

Knowledge, Use and Problems Faced by Rural Respondents in Using Solar Technologies



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Abstract

Energy has been recognized as one of the most pertinent contributors of economic growth and human development universally. There is a strong two-way relationship between economic development and energy consumption. Solar energy is the instant source of energy and can be used in many ways, such as domestic lighting, heating, cooking, water pumping etc. The present study was conducted in village Chamar Khara of Hisar district of Haryana state. A sample of 100 rural women was selected randomly to explore the knowledge, use and problems faced in using solar technologies by rural women. It was found that 55 per cent of respondents belonged to 41 to 50 years of age group, were educated up to middle class (38.0 %), belonged to high caste (50.0 %), were having medium family education status (52.0 %), had joint family (52.0%) with 7-9 family members (48.0%). More than half of the respondents (58.0%) had farming as their main occupation and 48 per cent were having monthly income between ₹43000- 66000. Majority of the respondents (68.0%) had knowledge about solar technologies but only 16 solar technologies were possessed and used by the families i.e. 7 solar home lighting systems, 5 solar lanterns and 4 solar inverters and all these 16 technologies were used in bedroom and kitchen. The respondents faced some problems while using these solar technologies that these technologies cannot be used in rainy and cloudy day, more space was required in using them and had high repair cost. All the 16 respondents purchased solar technologies because of the reasons that in these technologies no fuel is required, time is saved and these are eco-friendly. It is concluded that as very less number of rural families are using solar technologies so efforts should be made so that more number of families should use the solar technologies which save time, fuel and money and above all are eco- friendly.

Keywords: Solar Technologies, Solar Home Lighting System, Solar Lantern, Solar Inverter

Introduction

Energy has been recognized as one of the most pertinent contributors of economic growth and human development universally and is vital for sustaining a modern economy and society. There is a strong two-way relationship between economic development and energy consumption. Future economic growth significantly depends on the long-term availability, accessible and secure sources of energy. Although 80 per cent of the world's population lies in the developing countries, their energy consumption amounts to only 40 per cent of the world's total energy consumption. The high standard of living in the developed countries is attributable to high-energy consumption levels. In industrialized countries, people use four to five times more energy than the world average and nine times more than the average for the developing countries.

Solar energy as a renewable energy source is considered as an important alternative. In many developing countries, solar energy has the potential to improve the living conditions of rural households and contribute to the country's future energy security. Solar energy is the instant source of energy and can be used in many ways, such as domestic lighting, heating, cooking, water pumping etc.

Review of Literature

Energy is the prime mover of economic growth and is vital to sustaining a modern economy and society. Future economic growth significantly depends on the long-term availability, accessible and secure sources of energy. Although 80% of the world's population lies in the

developing countries (a fourfold population increase in the past 25 years), their energy consumption amounts to only 40% of the world's total energy consumption. The high standards of living in the developed countries are attributable to high-energy consumption levels. In industrialized countries, people use four to five times more energy than the world average and nine times more than the average for the developing countries (Bureau of Energy Efficiency, 2009).

Ministry of Non-Conventional Energy Sources, Government of India, launched Integrated Rural Energy Programme (IREP) in the year 1986-87. The objective of this programme was to supplement the total household energy demand by using solar energy and to promote energy conservation devices at household and community level. Under this programme, several renewable energy devices like solar cooker, solar home lighting system, solar pumps, solar radio, solar lantern, solar water heating system etc. and energy conservation devices like pressure cookers, *Nutan wick* stove, energy efficient motors, CFLs, tube lights were promoted by providing them at subsidized rates to the rural masses. Ministry of New and Renewable Energy (MNRE), Government of India, launched Jawaharlal Nehru National Solar Mission in January 2010 with the objective to create conditions to generate 20 GW of solar power by 2022 in India, through rapid scale-up of capacity and technological innovation (Mishra *et al.* 2011).

