Chapter 1

SYNOPSIS OF THIS STUDY

Contents

1.0. Introduction
1.1. Research problem
1.2. The objectives
1.3. Research methodology
1.4. Hypotheses tested
1.5. Limitations of the study
1.6. Chapterization
1.7. Conclusion
STUDIES ON FIREWOOD CONSUMPTION IN RURAL AND URBAN COMMUNITIES OF TIRUNELVELI DISTRICT IN TAMILNADU, INDIA

Chapter-1
SYNOPSIS OF THIS STUDY

Introduction

Energy the important necessity to run human life seems to be a critical commodity regarding its availability and use, which to some notable extent varies from country to country and from location to location within the country. Our society needs a significant amount of energy for households and industries and different commercial and service sectors, in both rural and urban areas. Energy is a basic requirement for all economic activities of human life. It is an inevitable commodity for all parts of the world, especially for cooking, running industrial machinery so as to reduce the use of man-power and to reduce the cost of production from the economic point of view, and for those in cool climates, it is a must to keep houses warm. In order to obtain enough energy, we have relied on a wide variety of natural resources, be it a renewable or non-renewable one. Next to the food constraint, shortage of energy to meet the existing demand prevails in almost all developing countries, and it has been the most pressing problem in countries like India for the last few decades due to rapid explosion of population and industrialization, leading to deforestation to some measurable extent year by year. Therefore, attempts have been taken to prepare viable plans in such a way that energy consumption does not have a harmful effect on existing vegetation while using sufficient energy resources (Hill, 1982).
Energy has been obtained by exploiting a wide variety of resources, of which some are commercial and others are non-commercial. The former includes electricity, coal, biogas, kerosene and other petroleum products, which are commercially available to consumers, whereas the latter includes agricultural wastes, cow dung and firewood, which are low in energy efficiency (10-15 per cent) and availability but are relatively very cheap. The commercial fuels, account for as much as 41.0 per cent of the total energy consumption of India (Standing Committee Report on Energy, 1994). And the rest of the energy (59.0 per cent) is provided by non-commercial energy sources, which are available in abundance in rural areas.

Firewood as a Renewable Energy Source

Renewable energy sources, as the name itself implies, are available in unlimited amounts in nature, which can be recreated again and again within a relatively short period without any marked depletion in their actual level. Though they are used continuously, they never get exhausted because of their unique ability of reproducing themselves. Although dung cake, solar, wind and geothermal energy are also renewable, plant-based resources are superior in their use by laymen who are poor in technical skill, and such resources are less expensive. The major point to be noted here is that non-renewable resources such as coal, petroleum and natural gas are available infinite quantity, and that if we use them constantly at this rate at which we are consuming today, they would, without any doubt, get exhausted in the near future. A proper energy budget is, therefore, essential to keep all available resources for sustained use. Firewood and its conversion products would be substitutes for non-renewable resources for the future, especially for developing countries like India, so that,
attempts have to be taken to conserve plants which are growing around us and in forests in order to supply energy for the future so as to attain sustainable development (Gurumurthi et. al., 1987)

Firewood as a Conventional Source

As far as storage facilities and nature are concerned, firewood is a conventional energy source, which is convenient to store for a long-time for household uses as well as industries, so that it can be put into use at any time when we are in need. Firewood occupies a central position for domestic purposes, but it is substituted with coal in the industrial sector. Agricultural wastes and cow dung, though renewable and available in sufficient quantity, are non-conventional for storage and future use. Since firewood is conventional and renewable, it is considered to be superior to dung cake and also agricultural wastes, in terms of energy supply, and it can be transported from rural areas to urban areas to meet the energy demand. Firewood consumption, though not aiming with conservation of non-renewable resources, can delay their depletion in a harmless manner until a new type of energy, which is superior in all aspects, has to be found for the benefit of human beings. Besides, firewood is treated as a direct energy source because it is directly burnt to obtain energy without converting into electrical power (Emily, 2001).

Necessity for Firewood

The survival of man in society is not possible without energy, since it is a crucial factor, which is associated with all activities of our daily life. Energy is used to provide heat, mechanical power and electricity, which are the three major forms determining the culture and life style in our society. Firewood has always played an indispensable role in the generation of heat, used for cooking
food, warming houses in temperate areas and for manufacturing some valuable goods in cottage industries. Firewood cannot be substituted with coal; petroleum products which are considered as promising energy for modern industries and transportation. It should furthermore be remembered that firewood is the major energy source for poor people who have very little purchasing power in rural as well as urban areas. People who cannot afford highly expensive energy such as petroleum, natural gas and electricity, collect firewood and agricultural wastes found in nearby areas and use them for household activities like cooking and heating water. Even in urban areas, people belonging to the low income group purchase firewood for their cooking needs since it is available at a low cost (Knool, 1987).

