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Comparative Study of Energy Consumption Pattern in Three Regions of Degraded Forest Area of Central India

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ABSTRACT

Present study had been conducted in nine villages of central Chhattisgarh. Out of these villages three villages are having forest committees and remaining six villages have less 5% forest cover. Firewood consumption have been examined according to distance from the forest. The analysis has clearly shown that the distance from forest has significant effect on total and per capita firewood consumption. Easy availability of firewood increases its consumption. Therefore firewood saving services should be thrust in areas near the forest to decrease the firewood consumption. Firewood Consumption have been examined according to distance from the forest. The analysis has clearly shown that the distance from forests has significant effect on total and per capita firewood consumption.

Key Words: Fuel wood, Forest committees, Firewood consumption.

1. INTRODUCTION

Fuel wood

Wood constitutes the principal source of energy for the rural people. They usually collect fuel wood from neighboring forest or fields at no cost except the labour involved in its collection and carriage. With the increase of human and cattle population, the boundaries of dense forest cover is increasing the labor spent.

Fuel wood consumption

In India about 70% of the population lives in rural area (Raman et al. 2012). Mostly village women spent 3 to 6 hr a day for collection of fuel wood. Many factors such as population, climate, food habit, income, availability, and cost of substitute, occupation, household size, land holding and cattle population may influence fuel wood requirement. Transmission and distribution of power to this less densely populated areas which are located far away from the power generating stations is the major reason for not able to achieve 100% electrification in the country. Hence it is necessary to find out an energy source which can be decentralized to supply power to these hamlets (Raman et al. 2012). A study was done for nine remote villages of Chhattisgarh, India to examine the relationship between fuel consumption pattern and certain influencing factors. It was observed that enhanced use of alternative sources of energy can balance the

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increasing demand of fuel wood and make use of fuel more economic. In this paper we have presented an study of firewood consumption in the central Chhattisgarh where the people are largely dependent on forest for firewood. We have analyzed the effect of distance from forest, household size, annual income, land holding and cattle on the consumption of firewood by a household.

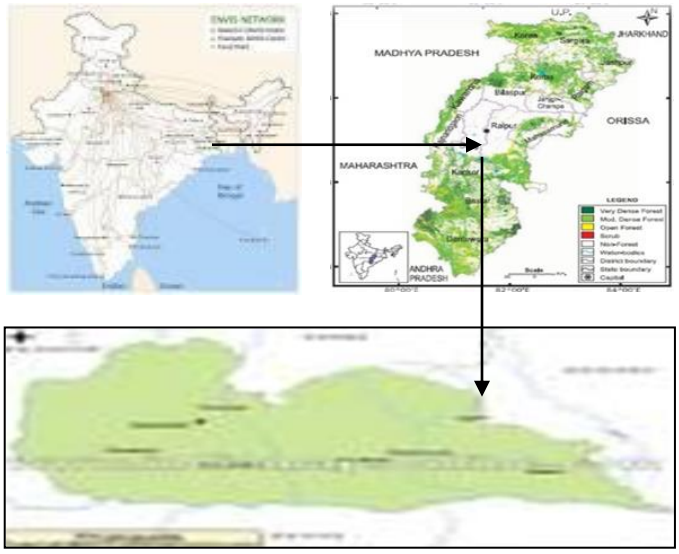

Figure 1
Location of Study site

2. SCOPE OF THE STUDY

The aim of carrying out this study is to identify about the consumption pattern of energy in rural part of central India and to analyze approximately the different alternative sources of energy which villagers reside far from forest areas are using.

Table 1 Geographical Status of the villages of three regions

SN	Villages	Particulars	Region	No. of household	Population
1	Pakariya	Villages Surrounded by Forest	Region 1	250	1250
2	Banahil	Villages Surrounded by Forest	Region 1	100	500
3	Tundri	Villages Surrounded by Forest	Region 1	150	750
4	Tarod	Villages more than 5 km from forest	Region 2	200	1000
5	Lagra	Villages more than 5 km from forest	Region 2	120	600
6	Nariyara	Villages more than 5 km from forest	Region 2	300	1500
7	Kosa	Villages more than 10 km from forest	Region 3	250	1250
8	Konar	Villgaes more than 10 km from forest	Region 3	200	1000
9	Khunti	Villages more than 10 km from forest	Region 3	150	750

Table 2 Socio economic status of the villages of three regions

SL	Villages	Average Household size	Average Annual income of family	Average land holding	Average cattle population family	Average annual firewood consumption per household quintals
1	Pakariya	05	24000	3	2	10.8
2	Banahil	04	15000	3	3	12
3	Tundri	05	18000	4	2	10.5
4	Tarod	05	15000	2	1	8
5	Lagra	04	24000	2	2	8.5

