

HOUSEHOLD CONSUMPTION: EXPENDITURE ENERGY IN KERALA

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INTRODUCTION

Energy resources were abundant and free gifts of nature in the past. But as their use increased over the course of time, they became scarce economic goods having considerable exchange value. Mankind was forced to discover more and more energy sources, extract and transmit them to different regions to accelerate the pace of economic development. These processes involved spending enormous amounts of money which could not be afforded by private entities. Thus the scarcity of energy supply, high cost involved in their extraction and transmission, their inevitable and undeniable status as an intermediary capital good, along with the ever increasing demand for them made their allocation and distribution a responsibility of the public sector in all countries of the world. At the same time energy poverty and energy inequality among different economic classes reflected through the extent of individual access to clean energy sources raised some micro economic questions within the national arena.

Both energy demand and supply have augmented as the history of mankind passed through different stages of evolution. Though comparable estimates of the increase in energy supply over the entire period of human history are by and large non-existent, reliable and equivalent demand statistics do exist. Some estimates reveal that the per day energy consumption by man has increased through consecutive stages of history roughly along the following lines. It has increased from 2000 Kcal of energy consumed by the primitive man to 5000 Kcal by the hunting man, 12000 Kcal by the primitive agricultural man, 26,000 Kcal by the advanced agricultural man and 2,30,000 Kcal by the modern technological man (Cook 1971). It has also been estimated that man will consume about 460,000 Kilocalories, by the year 2030 A.D (Simon 1975).

STATEMENT OF THE PROBLEM

Energy is a highly essential ingredient for economic development and it plays a vital role in deciding the standard of living and economic status of the households in the state.

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There is a close relation between energy consumption and energy growth. The nature and extent of its utilization highlights the degree of income inequality among the different socioeconomic groups of people in the rural and the urban areas. It was studied that those countries whose income level is higher there consumption of energy is also higher. Energy poverty and energy inequality among different economic classes are reflected through their extent of access and usage of clean energy sources.

Domestic sector in India is increasing usage of electrical appliances in both the urban and rural households further widens the supply demand gap. If the generation capacity does not meet the demand, it will consequently burden the economic growth of the nation. Though the majority of the energy consumed in the domestic sector is by the light sources, there is an urgent need to analyse the power consumption pattern of various other appliances. Sensible usage of electrical appliances has a huge scope in conserving the electricity and eventually minimizing the load shedding. Replacement of conventional lighting sources to compact fluorescent light bulbs or LEDs will save power consumption and consequently help in reducing the greenhouse gases. The location of these light sources in a rooms overlooked in households which generally lead to over illumination and excess power consumption. Another important aspect to be considered in energy conservation is standby power. Standby power also called as vampire power is the power that any equipment consumes when not in use. This power approximates to 4 percent of total residential energy consumption.

In the state of Kerala the demand for energy exceeds the supply leading to energy shortages with drastic consequences. Various socioeconomic factors affect this demand-supply gap. Most of these factors are inter-related and have major implications for the policies aimed at solving problems of power shortage.

OBJECTIVES OF THE STUDY

1. To study the nature and extent of energy use by activity and resource among the rural and urban households in the study areas.
2. To estimate the expenditure incurred for all types of energy used in the sample households and to observe the magnitude of poverty and inequality in the consumption and distribution of energy among them.
3. To assess the measures adopted by the households to conserve and economise the use of energy.

HYPOTHESIS OF THE STUDY

To study the first two objectives Independent sample 't' tests were conducted for comparing the average consumption of each fuel in all income strata. The null hypothesis (H₀) in all the cases tested was that there is no significant difference between the means of the two distinct sample populations rural and urban. Alternatively the hypothesis H₁ denoted significant differences in consumption between the rural and urban regions. The research has made use of only Excel views software and SPSS for the analysis.

METHODOLOGY

Both primary and secondary data are made use of to analyze the objectives of the present study. While the main body of analysis of the study is based on primary data, secondary data served as a framework to define the problem and to select the study area.

