

# Fuel Stress and Coping Measures Adopted by Rural Households in Hisar District of Haryana

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**Abstract:** The present study was conducted with a sample of 100 rural women, selected randomly from *Gangwa* village of district Hisar. Data were collected with the help of structured and duly pre-tested interview schedule. Results revealed that cent per cent respondents continue to use biomass because of familiarity with its use and free availability. LPG was used by 53.00 per cent respondents for reasons like cleanliness, no smoke and easy to use. Respondents experienced 'most severe' economic stress because of fuel energy crisis with WMS of 2.62. Emotional stress due to disturbance in household work was also experienced as 'most severe' (WMS- 2.59), followed by 'severe' level of stress due to obstruction in comfortable living (WMS- 2.33) and being unable to meet family demands (WMS- 2.12). To deal with fuel energy crisis and stress, respondents adopted 'adequate' coping measures in the form of appropriate cooking practices with WMS of 2.47.

**Keywords:** Fuel Stress, Coping Measures Adopted, Rural Households.

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## I. INTRODUCTION

Major proportion of population still lags behind in access to new forms of energy in India, the major share of fuel energy needs of rural homes for cooking is met from non-commercial sources viz., sticks, agro-waste and dry dung (Shakya *et.al.*, 2013). This biomass (agro-waste/twigs/stalks *etc.*) is primarily collected by woman which is very labor intensive and time consuming process as they have to walk long distances in present scenario of fast urbanization and industrialization. In context of commercial fuels, the transition of rural households from use of biomass to clean types is extremely slow because of the higher costs of cleaner fuels, along with lack of an effective supply network in rural areas (Mishra, 2008). Households use limited amounts of commercial fuels like LPG because of unavailability, running cost and lower economy in rural areas (Foysal *et.al.*, 2012). With the prevalence of limited energy sources and increasing demand, many families face stressful conditions. Therefore, appropriate coping measures to deal with fuel energy stress is an imperative need as significant fuel energy can be saved through fuel energy saving strategies at household level. In fact, the present fuel energy crisis condition calls upon rural women to incorporate maximum saving practices to cope with such situation of fuel energy stress. The Government of India has been making intensive efforts to encourage the use of renewable energy sources, especially biogas and solar energy at household level, but still the use of non-conventional resources has not percolated to the grassroot level. Hence, the present study was undertaken to ascertain the stress felt by rural women and coping measures adopted by them to deal with fuel energy crisis situation, with the following specific objectives:

1. To study the fuel related stress in rural households.
2. To identify coping measures to deal with fuel energy crisis and stress.

## II. METHODOLOGY

The study was conducted in randomly selected *Gangwa* village of Hisar district of Haryana state. A list of all households for the selected village was obtained from the office of Sarpanch. Hundred households from this list were selected randomly. One female worker was taken from each selected household as the respondent. Thus, the total sample size comprised of 100 women respondents. Data were collected with the help of structured and duly pre-tested interview schedule. Severity of level of fuel energy stress was calculated with the help of weighted mean scores as high (3.00-2.34), medium (2.33-1.68) and low (1.67-1.00). Level of coping measures adopted by the respondents to deal with fuel energy crisis was measured as adequate (WMS: 3.00-2.34), somewhat adequate (WMS: 2.33-1.68) and inadequate (WMS: 1.67-1.00).

## III. RESULTS AND DISCUSSION

The results have been presented under the following heads:

- Use pattern of fuels
- Stress due to fuel energy crisis
- Coping measures adopted

### Use pattern of fuels:

**Non-commercial fuel energy sources:** Cent per cent respondents continue the use of biomass as fuel for cooking (Table 1). The most important reason behind use of agro-waste/twigs/stalks as cooking fuel was familiarity with its use (100.00%), followed by free availability of agro-waste/twigs/stalks within or near the village (71.00%) and lack of availability of alternate fuels (70.00%). Almost similar reasons were expressed for use of cow-dung cakes also *viz.*, familiarity with its use (100.00%), lack of alternate fuels (82.00%) and its free availability (72.00%) from own animals or from road side. These findings are also supported by Ramchandra *et al.* (2000) and Saud *et al.* (2011).

