

A Micro View of Energy Consumption in The Household Ecosystem

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INTRODUCTION

Energy is the basic natural resource without which the existence of mankind is almost impossible. The human civilization started with the historic revolutionary invention of fuel energy which today has become an universal concern. Energy plays a vital role in human development and welfare, since all the important economic activities of present civilization are dependent on availability and level of consumption of energy (Rajgopal and Mishra, 1994). Energy is the important component of ecosystem and household is the major consumer of this component for various activities like cooking, water heating and lighting.

In India about 50 percent of the total energy consumption is met from the non commercial energy sources like wood, vegetable/ agricultural wastes, dried cow dung cakes etc. In Karnataka out of the total 51.41 percent energy produced from the traditional sources, fire wood alone accounts for 41.29 percent energy production. In rural areas cooking alone consumes maximum energy in the households and fire wood is the primary source for more than 90 percent of the households (Sumangala, 1997).

Today the whole world, particularly India is facing energy crisis not only due to price rise but also due to steady increase in population and the depleting availability of the energy sources (Sharma, 1993). Some of the technologies like biogas, solar cookers, improved chulahs etc. are not readily accepted by the population for regular use in the micro ecosystem. Hence the present study is designed to gain knowledge about the use of major energy sources in the household level both in rural and urban areas and the constraints faced by the families in the procurement and use of these energy sources.

METHODOLOGY

Research data for this paper is taken from two field studies conducted on this aspect. Even

today a clear picture of energy consumption pattern and supply in the rural areas is not available because it varies from place to place and region to region depending upon the crops they grow. To gather information on the energy consumption pattern two studies, viz., a survey was carried out in Dharwad taluka and another base line study of Hubli-Dharwad peri-urban interface in five talukas around Hubli-Dharwad city were carried out.

The indepth study in Dharwad taluka included representative sample households from rural area, urban area and urban slums. Seventy households from each of the three areas were interviewed. A detailed interview schedule was prepared to elicit the information on energy consumption pattern in rural, urban and urban slum households. The data was collected by personal interview method with the housewives in an informal atmosphere. The information comprised of the general household status, family composition, Types and purposes of energy sources used, reasons for using the particular energy sources and the problems faced while using those energy sources.

For the base line information from each taluka 4-6 villages were covered. The selected villages were within the radius of 15 kms from Hubli-Dharwad corporation. In each village a focus group (a minimum of 5 to a maximum of 10 members) was interviewed for collecting data on the household energy sources. The focus group were categorised based on land holdings in rural areas. With the help of suitable statistical analysis the results are presented in this paper.

RESULTS AND DISCUSSION

Every household uses various energy sources to satisfy the needs of the family. Table 1 depicts the types of energy sources used for household purposes by the rural and urban respondents and the influence of locality on the usage of various energy sources.

Among the commercial energy sources electricity was mainly used by maximum percentage of

Table 1: Types of energy sources used by the rural and urban households

S. No.	Energy sources	Urban (n=70)	Rural (n=70)	χ^2 value
<i>I. Commercial Energy Sources</i>				
1.	Electricity	70(100.0)	64(91.42)	0.27NS
2.	LPG	70(100.0)	08(11.42)	49.28**
3.	Kerosene	19(24.14)	70(100.0)	29.22**
<i>II. Non-commercial Energy Sources</i>				
1.	Firewood	6(8.6)	70(100.0)	50.97**
2.	Cowdung cakes	-	55(78.4)	55.00**
3.	Agricultural wastes	-	64(91.0)	64.00**
<i>III. Renewable Energy Sources</i>				
1.	Biogas	-	5(7.14)	5*
2.	Solar energy	1(1.42)	-	1NS

(Figures in the paranthesis indicate percentages)

NS = Non significant.

** = Significant at 1 percent level.

* = Significant at 5 percent level.

households both in rural and urban areas. All urban respondents used LPG and only 11.42 percent rural respondents had LPG in their house. But the use of kerosene was observed to be almost vica-versa, i.e. all respondents used kerosene in rural areas and only 27.14 urban respondents used it, which was statiatstically highly significant.

Almost all non-commercial energy sources viz., firewood cowdung cake and agricultural wastes were used by significantly highest percentage of rural respondents compared to the urban respondents, where the usage of non-commercial energy sources was negligible. Among the renewable energy sources biogas was used only by 7.14 percent of rural respondents (significant at 5 % level). The use of solar energy was found to be nil in rural areas and negligible in urban areas.

