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*Original Research Article*

# Study on fuel types of consumption in traditional Chulhas of Manjheeva Sani village and its impact on health in Banda district

**Ravindra Singh and Ranjeeta Simon***

Dept of Biological Science
MGCGV, Chitrakoot Satna MP, India

***Corresponding Author's Email: ranjeeta.simon722@gmail.com**

**Abstract**

**Indoor air pollution from traditional fuels and cooking stoves is potentially a large health threat in rural regions. This paper reports the results of a survey of types of fuel consumption and health among the 150 households in village Manjheeva Sani of Banda district. Firewood ,dung cake, Coal, Kerosene, Agricultural waste, were found to be the major fuels consumed by the villagers whereas dry leaves, shreds of cloth, plastic, etc are consumed in very less proportion. Wood of *Acacia nilotica* is found to be consumed maximum followed by *Madhuca longifolia* wood. *Azadirachta indica* wood is consumed the minimum. About 17.30 % people were found to be lung infected and 48.07% were suffering from the eye related problems among all the diseased reported. 34.61% people were found to be suffering from the other problems like cough and cold, headache, body pain, vomiting etc .We cannot rule out the possibility that the level of observed respiratory illness and eye sight weakness is due other factors that also contribute to a household's decision to use a traditional stove, such as poverty, health preferences and the bargaining power of the women in the household**.

**Keywords:** Agricultural waste, dungcake, fuel consumption, fuel wood, health, indoor air pollution, kerosene and coal, traditional biomass fuel

## INTRODUCTION

In big cities air pollution gets headlines, but in many rural areas indoor air pollution is even more serious problem approximately 2.5 to 3 billion people worldwide rely on traditional cooking methods to meet their household energy needs. Rural people burn fire wood, dung cake, agricultural waste, kerosene, coal and other biomass fuels which contribute to respiratory illness, lung cancer, cataract. Dependence on traditional fuel leads to higher risk of child mortality, poverty conditions are also worsened through the health and quality of life impacts associated with traditional biomass fuel. Direct effects include burns to children falling into fires, household fires and respiratory illness from indoor air pollution. Indirect effect include the opportunity cost of time spent by women and children in collection of fuel, injuries from carrying large amounts of wood, restriction on economic and educational activity due to poor air quality. Traditional biomass fuel contains fuel contaminants such as Sulphur / metal which also affect the health, moreover fuel wood demand contributes to greater environmental stress and in localized cases such as sub Saharan Africa thus contributes to forest depletion (Holdren and Smith 2001, Schirinding et al., 2002).

Incomplete and inefficient combustion results in a complex and unstable mixture of particulate matter, CO, Hydrocarbons, Nitrogen oxides, HCHO and $C_6H_6$ that often greatly exceeds the standards for indoor air pollutants, set by U.S. Environmental protection agency

**Table 1.** Showing the amount of particular fuel consumed weekly

| SNo. | Fuel type | Amount consumed in Kg/litre |
|---|---|---|
| 1 | Firewood | 6284 Kg |
| 2 | Dungcake | 2035 Kg |
| 3 | Coal | Nil |
| 4 | Kerosene | 385 Ltrs |
| 5 | Agricultural waste | 240 Kg |
| 6 | Others | Nil |