**Commercial fuel energy sources:** Only sixty-five per cent respondents of the total respondents were purchasing fuelwood for cooking and the most important reason for its use was better taste of food as expressed by all users of fuelwood. This was followed by 86.15 per cent fuelwood users who reported familiarity with its use as main reason. These findings are also supported by Heltberg (2005), IEA (2006) and Joon *et al.* (2009). About one-third of these respondents (33.84%) expressed lack of availability of alternate fuels such as LPG which forced them to use fuelwood for cooking purpose.

Slightly more than half of the total respondents (53.00%) were using LPG. All these respondents expressed various reasons for its use like cleanliness, no smoke and easy to use (100.00% each). A vast majority of LPG users also expressed other reasons for its use like fuel saving (94.33%), time saving (86.79%) and efficient burning (73.38%). Only a negligible percentage of respondents (4.00%) used kerosene, mainly to ignite fire in the *chullah*. Karekazi *et al.* (2008) also reported that respondents used kerosene oil for igniting biomass fuel.

### Stress due to fuel energy crisis:

Majority of the respondents experienced 'high' economic stress while using different types of fuel energy sources (WMS-2.62). Respondents 'agreed' on various aspects related to their inability to meet fuel requirements *viz.*, high price of commercial fuels, frequent increase in fuel price and restriction in use of LPG because of high cost (88.00%, each). These findings are supported by Kammen *et al.* (2012) that higher costs of commercial forms of energy and lower incomes, which is characteristic of rural populations, compel them to rely more heavily on traditional fuels.

Respondents also experienced high emotional stress with overall WMS of 2.35. Regarding fuel stress due to disturbance in household work, it was observed that majority of the respondents 'agreed' to time related problems *viz.*, disturbance in their daily work schedule while spending long hours in collection of fuel (88.00%), arranging fuel for daily needs (78.00%), and unable to complete daily work (62.00%). Kumari (2014) also reported similar findings that women covered a distance between 6 - 10 km for fuel collection and spent 4.10 - 6.00 hours per trip. Cent per cent respondents agreed that smoke from use of biomass and cow-dung blackens the utensils and walls. Majority of the respondents also agreed that they get fatigued as they have to walk long distances for search of fuelwood (72.00%), more time is spent in collection of

biomass (68.00%) and that the storage of biomass occupies lot of space (53.00%). Kumari (2014) also reported similar problems in use of agro-waste/biomass fuel in traditional *chulha* viz., 'blackening of walls/ceiling', 'deposition of soot on the utensils' and 'uncleanliness' in kitchen'. Besides physical fatigue, headache and backache were the major problems faced by women while fetching fuel.

Nearly three-fourth of the respondents reported that they are not able to cook foods which require longer time to cook (76.00%) and that they were not able to spend sufficient time with family members as lot of time is spent on fuel collection (73.00%).

#### **Coping measures adopted:**

Since fuel procurement is getting more and more difficult, women try to economize on its use. The information pertaining to the coping measures adopted by respondents to deal with fuel energy stress is presented in Table 3. Coping measures were categorized under three groups viz., conservation of fuel through use of appropriate cooking techniques, supplementation with other fuels, and miscellaneous measures.

It was revealed that cent per cent respondents 'frequently' organized tools and utensils before cooking, do pre-preparation of food, use vessels of correct size and shape for cooking, dry utensils before keeping it on fire, and use sufficient quantity of water for cooking. Two-third respondents 'frequently' cooked food in covered vessels, followed by 64.00 per cent respondents who prefer to use more raw vegetables in the form of chutney/pickle *etc.* Majority of the respondents 'sometimes' prefer to have less social gatherings (88.00%), avoid overcooking of food (76.00%), less use of foods that require more cooking time (62.00%) and prefer to have at least one simple meal in a day (56.00%). Bisht and Bakhshi (2013) also concluded similar findings that large number of rural people were using energy saving practices such as using optimum quantity of water for cooking and using dry pan to cook food.

