

# **Impact of Socio Economic Factors to Changing Energy Consumption Expenditure of the Rural Sector (With Special Reference to Arachchikattuwa Divisional Secretariat Division)**

\*K.H.M.S.K Kumari and B.S.K. Balasooriya

Department of Economics and Statistics,

Faculty of Social sciences and Languages,

Sabaragamuwa University of Sri Lanka, Sri Lanka

\*kahandawasureka822@gmail.com

## **ABSTRACT**

Energy is an essential requirement for today's day to day life. It is necessary to all of us for lighting, cooking, transportation, health service and fulfilling many of our basic needs. Choices of energy sources in a household are affected by many reasons. The main Objective of the study was to study the impact of the socio economic factors on the energy consumption of the rural households. Primary data were collected using questionnaires filled by the rural sector using 50 households in Puttalam district. The secondary data were collected using books, magazines, central bank reports. The multiple regression model and Chi-square test were used to analysis the data. There were 92% of electricity users in rural sector. Considering the Per Capita Energy Consumption Expenditure in rural sector, it was recorded as Rs.596.36. Energy expenditure of the rural sector households was Rs. 2481. Kerosene usage and dry cell battery usage were high in the rural sector. Solar power, which was used by 8% of the households in the rural sector. Lack of an electricity connection also contributes to lower energy spending among the rural poor. According to the survey results, number of family members, monthly income, Ownership of vehicles, education level of the head of family, number of school children, Types of vehicle were the significant factors to changing energy consumption expenditure of households in rural sector. Government should identify the possibilities to develop sustainable energy sources such as wind and solar and should introduce alternative energy sources to reduce the cost.

**Keyword-** Per capita energy consumption, Household Energy Usage, sustainable Energy sources

## **1. INTRODUCTION**

Industrial Revolution accompanied a dramatic change in energy system, away from locally gathered, traditional fuel such as biomass to commercially traded fossil fuels. New innovations are given high priority to the energy.

Energy is one of our most critical resources; without it, life would cease. In the 1950s and 1960s, questions about energy use were mainly of interest to those people whose job it was to provide energy in its various forms. For most energy users, energy was something that worked when they turned on the lights or cooked their food [1]

The pattern of energy usage is changing day by day. From the ancient time, the energy usage is most important to a household. In those days, simple energy sources were used by them and their wants limited to lighting, heating and looking. Until the 18<sup>th</sup> century, almost all energy use was supplied locally, from such traditional energy sources as human and animal power, wood, dung, crop residues, charcoal and the utilization of wind and water power. But when developing the world, the energy usage was also developed. With the arrival of the new technology in the mid 19<sup>th</sup> century, the range of energy source expanded due to the finding of modern energy sources mainly petroleum.

In an economy, energy is used for many purposes. Energy is used by the household sector for heating, cooking, lighting, air conditioning and hot water heating.

Energy is utilized for highway vehicles, air, Marine and railway made by the transportation sector.

The share of hydro electricity, biomass and petroleum consumed in Sri Lanka was 5%, 70%, and 25%, respectively in 1972 while it was 8%, 45% and 47%, respectively in 2006, showing drastic drop in the share of biomass and a use in petroleum products. Thus indigenous renewable sources of energy provide 55% of the national primary energy need. All petroleum products are imported, and used for transport, electricity generation, household, commercial and industrial requirements. Electricity and petroleum products are the main form of commercial energy and increasing amount of biomass is also commercially growth and traded [2].

When considering the world the energy consumption, it is differed by country wise. And when consider about a country it is differed according to sector wise. Average monthly household expenditure on fuel lighting in the year 2009 in Sri Lanka is Rs 1250 and it was 3.9% of the total expenditure share. It was differed from sector to sector. Expenditure share on fuel and lighting in urban, rural and Estate was 5.0%, 3.6% and 3.9% respectively[3]

Energy consumption is a major and complex process. Different socio economic factors are affected for the energy consumption. With this background, the study was considered about the effects of socio economic factors which influence to changing the energy consumption expenditure of the household in rural sector.

## 2. LITERATURE REVIEW

Energy is one of our most critical resources; without it, life would cease. In the 1950s and 1960s, questions about energy use were mainly of interest to those people whose job it was to provide energy in its various forms. For most energy users, energy was something that worked when they turned on the lights or cooked their food (Schipper, et al: 1992).