The table very clearly shows that the use of commercial energy source was higher in urban areas and the non-commercial energy sources was higher in rural areas. Similar results were observed by Rajgopal and Mishra (1994) in their study on fuel energy consumption pattern in selected households in Orissa state.

Table 2(a) presents in detail the different purposes of usage of various energy sources in the urban and rural areas selected for the study.

Among the commercial energy sources electricity is mainly used for lighting purpose by both the urban and rural households. Highly significant difference was observed in use of electricity for water heating and other activities in the urban and rural areas other than lighting. Only urban households used electricity for the electrical appliances and water heating. Similarly significant

Table 2(a): Purpose of usage of various energy sources at the household level in the selected areas

S. No.	Energy source	Purpose of use	Urban (n = 70)	Rural (n =70)	χ^2 value
I.	Electricity	1. Cooking	4(5.7)	-	4*
		2. Water heating	41(58.5)	-	41**
		3. Lighting	70(100)	64(91.0)	26NS
		4. Use of elec.Appliances	61(87.0)	23(33.0)	
II.	LPG	1. Cooking	70(100)	8(11.0)	49.28**
		2. Water heating	18(26.0)	-	18.00**
III.	Kerosene	1. Cooking	6(8.6)	30(43.0)	16.00**
		2. Water heating	6(8.6)	9(13.0)	0.6NS
		3. Lighting	15(21.4)	70(100)	35.59**
IV.	Firewood	1. Cooking	2(2.9)	70(100)	64.22**
		2. Water heating	-	42(60.0)	42.00**
V.	Cowdung cakes	1. Cooking	-	42(60.0)	27.00**
		2. Water heating	-	13(17.6)	11.00**
VI.	Agril. wastes	1. Cooking	4(5.68)	23(34.8)	13.37**
		2. Water heating	-	44(62.9)	9.00**
VII.	Biogas	1. Cooking	-	5 (7.14)	5.00 **

(Figures in the paranthesis indicate percentages).

NS = Non significant.

* = Significant at 5 percent level.

** = Significant at 1 percent level.

difference was observed in use of LPG and kerosene also. Higher percentage of urban households used LPG for cooking (100 %) and water heating (18 %) compared to the rural households. It was vica-versa in case of kerosene. Almost all rural households used kerosene for lighting purpose because of the frequent power failure in rural areas.

Among the non-commercial energy sources firewood was used by cent percent rural households for cooking and maximum percentage of rural households used dung cakes and agricultural wastes for both cooking and water heating (27 % and 11 % respectively) compared to the urban households (nil). This difference in urban and rural areas in use of non-commercial energy sources was found to be significant at 1 percent level.

Though the use of renewable energy sources for household purposes was very much negligible, the biogas was used only in 7.14 percent of the households in rural areas because of the availability of the cowdung.

The table 2(b) depicts types of fuels and purposes of usage in urban slums. Electricity is used only by 30 percent of the households for lighting purpose and as high as 80 percent of the urban slum households used kerosene for lighting. These households used firewood and twigs and branches for cooking and water heating purposes. Though the urban slums are nearer to the urban areas they did not have the facilities of electricity and LPG.

Table 3 presents the most commonly used energy sources for the major household activities in the rural households under different land holding categories. Agricultural wastes are the commonly used energy sources in almost all land holding category households for cooking and water heating purposes. Among the agricultural

wastes cotton stalk was the most common source. Firewood consumption was evident only in areas having accessibility to the forests. Since the Bhagyajyoti scheme is there in the selected villages all households used electricity for lighting purpose and kerosene whenever there is power failure.

Table 4 depicts the reasons given by the respondents for using various energy sources. Among the commercial energy sources maximum percentage of both urban and rural households used electricity because of its easy accessibility (70 % and 47.14 % respectively) followed by the reasons time and labour saving in urban area (18.5 %) and easy and clean to maintain (20 %). The LPG is mainly used by maximum percentage of urban households and the reasons given are time and labour saving (91.4%), clean and prestigious (72.8 %) and easy to handle (70 %). Higher percentage of rural households used kerosene and they felt it was labour saving (48.5 %) and good substitute for other energy sources (47.1 %). The non-commercial energy sources were mainly used in rural areas and the main reasons for usage were it is a traditional fuel (92.8 %), it is easy to handle (91.4 %) and the other interesting reason is the food cooked on firewood is quit tasty (8.5 % - urban and 82.8 % - rural).