As far as supplementing of biomass fuel with other fuels is concerned, 58.00 per cent of the users of fuelwood 'sometimes' used fuelwood only as a supplementary fuel, along with biomass. Nearly half of the respondents also used LPG as a supplementary fuel for cooking (53.00%). Out of this, forty-one per cent of the respondents 'sometimes' used LPG for short duration cooking. It was clearly revealed that none of the respondents opted for use of renewable energy sources viz., biogas or solar energy as supplementary fuels for cooking.

Under miscellaneous measures, cent per cent respondents prefer to use fuels which are easily available and which can be collected from nearby sources. Respondents also prefer to store biomass/agro-waste/twigs *etc.*, in large quantities after harvesting season (88.00%). As far as LPG is concerned, twenty-nine per cent users of LPG do not prefer to buy LPG in black market and book LPG well in time. In support of this, Sejhpal *et al.* (2012) pointed out that if women contribute significant income shares to the household, there is a higher probability of households switching to cleaner energy options and thus, reducing their dependence on fuelwood consumption for cooking purpose. Findings have, further, revealed that rural women go for those alternative fuels which are available easily, and freely. Supporting this, Egeru *et al.* (2014) reported that rural households prefer to use crop residues because availability of crop residue is easy as compared to fuelwood.

#### **IV. CONCLUSION AND IMPLICATIONS**

On the whole, respondents used non-commercial sources of energy viz., agro-waste/twigs/stalks and cow-dung cakes as they were familiar with its use (100.00%) and also because it was available free of cost (71.00% and 72.0% respectively). Respondents used fuelwood for cooking because of better taste of cooked food (100.00%) and familiarity with use (86.15%). LPG was used by fifty-three per cent respondents as supplementary fuel for various reasons like cleanliness, no-smoke and easy to use. Respondents experienced 'most severe' economic and emotional strain with WMS of 2.62 and 2.35 respectively. Under emotional strain, stress due to disturbance in household work was 'most severe' (WMS- 2.59), followed by 'severe' level of stress due to obstruction in comfortable living (WMS- 2.33) and stress due to unable to meet family demands (WMS- 2.12). Adoption of appropriate cooking techniques by the respondents to deal with fuel energy crisis and stress was adequate with weighted mean scores of 2.47. Adoption level for miscellaneous coping measures and supplementation with commercial was only 'somewhat adequate' with WMS of 2.25 and 2.16 respectively. Coping measures related to energy sources were also 'somewhat adequate' (WMS- 2.16). None of the respondents used renewable energy sources as coping measures to deal with fuel crisis and stress.

These findings have strong implications for policy makers and government. Results suggest that focus of the policies and programme should be on education and attitudinal change of people in relation to energy use. This will further help them to combat with stress felt due to fuel energy crises and greater adoption of fuel energy saving practices. Addition to this, there is a significant need in introduction of use of renewable energy fuel sources such as solar energy and biogas energy at rural household level. Field functionaries can also play an important role in promoting energy literacy programme which will help to educate the homemakers about the fuel energy problems and how to overcome from it. Mass media can also play an important role in this direction.

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Table 1: Use pattern of fuel energy

Sr. No.	Fuel energy	n	Reasons*	Frequency	Percentage
<b>A</b>					
<b>Non-commercial sources</b>					
1.	Agro-waste/ twigs/ stalks	100	Familiarity	100	100.00
			Lack of alternate fuels	70	70.00
			Better taste of food	33	33.00
			Easy availability	20	20.00
			Free availability	71	71.00
2.	Cow-dung cakes	100	Familiarity	100	100.00
			Lack of alternate fuels	82	82.00
			Easy availability	49	49.00
			Free availability	72	72.00
<b>B</b>					
<b>Commercial sources</b>					
1.	Fuelwood	65	Familiarity	56	86.15
			Lack of alternate fuels	22	33.84
			Better taste of food	65	100.00
			Easy availability	02	3.07
			Free availability	04	6.15
2.	LPG	53	Cleanliness	53	100.00
			Efficient burning	39	73.58
			No smoke	53	100.00
			Time saving	46	86.79
			Fuel saving	50	94.33
			Easy to use	53	100.00
3.	Kerosene	04	Helps to ignite fire in <i>chullah</i>	04	100.00