The Industrial Revolution which began with the discovery of the steam energy (AD 1700) brought about a great many changes. For the first time, man began to use a new source of energy, coal, in large quantities. A little later, the internal combustion engine was invented (AD 1870) and the other fossil fuels, oil and natural gas began to be used extensively. The invention of heat engines and the use of fossil fuels made energy portable and introduced the much needed flexibility in man's movement. This flexibility was enhanced with the discovery of electricity and the development of central power generating stations using either fossil fuels or water power.

A new source of energy – nuclear energy came on the scene after the Second World War. The first large nuclear power station was commissioned about 30 years ago, and already, nuclear energy is providing a small but significant amount of the energy requirement of many countries [4]

The economics of energy refers to its aspect as a commodity. Exchange takes place when energy is transferred from one party to another and some valuable good, usually money, is transferred in the opposite direction. Energy is principally used as an input to an economics process and an intermediate good. When energy is exchanged, it has a price per unit [5]

Energy has been a key to increased industrialization. The availability of inexpensive and abundant energy is important to mechanized agriculture, industrial manufacture modern transportation and modern physical comfort [1].

World primary energy use, including biomass grew by over one-third between 1970 and 1990. The average increases over these two decades of 2.3% per year. World energy use was steady in the 1974-1975 and 1980-1983 periods as a result of response to higher energy prices and slowing of economic activities. But growth continued after each period of stagnation as real oil prices declined and economic growth resumed. Between 1983 and 1989, growth in world energy use was rather steady averaging 2.8% per year [1]

World energy consumption differed from country to country. Considering world energy consumption in 2002, North America was consumed large amount of energy as 27% of total world energy. Western Europe, Asia and China were consumed as 18%, 13% and 11% respectively. From world Energy, Central South America and Russia were consumed 6.8% and 6.7% in 2002. It was 5.3% for Japan. Middle East and Africa were countries that consumed energy in low level compared with others. It was 5% and 3% for Middle East and Africa respectively [6].

Energy use and the choice of fuels consumed depend on most factors. This study has found that there two variables as supply variables and demand variables. Price and availability (for marketed fuels), less easily defined measures of abundance or scarcity, especially the time and “effort” devoted to fuel gathering and fuel use, access to fuels by different groups, seasonal variation in supply, and cultural and socio-economic factors, such as gender differences over decision-making and divisions of labor, The availability of and competition between substitutes for fuel and non-fuel uses of biomass (e.g., animal fodder, construction materials, timber for sale, small

wood for tools, etc., and soil conditioners or fertilizer), fuel preferences (between bio fuels, and bio fuel versus modern fuels), urban or rural occasions are the supply factors affect to energy consumption. Household income, household size, Temperature and precipitation (for space heating and drying needs), cultural factors (diet, cooking and lighting habits, number of meals, feasts and burial rituals), cost and performance of end use equipment are the demand variables. Moreover, religious festivals, celebrations, burials and other occasional functions may consume large amounts of fuel (<http://www.energycommunity.org> Accessed date 04August 2012),[7].

### 3. RESEARCH PROBLEM

According to most recent statistical data in Sri Lanka, sector wise energy expenditure differences can be identified. Energy expenditure of the urban sector households was recorded as Rs. 2226. While rural sector was Rs. 1103 and Rs. 999 was spent by the estate sector [3].

There is a strong correlation between the standard of living as measured by the per capita gross national product and the per capita energy consumption. Choices of energy sources in a household are affected by many reasons and consumption pattern can be different from each sector. According to that identification of those reasons are essential. Considering this situation, the research problem was what are the impact of socio economic factors to changing the energy consumption expenditure in rural sector?

### 4. IMPORTANCE OF THE STUDY

Energy is an essential requirement of today's day to day life. It is requirement to all of us for lighting, cooking, transportation, health service and fulfilling many of our basic needs. Having access to electricity would enhance telecommunication at household level, would help women in cooking, radio and television would give entertainment, knowledge and information dissemination. Electricity plays a major role in enhancing livelihood opportunities for all, including poor and non-poor. Considering energy, it plays a crucial role in household expenditure. Therefore studying the pattern of energy consumption expenditure in a household is essential.