Various types of demand for power in Kerala are classified into domestic, commercial, industrial low tension, industrial high tension, agricultural, public lighting, public works and licensees. Our study concentrates on the first category of consumers, which is demand for domestic consumption. For a detailed enquiry, the regions of study chosen are Ernakulam, Palakkad and Wayanad districts in the state. These districts were selected on the basis of their rank in the low tension (LT) consumption of electricity – the most common form of energy used in the state. Ernakulam is the district with highest LT consumption of electricity (2489 MU) and Wayanad has the lowest (187.13 MU). Both these districts are therefore included in our study as sample districts. In addition the study included a district having LT consumption close to the state average. Thus Palakkad district having an LT consumption of 1029.20 MU closer to the state average of 965.71 MU was also included in the sample. Again the circle wise LT consumption details were obtained to select the rural and urban regions of the districts selected for detailed enquiry. Perumbavoor circle in Ernakulam district was revealed to have the highest consumption continuously for the years 2012- 13 to 2014-15. The urban area selected was Perumbavoor municipality and the rural area chosen was Rayamangalam Panchayat. A sample of 100 households each from the municipality and the panchayat were chosen as the sample households.

A pilot survey was conducted in hundred households from the District of Ernakulam. This survey was conducted during the first half of 2015-16. Because of this experience later on the researcher got a chance to participate in an energy conservation survey by the Energy

Management Center, Trivandrum as supervisor. In all the three districts Focus Group Discussions (FGD) were held by this team of EMC on the availability of different energy sources and their common uses and the need for revealing data to the team members who approach each households. Because of the association with the EMC group focus group discussions with electricity board officials were also made possible to get enlightened on energy conservation measures. A sample survey was conducted for the collection of primary data from these 600 households with a structured interview schedule during the year 2016-17. As a supervisor of the EMC team the researcher was familiar with household members in the sample districts and could elicit information more easily and effectively for her own research.

For analysis of data we have made use of simple statistical tools like averages, percentages, variances and standard deviations. Some figures like bar charts, pie diagrams, are also included to project the profile of the sample households. Multiple comparison test-Posthoc analysis is used to understand the inter relationship between the districts to highlight the inter district differences. A few error bar graphs and radar diagrams are also shown for the same purpose. The error bars often stand for one standard deviation of hesitation, one standard error, or a particular assurance interval. The error bar diagram clearly shows multiple comparisons of the sample districts. When the three lines come in a consecutive line, there seems to be no significant difference. Whereas when the lines are scattered, there is a difference in the consumption of energy in the three districts. The radar diagram is a graphical method of displaying multivariate data in the form of a two dimensional chart of three or more quantitative variables represented on axes starting from the same point. The relative position and angle of the axes is typically uninformative. The radar diagram clearly shows the interrelationship between the three districts.

SUMMARY, POLICY IMPLICATIONS & CONCLUSION

The most significant input for any economic activity - may it be production or consumption is energy. Its sources varied in importance from time to time and from place to place. Still without access to one or other forms of energy economic life comes to a standstill. Today we cannot imagine a world without coal, electricity or petroleum products. They have become so inevitable to mankind that modern technology of production leans heavily on these energy sources. This situation has also led to an ever increasing competition and search for cost effective and ecofriendly energy resources. At the same time there is also the need for

conservation of the available supply as most energy resources are nonrenewable in nature. Energy conservation can be real if only we make efforts to assess energy demand, reduce transmission and distribution losses and cut down energy consumption.

The basic objective of the present study was to analyze the nature and extent of energy use by activity and resource among the sample households in the study areas with regard to their preference for fuel as a source of lighting, working appliances and for cooking. Having got conclusive evidences of marked preferences to LPG and electricity by the families our next attempt was to estimate the quantity and expenditure on energy used by the sample households. An effort was also made to recognize the differences in the usage of energy and extent of differences in expenditure on each energy source between the rural and urban regions. The data shows the strong positive relationship between energy consumption and income of the households.

Simultaneously energy resources deplete very fast on a large scale and most of them are non-renewable. In this context it is fundamental that we take steps to conserve our energy resources and try to promote the use of renewable energy sources. It was noticed from our study that even though people have knowledge about renewable sources and energy saving methods, they are not applying it in their practical life. There is no large difference between rural and urban households for using their electric gadgets and this has led to high consumption of electricity in the state. To reduce this consumption level awareness is to be created among the households and amidst each individual within the household. In contrast to electricity where there is not much difference in rural urban consumption in the case of LPG, firewood and petrol/diesel there do exist considerable difference between rural and urban households. Mainly in rural households are poor and their income is hardly 300 per day and their monthly income is below 10000. They are mainly daily wage earner. Some people are even not able to satisfy their family income due to low income. Many rural people not only working as daily wage earner but when they are not getting any kind of work they used to work in agriculture field. The present study focused generally on all intentions behind energy usage for domestic purposes like lighting, heating cooking and transport to assess the energy demand. Then it exclusively took into account each source of energy tapped by the sampled households.

