others. Biomass resources include wood, bamboo, twigs, wood shavings, sawdust, bark, roots, shell and coir of coconut, agricultural residues such as paddy husk and bran, straw, jute stick, charcoal and cow dung. The most important single factor which can act as a constraint on economic growth of a country is the availability of these energy sources.

India is a developing country and it is both a major energy producer and consumer. India ranks as the world's seventh largest energy producer and fifth largest energy consumer. Rural areas need large quantities of energy. In order to improve the economic development of the country, it is necessary to stimulate growth and productivity of the rural sector. Energy is a factor which stimulates both productivity and growth in the rural sector. These rural households in India use both traditional and modern fuels. The traditional forms consist of wood fuel, agricultural residues, animal dung and now the modern ones of kerosene, liquefied petroleum gas (LPG), diesel, petrol and electricity. In the Indian context, biomass is still a 'traditional' fuel, not yet having made the transition to be advanced technology.

In rural areas, the largest consumer of the energy is the household sector. The demand for the household energy is generally met by both commercial as well as by the non-commercial sources of energy in the rural area. In the study area, the common forms of fuel consumption are firewood, agricultural waste, cow dung, kerosene, electricity and the liquefied petroleum gas.

Household sector performs various activities such as cooking, heating water and preparing tea and coffee, lighting, entertainment, transport and also non-cooking activities like using fan, iron box and pre-preparing cooking activities. For these things, the sample households need energy from various sources. This paper analyses the basic characteristics of the respondents like age, educational qualification, occupation, household type, annual income and expenditure and the energy sources.

With this background the following objectives have been framed for the purpose of the study: i) to study the sources of energy consumption among the sample households and ii) to analyze the pattern of energy consumption among the sample household sectors.

The remaining part of the this study is organized as follows: After a brief introduction in Section – I, Data and methodology are outlined in Section – II, Section – III presents the analysis and findings of the study and Section – IV gives the conclusion of the study.

Data and Methodology

Sivakasi block consists of 56 villages. Out of 56 villages, only 30 revenue villages are there in the study area. In each revenue village 10 households were selected using proportionate random sampling technique to select the 300 households as respondents from these 30 revenue villages. Using random table number, sample respondents' households were selected proportionally based on the number of households in the revenue village.

Analysis and Findings of the Study

The age is a factor which influences the energy consumption pattern of the sample household respondents. The sample respondents belonging to the old age group are generally unwilling to change the traditional energy utilization to modern forms of energy. But the respondents of the younger generation are willing to switch over to the commercial energy sources rather than to continue to utilise the sources of traditional energy.

The table 1 shows the distribution of the head of the sample household respondents, classified according to the different age groups.

Table: 1 Age-Wise Distribution of the Sample Respondents

Sl. No.	Age Distribution (in years)	Number of Respondents	Percentage
1	Below 30	32	10.7
2	31 to 45	126	42.0
3	46 to 60	122	40.7
4	Above 61	20	6.7
Total	**300**	**100.00**	
Mean: 2.4333	**Standard deviation:.77085**		

Source: Primary Data

It could be seen from Table 1, that out of the 300 respondents, 52.7 per cent of the respondents are in the age group of below 45 years. The middle age group respondents dominate the rest of respondents. So they are ready to switch off the traditional fuel system and adopt the modern fuel system. About 40.7 per cent of the respondents are in the age group of 46 to 60 years. They use traditional fuel system and there is a change in the trend with influence of Government role.

About 6.7 per cent of the respondents are in the age group of the above 60 years. The mean value shows that (2.4333), majority of the sample respondents are in the age group of 31 to 45 years and the standard deviation is .77085.