Some of the major problems faced by the urban

Table 3: Major needs and energy sources used at micro level in rural areas

Focus group	Major needs and energy sources		
	Cooking	Water heating	Lighting
1. Landless labourers	Cowdung cakes, agril, wastes & firewood	Cowdung cakes, agril, wastes & firewood	Electricity & kerosene
2. Small land holders	Cowdung cakes, agril, wastes & firewood	Cowdung cakes, agril, wastes & firewood	Electricity & kerosene
3. Medium land holders	Cowdung cakes, agril, wastes & firewood	Cowdung cakes, agril, wastes & firewood	Electricity & kerosene
4. Big land holders	Agрил, Wastes & firewood	Agрил, Wastes & firewood	Electricity & kerosene
5. Occupational groups	Cowdung cakes, agril, wastes & firewood	Cowdung cakes, agril, wastes & firewood	Electricity

Table 2(b): Types of fuel and purposes of usage in urban slums

S. No.	Energy source	Purpose of use	Percentage
I.	Electricity	1. Lighting	30.0
II.	Kerosene	1. Lighting	80.0
III.	1. Firewood	1. Cooking	100.0
		2. Water heating	100.0
	2. Twigs & branches	1. Cooking	50.0
		2. Water heating	40.0

Table 4: Reasons for using various energy sources by the urban and rural households

S. No.	Energy sources	Reasons for use	Urban (n = 70)%	Rural (n = 70)%
I.	Electricity	1. Easy accessibility	70.00	47.14
		2. Clean & easy to maintain	15.70	20.00
		3. Time & labour saving	18.50	11.00
		4. Family prestige	10.00	-
II.	LPG	1. Time & labour saving	91.40	18.50
		2. Clean & prestigious	72.80	11.40
		3. East to handle	70.00	5.70
		4. Less expensive	22.80	-
III.	Kerosene	1. Labour saving	24.20	48.50
		2. Good substitute	32.00	47.10
		3. Cheap source	17.10	20.00
		4. Easy to transport	32.00	-
IV.	Firewood & Agril. wastes	1. Traditional fuel	5.70	92.80
		2. Easy to procure	2.80	51.40
		3. No initial investments	1.40	47.10
		4. Easy to handle	5.70	91.40
		5. Food is tasty	8.50	82.80

and rural households while using various energy sources are presented in table-5. For electricity, frequent power failure was the problem faced by maximum percentage of both urban and rural households (55.7 %) followed by lack of knowledge of usage in rural areas (54.3 %) and the problem of danger in urban areas (40 %). As high as 40 percent of the urban respondents expressed that delay in supply of LPG was the main problem followed by the danger in use (34.2 %). Minimum percentage of rural households used LPG and high initial investment was the problem expressed by maximum percentage of rural respondents (20 %). Limited supply was the

problem faced by maximum percentage of both urban and rural households (25.7 % and 61.4 % respectively) in kerosene usage, followed by the problems of adulteration of kerosene in urban areas and the unpleasant odour in rural areas.

Cent percent households in rural areas used firewood for cooking and water heating purposes. Highest percentage of respondents (57 %) expressed the problem of smoke and health hazards followed by unclean surroundings (38.5 %) and difficulties faced in procurement of firewood (25.1 %). It is clear from all the results presented that the commercial energy sources are not easily and readily available in rural areas and

Table 5: Problems faced by the urban and rural households in using various energy sources

S. No.	Energy sources	Problems faced	Urban (n = 70)%	Rural (n = 70)%
I.	Electricity	1. Expensive	28.50	28.50
		2. Dangerous	40.00	21.40
		3. Frequent power failure	55.70	55.70
		4. Lack of knowledge	4.20	54.30
II.	LPG	1. High initial investment	25.70	20.00
		2. Dangerous	34.20	8.50
		3. Delay in supply	40.00	11.40
		4. Lack of knowledge	8.50	8.50
III.	Kerosene	1. Unpleasant odour	12.80	21.40
		2. Adulteration	14.20	20.00
		3. Limited supply	25.70	61.40
IV.	Firewood & Agril. wastes	1. Unclean atmosphere	4.20	38.50
		2. Smoke & health problems	2.80	57.00
		3. Labourious	2.80	21.40
		4. Difficultyn in procurement	1.40	25.10
		5. Storage problem	-	12.80

they depend mainly on non-commercial energy sources for household energy needs.

CONCLUSION

It is evident from the study that the urban households depend mainly on commercial energy sources for household energy needs and the rural households on the noncommercial energy sources. The increasing demand for firewood has led to deforestation which is the major concern of the society. Looking into the results of the studies conducted, the need of the day is to concentrate efforts on conservation of the depleting energy

sources including the forests and popularisation of the use of non conventional energy sources like solar energy biogas etc. to satisfy the household energy needs.

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