For analysis of data we made use of simple statistical tools like averages, percentages, variances and standard deviations. Some figures like bar charts, pie diagrams, error bar diagrams and radar diagrams are also used to project the profile of the sample households. Independent sample 't' tests were conducted for comparing the average consumption of each fuel in all income strata. Multiple comparison test - Posthoc analysis was used to analyse the inter relationship among the three districts. The null hypothesis (H₀) in all the cases tested was that there is no significant difference between the means of the two distinct sample populations rural and urban. Alternatively the hypothesis H₁ denoted significant differences in consumption between the rural and urban regions. The researcher has made use of only Excel views software and SPSS for the analysis. It is evident from the study that there is no relationship between the income of household and their expenditure on energy, this is an adequate proof for the hypothesis.

MAJOR FINDINGS - ENERGY USE IN THE SAMPLE HOUSEHOLDS

In each of these households' selected detailed enquiries about the nature and pattern of energy consumption was made. The data analysis first concentrated on observing the nature of preference of the households with regard to their consumption. The major findings of the study are reported use wise and source wise. The uses of energy in the sample households were for lighting, working of appliances, cooking, heating, and for transport. Of these lighting and working of appliances were taken together whereas heating was clubbed with cooking.

Firewood is not an efficient source of fuel. It produced large amounts of Carbon Monoxide which is harmful to people in the vicinity. It is advisable for people to use more modern methods such as LPG because of the following reasons we could note down from our survey. First of course there is a health issue involved in collection of firewood in the rural areas. The women surveyed in our study expressed back pain, itching, rashes and allergies while engaged in the process of collecting firewood. Then there is acute shortage of firewood especially in urban areas and this poses a major challenge to those who are completely dependent of collection of firewood for cooking purpose. The collection of firewood is also a very tiring and time consuming exercise and after that women and other household family members hardly get any time for other works to be done. In rural household women spent up to three to four hours of their productive time of a day in fetching fuel wood and cooking. Children too are involved in collection of fuel wood. About 55 percent of the rural energy

used is derived from biomass. Dearth of space in the house to store the firewood collected for a prolonged period of time is another major concern especially in the rainy session. Due to fear of animals from the forest area from where it is collected and snakes from where it is stored there is increased risk in the usage of firewood.

ANERT the governmental agency for Non-conventional Energy and Rural Technology is providing of subsidized rates for domestic biogas projects. Solar energy will become a viable energy source. So in Palakkad district 3 percent of the households in rural areas have biogas plants. Plants of portable or fixed models are made available by ANERT. The project besides providing biogas for cooking purposes also enables the production of organic manure and contributes to environmental protection by reducing the use of fossil fuels.

ENERGY CONSERVATION MEASURES

Questions were also asked on the efforts of the households to conserve energy. But the answers were often vague and inconsequential. The few measures the respondents suggested were switch off fan and lights off when leaving the room, and not to use light at daytime and not to use fan at rainy season. The households surveyed used CFL and LED for household use. Ironing all clothes together, reducing the usage of energy to 3hrs in the morning and morning, use of energy efficient electric appliances like star products etc were the other measures suggested by the respondents to reduce energy consumption.

Still the overall impression the survey gave us is that the people are not much bothered about the volume of their energy consumption and does not deliberately make much efforts to reduce their consumption and save money. This negligence is to be removed with massive awareness campaigns to the new generation which should begin from childhood itself from both at home and the school level. Energy efficiency & energy conservation are the most cost effective solution for sustainable development. During the survey it was realized that large savings and conservation opportunities exist in all sectors of the economy. But to tap this opportunities and conserve energy massive efforts are to be taken for better utilization of energy and effective utilization of existing sources in all sectors of life. If such measures are taken it would be A WIN –WIN FOR ALL.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Energy policy embraces economic policy and environment policy, planning, pricing, consumption, expenditure all these relate to economic principles whereas conservation and management of the resources are to be guided by the principles of environment. An admirable energy policy begins with the efficient use of energy. Energy intensity of the economy remaining constant, the energy demand will increase and the relationship between energy consumption and GDP becomes directional. The implementation of renewable energy sources should ensure uninterrupted supply. The empirical results reveal that in the long-run energy demand will be price inelastic and in our results, we have found co integration between the series in the presence of structural breaks arising in the variables. We found that energy consumption increases as income increases and raises energy demand. Economic growth and energy consumption are interrelated. Energy consumption boosts economic growth and income increases also contribute to economic growth. Furthermore, energy consumption and economic growth increase the rate of energy expenditure.