According to Khare *et al.* (2013), India is ranked 11th in solar power generation in the world. Government funded solar energy in India only accounted for about 6.4MW/yr. of power as of 2005. In 2010, capacity of 25.1 MW was added and 468.3MW in 2011. In 2012 the capacity increased more than two times and became 1205 MW. During 2013 capacity was added by 1114 MW and during 2014 capacity was added by 313 MW. In August 2015, the installed grid connected solar power capacity was 4.22 GW. The price of solar energy has come down from ₹ 17.90 per unit in 2010 to about ₹ 7 per unit in 2015.

Government of India had also launched Jawaharlal Nehru National Solar Mission (JNNSM) in 2010. The target was to start Grid connected Solar Projects of 20 GW by 2022. In May 2015 government increased the target to 100 GW by 2022. Jawaharlal Nehru National Solar Mission, also known as the National Solar Mission (NSM), is a major initiative of GOI for addressing India's energy security challenge through harnessing of solar energy. Prime Minister Mr. Narendra Modi said that his government is committed to accomplish the target of 1.75 lakh MW renewable energy including one lakh MW solar energy by 2022 (Goyal, P. 2015).

Solar energy is the oldest type of energy found on earth, as it is as old as the sun. Every second the world receives 95.8 trillion watts of power (Pearce, 2002). That is well beyond the amount of power used in one day. It is estimated that the sunlight that falls on the surface of the earth in the time period of two weeks is equivalent in energy to all the energy stored in all the oil and natural gas and coal and other fuels that exist on, or under the earth

(Markvart and Castaner, 2003). Solar energy is the instant source of energy. Three of the fastest growing sun based technologies are solar thermal, concentrating solar power (CSP) and photovoltaic. This solar energy can be used in many ways, such as domestic lighting/ heating/cooking, street light, electricity/power generation, water pumping, powering of remote telecommunication etc. (Nagamani, 2016).

Aim of the Study

There is an urgent need to supplement present energy sources with renewable energy sources. Use of solar energy is one such option which can be easily adopted by the families to supplement the existing energy use patterns for cooking, heating, and lighting at household level. Therefore, solar energy was selected for the present research work which is very useful for the conservation of the limited non-renewable energy resources available on the earth. Besides, solar energy is inexhaustible, replenishable and also supplies cleaner energy without endangering or polluting the environment. Thus, keeping the above facts in mind, the present study was undertaken with the objective to study the knowledge and use/ practices of solar technologies by rural women and to ascertain the problems faced by rural women while using solar technologies

Research Design

The study was conducted in Chamar Khara village of Hisar district of Haryana state. Sample of 100 rural women was selected randomly to explore the knowledge and practices pertaining to use of solar technologies by rural women. Active female heads of the families were selected as the respondents. Data were collected with the help of well-structured and pre-tested interview schedule.

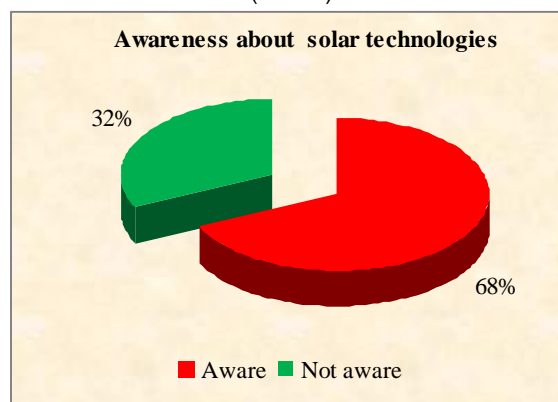
Analysis and Interpretation of data

The data thus collected were processed, tabulated and analyzed using frequency, percentage and weighted mean score.

Findings

1. Awareness of respondents about solar technologies

Fig. Awareness of Respondents about Solar Technologies
(n=100)



Above Figure shows that majority of the respondents (68%) were aware of solar technologies while 32 per cent respondents had never heard about any solar technology.