The most recent household income and expenditure survey was conducted from June 2009 to July 2010 excluding Mannar, Kilinochchi, and Mullaitivu. But, energy price is rising day by day. This sharp increase reflects then a possible change in expenditure share of household energy consumption.

According to the energy consumption pattern of urban, rural and estate sectors consumption differences can be identified. Price was not the only factor which determines the energy consumption. Then indentifying these socio-economic factors is essential for distinguish the consumption disparities among sectors. In that view, this study is very important for the policy makers. Since this is important to identify the consumption pattern and consumer behavior with related to the energy.

Considering Sri Lankan context the limited researches are done related to identify the determinants of energy consumption. Therefore conducting this kind of study is very important.

Considering above factors, research findings of this study are very important to realize different consumption patterns among in the rural sector.

### 5. OBJECTIVES OF THE STUDY

#### Main Objective

To study the impact of the socio economic factors on the energy consumption expenditure of the households.

#### The specific Objective of the Study

To identify the trend of the current energy expenditure pattern of the rural sector.

### 6. RESEARCH METHODOLOGY

#### Sample and Sampling Method

Simple random sampling method was used and 50 rural households were selected from Arachchikattuwa Divisional secretariat.

#### Data Collection methods

Primary and secondary data were used for this study. The data was collected using questionnaires filled by sample rural sector consumers in Puttalam district. The relevant data were collected based on a structured questionnaire by visiting each of the randomly selected household in the sample. Secondary data were collected using books, journal articles and websites.

#### Data Presentation

To present the data graphs, charts and tables were used.

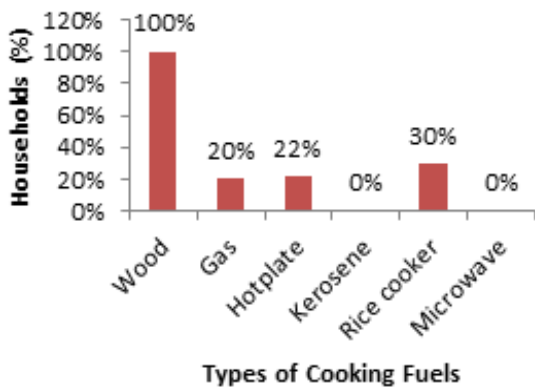


Fig. 1 Types of Cooking Fuels used by the rural consumers

The majority of them are used woods. In addition to that usage of electricity equipment are lower in rural sector.

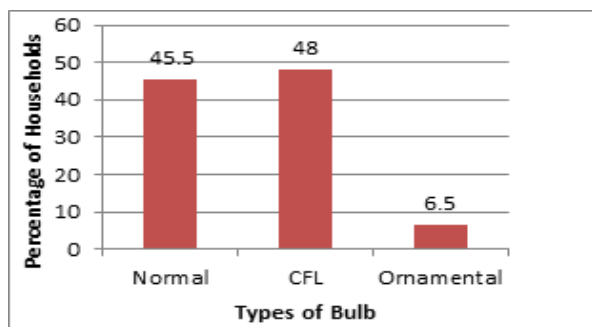


Fig. 2 Types of Bulb Usage in rural sector

Most of the rural households use CFL and it was recorded as 48%.

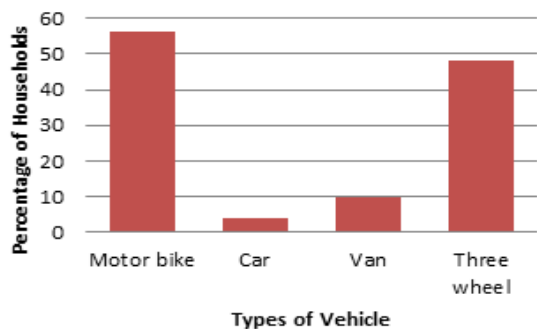


Fig. 3 Types of Vehicle

Considering the types of vehicle usage in rural sector the majority of them use Motorbike and three wheel.

Table 1: Monthly energy usage in rural sector

Energy type	% of users	Ave. monthly expenditure (Rs)
Diesel	8%	260.00
Petrol	54%	1244.00
Electricity	92%	594.80
Kerosene	100%	164.40
Dry Cell Battery	74%	69.00
LPG	16%	120.00
Solar power	8%	15.63
Candle	52%	13.90

Data Analysis

To identify the relationship between dependent and independent variables chi-square and correlation methods were use. The significance variables are summarized as follows.