Size of the Sample Households

Household size is a vital unit to determine the energy consumption. There is always a positive relationship between the size of the household and its energy consumption. The household size of the respondents is divided into three categories such as upto 3 members, 4 to 5 members and above 5 members. The distribution of the sample households according to their size is presented in Table 2

Table:2 Distribution of the Sample Households according to the Size

Sl. No.	Household size	Number of Respondents	Percentage
1	Upto 3 Members	56	18.7
2	3 to 5 Members	175	58.3
3	Above 5 Members	69	23.0
Total		**300**	**100.00**
Mean: 2.043		**Standard deviation:.6451**	

Source: Primary Data

The table 2 shows that about 58.3 per cent of the respondents belong to the household size of 3 to 5 members, 23 per cent of the respondents belong to the household size of above 5 members, and 18.7 per cent of the respondents belong to the household size of below 3 members. The mean value shows that (2.043), majority of the sample households belongs to the size of 3 to 5 members and the standard deviation is 0.6451.

Educational Level of the Household Sample Respondents

While studying the energy consumption pattern of sample respondents, it is necessary to understand the level of education. Education of the people also determines the mode of energy consumption preferred by them. The distribution of the sample households classified according to the educational status of the head of the households is presented in Table 3.

Table:3 Distribution of the Head of the Sample Households according to their Educational Level

Sl. No.	Educational level	Number of Respondents	Percentage
1	Primary Education	30	10.00
2	Middle School Education	80	26.7
3	Secondary Level Education	72	24.00
4	Higher Secondary Education	37	12.3
5	College	31	10.3
6	Diploma	3	1.0
7	Illiteracy	47	15.7
Total		**300**	**100.00**
Mean: 3.5200		**Standard deviation:1.88186**	

Source: Primary Data

The table 3 shows that about 26.7 per cent of sample respondents studied upto middle school level; 24.00 per cent of the respondents studied upto secondary level education. It may be due to their poor economic condition which forced them to leave the school to support their family by engaging themselves in some work. The education status is responsible for changing model fuels or alternative fuels in their households. 15.7 per cent of the respondents were illiterated. It is also found that 12.3 per cent, 10.3 per cent and 1.0 per cent of the respondents studied higher secondary level, college level and diploma respectively. Their education would have opened their eyes to alternative energy or to consume renewable energy sources efficiently. The mean value shows that (3.5200) the majority of the heads of households have only middle school and secondary level education and the standard deviation is 1.88186.

Occupation of the Sample Respondents

The occupational distribution of the sample respondents determines the level of various sources of energy consumption. The respondents are farmers, agricultural labourers, industrial workers, private employees, government employees, businessmen, construction workers and others. It also includes carpenters, coolie, agents, wiremen and milk vendors.

The details relating to the occupation level of the sample household respondents are given in Table 4.

Table:4 Occupation-Wise Distribution of the Sample Household Respondents

Sl. No.	Occupation	Number of Respondents	Percentage
1	Farmers	61	20.3
2	Agricultural Labourers	50	16.7
3	Industrial Labourers	108	36.0
4	Private Employees	31	10.3
5	Government Employees	5	1.7
6	Businessmen	15	5.0
7	Construction workers	8	2.7
8.	Others	22	7.3
Total		**300**	**100.00**
Mean: 2.3933		**Standard deviation:2.01664**	

Source: Primary Data

The table 4 shows that about 36 per cent of the respondents are agricultural labourers; 20.3 per cent of the respondents are farmers. It is seen from the table 4 that the lowest share of 1.7 per cent of the respondents are Government employees. They are utilizing commercial fuel like liquefied petroleum gas, kerosene, petrol and electricity for cooking and other purposes due to their sufficient income. 2.7 per cent, 5.0 per cent, 7.3 per cent, 10.3 per cent and 16.7 per cent of the respondents belong to construction workers, businessmen, others, private employees, and industrial labourers respectively.

The mean value shows that (2.3933), the majority of sample household respondents are industrial labourers and the standard deviation is 2.01664.

Type of the Family in the Study Area

The type of the family of the sample respondents also influences the level of energy consumption in the household sector. Table 5 shows the details related to the family type of the sample households and their distribution.

