Energy Issues in the Rural Household Sector

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Introduction

This report is based on information gathered through a literature survey, a field study in four villages in four districts carried out by the author, the findings of a workshop on rural energy issues, interviews conducted with resource persons and the personal experiences of the author.

Energy is a complex issue. The supply and consumption of energy in the different sectors (domestic, public and industrial, transport, rural and urban etc.) are interrelated. However, this report will focus on the rural household sector.

Methodology of the study

The author carried out a comprehensive literature survey and four village studies in four districts in Sri Lanka. The districts and the villages chosen for the village study were:

Ratnapura District: Sudagala
Hambantota District: Ihala Kumbukwewa
Gampaha District: Parangoda, and
Anuradhapura District: Dematawewa.

The four villages were chosen to include the following characteristics: small size, considerable income variation, a predominance of agricultural activity, varying distances from the main road and town, and villages with and without electricity.

Ihala Kumbukwewa from Hambantota District is a remote rural village from the dry arid zone of the country in which the major economic activity is subsistence agriculture. Sudagala is a village in the Sabaragamuwa province. Parangoda is a changing village in the wet zone in close proximity to a small town. Dematawewa is a dry zone purana village in the North Central Province. Sudagala and Ihala Kumbukwewa have no electricity.

The field work for this study was carried out in January and February 1994. The sample size was 240; 60 households from each village. The main purpose of the village case studies is to provide data of village level patterns of energy use and to examine related problems and issues. The sample size and the villages chosen are not sufficient to make reliable predictions or generalisations for the entire rural sector of Sri Lanka. However, the field study can indicate the trends of energy usage in the rural sector of Sri Lanka.

Energy use by households

Table 1

Current Energy Use in Sample Households classified by types of energy

Types of Energy	Uses							
	Cooking		Lighting		Appliances		Transport	
Fuelwood	237	98%						
Other Biomass	75	31%			73	30%		
LP Gas	10	4%						
Electricity			34	14%	30	12%		
Kerosene	3	1%	235	98%				
Batteries					47	19%		
Diesel					226	94%	5	2%
Petrol							16	7%

Cooking

98% of the households use fuelwood for cooking. Quite often (in 31% of the households surveyed) other biomass (residue from mills and coconut shells) is also used. In the sample only 4% used LP gas for cooking, and this usually in combination with firewood. For communities at considerable distance from the towns, fuelwood is more easily available and a majority cannot afford to spend the capital cost of a gas cooker and cylinder. In villages with closer proximity to the towns there is an increasing use of LP gas for cooking. In Sudagala 6% use LP gas; in Parangoda the usage is 10%. This suggests perhaps that as a community becomes increasingly urbanised, they begin using LP gas and fuelwood for cooking, and finally give up fuelwood and rely solely on LP gas.

The majority of the fuelwood users collect fuelwood from the forests (62%). 29% collect from their home gardens, 14% from neighbours' gardens and a few (8%) from nearby estates and from saw mills (7%). In Dematawewa and Ihala Kumbukwewa where there is still sufficient reservation lands and forests. The main source of fuelwood is still the forest (92-95%). In villages where there is no forest land (e.g. Sudagala) fuelwood is collected from home gardens (81%). The people of Parangoda collect fuelwood from a variety of sources - scrub jungle, home gardens and neighbours' lands.

Though use of fuelwood is common in the rural communities, the users are concerned about a number of factors relating to its collection and use. A large number (41%) said that though it has no monetary cost, they have to spend considerable time collecting it. This is particularly so for those who do not live close to the forests or have no home gardens. For those who lived close to forests or had home gardens, the ready availability of fuelwood was a positive factor. Yet, many were concerned about the time it took to cook using fuelwood. About a third of the respondents said that it was an environmental hazard and difficult to use.

The energy saving wood stoves have not yet been widely distributed in the sample villages. 94% of the households use the traditional fire place (3 stones) for cooking. Only about 8% use the Anagi stove.

Lighting

The major energy source for lighting in rural households is kerosene oil. The three main items used for lighting are the bottle lamp, the chimney lamp and the petromax lamp. Kerosene also accounts for the highest expenditure in a household energy budget. Most users see no advantage in using kerosene oil 58% find it expensive; 31% find it difficult to use 22% find it unreliable and inefficient (18%).

Only two of the four villages studied, Parangoda and Dematawewa, have access to grid electricity. In Dematawewa only two households have an electricity connection. In the 34 households with connections, electricity is used for lighting (100%) and for working of household appliances such as television (90%). Many perceive electricity as easy to use unlike kerosene or petromax (72%); efficient (65% and having multiple uses (50%). Like the combined use of fuelwood and LP gas for cooking, household with electricity also use kerosene for lighting.

