DISSEMINATION OF SOLAR COOKER INFORMATION

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ABSTRACT

In the Indian sub-continent cooking is traditionally done by women. Cooking is done with various fossil fuels in urban areas while both bio-mass and fossil -fuels are used by rural people in their kitchen. All these emit poisonous gases. In India sunshine is available in sufficient quantity to cook food through solar cookers. Use of solar cooker has several advantages over other fuels, yet it is not used by common people in West Bengal. A study conducted recently in Kolkata and adjacent rural areas indicates that lack of dissemination of solar cooking information is a major reason of not using solar cooker. This paper attempts to present some important findings of the on-going research study on solar cooker, identifies the reasons of non-acceptance of solar cooker by rural and urban people and suggests some channels of dissemination of solar cooking information for spread of solar cooking.

Keywords : cooking, solar cooker, fossil -fuel, sunray, dissemination channel, solar cooking information, rural and urban.

1. INTRODUCTION

In the Indian sub-continent household cooking is traditionally done by women-folk since time immemorial. Cooking appliances based on various fossil-fuels such as kerosene, coal, liquid petroleum gas (LPG) along with electricity are mostly used by urban people. Rural people use cow dung, firewood, crop-residues, kerosene and LPG for cooking. The appliances for using these fuels are chullah, kerosene stove, gas burner, electric heater and traditional dug oven. These are kept inside a small room known as the kitchen, an integral part of every Indian house, that is protected from air-flow to save the flame that cooks food. These fuels emit carbon monoxide, (CO), hydrocarbons (HC), nitrogen oxide (NO), and suspended particulate matter (SPM) within the small unventilated kitchen. Kitchens with more than one burner have more CO and NO concentration. These emissions are harmful to human health to which the women are exposed for several hours every day. These are more lethal to pregnant and heart patients. These hazards including several diseases could be avoided to a large extent by eliminating or reducing the exposure time of women to these gases. This is possible by using a solar cooker for boiling and cooking domestic food.

2. BACKGROUND

The Indian sub-continent extends from 8°N to 36.6°N. lattitude. This vast region is divided into two zones by the Tropic of Cancer - torrid and temperate. However, the entire sub-continent remains relatively warm throughout the year. Maximum temperature rises to 50°C. Average temperature remains about 20°C. The sun shines in both zones clearly throughout the year except 45-55 days during rainy seasons. Barring these days, sunshine that falls on earth's surface equals about 0.9KW/m^2. The insolations received in the aforesaid zones provide sufficient heat to cook food through a solar cooker. It is a device to trap or concentrate solar heat to cook or boil foodstuff. Solar energy is inexhaustible, available free of cost, produces no smoke, pollution, or health hazards, saves gas and other fossil fuels, conserves forestry, retains 100% of food value, keeps food warm for a long time, simultaneously cooks four dishes within 2-3 hours, is completely accident-free, and effectively saves time. Yet, solar cooking is not done by the common people in India, especially in West Bengal including Kolkata (Calcutta). Why? To get the answer a study entitled " Survey of Solar Cooker Use in Kolkata and Adjacent Rural areas" has been undertaken recently. We present below the salient findings of the research project with other details.

3. RESEARCH PROJECT ON SOLAR COOKER

Solar cooker information is one of the most essential prerequisites of the people's accessibility to solar cooking. And solar cooker information service in the entire country would be an important component of infrastructural development in the energy sector. There is no doubt that solar cooker use can be accelerated if the people have accurate solar cooker information. Now, what is solar cooker information? Solar cooker information may be defined as all materials likely to influence the use of solar cookers. It is essential for those who are involved in some way or the other with cooking systems. To assess the present state of cooking affairs vis-à-vis use of solar cookers and to find out the solar cooker information required by the common people, a research project has been undertaken by the present authors. The present paper is related to this larger ongoing research project called "Survey of Solar Cooker Use in Kolkata and Adjacent Rural areas".