Table: 5 Distribution of Sample Household Respondents according to their Family Type

Sl. No.	Family type	Number of Respondents	Percentage
1	Joint family	89	29.7
2.	Nuclear family	211	70.3
Total		**300**	**100**
Mean: 1.7033		**Standard Deviation: 0.54755**	

Source: Primary Data

The table 5 shows that 70.3 per cent of the respondents belong to nuclear family. Again 29.7 per cent belong to joint family type. In recent days, there is a sharp rise in nuclear family. The joint family system is also in practice in the rural areas.

The mean value shows that (1.7033) the majority of family type of the sample respondents belong to the nuclear family type and the standard deviation is 0.54755

Nature of the House of Household Sample Respondents

The nature of the houses could determine energy consumption and it is essential for using commercial fuel like steel stove, electrical stove, liquefied petroleum gas stove advanced chulhas and solar stove, which need some space for using these types of chulhas.

The distribution of the sample household respondents classified according to their nature of house is given in table 6.

Table: 6 Distribution of Sample Household Respondents according to their Nature of Houses

Sl. No.	Nature of House	Number of Respondents	Percentage
1	Pucca House	128	42.7
2.	Tiled House	158	52.7
3.	Thatched House	14	4.7
Total		**300**	**100**
Mean: 1.6200		**Standard Deviation: 0.57449**	

Source: Primary Data

Table 6 reveals that about 52.7 per cent of the sample respondents live in tiled houses. It is inferred that majority of household respondents' income is just sufficient for their day today expenses only. About 42.7 per cent of the respondents live in pucca houses. Further 4.7 per cent of them are living in thatched houses. The mean value shows that (1.6200) majority of the sample respondents are living in tiled houses and pucca houses and the standard deviation is 0.57449.

Annual Income of the Sample Households

The income of the household is a decisive factor in the household's ability to purchase fuel materials. The purchasing power of the household is the influencing factor to use more efficient sources, adopt new sources and go for better technologies. The present analysis is concerned with the energy consumption pattern of the sample households classified according to their income level. The table 7 presents the details related to the annual income of the sample households and their distribution.

Table: 7 Distribution of the Sample Households according to their Annual Income

(in Rupees)

Sl. No.	Income Distribution in Rs. (Per annum)	Number of Households	Percentage
1	Below 30000	10	3.3
2	30001 to 60000	122	40.7
3	60001 to 90000	102	34.0
4	90001 to 1,20,000	57	19.0
5.	Above 1,20,001	9	3
	Total	300	100.00
	Mean: 2.7767	Standard deviation:.89599	

Source: Primary Data

The table 7 shows that about 40.7 per cent of the households are under the income group of Rs. 30,001 to Rs.60,000 per year. About 34 per cent of the households come under the income range of Rs. 60,001 to Rs. 90,000. It shows that only 3.3 per cent and 3 per cent of the households are under the income level below Rs.30, 000 and above Rs. 1, 20,000 respectively. The mean value shows that (2.7767) the household income of the sample respondents is in the range of Rs.30, 001 to 90,000 and the standard deviation is 0.89599.

Annual Household Expenditure of the Sample Households

Table: 8 Distribution of the Sample Households according to Annual Expenditure

(in Rupees)

Sl. No.	Items	Total Value	Percentage
1	Food	79,04,280	36.61
2	Fuel	40,62,384	18.82
3	Rent	3,13,800	1.45
4	Health	10,88,760	5.04
5	Education	24,55,440	11.37
6	Communication	7,11,720	3.30
7	Clothing	27,56,699	12.77
8	Entrainments	5,77,800	2.68
9	Miscellaneous	17,17,200	7.96
	Total	2,15,88,083	100

Source: Primary Data

Expenditure pattern of the household also determines the energy consumption of the sample respondents. The expenditure is classified into food and other related items like, fuel, rent, health, education, communication, cloth, entertainment and miscellaneous. Table 8 shows the annual household expenditure pattern of the sample households and their distribution.