Table 2: Significance of the Selected Factors in Rural Sector

Predictors	P values
Constant	0.672
Family income	0.032
Number Family member	0.012
Gender of head	0.135
Number of school children	0.045
Ownership of vehicle	0.000
Types of occupation of head	0.031
Type of vehicle	0.039

Source: Sample survey, 2013

Table 3: Actions for reducing Energy Cost

Activity	Actions	Rural (%)
Cooking	wood usage	99
	reducing cooking times	1
Lighting	CFL usage	64
	reducing time	36
Transportation	reducing trial	35

7. DATAANALYSIS

Data was analyzed using multiple regression model. The dependent variable is Monthly energy expenditure. Socio economic variables were used as independent variables.

The Regression Equation of Rural Sector is

$$Y = 184 + 175X_1 + 0.0183 X_3 + 1516X_4 + 228X_5 + 143X_6 - 320X_7$$

Dependent variable

Y = Monthly energy consumption expenditure

Independent variables are

$X_1$  = Number of family members( $\beta_1$ )

$X_2$  = Monthly income( $\beta_2$ )

$X_3$  = Ownership of vehicles( $\beta_3$ )

$X_4$  = Education level of the head of family( $\beta_4$ )

$X_5$  = Number of school children ( $\beta_5$ )

$X_6$  = Types of vehicle ( $\beta_6$ )

## 8. CONCLUSIONS

Energy plays an important role and energy was an essential item for the consumers. Considering cooking fuel, wood usage was high in rural sector.

Considering electric item usage, Heaters and refrigerator were common electric item in the kitchen in rural sector. Home electric items usage was high in urban sector as TV, Radio, Iron, computer and Fan.

Diesel, Petrol, Electricity, LPG and Kerosene were the most commonly used energy sources among the rural consumers Electricity usage was recorded in rural sector as 92% while there were some households in rural sector as non electrified. Kerosene usage was high in the rural sector sample. Dry cell batteries were used across the three sample groups and it was high in rural sector. Solar power, which is used by 8% of the sample households in the rural sector samples but does not feature at all amongst the other samples. When there was an electric failure, candles was the most common fuel source used for lighting .

Energy expenditure of the rural sector was Rs. 2481 and Per Capita Energy Consumption Expenditure was Rs.596.36 in rural sector.

Lack of an electricity connection also contributes to lower energy spending among the rural poor. Lighting with solar power, kerosene and candles were less cost with the absence of electricity. That meant the unconnected households for electricity spend less overall on energy than connected households for electricity. Moreover, deforestation, urbanization and electrification can be considered for changing the fuel choices.

Main objective was to find out the effects of socio economic factors to change the energy consumption. According to the survey results, number of family members, monthly income, Ownership of vehicles,

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education level of the head of family, number of school children, Types of vehicle were the significant factors to changing energy consumption expenditure of households in rural sector.

## 9. RECOMMENDATIONS

- Government should launch awareness and training programs to improve the performance of energy and materials use and energy savings.
- Have to introduce energy-conserving products to consumers.
- Government should initiate research and development activities with industry participation to explore new technological solutions to reduce power usages.
- Government should identify the possibilities to develop sustainable energy sources such as wind and solar.
- It should be limited the imports of highly energy consumed electric items.
- Have to innovate to identify the alternative energy sources to reduce the cost.

## 10. RESEARCH LIMITATIONS

- Firewood consumption expenditure was not taken into the account.
- The study was conducted using 50 households from rural sector.
- Study was limited to the Arachchikattuwa Divisional Secretariat .

## REFERENCES

- [1] Shipper, L..Energy Efficiency & Human Activity. Cambridge University press.1992
- [2] Central Bank Annual Report,Central Bank of Sri Lanka.2006
- [3] Household Expenditure and Consumption Survey, Department of Census and Statistics, Sri Lanka.2009-2010
- [4] Sukhathme, S.P. Solar energy principals of thermal collection & storage.Tatame, Graw Hill Publish company Ltd.1984
- [5] Dorf, R.C..”Energy, Resource &Policy” .University of California press, 1978
- [6] Hinrich, R.A &Kleinbach, M..”Energy, its use and the environment “.Thomson Brooks/Cole.2006