3.1 Objective of the Study

In the present study efforts have been made to find out the types of ovens currently used in rural and urban areas, to identify the reasons of non-acceptance of solar cookers by rural and urban people of West Bengal, to understand their perception about solar cookers, to know the availability of sunlight in the houses of rural and urban people, types of solar cooker information required by them, and availability and sources of such information.

3.2 Methodology and Sampling

The methodology adopted for the study was collection of primary data and information through a structured pre-tested questionnaire. Data and information have been collected from several villages adjacent to Kolkata and from urban areas including different parts of Kolkata. Five hundred people, randomly selected in each of the rural and urban areas, have been directly interviewed. Secondary data have also been consulted when required. Selected samples were composed of people belonging to different income groups with different family sizes, different occupations and different educational background as shown in the following three tables.

4. DISCUSSION AND FINDINGS

4.1 Sample Profile

Details of the four core variables of the samples surveyed, e.g. family size, education, occupation and income, would establish that the samples in our study constitute a profoundly large size with diverse characteristics.

TABLE- 1 FAMILY SIZE OF THE RESPONDENTS

Area	Share of families (%) according to no. of members			
	Up to 3	4-5	6-8	Above 8
RURAL	26.92	46.70	22.53	3.85
URBAN	44.89	43.18	10.23	1.70

Table –1 shows that respondents in both rural and urban areas belong to four different size groups starting with nuclear families and covering extended and joint families.

TABLE- 2 EDUCATIONAL BACKGROUND OF THE RESPONDENTS

Educational Qualification	Rural (%)	Urban (%)
1. Illiterate	2.14	Nil
2. Up to Primary Level	12.85	Nil
3. Up to Secondary Level	39.57	6.25
4. Up to Higher Secondary Level	13.90	3.41
5. Up to Graduation Level	20.85	32.39
6. Up to Post-Graduation Level	5.88	43.75
7. Above Post Graduation Level	2.14	3.41
8. Professional Qualification Holders	2.67	9.09
9. Any other	Nil	1.70

Table –2 shows the educational background of the respondents in rural and urban areas. It is evident from the table that the educational composition of the respondents ranges from illiterates to above post graduation level with professional qualification.

TABLE –3 OCCUPATIONAL BACKGROUND OF THE RESPONDENTS

Occupations	Rural (%)	Urban (%)
1. Government Sector Service	9.68	7.39
2. Private Sector Service	22.04	65.34
3. Business/ Trade	16.13	2.27
4. Professional Practitioner (Doctor, Lawyer, Engineer Teachers, Professors etc.)	0.58	1.14
5. Small Industry Owners	1.60	1.70
6. Farming	3.76	0.00
7. Day-labourers/ Maid servant	15.60	12.50
8. Superannuated persons	5.38	2.84
9. Students/Housewives/unemployed	25.23	6.82

As evident from Table-3, the respondents belong to fourteen categories of occupations. The respondents include students, teachers, employed, unemployed, housewives, traders, small industry owners, labourers, maid-servants, farmers, retired persons and other professional people. The average family income of the respondents, as evident from Table –5, varies from Rs. 1000 to more than Rs. 25000. Thus,

in all aspects, the four tables 1, 2, 3 & 5 suggest that the composition of the sample size in our project is a fairly large and mixed one.

4.2 Oven and Fuel Profile

A close study of Table 4 would reveal that the rural people in West Bengal are traditionally accustomed to using a dug oven fuelled by firewood that is easily available to them. Along with a dug oven, a portable chullah, kerosene stove, oven fuelled by coal/coal dust ball/cowdung cake, kerosene oil and LPG are also used in the rural area. In the urban sector, however, the dominant role is played by the LPG that contributes to as many as 96% people to cook their daily meal. Some important findings emerge- a) a vast majority of rural people still depend on firewood as their major fuel; b) in rural area 45.6% of people and in urban area 9.09% of people use more than one type of oven because of inadequate availability of the fuel they use; c) LPG is the most important and dependable source of fuel in the urban sector; d) now-a-days, a section of rural people use LPG incurring high expenses. In the course of our study, it has also been found that people, both in rural and urban areas, have to make several other payments while purchasing their fuel in the form of transport cost, higher price in crisis time, tips to delivery man etc. Needless to say, these undue payments inflate the fuel budget of the people.