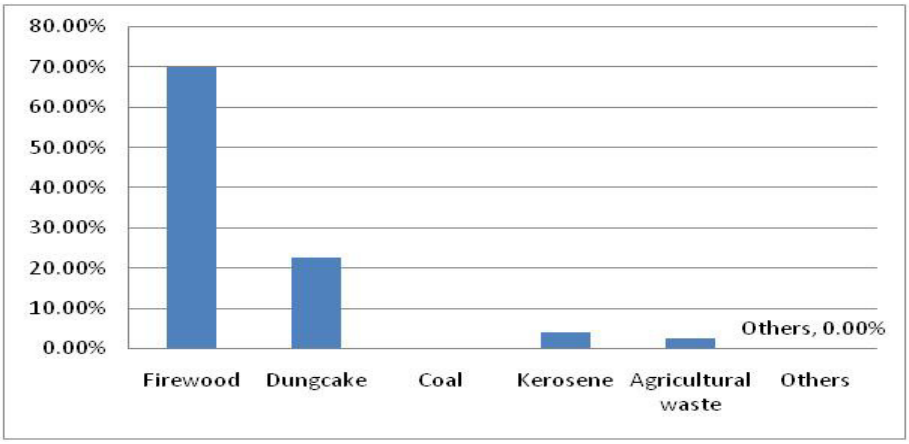


**Figure 1.** Graph Showing Total Consumption Percentage of Different Fuels

(USEPA) Schrinding et al., 2002.

Infant and child deaths are therefore substantial health impacts attributable to indoor air pollution. In fact, Smith and Mehta (2000) estimate 1.8 million annual deaths results from global exposure to indoor air pollution, with approximately 1 million due to ALRI in children under 5 years.

Since the early eighties the government of India initiated several household programs focusing on improved stove, biogas plants kerosene and energy supply, which were aimed at reducing the dependence on biomass fuels and removing smoke from the kitchens. Although these programs had varying levels of success. Now different initiatives have been undertaken at the grassroots level and extensive infrastructure for implementing projects to overcome the problems related to indoor air pollution and health problems.

In addition, experience with existing behavior change interventions in health sector can be harnessed to focus the health issues arising from the use of household energy.

## MATERIALS AND METHODS

To study the types of fuel consumption in traditional chulhas of village Manjheeva Sani of Baberu tehsil and its adverse effects on health, a survey was conducted in 150 families of the village. The information was collected in the questionnaire prepared which consisted the questions related to the types of fuel and its amount consumed by a particular family, percentage of people using different cook stoves for food preparation, from where the fuel is collected or purchased, which wood is consumed more as a fuel, how much distance is nearly covered to collect the fuel. At last questions related to the types of diseases with which people are infected were asked.

One questionnaire was filled for one family and generally all the fuel related information was taken from the lady of the house who is mainly responsible for cooking food.

## RESULTS

In this paper I have focused on what types of fuel are consumed and their amount used in APL and BPL families per person per day and which fuel is consumed the maximum. Moreover the percentage of people suffering from diseases due to traditional cooking methods and indoor air pollution has been calculated. The fuels that were identified in cooking food are wood, dung cake, coal, kerosene, agricultural waste and other (includes plastic, scrap papers, dry leaves, shreds of cloth etc).

The amount of fuel consumed weekly in 150 families of Manjheeva Sani village is 8944 Kg. Now the question