Table 8 reveals that 36.61 per cent of the total expenditure is spent on food items, followed by 18.82 per cent for fuel. The main usage in rural households is electricity. The Government provides free television, mixi, grinder and fan to rural people leading to high demand for electricity. Recently, the Government has increased the electricity charges which influence the share of fuel expenses and it comes as the second place in household expenditure. The table 4.8 shows that 12.77 per cent is spent on clothing. In modern days, the rural people also use the cell phones liberally which contribute to 3.30 per cent. The rural households are ready to spend 11.37 per cent on educations and 2.68 per cent is spent on entrainment.

Energy Conversion of Various Energy Sources

The various sources of household energy are classified as fuel energy. It includes the consumption of firewood, agricultural waste, dung cake, kerosene, liquefied petroleum gas, electricity energy, and other sources including petrol and diesel. While considering such a variety of energy which has different units, the choice of common energy denominator becomes inevitable for assessing the relative contribution of different forms of energy. Energy sources are converted from their quantity to mega joules.

Table 9 Energy Conversion of Various Energy Sources

Sl. No.	Energy Sources	Unit	Mega Joules / Unit
1	Firewood	Kg	16.74
2.	Agricultural waste	Kg	12.55
3.	Animal Dung cake	Kg	10.05
4	Kerosene	Liter	37.57
5.	Petrol	Liter	48.23
6.	LPG	Kg	47.95
7.	Diesel	Liter	56.31
8	Electricity *	Kwh	3.6

* Note = Kwh – Kilowatt hour,

1000 joules = 1 Kilo Joules, 10,00,000 or 1 million = 1 Mega Joules

Sources

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- Project Report, "Energy resources Assessment and Planning Villages Katia and Marshiar in West Bengal" Department of Agricultural Engineering, Indian Institute of Technology, Kharapur, West Bengal, 1990, pp. 12-27.

- Greherm, D. Trstman, Energy Managers Hand Book, p.34.

Energy Sources and Consumption Pattern by the Households

The various energy sources tapped by the selected household respondents are converted into joules of energy by using the information provided in table 9. The data on the converted different energy sources consumed by the selected households per annum are furnished in table 10.

Table: 10 Distribution of Sample Households according to Annual Pattern of Energy Consumption

Fuel	Quantity	Energy (MJ/Unit)	Annual Energy (MJ)	Percentage
Fuel Wood (kg)	108002.4	16.74	1807960.18	39.08
Agricultural Waste (kg)	31014	12.55	389225.7	8.41
Electricity (Kwh)	299275.92	3.6	1077393.31	23.29
Animal Dung (kg)	3516	10.05	36918	0.80
Kerosene (Lit)	8916.6	37.57	334996.66	7.24
Petrol (lit	9981.6	48.23	481412.57	10.41
LPG (kg)	10396.8	47.95	498526.56	10.78
Total			4626432.98	100.00

Source: Primary Data

The table 10 shows that about 39.08 per cent of the households utilise the firewood for various purpose of household activities. It is mainly due to the availability of resources and free of cost in rural areas. Electricity is consumed by 23.29 per cent of the households. The Government provides electricity with the minimum cost compared to other states. The Tamil Nadu Government provides free television, fan, laptop, mixie and grinder etc., for the past three years. So, the rural population utilises electricity largely next only to fuelwood.

It is inferred from the table 10 that the lowest share of 0.8 percentage of the animal dung is used in the households. The table shows that 7.24 per cent, 8.41 per cent, 10.41 per cent and 10.78 per cent form the share of kerosene, agricultural waste, petrol and liquefied petroleum gas respectively.

Various Sources of Energy Consumption by the Households

Energy sources are converted from their quantity to money value for various household energy sources. It includes firewood, agricultural waste, dung cake kerosene, liquefied petroleum gas, electricity energy, and other sources including petrol and diesel for the day today consumption.