4.3 Average Monthly Fuel Cost

Table 5 gives a picture of the fuel budget of the rural and urban people. It appears from the table that a vast majority, almost 93% of rural people have to spend up to Rs. 500 per month. Majority of them earn Rs. 1000 to Rs. 5000 per month. Table –5 also shows that in the urban area almost 90% households incur an expense up to Rs. 500 per month. Majority of these people earn Rs. 5000 to more than Rs 25000 per month. In this context, Table – 5 further shows that 25% to 50% of income is spent as fuel cost by more than 7% respondents in rural areas under study who earn Rs 1000/- to Rs 2500/- only per month. Again, it is found that both in rural and urban areas people with higher income spend lower share of their income as fuel cost.

TABLE –4 TYPE OF OVEN AND AVAILABILITY OF FUEL FOR COOKING

(Figures are in per cent)

	Type of oven	Fuel used	Used by		Inadequate Quantity	
			Rural	Urban	Rural	Urban
1.	Traditional dug oven	Firewood	46.70	------	12.27	----
2.	Portable Chullah	Coal, cowdung cake & Gul	23.07	1.70	10.27	----
3.	Electric Heater	Electricity	------	1.14	-----	----
4.	Kerosene Stove	Kerosene oil	21.98	10.23	5.38	----
5.	Gas Oven	L P G	53.85	96.02	17.20	9.09
	T O T A L		145.60	109.09	45.60*	9.09*

- 45.60% users in rural area use two/three types of oven because of inadequacy of available fuel.
- 9.09% users in urban area use more than one type of oven because of inadequacy of LPG.

TABLE – 5 AVERAGE FUEL COST VIS-A-VIS AVERAGE FAMILY INCOME

	Fuel Cost (Rs.)	Rural (%)	Urban (%)		Monthly Income (Rs)	Rural(%)	Urban(%)
1.	Upto 250	30.00	13.64	1.	Upto 1,000.00	6.47	2.27
2.	251--- 500	62.63	76.14	2.	1001.00--- 2,500.00	37.10	5.11
3.	501--- 750	7.37	7.38	3.	2501.00--- 5,000.00	25.80	21.60
4.	751---1000	----	2.84	4.	5001.00--- 10,000.00	16.10	24.43
5.	Above1000	----	----	5.	10001.00 25,000.00	9.14	30.11
				6.	Above -----25,000.00	5.38	16.48

Thus, we learn from this that a) both the rural and urban people with low incomes spend a major share of their income to meet the fuel cost to prepare their daily meal; b) in addition to the actual fuel-price, most of the users have to pay some undue amount to the fuel suppliers by way of tips, carrying cost and higher prices in times of fuel crisis; c) as a result, the fuel budget soars high and in many cases it exceeds 25% to 50% of family income

4.4 Inconvenience faced by users from different fuels

TABLE 6.- PROBLEMS FACED FROM DIFFERENT TYPES OF FUEL BY THE USERS

Nature of problem	Relating to fuel	Suffered by	
		Rural(%)	Urban(%)
1. Smoke	Firewood	21.50	Nil
2. Smoke	Coal/cow-dung & coal-dust cake	47.31	1.70
3. Fume & Smell	Kerosene oil	18.82	2.84
4. Electric shock	Electricity in Heater	-----	2.84
5. Black spot on the body of cooking utensil	Yellow flame of LPG	31.72	37.50
6 Burner Problem	LPG	34.95	45.45