**Table 2.** Showing per person per day consumption of different fuels in APL and BPL families

| S.No | Types of fuel | Fuel Consumption | BPL Consumption | APL Consumption |
|---|---|---|---|---|
| 1 | Wood | 1. Fuel wood weekly | 730 Kg | 5554 Kg |
| | | 2. % of fuel wood consumption | 71.22 % | 70.14 % |
| | | 3. Wood consumption per day | 104.28 Kg | 793.43 Kg |
| | | 4. Consumption per person per day | 1.32 Kg | 1.17 Kg |
| 2 | Dung Cake | 1. Dung cake weekly | 240 Kg | 1795 Kg |
| | | 2. % of Dung Cake consumption | 23.41 % | 22.65 % |
| | | 3. Dung Cake consumption / day | 34.285 Kg | 256.43 Kg |
| | | 4. Consumption per person per day | 0.43 Kg | 0.37 Kg |
| 3 | Coal | 1. Coal weekly | Nil | Nil |
| | | 2. % of Coal consumption | - | - |
| | | 3. Coal consumption / day | - | - |
| | | 4. Consumption per person per day | - | - |
| 4 | Kerosene | 1. Kerosene weekly | 35 Kg | 350 Kg |
| | | 2. % of Kerosene consumption | 3.41 % | 4.42 % |
| | | 3. Kerosene consumption / day | 5 Kg | 50 Kg |
| | | 4. Consumption per person per day | 0.63 Kg | 0.073 Kg |
| 5 | Ag.Waste | 1. Agricultural Waste weekly | 20 Kg | 220 Kg |
| | | 2. % of Agricultural Waste consumption | 1.95 % | 2.78 % |
| | | 3. Agricultural Waste consumption / day | 2.85 Kg | 31.43 Kg |
| | | 4. Consumption per person per day | 0.361 Kg | 0.046 Kg |
| 6 | Other | 1. Other fuel weekly | Nil | Nil |
| | | 2. % of Other fuel consumption | - | - |
| | | 3. Other fuel consumption / day | - | - |
| | | 4. Consumption per person per day | - | - |
| 7 | Total | 1. Total weekly | 1025 Kg | 7919 Kg |
| | | 2. % of Total fuel consumed | 11.46% | 88.53% |
| | | 3. Total consumption / day | 146.42 Kg | 1131 Kg |
| | | 4. Total consumption per person per day | 1.85 Kg | 1.66 Kg |

**Table 3.** Showing total consumption of types of wood

| S.No | Wood type | Amount consumed (Kg) | Percentage |
|---|---|---|---|
| 1 | *Mangifera indica* | 1197 | 19.05% |
| 2 | *Azadirachta indica* | 190 | 3.02% |
| 3 | *Ipomoea carnea* | 485 | 7.72% |
| 4 | *Zizyphus mauritiana* | 715 | 11.38% |
| 5 | *Madhuca longifolia* | 1730 | 27.53% |
| 6 | *Acacia nilotica* | 1967 | 31.30% |
| 7 | Other | - | |
| | **Total** | 6284 | |

is what is the main fuel used for cooking? The following table will reveal the amount of particular fuel consumed in Kg/litre weekly by the residents of Manjheeva Sani. (Table 1)

The graphical representation given below in figure 1 will clearly reveal which type of fuel is used the maximum.

Among all the 150 families surveyed, on the basis of economic condition or the income earned yearly the families were categorized into Above poverty line and Below poverty line.17 families i.e. 79 people were found to be in BPL and 133 families i.e. 678 people among the total families surveyed were found to lie in APL category. That means 11.33% people are BPL and 88.66%% people are APL. The amount of fuel consumed by these people per person per day(in Kg) is given in the table 2 shown above.

The above table 2 clearly shows that maximum proportion of all types of fuel is consumed by the APL people. Which clearly indicates that the condition is so critical that people even above poverty line also use traditional cooking fuels instead of using LPG, biogas which are the other clean and safe methods of cooking?

It was calculated that among all the fuels wood is consumed the maximum, but which wood is consumed the most in Manjheeva Sani is still a matter of concern. Table 3 will show which wood is consumed the maximum.