Table: 11 Conversion of Various Energy Sources in Money Values (in Rupees)

Sl. No.	Sources of Energy	Money values
1	Firewood (Per Kg)	3.75
2.	Agricultural Waste (Per Kg)	2.10
3.	Animal dung (Per Kg)	1.20
4.	Kerosene (Per Liter)*	15
5.	LPG (Per Kg)	28.24
6.	Petrol (Per Liter)	66
7.	Electricity (Bi-monthly) + Fixed amount = Rs.20	
	1 to 100 Units	Rs. 1
	101 to 200 Units	Rs. 1.5
	Upto 500 units	
	0 to 200	Rs.2
	201 to 500	Rs.3
	Above 500 Units	
	0 to 200	Rs.3
	201 to 500	Rs.4
	501 to 10000	Rs.5.75

Source: Primary Data

Note: Various sources of energy are converted to money value

Table: 12 Use of Energy Sources by Sample Households and their Values

in the Study Area   **(in Rupees)**

Type of Fuel	Quantity per year	Value	Percentage
Firewood (kg)	108002.4	405009	19.14
Agricultural Waste (kg)	31014	65129.4	3.08
Electricity (Kwh)	299275.92	515344	24.36
Animal Dung (kg)	3516	4219.2	0.20
Kerosene (Lit)	8916.6	133749	6.32
Petrol (lit	9981.6	698712	33.02
LPG (kg)	10396.8	293605.632	13.88
Total		2115768.232	100.00

Source: Primary Data

It can be seen from the table 12 that in the consumption expenditure on the various energy sources by the sample households in the household sector, the expenditure on electricity is higher in the total energy consumption expenditure. The share of animal dung is found to be the lowest contributing to only 0.20 per cent in the total expenditure of energy consumption. Though firewood is consumed in larger quantities, the share of this source to overall total energy consumption expenditure is lower to the extent of 19.14 per cent only. Liquefied petroleum gas is one of the important sources of energy as it is used for purposes of cooking. The analysis also shows that the use of the non-commercial fuel energy is being steadily replaced by liquefied petroleum gas energy. The study shows that the liquefied petroleum gas stoves are provided to rural household sector by the Government. Higher education status of the respondents in the rural areas stimulates them to use the modern cooking appliances. Though renewable energy source is expensive, the respondents use liquefied petroleum gas for cooking.

Use of Firewood for Various Activities by the Household Sector

Firewood serves as the major source of energy in the rural areas and the business of fuel wood collection is the livelihood option that is most resorted to, by millions of people. They continue to depend on firewood and chips for cooking, water heating and other activities. The table 13 shows the use of firewood for various purposes by the sample households.

Table: 13 Purpose-Wise Distribution of Firewood by the Sample Households

Sl. No.	Purpose	Number of Households	Percentage
1	Cooking Activities	84	28
2.	Preparation of Tea and Heating Activities	24	8.0
3.	Reheating	14	4.7
4.	All the Cooking and others	164	54.6
5.	No Uses	14	4.7
Total		**300**	**100.00**
Mean: 4.2267		**Standard Deviation:2.94009**	

Source: Primary Data

It is evident from the table 13 that 54.6 per cent of the households use the firewood for the purpose of cooking as well as for the preparation of tea or coffee and reheating activities. It follows that 28 per cent of the households use it only for cooking activities; they use some other energy sources. Table 13 shows that 4.7 per cent of the households utilize firewood for reheating purposes and the same percentage of households do not utilize firewood for any purpose. The mean value shows that (4.2267) all cooking and other activities stand as the most important purpose for using the firewood by the sample households in the study area and the standard deviation is 2.94009.

Reasons for Using Firewood by the Sample Households

Table 14 provides the reasons for using firewood in the household sector for various activities.