\*Multiple response

Table 2: Stress felt by respondents due to fuel energy crisis n=100

Sr. No	Statements	Agree	Neutral	Disagree	WMS*
<b>A</b>					
<b>Economic stress</b>					
1.	High price of fuelwood	88	12	-	2.88
2.	Frequent increase in price of fuel	88	-	12	2.76
3.	Frequent increase in price of cooking gas	88	-	12	2.76
4.	Restrict/refrain from the use of LPG	88	-	12	2.76
5.	Impossible to buy LPG at black market rates	78	10	12	2.66
6.	Unable to meet fuel cost in existing budget	79	-	21	2.58
7.	Worried about fuel energy expenses	79	-	21	2.58
8.	Feel disgusted as I have to supplement with commercial fuels	65	23	12	2.53
9.	Unable to completely switch over to cleaner fuels because of their high cost	53	47	-	2.53
10.	Unable to pursue income generating activities because of time consumed in biomass collection	51	12	37	2.20
		<b>Overall WMS - 2.62 Rank- I</b>			
<b>B.</b>					
<b>Emotional stress</b>					
<b>I</b>					
<b>Disturbance in household work</b>					
1.	Long hours spent in collection of fuel for cooking	88	08	04	2.84
2.	Disturbance in daily work schedule due to fuel collection for day to day needs	78	20	02	2.76
3.	Unable to complete day's work due to long hours spent biomass search	62	34	04	2.58
4.	Adverse affect on cooking pattern due to fuel shortage	47	25	28	2.19
		<b>Overall WMS- 2.59 Rank- I</b>			
<b>II</b>					
<b>Obstruction in comfortable living</b>					
1.	Blackening of utensils and walls due to smoke	100	-	-	3.00
2.	Fatigued due to long distances in search for biomass	72	17	11	2.61
3.	No relaxing or leisure time activities	68	12	20	2.48

4.	Additional space required for biomass storage	53	27	20	2.33
5.	Health affected due to smoke	25	39	36	1.89
6.	Start household work early to spare time for fuel collection	34	-	66	1.68
<b>Overall WMS- 2.33 Rank- II</b>					
<b>III</b>	<b>Unable to meet family demands</b>				
1.	Unable to cook foods which requiring more time	76	12	12	2.64
2.	Unable to spend time with family due to fuel collection	73	08	19	2.54
3.	Unable to satisfy children's demand for special foods because of fuel shortage	36	16	48	1.88
4.	Children drop out from school because of help in fuel collection	18	04	78	1.40
<b>Overall WMS- 2.12 Rank- III</b>					
<b>Overall emotional stress WMS- 2.35</b>					