It is certain that, even if consumed in finite quantity, non-renewable resources are exhaustible and they would face depletion sometime in the future (Hema Patel, 1991). Further more, the present production cannot meet the energy demand of rapidly growing human population, and the availability of non-renewable resources cannot be sustained in its present status (Hariss and Godwin, 1995). In order to overcome these problems, our society needs to use more renewable resources to the household sector meet the energy demand, of which firewood will be the right choice to household sector in rural areas and poor people living in urban areas. In recent years, due to the advent of new technologies, new fuels have been manufactured from firewood and agro wastes with a view to reduce pollution hazards, to abate global warming and to increase fuel efficiency. However at present, those technologies are not cost effective and economic enough for recommendation.
Both the exhaustion of energy sources and the pollution consequences of resource use will eventually set constraints on growth of population and economy (Parikh and Vijayalaxmi, 2000). An energy budget, therefore, is necessary for a country for efficient energy management. It should be noted that energy is the major input in almost all progresses and developments in a country and that most developmental activities are based on increased energy consumption (Maitra, 1994). Firewood, although not involving directly in developments, provides energy at least to household sector and cottage industries, and reduces the use of other energy to some extent. Hence, the status of firewood consumption must be studied before allocating funds to meet the demand for commercial energy (Jose Goldenberg et al., 1998).

Taking these views into consideration, the present study illustrates the firewood consumption pattern in rural and urban areas of Tirunelveli district of TamilNadu, India to examine firewood resources and to estimate the quantity of firewood consumption pattern among different economic sectors.

Research Problem

Migration of people to nearby towns for seeking jobs, business and settlement leads to urbanization in the town limits, and hence inequality in income develops in the society, which is the main determinant of difference in energy consumption among the people living in urban areas. The purchasing power of people decides the type of energy source that has to be consumed at household level, even though it is not at all the major factor to determine the type of energy being consumed in industrial and commercial sectors. Poor households who cannot afford to buy kerosene and LPG for cooking purposes, are forced to use firewood which is available free of cost or at a low price in their
surrounding or nearby forest areas with a view to reducing the cost of living. Kerosene is the main cooking energy for households belonging to the next higher income group, whereas LPG is mainly used by wealthy people. The source of cooking energy at household level, therefore, would be an index of the economic status of people living in that urban society. Energy consumption of rural areas is slightly different from that of urban society, because most people in the rural areas are poor and directly or indirectly involved in agriculture based work. Yet another point to be noted is that more number of households in rural areas relay firewood for cooking energy than in urban areas. Besides this, agricultural wastes like crop residues and dung cake are available free of cost or at cheaper rate to rural people. Since rural households use much of agricultural wastes, which are available in plenty in one season and less in the subsequent season, the energy consumption pattern of rural areas too shows some sort of flexibility.

It is generally accepted that scarcity of certain resources, for instance petroleum oil and LPG, has appeared in the society due to continuous urbanization and gradual upgrading in the standard of living, which are the two essential objectives that have to be met with during economic growth and development of a country. Since household sector of India is the dominant user of energy and firewood is most likely to be used by a great many number of households, a clear picture of firewood consumption is necessary to evaluate energy planning and policy development for the future. There has been a gap in the knowledge about firewood consumption strategies of Tirunelveli district of TamilNadu for the past few years. The present study attempts to fill up the gap in the existing knowledge system with a scientific back-up.
The Objectives

Although rural and urban poor depend entirely on firewood for their cooking energy need, the energy consumption pattern in rural areas is different from that of urban areas. Hence, the following objectives are considered as very significant in the present study:

1. to explore the different plant species which provide firewood to rural and urban people of Tirunelveli district;

2. to examine the firewood consumption pattern in rural and urban areas of Tirunelveli district;

3. to analyse and compare size-wise, income-wise and expenditure-wise household consumption of firewood;

4. to find out the average cooking fuel need of households in different income groups;

5. to identify the major determinants of energy consumption for cooking in household sector;

6. to compare firewood consumption pattern in Tirunelveli district with that of TamilNadu State and India;

7. to offer sustainable and viable policy recommendations for developing the existing pattern of energy consumption, in general and firewood consumption particular.
Research Methodology

As Tirunelveli district is a vast area to study, the present study was limited to two small areas so as to circumvent the difficulties, which arose while collecting primary data. Kalakadu Town Panchayat, which is denoted as a rural area by official records, was selected to depict firewood consumption in rural parts of Tirunelveli district, and Tirunelveli Municipal Corporation area, an urban area-was chosen and accredited with having explained firewood consumption in urban parts of that district. The different firewood consuming sectors were surveyed and people belonging to those sectors were interviewed with the aid of pre-tested and well-structured interview schedule to collect the primary data from different economic sectors, which would be the gist of the present research work.