Table: 14 Reason-Wise Distribution of Firewood by the Sample Households

Sl. No.	Particulars	Number of Households	Percentage
1	Non-users	14	4.7
2.	Availability	119	39.6
3.	Accessibility	27	9.0
4.	Economical	41	13.7
5.	Convenient	38	12.7
6.	Traditional	30	10.0
7	No Alternative	31	10.3
Total		**300**	**100**
Mean : 2.8167		**Standard Deviation : 1.18149**	

Sources: Primary Data

Table 14 shows that about 39.6 per cent of the households utilize firewood for various household activities, because of easy availability of resources. It is followed by 13.7 per cent of the households consume firewood for economical reason. It is inferred from the table 14 that a lower percentage of households, 9 per cent, use it because of its accessibility. It is followed by shares of 12.7 per cent, 10.3 per cent and 10 perc ent for reasons of convenience, no alternative sources and traditional respectively.

The mean value shows that (2.8167) the availability of firewood is the main reason for the highest percentage of sample households and the standard deviation is 1.18149.

Use of Kerosene for Various Activities by the Rural Household Sector

Kerosene is the major alternative to traditional fuels, which is used by all income groups. As kerosene is recognized as a fuel for poor people, the Indian government subsidizes price of kerosene and maintains good price control in rural consumers for finding kerosene is a convenient fuel for cooking and heating.

Table 15 presents the details about the purpose wise use of kerosene in the household sectors among the various activities in rural household.

Table: 15 Purpose-Wise Use of Kerosene by Sample Households

Sl. No.	Purpose	Number of Households	Percentage
1	Cooking Activities	59	19.7
2.	Preparation of Tea and Heating Activities	16	5.3
3.	Lighting	4	1.3
4.	All the Cooking and others	115	38.4
5.	No Uses	106	35.3
Total		**300**	**100.00**
Mean: 3.6633		**Standard Deviation:4.00292**	

Source: Primary Data

The table 15 shows that 38.4 per cent of the households use kerosene for the purpose of cooking as well as for the preparation of tea or coffee, reheating activities. It is followed by 35.3 per cent where respondents do not use kerosene for any purpose in their households. The usage of kerosene for cooking is avoided by poor families although it is very cost-effective, because it is difficult to buy stoves in the desired sizes, shortages of kerosene, long queues at ration shops and other difficulties. It is seen from the table 15 that 19.7 per cent of the households utilize kerosene for cooking activities only. About 1.3 per cent of households utilize it for lighting at the time of power cut in rural areas.

The mean value shows that (3.6633) all the cooking activities stand as the prime purpose for using the kerosene by the sample households and the standard deviation is 4.0029.

Reasons for Using Kerosene by the Sample Households

In the study area, kerosene is one of the sources of energy in household consumption. The household consumption of kerosene is followed by charcoal, electricity, firewood and agricultural waste. This implies that the use of kerosene is the most common in the study area.

Table 16 illustrates the reasons for using kerosene by the household sector for various activities.

Table: 16 Reasons for using Kerosene by the Sample Households

Sl. No.	Particulars	Number of Households	Percentage
1	Non-users	106	35.3
2.	Availability	84	28.0
3.	Economical	31	10.3
4.	Convenient	10	3.3
5.	Time Saving	24	8.0
6.	Traditional	11	3.7
7	No Alternative	34	11.4
	Total	**300**	**100**

Source: Primary Data

The table 16 shows that about 28 per cent of the households prefer kerosene for various activities of the household. The availability stands out to be the major reason for a particular fuel to be the most preferred fuel. It is followed by 11.4 per cent of households who opine that there is no alternative for kerosene in household activities. It is inferred from the table 16 that 10.3 per cent, 8.0 per cent, 3.7 per cent, 3.3 per cent of the households which are consuming kerosene opine that the kerosene usage is economical, time saving, traditional and convenient respectively.

Use of Liquefied Petroleum Gas for Various Activities in the Household Sector

Liquefied Petroleum Gas (LPG) is convenient to use and it is easily portable. These factors have made the respondents prefer this fuel among many rural households. Today, liquefied petroleum gas has become a major fuel used by upper-income households in rural areas.

Table 17 shows the purposes for which liquefied petroleum gas is used in household sector for various activities in rural households.

