



# SUSTAINABLE ENERGY MANAGEMENT IN LOW FOREST DENSITY SITES OF CENTRAL INDIA : SIGNIFICANCE OF WOMEN PARTICIPATION

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## Abstract

Women in India are playing a crucial role in protection and conservation of environment. Women in our country have brought a different perspective to the environment debate, because of their different experience base. In India about approximately 96% of rural household are estimated to be using bio fuels. One of the important features of rural energy is the dependence on locally available biomass resources. Fuel wood is the primary energy source for cooking used by rural households. Mostly village women spent 3 to 6 hr a day for collection of fuel wood. They understand clearly that economics and environment are compatible. Their experience reveals to them that soil, water and vegetation, necessary for their day-to-day living, requires care and good management. Environmental degradation is related not only to the biosphere alone, but to the social sphere as well. Women are also the active members of most of the community forests. women are providing an important role in sustainable development of community forests. However, their role is neither properly identified nor explored. A study was done in remote villages of central Chhattisgarh, India to examine the relationship between fuel consumption pattern and certain influencing factors. To formulate a systematic approach for studying about women's participation an elaborate exercise was taken for data collection. It was observed that enhanced use of alternative sources of energy can balance the increasing demand of fuel wood and make use of fuel more economic. 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. This paper explores and analyzes women's role in development and conservation of forest for through sustainable energy management.

**Key words :** Sustainable energy management, bio-diversity, women participation.

## Introduction

Women have always been the major conservers of bio-diversity. Traditionally, women have been responsible for subsistence and survival for water, food, fuel, fodder and habitat, though they rarely get the credit for nurturing these life support systems. Even today they perform duties such as seed selection, multiplication and conservation. The on-farm conservation traditions of rural and tribal women, with reference to agro-biodiversity are well known. Janjgeer district of Chhattisgarh is a typical example of severe deforestation, soil erosion and destruction of natural resources resulting in degradation of environment, and social problems such as poverty

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unemployment and unrest. Frequent drought had made the situation worse. To Arrest forest degradation and rehabilitation of degraded forests the Government of India issued guidelines on June 1, 1990. Joint forest management advocates strong community participation, bottom up planning and sustainable use of forest resources. Women are also the active members of these committees. Thus, women are providing an important role in sustainable development of community forests. This paper explores and analyzes women's role in development and conservation of forest for its sustainable development.

Wood constitutes the principal source of energy for the rural people. They usually collect fuel wood from neighbouring 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 receding away from the inhabitants thereby increasing the labour spent in carrying fuel wood from distant forest. In India about 70% of the population lives in rural area. (Raman P *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, 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 P *et al.*, 2012)

A study was done for 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 increasing demand of fuel wood and make use of fuel more economic. This paper presented an study of firewood consumption in the central Chhattisgarh where the people are largely dependent on forest for firewood and analyzed the role of women in energy management. Paper also cover the effect of distance from forest, household size, annual income, land holding and cattle on the consumption of firewood by a household.

### Materials and Methods

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. Villages of almost similar socio economic status were surveyed. Present study had been conducted in five villages of central Chhattisgarh. Janjgeer was one of the area of central Chhattisgarh that were severely drought-affected for several years. Only 4.2% of the land area of the division is under forest cover. Villages *Kosir*, *Dhangaon*, *Sasha*, *Sirri* are selected for study. These were classified into three regions depending upon their distance from forest. Region 1 surrounded by forest. Region 2 villages more than 5 km from forest. Techniques were based on PRA, RRA as well as questionnaire methods depending upon the suitability. Questionnaire records had been collected from 10% representative houses of each villages. To formulate a systematic approach for studying about

women's participation an elaborate exercise was taken for data collection. Questionnaire records had been collected from 10% representative houses of each villages.

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 village women reside near by areas are using.

### Results and Discussion

A total 67 selected households were surveyed in five villages which is about the 10 % of total 670 household. Socio economic survey have revealed that main occupation of the villagers is farming. In all these villages large population is dependent on various non timber forest resources obtained from forests. During PRA its has been come to know that fifteen years prior 100% fuel wood requirement of the house were met from forests. Largely by women. This dependence on forests consumes long useful working hours of women. According to Bandyopadhyay *et al.*, (2004) village proximity to forest, leadership and fuel wood dependence are significant factors in forestry.

Alternative means of energy like solar cooker is not very popular in all these villages. In all the houses women are using more than one source of energy. Only in village Sasha about 20% women are using LPG cylinders besides this about 80 % houses are using fuel wood. Use of hot plate and heater are also most common in as 14 % women have given positive response for use of electrical appliances (Table 3). In Janjgeer forest division where only 4.2% forest cover is there average 80% women are using fuel wood. During the PRA it has been noticed that women of these areas are very keen to raise trees in their private land. Though their response about forest protection was very poor. But through these activities they are conserving the forest.

The average annual income of the household in different regions was between 15 to 24 thousand. All the households were engaged partly or wholly in agricultural occupation (Table 3). An undivided family having common kitchen land and cattle was considered as one household. Impact 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 distance form forests 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.