Research Design

As research designing is the preliminary step in any research work, that illustrates the clear picture of all activities undertaken as a whole, descriptive research design was selected for this study. In the descriptive approach, Kalakadu Town Panchayat and Tirunelveli Municipal Corporation alone were selected to describe the firewood consumption in rural and urban parts of the whole Tirunelveli district. The following sections of this chapter discuss the conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.

Area Description

It is conventional to state about conditions prevailing in the study areas before starting the data collection, because description of the areas offer some key points for investigations. The geographical position, climatic conditions,
available natural resources, population, literacy, average family income, town panchayats, village panchayats, forest cover and any other related information about Tirunelveli district are necessary to have a clear idea about the district so as to interpret the actual research findings at the district level. Secondary data were also collected from official records of Panchayat union and District Collectorate, Tirunelveli, helped the investigator to examine the actual status of the present investigation. Chapter 4 has provided enough information about the study area to proceed with this study.

Research Tools

An interview schedule was prepared and pre-tested before going to collect primary data from firewood consuming economic sectors so as to avoid any ambiguity, confusion, overlapping and omission of ideas, which are matters of the present research. Having made necessary modifications, the interview schedule was clear in its content and had meaningful questions to be asked to people concerned while collecting the data. The standard interview schedules used to collect data from household sector are given in the Annexure -1. In this way, separate interview schedules were prepared to collect data from industrial and commercial sectors (Annexure-II), firewood carrying lorries (Trucks) (Annexure-III) and firewood depots (Annexure-IV). The primary data was collected by casual confab with the respondents residing at Kalakadu Town Panchayat and Tirunelveli Municipal Corporation of the study area. The secondary data relating to such things as population, number of households, were taken from official records of Kalakadu Panchayat Union, Tirunelveli Municipal Corporation and of the office of District Collectorate, Tirunelveli. Further, the firewood consumption status of TamilNadu, India and the world
were obtained from reports, journals, books and internet to interpret the research findings.

Method of Sampling

The different firewood consumers, as noticed during the preliminary study conducted in the study areas, were categorised into five different sectors-1) Households, 2) Industrial sector, 3) Commercial sector, 4) Social sector, and 5) Service sector. There were 14 types of firewood consumers in Kalakadu Town Panchayat area of Tirunelveli district and they are listed in the Table 1.1.

Household’s samples were selected by random sampling from all of the 21 wards of Kalakadu Town Panchyat, consisting of 477 villages with 9,156 households. In Tirunelveli Municipal Corporation, 55 wards were subjected to the sampling survey, which had a total of 902 villages with 1,02,372 households.

About 1,000 households were selected from the total of 9,156 households in Kalakadu Town Panchayat (Rural) by adopting proportionate random sampling method to collect the primary data. All other types of firewood consumers in that area were directly subjected to interviews, without any selection, for data collection because of their existence in small numbers and census method was used in the industrial, commercial and service sectors.
Table 1.1.

Firewood Consuming Sectors and Firewood Consumers of Kalakadu Town Panchayat

<table>
<thead>
<tr>
<th>S1. No.</th>
<th>Sectors</th>
<th>Type of consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Household sector</td>
<td>Houses</td>
</tr>
<tr>
<td>2</td>
<td>Industrial sector</td>
<td>Brick kilns, Rice mills.</td>
</tr>
<tr>
<td>3</td>
<td>Commercial sector</td>
<td>Hotels, Tea stalls, Sweet stalls, Bakeries,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Home-made murukku stalls</td>
</tr>
<tr>
<td>4</td>
<td>Social sector</td>
<td>Marriage halls, Temples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cremation grounds, Hospital</td>
</tr>
<tr>
<td>5</td>
<td>Service sector</td>
<td>Hostels,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noon-meal centres</td>
</tr>
</tbody>
</table>

Firewood consumers of Tirunelveli Municipal Corporation area (Urban) were categorized into five sectors viz. Household, Industrial, Commercial, Social and Service sectors, which included 23 types of firewood consumers. The different firewood consuming sectors and types of consumers of Tirunelveli Municipal Corporation are shown in Table 1.2.