Use of household appliances

While 90% of the households with electricity use electricity for operating household appliances, about 20% of all the households surveyed use wet batteries for operating electrical items especially television and cassette recorders. The usage of wet batteries is higher in the villages that are closer to the towns, but which have no electricity supply (eg. Sudagala) but even people in remoter villages use wet batteries (e about 20% of the households in Ihala Kumbukwewa

Household appliances other than televisions (torches radios, cassette recorders) in 94% of the household are operated on dry batteries. This is the second largest item of expenditure on the energy budget these households. People (30% of the household surveyed) also use biomass from rice and saw mills and coconut shells for the operation of certain household appliances such as irons.

Transport

2% of the sample (5 people) use diesel for the operation of vehicles. 7% operate private petrol vehicles. For these families, the expenditure on petrol comprises the third highest expenditure in their energy budget.

Preferences

The study looked at respondents' preferences for different types of energy.

Table 2:

Preferred Energy Sources in Sample Households classified by types of energy

Preferred Energy Sources	Uses							
	Cooking		Lighting		Appliances		Transport	
Fuelwood	133	55%						
Other Biomass	1	4%						
LP Gas	72	30%						
Electricity	34	14%	233	97%	169	70%		
Kerosene			7	3%	7	3%		
Batteries					55	23%		
Diesel							6	2%
Petrol							23	9%

When we look at the above information together with the current usage of the different types of energy, it would seem that there is a preference for LP gas (for cooking) and electricity for lighting and for the operation of household appliances. Non-availability of these sources, and inability to meet the initial investment costs (of equipment in the case of LP gas, and of obtaining the connection in the case of electricity) constrains a majority of rural households from using these preferred sources.

The family budget and the use of energy

The average household spends about Rs 183 per month on firewood, kerosene and dry batteries. If we take into account expenditures on LP gas, wet batteries, electricity and fuel for vehicles (which are used by a relatively small proportion of the households in the sample), the average expenditure on energy is around Rs 300 per month. This accounts for 5% of the total household income and about 6% of total household expenditure. The percentage will change according to the income levels. According to national figures, the proportion of expenditure on energy decreases with increasing incomes. In an average household, the highest amount of expenditure is on kerosene oil. Dry batteries and petrol (where it is used) also account for a large proportion of household expenditure (27% and 24% respectively).

The study also indicated that there was a strong positive correlation between family income and expenditure on energy. As income increases, expenditure on LP gas, batteries (wet and dry), petrol, kerosene and electricity increases but the expenditure on fuelwood declines. People with higher incomes spend a larger proportion of their energy budget on electricity and LP gas, while those with no electricity connections but with higher incomes spend increasing amounts on batteries as an alternative energy source. As households increase their expenditure on electricity, their expenditure on kerosene decreases. Kerosene provides the main alternative for lighting houses in the villages.

There is also a significant relationship between household size and biomass, fuelwood and kerosene oil usage. Larger families require longer cooking times. As time on cooking increases, the quantity of fuelwood increases. In households where LP gas is used, the education levels of the women, and the fact that they are employed outside of the home also make a significant contribution to the usage of LP gas as an alternative energy for cooking.

hanges in use of energy

ery household that uses fuelwood has been using or generations. The use of LP gas has begun after 980. In Sudagala and Parangoda, 10 households ave changed from fuelwood to LP gas. But this has not happened in any of the other villages. While LP gas is preferred because its easy to use, the shift has been facilitated by opening of sales outlets close by and increases in income of the households.

Before 1970 no one in any of the villages had access to grid electricity. After 1970, 3 families (1%) obtained connections; after 1980, 9 families (4%) were connected and in the 1990s a further 19 families (8%) obtained electricity. Electricity is perceived as easy to use and more economical than other energy sources. Shifts to the use of electricity has occurred through villages being connected to the grid. At the household level, increase in incomes have facilitated household connections.

Conclusions

The information collected through the village surveys are limited in their scope. For instance the studies do not include communities in the hill country where 25-50% of the fuelwood is used for the purpose of heating water for bathing, and a considerable amount of energy is expended on space heating. The study also does not take into account the energy needs of communities in the North and East, provinces which currently have no electricity supply at all. Despite these limitations, much of the information collected from these village studies supports the findings of other researchers.

It is obvious that fuelwood is becoming scarce and that this is leading to an increase cost both in terms of money and time spent on collection. There is also a perception that using fuelwood is inefficient, particularly where families are large and cooking takes that much longer.

When affordability and availability are not problems, people are making the shift to LP gas for cooking. This suggests that there could be a growing need for this source of energy supply.

For those who cannot afford to make the shift there is the danger that scarcity of fuelwood could have long term detrimental effects. To cope with the increased cost of fuelwood, families will change their cooking habits. They will begin to cook less and be reluctant to boil water. This in turn will have a negative impact on their health and nutrition. Families will also begin to use low quality biomass which could lead to household pollution. Scarcity will also increase the economic burden on the poorer households who are compelled to purchase fuelwood.