Table 1: Awareness and Source of Information about Different Solar Technologies

(n=68)

S. No.	Solar Technology	Awareness About Solar Technology	Source of information				
			Radio f (%)	Television f (%)	Newspaper f (%)	Relatives f (%)	Friends f (%)
1.	Box type solar cooker	8 (11.7)	-	-	1 (12.5)	3 (37.5)	4 (50.0)
2.	Dish type solar cooker	4 (5.8)	-	-	-	2 (50.0)	2 (50.0)
3.	Solar lantern	19 (27.9)	1 (5.2)	1 (5.2)	2 (10.5)	3 (5.7)	12 (63.1)
4.	Solar home lighting system (Fan + Light)	23(33.8)	2 (8.6)	3 (15.7)	1 (4.3)	14 (60.8)	3 (15.7)
5.	Solar water heater	4 (5.8)	-	-	1 (25.0)	1 (25.0)	2 (50.0)
6.	Solar inverter	10 (14.7)	0 (0)	2 (20.0)	1 (10.0)	4 (40.0)	3 (30.0)
Total		68	3 (4.4)	6 (8.8)	6 (8.8)	27(39.7)	26(38.2)

It is clear from Table 1 that 33.8 percent respondents were having awareness about home lighting system (Fan + Light), followed by solar lantern (27.9%), solar inverter (14.7%), box type solar cooker (11.7%) and only 5.8 percent respondents were having awareness about dish type solar cooker and solar water heater.

With regards to source of information, it was found that 39.7 percent respondents had awareness about solar technologies from relatives followed by friends (38.2%) while 8.8 percent respondents had knowledge from newspaper and television and only 4.4 percent respondents from radio.

Table 2: Knowledge of Respondents Regarding Different Aspects of Solar Technologies

(n=68)

S. No.	Solar Technologies	Knowledge regarding					
		Concept and Importance WMS	Advantages WMS	Limitations WMS	Precautions WMS	Average	Rank
1.	Solar home lighting system (fan+light) (n=23)	1.79	1.62	1.65	1.63	1.67	I
2.	Solar lantern (n=19)	1.56	1.57	1.61	1.59	1.59	III
3.	Box type and dish type solar cooker (n=12)	1.47	1.5	1.66	1.27	1.47	V
6.	Solar inverter (n=10)	1.63	1.7	1.8	1.5	1.65	II
5.	Solar water heater (n=4)	1.75	1.5	1.19	1.5	1.48	IV

WMS= Weighted Mean Score

Data presented in Table 2 depict the knowledge of respondents regarding different aspects of solar technologies. It was found that knowledge about solar home lighting system got the first rank having mean score 1.67 followed by knowledge about solar inverter (mean score 1.65, II rank), solar lantern (mean score 1.59, III rank), solar water heater (mean score 1.48, IV rank) and box type and dish type solar cooker (mean score 1.47, V rank).

Table 3: Solar technologies possessed by the families

(n=100)

S. No.	Solar technologies	Adopted
1	Solar home lighting system	7
2	Solar lantern	5
3	Solar inverter	4
Total		16

Table 3 depicts the possession of solar technologies by the families. It was found that only seven percent families possessed solar home lighting system followed by 5 percent families which possessed solar lantern and only 4 percent families possessed solar inverter. Thus, in total only 16 percent respondents were having solar technologies in their families.

Table 4: Reasons for Purchasing Solar Technologies by the Respondents

(n=16)

S. No.	Reasons	Solar Home Lighting System (n=7)		Solar Lantern (n=5)		Solar Inverter (n=4)	
		f	(%)	f	(%)	f	(%)
1.	Economical						
	No fuel required	7	(100)	5	(100)	4	(100)
	Available at subsidized rate	6	(85.7)	5	(100)	3	(100)
	Save money	6	(85.7)	4	(80.0)	3	(75.0)

2.	Environmental						
	Eco friendly	7	(100)	5	(100)	4	(100)
	No smoke/ harmful emission	7	(100)	5	(100)	4	(100)
3.	Personal and family						
	Save time of family members	4	(57.1)	4	(80.0)	1	(100)
	Promote health of family members	6	(85.7)	5	(100)	4	(100)
4.	Technical						
	Easy maintenance	4	(57.1)	3	(60.0)	2	(50.0)
	No chance of electric shock	7	(100)	5	(100)	4	(100)
	Can be used anywhere in the house	7	(100)	4	(80.0)	4	(100)

*Multiple responses

Table 4 reveals the reasons for usage of solar technologies. Cent percent of the respondents used solar home lighting system, solar lantern and solar inverter because no fuel was required and cent percent respondents used solar lantern and solar inverter because these were available at subsidized rate and save money while 85.7 percent respondents

used solar home lighting system as these were available at subsidized rate.