While collecting the primary data, 10,000 households were chosen from the total of 1,02,372 households in Tirunelveli Municipal area by adopting proportionate random sampling technique. The respondents of all other types of firewood consuming sectors were directly interviewed to collect the data without any selection procedure and thus other than household sector, census method was used in industrial, commercial, social and service sectors.
Table 1.2.
Firewood Consuming Sectors and Firewood Consumers in Tirunelveli Municipal Corporation Area.

<table>
<thead>
<tr>
<th>S1.No.</th>
<th>Sectors</th>
<th>Types of consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Household sector</td>
<td>Houses, Brick kilns, Rice mills, Dyeing factories, Mat industries, Oil mills, Potteries, Sem-factories, Lime factories, Alumini-Alloy factories, Tyre retreading companies</td>
</tr>
<tr>
<td>2</td>
<td>Industrial sector</td>
<td>Hotels, Tea stalls, Sweet stalls, Bakeries, Murukku stalls</td>
</tr>
<tr>
<td>3</td>
<td>Commercial sector</td>
<td>Hospitals, Temples, Marriage halls, Cremation grounds, Central and sub Jails</td>
</tr>
<tr>
<td>4</td>
<td>Social sector</td>
<td>Hospitals, Temples, Marriage halls, Cremation grounds, Central and sub Jails</td>
</tr>
<tr>
<td>5</td>
<td>Service sector</td>
<td>Hostels, Noon-meal centres</td>
</tr>
</tbody>
</table>

Collection of Data

People associated with different types of firewood consumption were inquired about their firewood consumption, and were requested to answer the appropriate standard questions to extract necessary data from them. Separate interview schedules were used to collect data from households, industrial and commercial sectors, firewood carrying lorries(Truck) and firewood depots.
As the household sector consumes more firewood than any other sectors and as it is quite diverse in firewood utility depending upon certain social and economic parameters of the society, the data on firewood consumption were collected in relation to-

1. Family income (LIF/ MIF/ HIF)
2. Occupation
3. Size of the family (SF/MF/BF)
4. Size of landholdings in acre (MALH/ SLH/MLH/BLH/ ZLH)
5. Educational status
6. Type of Oven/ Chulha
7. Types of utensils (Mud pot/ Aluminium/ Stainless steel)
8. Number of times food is cooked per day (One time /Two times / Three times/ Four times)
9. Type of food cooked (Veg./ Non-veg.)
10. Number of guests arrived per month
11. Number of persons taking food outside
12. Social status (FC/BC/ MBC/SC/ST)
13. Family functions
14. Religious functions
15. Sources of firewood (Social forests /Common land / Agricultural land)

Keeping in view the objectives of this study in mind, families earning Rs.1,000 to Rs.5,000 per month, were grouped under Low Income Families (LIF), those earning Rs.5,000 to Rs.10,000 per month were grouped under Medium Income Families (MIF) and those families earning more than Rs.10,000/month were grouped under High Income Families (HIF).
Regarding the family size, families with 4 or less than 4 members were grouped under small families (SF), those with 5 to 8 members were put under medium families (MF) and those with 9 or more members were kept under big families (BF).

As far as landholdings are concerned, families having less than 2.5 acre land were grouped under Marginal Land Holds (MALH), those having 2.5 to 5 acres were put under Small Land Holds (SLH), those having 5 to 10 acres were put under Medium Land Holds (MLH) and those families having more than 10 acres were put under Big Land Holds (BLH) The families which have no land were treated as Zero Land Holds (ZLH).

Families to which a maximum of five guests visit per month were grouped under Low Guests Families (LCF), those to which 5 to 10 guests visit in a month were put under Medium Guests Families (MGF) and those families to which more than 10 guests visit were put under the group High Guests Families (HGF).

The data collected from the interview schedules of Kalakadu and Tirunelveli Municipality areas were represented in the master table, from which necessary data was extracted to compare firewood consumption in the rural and urban areas. The average firewood consumption in the rural and urban communities, types of firewood preferred, need of firewood on special occasions, etc. were calculated from the data collected from the interview schedules and they are given in the subsequent chapters.

Period of Study

The field study was conducted to collect the primary data between April 2000 and March 2003, which covers three financial years.
Methods of Analysis

To draw a sagacious conclusion from the abundance of data collected, conventional statistical techniques such as percentages, averages and ratios were used to process the data. The kingpin-data thus obtained was used to analyse and compare firewood consumption patterns of rural and urban areas of Tirunelveli district. Per capita firewood consumption was calculated from the total firewood consumption of a year divided by the total number of people living in the area.