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6	Nariyara	05	36000	2	2	12.5
7	Kosa	04	24000	4	3	5
8	Konar	05	20000	3	3	6
9	Khunti	05	18000	2	3	5

Table 3 Energy Utilization Status of the villages of three regions

SL	Villages	Electricity Utilization in (%)	LPG Utilization in (%)	Kerosene Utilization in (%)	Bio fuel Utilization in (%)	Solar cooker Utilization in (%)
1	Pakariya	05	04	10	40	1
2	Banahil	05	06	15	40	0
3	Tundri	01	02	12	40	0
4	Tarod	10	02	20	50	02
5	Lagra	08	01	30	65	0
6	Nariyara	30	20	35	30	05
7	Kosa	25	05	10	70	0
8	Konar	20	04	15	75	0
9	Khunti	15	06	10	75	0

2.1. Materials

Study conducted in villages of Janjgir Chapma Forest Division of Chhattisgarh state of central India. According to report of forest survey of India (FSI, 2011), of total geographical area of 3,852 Sq.Km of division only 4.2% area (155 Sq. Km area) is forest covered. Nine villages of almost similar socio economic status was surveyed (Fig.1).Region 1 surrounded by forest. Region 2 villages more than 5 km from forest. Region 3 villages more than 10 km from forest (Table 1).

2.2. Methodology

Questionnaire records had been collected from 10% representative houses of each village.

3. RESULTS AND DISCUSSION

As shown in table- 2, 3 and 4. The average annual income of the household in different regions was between 10 to 36 thousand. All the households were engaged partly or wholly in agricultural occupation (Table 2). Many were in addition engaged in some other occupation like working as daily wages worker in nearby town, doing some small business, working as carpenter, meson, etc .Certain assumption have been used in this study viz. all human being were given equal weight age irrespective of sex and age. An undivided family having common kitchen land and cattle was considered as one household. Impacts of influencing factor on the firewood consumption of a household were examined for each region separately. Influence of distance form forest was also examined. The result of the study indicates that a distance form forest has a very major effect on firewood consumption. Result shows that as compared to Region 1 average consumption per household is lower in the region 2 and in region 3. This clearly shows that wood fuels are the main source of energy for rural population. Household size has a significant positive effect on firewood consumption though average family size in almost all the village is same (Table 2), while annual income has also significant effect on energy consumption since they become able to purchase the energy substitutes (Fig. 2&4). Size of land holding does not influence firewood consumption significantly in Region 1 (Fig. 3). This may be because contribution of agricultural waste to fuel wood consumption is negligible due to easy availability of firewood form adjoining forests.

In case of per capita consumption of firewood only region and household size variables were found significant.

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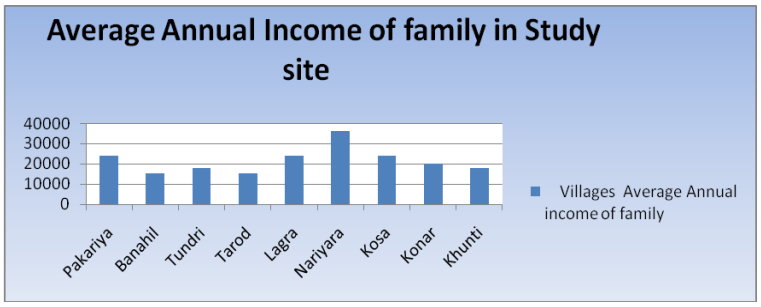