\*High= 3.00-2.34, Medium= 2.33-1.68, Low=1.67-1.00

**Table 3: Coping measures to deal with fuel energy crisis**

Sr. No.	Statements	Frequently	Some times	Never	NA	WMS*
<b>A</b>	<b>Conservation of fuel</b>					
<b>I</b>	<b>Adoption of appropriate cooking techniques</b>					
i.	Allow refrigerated foods to reach room temperature before use	08	46	14	32	1.91
ii.	Soak pulses and legumes before cooking	46	50	04	-	2.42
iii.	Organize tools and utensils before starting to cook	100	-	-	-	3.00
iv.	Pre-preparations of food <i>i.e.</i> , cut vegetables etc before starting cooking	100	-	-	-	3.00
v.	Use vessels of correct size and shape	100	-	-	-	3.00
vi.	Cook in covered vessels	66	28	06	-	2.60
vii.	Dry utensils before keeping on fire	100	-	-	-	3.00
viii.	Use correct quantity of water for cooking	100	-	-	-	3.00
ix.	Maximum use of pressure cooker	30	18	26	26	2.05
x.	Reduce the flame of LPG when food reaches the boiling point	20	33	-	47	2.37
xi.	Make more use of small burners	26	27	-	47	2.49
xii.	Regularly clean gas burners	09	44	-	47	2.16
xiii.	Use more raw vegetables like chutney and pickles	64	31	05	-	2.59
xiv.	Have at least one simple meal	39	56	05	-	2.34
xv.	Avoid over cooking of food	24	76	-	-	2.24
xvi.	Cook in large quantities at a time and store in refrigerator	12	38	18	32	1.91
xvii.	Less use of foods which require more time to cook (soya bean, <i>rajmah</i> , non-veg <i>etc.</i> )	29	62	09	-	2.20
xviii.	Cook two meals instead of three per day	75	25	-	-	2.75
xix.	Have less social gatherings at home	-	88	12	-	1.88
xx.	Have meals together to avoid reheating of food	52	40	08	-	2.44
<b>Overall WMS- 2.47, Rank- I</b>						
<b>B.</b>	<b>Supplementation of fuel</b>					
<b>I.</b>	<b>Supplementing with commercial fuels</b>					
i.	Use of fuelwood	7	58	-	35	2.10
ii.	Use of LPG for short duration cooking	12	41	-	47	2.22
<b>Overall WMS- 2.16, Rank- III</b>						
<b>II.</b>	<b>Supplementing with renewable fuels</b>					
i.	Use of solar cooker	-	-	-	100	-
ii.	Use of solar water heater	-	-	-	100	-

iii.	Use of biogas energy	-	-	-	100	-
iv.	Use of pellet stove	-	-	-	100	-
		<b>NIL</b>				
<b>C.</b>	<b>Miscellaneous measures</b>					
i.	Use biomass which is easily available	100	-	-	-	3.00
ii.	Collect biomass from nearby sources	100	-	-	-	3.00
iii.	Do not buy kerosene in black market	-	-	04	96	1.00
iv.	Do not buy LPG in black market	29	-	24	47	2.09
v.	Book LPG well in time	29	-	24	47	2.09
vi.	Store biomass in adequate quantities after harvesting season	88	12	-	-	2.88
vii.	Cut down expenses on other items to pay for increased cost of fuel	38	43	19	-	2.19
viii.	Increase income through outside employment/casual labor	37	-	63	-	1.74
		<b>Overall WMS- 2.25, Rank- II</b>				
<b>B.</b>	<b>Supplementation of fuel</b>					
<b>I.</b>	<b>Supplementing with commercial fuels</b>					
i.	Use of fuelwood	7	58	-	35	2.10
ii.	Use of LPG for short duration cooking	12	41	-	47	2.22
		<b>Overall WMS- 2.16, Rank- III</b>				
<b>II.</b>	<b>Supplementing with renewable fuels</b>					
i.	Use of solar cooker	-	-	-	100	-
ii.	Use of solar water heater	-	-	-	100	-
iii.	Use of biogas energy	-	-	-	100	-
iv.	Use of pellet stove	-	-	-	100	-
		<b>NIL</b>				
<b>C.</b>	<b>Miscellaneous measures</b>					
i.	Use biomass which is easily available	100	-	-	-	3.00
ii.	Collect biomass from nearby sources	100	-	-	-	3.00
iii.	Do not buy kerosene in black market	-	-	04	96	1.00
iv.	Do not buy LPG in black market	29	-	24	47	2.09
v.	Book LPG well in time	29	-	24	47	2.09
vi.	Store biomass in adequate quantities after harvesting season	88	12	-	-	2.88
vii.	Cut down expenses on other items to pay for increased cost of fuel	38	43	19	-	2.19
viii.	Increase income through outside employment/casual labor	37	-	63	-	1.74
		<b>Overall WMS- 2.25, Rank- II</b>				

\*Adequate= 3.00-2.34, Somewhat adequate= 2.33-1.68, Inadequate=1.67-1.00