This clearly shows that wood fuel are the main source

**Table 1:** Villages selected for study.

S.N.	Villages	Existence of Forest	No. of household	Population	No. of houses surveyed
1	Kosir	Villages Surrounded by Forest	250	1250	25
2	Dhangaon	Villages Surrounded by Forest	100	500	10
3	Sasha	Villages more than 5 km from forest	200	1000	20
4	Sirri	Villages more than 5 km from forest	120	600	12
		Total	670	3300	67

**Table 2:** Geographical Status of the villages of three regions.

S.N.	Villages	Particulars	Region	No. of household	Population
1	Kosir	Villages Surrounded by Forest	Region 1	250	1250
2	Dhangaon	Villages Surrounded by Forest	Region 1	100	500
3	Sasha	Villages more than 5 km from forest	Region 2	200	1000
4	Sirri	Villages more than 5 km from forest	Region 2	120	600

**Table 3:** Energy Utilization Status of the villages.

S.N.	Villages	Electricity	LPG	Kerosene	Fuel wood	Solar cooker
1	Kosir	05	04	10	85	1
2	Dhangaon	05	06	15	90	0
3	Sasha	10	02	20	70	02
4	Sirri	20	01	30	76	0

of energy for rural population. Household size has a significant positive effect on firewood consumption though average family size in almost all the village are same. (Table 2), while annual income has also significant effect on energy consumption since they become able to

purchase the energy substitutes. (Fig. 1). Size of land holding does not influence firewood consumption significantly in Region 1 (Fig. 1). This may be because contribution of agricultural waste to fuel wood consumption is negligible due to easy availability of firewood.

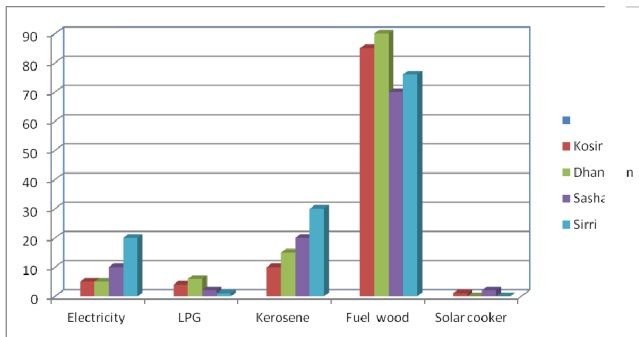
In case of per capita consumption of firewood only region and household size variables were found significant. The observation revealed that individual consumption of fire wood is higher where availability of firewood is easier. Also the income level of The average annual per capita consumption in Region 1 was higher as compared to the Region 2. Household size has significant negative effect

**Table 4:** Socio economic status of the villages of three regions.

S.L.	Villages	Average Household size	Average Annual income of family	Average land holding	Average cattle population family	Average annual firewood consumption per household uintals
1	Kosir	05	24000	3	2	10.8
2	Dhangaon	04	15000	3	3	12
3	Sasha	05	15000	2	1	8
4	Sirri	04	24000	2	2	8.5

**Table 5:** Energy Utilization Status of the villages of three regions.

S.L.	Villages	Electricity Utilization in (%)l	LPG Utilization in (%)l	Kerosene Utilization in (%)l	Bio fuel Utilization in (%)	Solar cooker Utilization in (%)l
1	Kosir	05	04	10	40	1
2	Dhangaon	05	06	15	40	0
3	Sasha	10	02	20	50	02
4	Sirri	08	01	30	65	0



**Fig. 1:** Energy Utilization Status of the villages.

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. Black carbon (BC) emissions from bio fuel cooking in South Asia is a significant source of uncertainty for health and climate impact studies. (Rehman I, *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 P *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 P *et al.*, 2012). There exists a large potential in India as far as achievement of 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)

## Conclusion

Fuel wood is the still the most common source of energy in all these villages. In Janjgeer division where forest cover is only 4.5% it is very tough for women to collect the fuel wood from forest. The women play most significant role in collection of fuel wood thus in village economy dependence especially on forest is through women. fuel wood requirement of the house is met largely by women.

Distance from forest affect the fuel wood collection

intensity. Areas where distance from forest is more women are using alternative sources of energy in better way. If vegetation is surrounds the village collection and utilization of fuel wood is high.

In all these study areas women are collecting their fuel requirement not only from near by forest areas but also from farm and community lands. There efforts for collecting the cow-dung for spreading on the fields, instead of using in the kitchen is helping to control depletion of soil resources and creating a positive effect on the environment.

Despite climatic vagaries agriculture is the main occupation of the people in Chhattisgarh. Various studies conducted reveal the extensive participation of women in farm operations (Gupta, 1987, Nayyar, 1987). During the time of agricultural practices women play very significant role for raising trees and there conservation. In all these activities of women, practices of Joint forest management plays very important role. The kind of awareness generated through JFM motivated women for all environment conservation practices. It has been observed that in areas where forest cover is quite good as in Kosir and Sasha women are dependent over forest for collection of fodder and other forest produces like Mahua, Tendupatta etc. Which supports their earning during the agriculture lean period. Women do about 75 percent of the marketing of mushrooms fruits and mahua flowers, gum collection. The women collect large quantities of NTFPs from forests. (Nanavaty, 1996).

During last 15 year various programme and projects have been undertaken by government for promoting peoples participation in natural resource management which has been gradually generating awareness among women. The JFM approach has undoubtedly helped in rehabilitating and improving the degraded forests. Soil, water and forest can be conserved if alternative kitchen fuel is provided. Our women can again contribute in this direction and come forward by raising the plants for fuel wood instead of deforestation. 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.

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