Limitations of the Methodology

The researcher could feel certain difficulties while employing the above said methodology in the data collection. They are:

a) The heterogenous and intermediate characters of urban society (Tirunelveli Municipal Corporation) casted difficulties in grouping the actual status of firewood consumers.

b) The urban people (Tirunelveli Municipal Corporation) extended little cooperation while interviewing them.

c) Information about family income and area of land hold were not authentic in many cases. However, care has been taken to collect information relevant to this study. As the area chosen was too vast, the resourcefulness of the researcher was required to perform the work satisfactorily.

Hypotheses Tested

The present study verifies the following major hypotheses:
1. Households in rural areas consume more firewood than in urban areas and firewood consumption is higher in industrial and commercial sector of the urban areas.

2. Family income, family size and dishes cooked are the main factors, which determine energy consumption pattern of an area.

3. As the economic status of people grows, firewood consumption decreases drastically.

4. Firewood cannot be avoided in rural and urban population.

5. Energy saving activity is not appreciated by people of Tirunelveli district.

Limitations of the Study

It is important to note that the present study meets with an impasse which limits its success and the efficient execution of energy consumption pattern of Tirunelveli district: First, the study area is too large to visit and collect data, so that the study area is restricted to Kalakadu Panchayat to refer to the firewood consumption pattern of rural area and to Tirunelveli Municipal Corporation area to refer to firewood consumption in urban areas; Secondly, even within the areas chosen, it is very difficult to visit and collect data from each and every family because of time constraints. In order to overcome these problems, only 10 per cent of households were interviewed to collect the primary data while all industries, hotels, marriage halls, etc. were inquired individually. Thirdly, the primary data were collected through personal interview with households using a standard interview schedule, but it is a rather crude technique because the respondents might have failed to recall the exact data and given an approximate data at the time of the interview and thus recall bias is considered as one of the
limitations of this study. For instance, while asking about the quantity of firewood being consumed per month, the respondents were unable to give the authentic data.

Yet another impasse is that the respondents did not tell their exact income and expenditures during the interview, because of innate fear- reluctance complex. Therefore, their income and expenditure range could be worked out only by some indirect, casual questions, instead of correct values. Keeping all these limitations in mind, a modest attempt has been taken to study the firewood consumption pattern of rural and urban areas of Tirunelveli district. It would be a case study of firewood consumption in this district.

Chapterization

This dissertation is the outcome of three years of research on firewood consumption strategies of rural and urban areas of Tirunelveli district, and it discusses all the objectives of the present investigation.

Chapter 1 highlights the importance of energy to mankind, advantages of firewood over commercial and non-renewable energy sources, necessity for firewood supply, research problems considered in this research, objectives of research, research methodology, hypotheses tested and limitations of present study, and ends with chapterization.

In Chapter 2, the scenario of firewood consumption at the global, national and regional (TamilNadu) level is explained.

In Chapter 3, earlier studies related to firewood consumption have been reviewed to explain the historical development of this research.
An attempt has been made in Chapter 4 to describe the geographical situation, climate, population, income groups, strategies of energy consumption and all other relevant points regarding the profile of the study area viz Kalakadu Panchayat (rural) and Tirunelveli Municipal Corporation (urban) in Tirunelveli district.

The Chapter 5 is devoted to an analysis of firewood consumption among people of Kalakadu Panchayat for their household uses, industries, commercial, social and service sectors.

Chapter 6 describes firewood consumption among urban communities of Tirunelveli Municipal Corporation for their household, industrial, commercial, social and service sectors. Emphasis is also given to family size, family income and expenditure, which are the chief determinants of firewood consumption in any area.

In Chapter 7, firewood consumption in rural and urban communities of Tirunelveli district are compared and analysed critically.

The Chapter 8 analyses firewood consumption at macro level with firewood consumption and energy demand of TamilNadu State, India, and the world.

The summary of major findings, general conclusion and area identified for future research are briefly narrated in Chapter 9.

Conclusion

This chapter highlights the importance of energy to mankind, advantages of firewood over commercial and non-renewable energy sources, research
problem, research methodology and objectives. The present study deals with the fire wood consumption of Tirunelveli district of TamilNadu. In Tirunelveli district, Kalakadu Town Panchayat was selected as sample for rural area and Tirunelveli Municipal Corporation was selected as urban area to describe the firewood consumption in rural and urban parts of the whole Tirunelveli district. The different fire wood consuming sectors in these areas were surveyed and people were interviewed with the aid of well structured interview schedule to collect the primary data. The secondary data were collected from official records of Kalakadu Panchayat Union, Tirunelveli Municipal Corporation and of District Collectorate, Tirunelveli.