Traditionally firewood, coal, coal–dust cakes, cow-dung cakes and kerosene oil are used as fuel in rural areas. Recently, LPG has also encroached into the kitchen of the rural people. In the urban area, however, LPG is the most popular single fuel that caters to the needs of the most of the people. Electric heaters also serve a negligible section of urban people as stand by fuel. The people in general face some inconvenience by using the aforesaid fuels. As evident from Table – 10, fuels such as firewood, coal, cow-dung cakes and coal-dust balls emit huge smoke, while kerosene oil emits fumes and bad smell, an electric heater sometimes gives shocks, and LPG accumulates black stains on the body of the cooking utensil and causes burner problems. The important finding in this section is that the people in general suffer from several problems by using the aforesaid fuels both in rural and urban areas.

4.5. Solar Cooker Profile

In this section we present some important findings of the study relating to people's awareness of solar cookers.

TABLE 7 AWARENESS OF SOLAR COOKER BY THE RESPONDENTS

Area	Aware of Solar Cooker		Heard /seen at Radio/ TV	Read at News paper	Other users-friends	Do not believe
	Yes	No				
Rural	61.83	38.17	48.39	20.43	7.00	31.72
Urban	90.90	9.10	7.95	69.89	26.70	6.82

(Figures are in per cent)

It is found from Table 7 that almost 62 per cent rural people are somewhat aware of Solar cooker while 38% people are absolutely in the dark about the solar cooker. On the other hand a vast majority of urban people covering almost 91% are to a large extent aware of solar cookers. Most of the rural and urban people have come to know about solar cookers through radio, television, newspaper and other users. Table 8 shows that among those who are aware of Solar Cooker, 9.68 % in rural area have seen the cooker physically. The same number of persons also know other Solar cooker users while only 2.15% of them use solar cookers. In the urban sector only 13.64% people have seen the cooker while no one uses it. It is not that sunlight is not available to the houses of rural and urban areas. On the contrary, abundant sunlight is hopefully available to use solar cookers for cooking food in the houses of rural and urban people as evident from Table 13. Despite solar cookers having definite advantages over other cooking modes in terms of financial and many other benefits, solar cookers are not used by people. As evident from Table 9 of our study.

TABLE 8 AWARENESS OF SOLAR COOKERS BY THE RESPONDENTS

(Figures are in per cent)

Area	Solar Cooker Physically		Solar Cooker User		Solar cooker	
	seen	9.68	known	9.68	use	2.15
Rural	not seen	90.32	not known	90.32	not use	97.85
Urban	seen	13.64	known	5.11	use	0.00
	not seen	86.36	not known	94.89	not use	100.00

TABLE 9 AVAILIBILITY OF SUNLIGHT IN RURAL AND URBAN HOUSES

Area	Sunshine Available	Up to 4 hours	Up to 8 hours	Whole day
Rural	94.08	10.86	51.43	37.71
Urban	75.00	21.59	5.68	47.73

(Figures are in percent)

Only 2.15 per cent of people in rural sectors use solar cookers, while sunshine is available to 94% of houses in rural areas and 75% in urban areas. Why do the people not use solar cookers? What prevents them from using solar cookers? We have identified several reasons. These are shown in Table 10. As evident the most important reason for not using a solar cooker is its non-availability in the market. Firstly, it is not easily and readily available in the market. Secondly, the common people do not know where and how to get the cooker. There is no dissemination of market news in this regard. The second important finding is that almost 78% of people in the survey areas do not know how to prepare Bengali dishes in a solar cooker. The same number of people did not hear about solar cookers in past and are not aware of them in detail at present. Most of the 78% people who have not seen the cooker even in pictures, live in rural area.