There is some thinking (even among scientists) that fuelwood consumption does not result in deforestation. The findings of the village study do reveal that a considerable proportion of the households collect fuelwood from the nearby forests. While villagers do not fell trees for fuelwood, they cut plants that gradually result in the decline of the thickness of the forest. The increasing commercialisation of fuelwood and its purchase by the urban sector and rural middle class can lead to deforestation by commercial wood suppliers. It can also be assumed (though research data is not available) that canal reservations, road reservations, catchments of tanks are also sources of fuelwood especially for people in settlements. It is also obvious that there is a growing demand for electricity. The study showed that electricity is the most preferred source of energy for lighting and for operating household appliances - even among people who have no grid connections.

The demand for electricity is influenced by a number of factors. Kerosene (which is used by almost all households in the sample) is more expensive on a daily use basis and is perceived as inefficient, unhealthy and dangerous. An increasing number of households have appliances that can be used with electricity. All of the households surveyed had either a radio or a cassette recorder or both. Eight households (3%) had television and a few owned other appliances such as a fridge, a fan, a washing machine, or a polisher. This is a feature of the decreasing isolation of the country's "rural" population.

Having an electricity supply is also considered a status symbol both for the family as well as for the community. It is seen as the initial step on the development path and the first step to linking the community with the outside world. Communities that receive a grid connection are seen as able to get other infrastructure facilities such as roads and service organisations. The supply of electricity has been long considered a political issue with politicians making (often unkept) promises to provide villages with grid connections. This has also contributed to the higher demand for electricity.

Implications for rural energy policy

In making recommendations for meeting the energy needs of rural households, it must be remembered that energy sources are a shared resource, and that meeting the demands of one sector will have repercussions on others.

Fuelwood is and will continue to be the major source of energy for cooking in a majority of the households. It is estimated that the demand for biomass (mainly fuelwood for use in the domestic sector) will grow at about 1.2% annually. Studies by several researchers however indicate emerging fuelwood shortages in different geographical areas. The major area of shortage is in the highly populated districts of Colombo and Gampaha and those most affected are low income urban households with no homestead lands. Declining rubber wood (a major source of commercial firewood) poses an added threat.

A number of industries also use fuel wood. These include manufacturing industries such as bakeries, brick, tile, lime and pottery kilns and agro industries such as copra, desiccated coconut, tea, rubber and tobacco. Attempts to meet the impending fuelwood crisis should consider increasing fuelwood (and other biomass) supplies in the long term; facilitating interfuel substitution guided on the basis of sustainable use of biomass (some industries convert to using firewood purely on cost advantages); and improving the efficiency of use of biomass energy in both the household and industrial sectors.

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Energy Efficient Lighting for Households

References

1. Wijeratna, D.C., Lucas, J.R., Perera, H.Y.R., Siyambalapitiya, T., Wijayatunga, P.D.C., and Jayasekera, T.A.K., "Pilot Project on Energy Efficient Lighting for Households 1993-1995 : Report on Phase 1 October 1993 - March 1994", Submitted to the Energy Conservation Fund, Ministry of Power and Energy, Colombo.

2. Wijeratna, D.G.D.C., "Potential for efficient lighting in Sri Lanka - An economic Analysis", IESL Trans, Vol I, 1993, p 118-126.

Several initiatives in this direction have already been started by government organisations and NGOs these include intensified management systems of forests, reforestation and afforestation, development of fuel wood plantations, community wood lots and home gardens, increased dissemination of fuel saving wood stoves, and the development and dissemination of other technologies such as gasification carbonisation, briquetting and biogas generation These initiatives should be expanded and encouraged.

The annual growth in demand for electricity is estimated at 10%. Electricity is high on the priority of rural households. Industrial and urban development also contribute to increases in demand. Most manufacturing industries depend on electricity for over 80% of their energy requirements. The North and East at present puts little pressure on the supply of gird electricity. This could change in the future. It is also estimated that over 50% of the hydro-electric generating capacity of the country is already in use. Large scale electricity generation (by hydro or other sources) has its advantages and disadvantages. In this context, attempts to meet the increasing demand for electricity should involve a combination of options; of demand management and conservation (both at the household, public and industrial levels); and of decentralised power generation which should include a variety of energy supply options.

based on some Findings from a Study
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Appendix A1 - Domestic Electricity Tariff

The monthly charges for supply under this tariff is a unit charge and a fixed charge as follows:

Unit Charge:

First Block - First 60 units at a basic rate of Rs 1.70 per unit
Second Block - In excess of 60 and up to 180 units at Rs 4.40 per unit
Third Block - In excess of 180 units at a basic rate of Rs 5.25 per unit

Fixed Charge

For consumers who consume less than or equal to 60 units per month	Rs 8.50
For all other consumers	Rs 17.00