Table: 17 Purpose -Wise Distribution of Liquid Petroleum Gas

Sl. No.	Purpose	Number of Households	Percentage
1	Cooking Activities	22	7.3
2.	Preparation of Tea and Heating Activities	1	.3
4.	All the Cooking and others	79	26.4
5.	No Uses	198	66.0
Total		**300**	**100.00**

Source: Primary Data

The table 17 shows that about only 26.4 per cent of the households use the liquefied petroleum gas for the all cooking purposes as well as for preparing tea or coffee and reheating activities. It is followed that 7.3 per cent of the households which use it only for cooking activities. Liquefied petroleum Gas cylinders are subsidized and are available at low prices, due to Government policy. Some households prefer to use kerosene for water heating and liquefied petroleum gas for cooking in rural areas.

It is inferred from the table 17 that 66 per cent of the households do not utilize liquefied petroleum gas for any purpose. A liquefied petroleum gas stove has good controllability; its energy waste is less than a wood stove and has less harmful emissions. Biomass fuels are substituted, mainly with liquefied petroleum gas. The usage of liquefied petroleum gas has been steadily increasing in recent years in rural households.

Reasons for using Liquefied Petroleum Gas by the Sample Households

The demand for kerosene has been diminishing due to higher penetration of liquefied petroleum gas cylinders in rural areas.

Table 18 explains the reasons for using liquefied petroleum gas in the household sector for various activities in the rural households.

Table: 18 Reasons for using Liquefied Petroleum Gas by Sample Households

Sl. No.	Reasons	Number of Households	Percentage
1	Non-users	198	66
2.	Availability	19	6.3
3.	Accessibility	9	3.0
3.	Economical	9	3.0
4.	Convenient	26	8.7
5.	Time Saving	28	9.3
6.	Traditional	4	1.3
7	No Alternative	7	2.3
Total		**300**	**100**

Sources: Primary Data

The table 18 shows that about 9.3 per cent of the respondents prefer liquefied petroleum gas for various activities of household sector for saving time. It is the major reason for a particular usage of liquefied petroleum gas. It is followed by 8.7 per cent of the respondents who prefer it for its convenience.

It is inferred from the table 18 that 6.3 per cent, 3.0 per cent, 2.3 per cent, 3.0 per cent and 1.3 per cent of the respondents respectively prefer liquefied petroleum gas because of its availability, accessibility, economical, no alternative sources and traditional.

Frequency of Cooking in the Sample Households

Cooking is an important daily household activity. It consumes significant quantities of energy. The rural energy is linked to the types of cooking fuel used, its quality, availability and accessibility, and the cooking devices used and its efficiency. Table 19 shows the details regarding cooking frequency in the sample households.

Table: 19 Frequency of Cooking in the Sample Households

Sl. No.	Frequency of Cooking	Number of Households	Percentage
1	Two Times	205	68.3
2.	Three Times	95	31.7
Total		**300**	**100.00**

Source: Primary Data

The table 19 shows that about 68.3 per cent of the households cook twice a day; they are not able to spend more time for cooking since they are involved in agricultural activities and other occupations. It is followed by 31.7 per cent of the households, which

cook for 3 times a day. They have enough time because of sufficient income and the availability of energy sources for utilization.

Conclusion

Consumption expenditure on the various energy sources by the sample households in the household sector, the expenditure on electricity is higher in the total energy consumption expenditure. The share of animal dung is found to be the lowest contributing to only 0.20 per cent in the total expenditure of energy consumption. Though firewood is consumed in larger quantities, the share of this source to overall total energy consumption expenditure is lower to the extent of 19.14 per cent only. Liquefied petroleum gas is one of the important sources of energy as it is used for purposes of cooking. The analysis also shows that the use of the non-commercial fuel energy is being steadily replaced by liquefied petroleum gas energy. The study shows that the liquefied petroleum gas stoves are provided to rural household sector by the Government. Higher education status of the respondents in the rural areas stimulates them to use the modern cooking appliances. Though renewable energy source is expensive, the respondents use liquefied petroleum gas for cooking.

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