Figure 2
Average Annual Income of villagers in study site

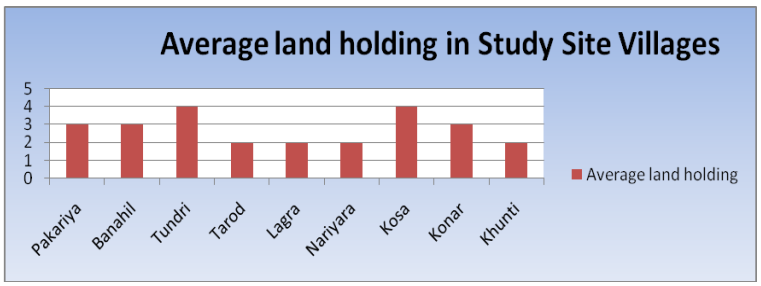

Figure 3
Average land holding in Study Site Villages

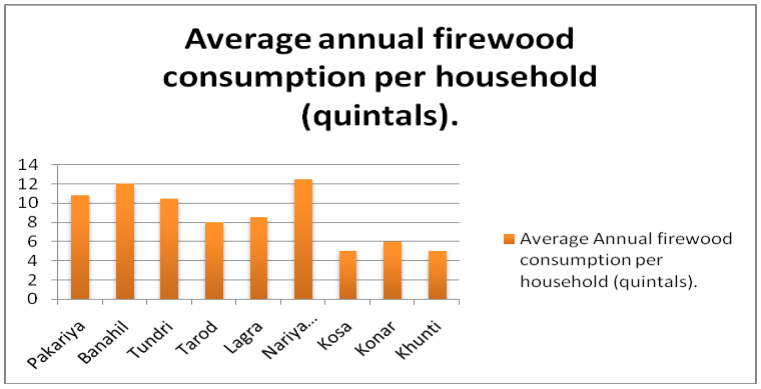

Figure 4
Average annual firewood consumption per household in Study Site Villages

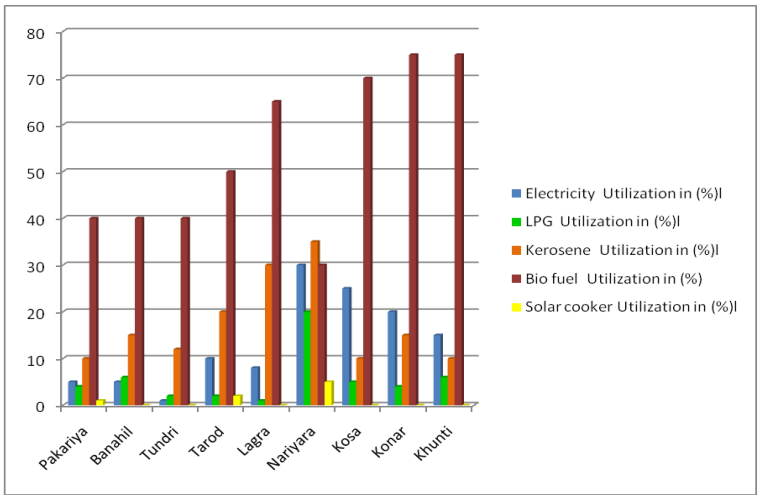

Figure 5
Utilization of different means of energy in Study Site Villages

The observation revealed that individual consumption of fire wood is higher where availability of firewood is easier. Also the income level of the average annual per capita consumption in Region 1 was higher as compared to the Region 2 and 3 respectively.

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Household size has significant negative effect on per capita firewood consumption. This may be due to economy of scale reflected in the efficiency of firewood utilization. The analysis has clearly shown that distance from forest has significant effect on total and per capita firewood consumption. Easy availability of firewood increases its consumption. A black carbon (BC) emission from bio fuel cooking in South Asia is a significant source of uncertainty for health and climate impact studies (Rehman et al, 2011). Therefore firewood saving programmes such as smokeless *chullahs*, cooking gas, solar *chullahs* should be introduced in areas adjoining forests. Rural area electrification in developing countries helps to improve the quality of life of the people. It increases productivity and supports education. It also discourages people from migrating towards urban areas (Raman et al, 2012). Hence it is necessary to electrify these villages to achieve inclusive economic growth. As India is blessed with solar energy which is omnipresent in almost all parts of the country, micro grid system which uses solar photovoltaic panels seems as the finest option. The solar photovoltaic system converts light energy into direct current power using photovoltaic effect (Raman et al. 2012). Black Carbon (BC) mitigation measure with significant climate and health benefits (Kar et al. 2012). Energy efficiency is concerned and it is up to the Indian policy-makers, regulators and obligated entities to ensure that India realizes this potential to the fullest (Bhattacharya et al. 2011).

4. CONCLUSION

Utilization of non-conventional sources of energy as solar cooker and bio gas and energy saving devices, promotion of the fuel wood plantation system near the villages not only reduce the biotic pressure from vegetation but also promote the green cover which could support the environment.

SUMMARY OF RESEARCH

1. This work within the available resources has provided useful information about the energy utilization pattern of rural houses of central India.
2. Better forest cover increase the dependency of fuel wood while in areas where village situation is far from forest, villagers are more dependent over the alternative sources of energy.

FUTURE ISSUES

Peoples residing beyond 5 kms from forest should grow their own fuel wood in their own land and also in village land. Promotion of energy saving devices and eco-friendly alternative energy means as biogas and solar cooker should be promoted through proper technology transfer and extensive extension work.

DISCLOSURE STATEMENT

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Conflict of interest

The authors declare that they have no conflict of interest.

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Data and materials availability

All data associated with this study are present in the paper.

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