Almost 74% of rural and urban people did not get users' manual for cooking and maintaining a solar cooker. Lack of dissemination of solar cooker information is responsible for this. Almost 79% of people, mostly urban, expressed the view that owing to easy availability and being accustomed to use LPG, they do not use solar cookers. In view of price hikes of LPG at a galloping rate (more than 475% over the last 15 years), the LPG users may use solar cookers considering the economy of solar cooking as a second unit to reduce LPG consumption, if solar cooker information is properly disseminated.

TABLE 10 .- CAUSES OF NOT USING SOLAR COOKER

Causes	Share (%)	
	Rural	Urban
1.Not easily available in the market / where available is not known	80.64	9.66
2.No idea of its price &cooking cost	20.43	2.27
3 Other fuels specially LPG is available / habituated to cook with LPG	9.68	68.75
4.Not heard in details about the cooker	65.60	13.07
5 Not seen Solar cooker even in picture / no publicity / nobody uses it	72.04	6.25
6 Users' Manual is not available	60.21	13.64
7.Not aware of Bengali dish preparation	69.90	8.52
8 Inadequate sunlight in the house	5.38	5.68

In this context, the awareness level of the respondents about twenty-one attributes of solar cookers has been tested. Results of the test are given below in Table- 11. However, for the sake of brevity, the attributes have been clubbed into following six groups:

1. Economic attributes- zero cooking expense, negligible maintenance cost, and low fuel budget.
2. Environmental attributes- eco-friendly cooking, no air Pollution, saves trees and bushes etc.
3. Health related attributes – no health hazard during Cooking time, no exposure to harmful gases during cooking hour, retains total food value, keeps users' health good etc.
4. Cooker related common attributes- solar cooker is a scientifically manufactured cooking instrument, sunshine is its only fuel it, no other fuel is required, etc.
5. Cooker related specific attributes – emission of no gas or fume, saves time and labour, other out door works can be done during cooking, several items can be cooked simultaneously, food remains hot long after cooking, no accident, one cooker can be used for 10/15 years, available in different models etc.
6. Food quality related attributes – solar cooked food becomes tasty, food becomes completely boiled, either over-boiled nor less nor burnt etc.

TABLE – 11 AWARENESS OF THE RESPONDENTS ABOUT SOME ATTRIBUTES OF SOLAR COOKER

	Attributes of Solar Cooker	Aware- Share (%)	
		Rural	Urban
1.	Economic attributes	35.84	66.30
2.	Environmental attributes	47.85	61.65
3.	Health-related attributes	24.19	41.76
4.	Cooker-related common attributes	69.89	75.75
5.	Cooker-related specific attributes	25.50	49.12
6.	Quality of Solar cooked food	19.53	27.65

As emerges, a large section of both rural and urban people are not aware of the six different groups of attributes mentioned above. Our Research project entitled " Survey of Solar cooker Use in Kolkata and Adjacent Rural areas" led to the conclusion that very little effort has been made to popularize solar cooker use in rural and urban areas of West Bengal through dissemination of solar cooker information to one hundred million people.

5. CONCLUSION

We conclude that both the rural and urban populations in West Bengal are habituated to cook their food through traditional and conventional modes of ovens. Therefore, introduction of a solar cooker in their kitchen would be a very difficult task, however beneficial and economical it may be, unless a proper marketing strategy is adopted. Promotion is one of the five Pillars in marketing. A good promotional plan includes proper dissemination of relevant information to the target group. Hence, market segmentation is necessary. The target group will be the nuclear families with three members for one cooker and extended amilies with five members for two cookers to get the benefit of cooking in accordance with Bengali food habits and preparation recipe. We should reachthe target group with a package containing information on all the attributes of solar cooker as grouped in the aforesaid six groups.

In order to reach the potential Cooker users, channels for dissemination of Solar cooker information have been suggested. All information relating to cooking good quality food on the one hand while all other information relating to marketing needs to be disseminated for creation of a perception of solar cooker and generating knowledge for solar cooker use. A combination of the two will convert a potential Solar cooker user into a real solar cooker user. The channels are shown in the following chart.