Cent percent of respondents used solar home lighting system, solar lantern and solar inverter because these were eco-friendly, no smoke/ harmful emission was there, promote health of family members and there was no chance of electric shock.

Table 5: Problems faced by Respondents While Using Solar Technologies

(n=16)

S. No.	Problem	Solar home lighting system (n=7)		Solar lantern (n=5)		Solar inverter (n=4)	
		f	(%)	f	(%)	f	(%)
1.	Situational						
	Can't be used in rainy /cloudy day	7	(100)	5	(100)	4	(100)
	Can't be charged after sunset	7	(100)	5	(100)	4	(100)
	More space required	3	(42.8)	2	(40.0)	-	-
2.	Technical						
	Time consuming/difficult to get repaired	6	(85.7)	2	(40.0)	-	-
	Requires regular charging	6	(85.7)	4	(80.0)	-	-
	No person in village to repair	7	(100)	5	(100)	2	(50.0)
	Non availability of spare parts	7	(100)	5	(100)	2	(50.0)
3.	Economical						
	High repair cost	7	(100)	4	(80.0)	2	(50.0)
	Battery to be changed after 3-4 years	6	(85.7)	4	(80.0)	-	-

*Multiple responses

Table 5 depicts the problems faced by the respondents while using solar technologies. It was found that cent percent of the respondents faced the same problem while using solar home lighting system, solar lantern and solar inverter i.e. can't be used in rainy /cloudy day and can't be charged after sunset.

Cent percent of the respondents faced problem while using solar home lighting system and solar lantern because there was no person in village to repair and non-availability of spare parts. Half number of the respondents faced this problem while using solar inverter.

Cent percent of the respondents faced the problem while using solar home lighting system that it had high repair cost; 80.0 percent of respondents while using solar lantern and 50.0 percent of respondents while using solar inverter faced the same problem.

Conclusion

Majority of the respondents (68%) had knowledge about solar technologies. It was found that 33.8 percent respondents were having knowledge about home lighting system (Fan + Light) followed by solar lantern (27.9%), solar inverter (14.7%), box type solar cooker (11.7%) and (5.8%) percent of

respondents were having knowledge about dish type solar cooker and solar water heater. Maximum percent of respondents (39.7%) received knowledge from relatives followed by friends (38.2%). Only 16 per cent of the respondent's possessed solar technologies (7 home lighting systems, 5 solar lanterns and 4 solar inverters). All the respondents used solar technologies because of the reasons that these were eco-friendly, save money, can be used anywhere in the house, no fuel was required and there was no chance of electric shock. All the respondents faced the problems that these can't be used in rainy/cloudy day, can't be charged after sun set and there was no person in village to repair.

Suggestions

Solar energy as a renewable energy source is considered as an important alternative. In many developing countries, solar energy has the potential to improve the living conditions of rural households and contribute to the country's future energy security. The house is the basic unit of energy consumption and the woman is the key player in consuming and saving energy. She can play a vital role in helping the nation to tackle the problem of energy crisis by adopting solar energy technologies in her day to day life.

Government of India is mainly concerned with energy conservation. Research studies reveal that there is a huge scope for energy conservation in the domestic sector. As very less number of rural families are using solar technologies so efforts should be made so that more number of families should use the solar technologies which save time, fuel and money and above all are eco- friendly. Although government and non-government organizations are working hard to improve the awareness of people pertaining to energy conservation but still much more needs to be done in this regard.

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