FURTHER AREAS FOR RESEARCH

The study, therefore, recommends and the researcher is quite optimistic that the study will be of tremendous use to the progeny in general.

The most prominent of such uses are:

- It would pave the way of numerous innovative and scientific researches in the years ahead, on the domestic consumption, expenditure pattern and the factors influencing them.
- It will create awareness among people about the need to make a rational and optimum uses of all available non-commercial energy sources.
- The study will educate people, of the necessity of depending on the natural environmental around for their domestic energy requirements as a major pre-requisite for bringing down their day to day family expenditure in the years ahead.
- In evolving energy efficient technological upgrades in appliances, the main efforts should be focused on targeting consumer's behaviour and increasing their energy-use awareness and knowledge.
- Formation of energy clubs among housewives for energy competence and energy conservation may be studied and it will be a persuasive area for future research.

- Greater reductions of electricity consumption can be achieved by changing people's habits and usage patterns.
- An assessment of the process of fuel markets and the relationship between the prices of marketed bio-gas and fossil fuels will be a persuasive area for future research. This will be helpful for framing future fuel subsidies and action policies.
- Households from the high income group did not complain about their electricity bills and consumed much more electricity than the rest of groups.
- The group with high energy usage had displayed had higher incomes and needed a different motivation to save energy.
- □ The parameters of age, family size, income, caste, occupation, geographical area etc are to be chosen after analyzing and comparing a large set of feedback preference data and are highly recommended in future development of policies.

CONCLUSION

To conclude, the study has probed in detail all the objectives set prior to the detailed enquiry. There were many macro level studies in energy economics using census and NSSO data while there was a total lack of micro level studies. This prompted us to initiate this piece of research and it is expected to serve as a forerunner for further studies in this direction covering more districts at the state level and more states at the national level. Again we have considered only the domestic consumption of energy, similar studies in other sectors like industrial, agricultural and commercial consumption patterns can contribute to the further development of theoretical research in this area.

The present study focused on the household energy consumption pattern of Kerala. The study revealed that household energy demand and per capita consumption increase as the household income increases. Significant relationship exists between household income and energy consumption. This indicates that energy demand is income elastic. The result could be useful to evolve strategies to reduce consumption as well as to introduce suitable pricing policies in the household sector. Against the common notion that in Kerala there is hardly any rural urban divide the findings of the study indicate that in this region also there do exist significant differences in the domestic consumption pattern of all energy sources at the aggregate level between the two regions. The earlier studies in the state have studied or analyzed just the energy consumption pattern of rural households, but the present study, in

addition to similar efforts has also investigated into several aspects like comparison of rural and urban households in three districts of Kerala, compare inter-districts differences in energy consumption pattern and demand for energy, energy poverty, energy ladder and the relationship between energy demand and its determinants. It is suggested that future researchers may attempt to have a comprehensive analysis of these diversities with a survey in more districts so that meaningful generalizations can be made regarding the state. Consequently the policies to be framed by the government can be given a region specific outlook in the event of energy management and conservation of nonrenewable sources. All through our survey we noticed both in the rural and urban areas, the scope for installation of biogas and solid waste management plants. But only a few households in the rural and still fewer in the urban area tapped such alternative energy sources. The local self-governing bodies with the financial help of state government can give subsidies to encourage such measures. Even subsidized solar plants can be encouraged to be installed in the households of high income groups if necessary legislations are made in the state legislature. If the government enact such laws many a palatial buildings in Kerala both in the rural and urban area can be turned into power plants. Though the agencies like energy management Centre and ANERT are making efforts in this direction, a public awareness campaign is needed to make the households act to become self-reliant and follow a green energy consumption pattern as it is technically called.

Shortage of energy and solid waste management are over and over again considered as instances of government failure. Entrusting the households some accountability in solving these twin problems will definitely be a partial solution. Finding ways and means to dispose at least the domestic wastes at the point of origin itself and generating bio energy thereby simultaneously should be the main concern of the government. Training the public to manage the wastes created by them on their own is a better solution than the government shouldering this entire responsibility. Of course the government or its agencies can act as good facilitators by encouraging and introducing technologies that can turn wastes most often considered as a bane of economic development to gold that is energy, the generation of which is a boon to the development of a nation.

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