From figure 2, it is clear that *Acacia nilotica* is con-

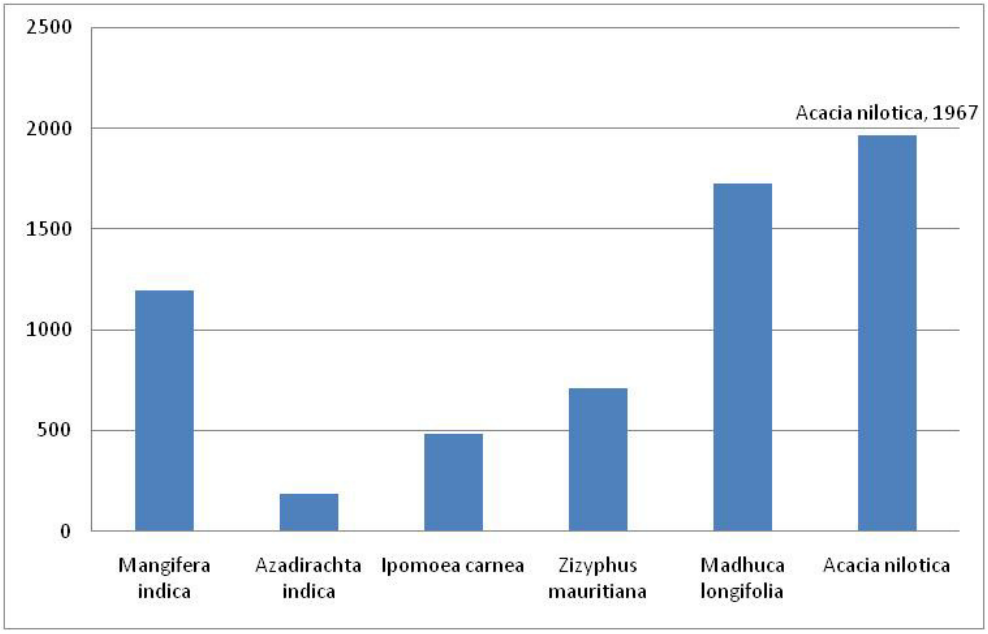


**Figure 2.** Graph showing percentage consumption of different wood.

**Table 4.** Showing per person per day consumption of different woods in APL and BPL families

| S.No | Types of wood | Wood consumption | BPL Consumption | APL consumption |
|---|---|---|---|---|
| 1 | *Mangifera indica* | 1. *Mangifera indica* consumed weekly | 150 Kg | 1047 Kg |
| | | 2. % of *Mangifera indica* consumption | 20.55 % | 18.85 % |
| | | 3. *Mangifera indica* consumption per day | 21.429 Kg | 149.57 Kg |
| | | 4. Consumption per person per day | 0.27 Kg | 0.22 Kg |
| 2 | *Azadirachta indica* | 1. *Azadirachta indica* consumed weekly | 15 Kg | 175 Kg |
| | | 2. % of *Azadirachta indica* consumption | 2.05% | 3.15 % |
| | | 3. *Azadirachta indica* consumption / day | 2.14 Kg | 25 Kg |
| | | 4. Consumption per person per day | 0.027 Kg | 0.03 Kg |
| 3 | *Ipomoea carnea* | 1. *Ipomoea carnea* consumed weekly | 45 Kg | 440 Kg |
| | | 2. % of *Ipomoea carnea* consumption | 6.16 % | 7.92 % |
| | | 3. *Ipomoea carnea* consumption / day | 6.42 Kg | 62.85 Kg |
| | | 4. Consumption per person per day | 0.081 Kg | 0.092 Kg |
| 4 | *Zizyphus mauritiana* | 1. *Zizyphus mauritiana* consumed weekly | 70 Kg | 645 Kg |
| | | 2. % of *Zizyphus mauritiana* consumption | 9.59 % | 11.61 % |
| | | 3. *Zizyphus mauritiana* consumption / day | 10 Kg | 92.14 Kg |
| | | 4. Consumption per person per day | 0.12 Kg | 0.13 Kg |
| 5 | *Madhuca longifolia* | 1. *Madhuca longifolia* consumed weekly | 185 Kg | 1545 Kg |
| | | 2. % of *Madhuca longifolia* consumption | 25.34 % | 27.82 % |
| | | 3. *Madhuca longifolia* consumption / day | 26.42 Kg | 220.71 Kg |
| | | 4. Consumption per person per day | 0.33 Kg | 0.325 Kg |
| 5 | *Acacia nilotica* | 1. *Acacia nilotica* consumed weekly | 265 Kg | 1702 Kg |
| | | 2. % of *Acacia nilotica* consumption | 36.3 % | 30.64 % |
| | | 3. *Acacia nilotica* consumption / day | 37.857 Kg | 243.14 Kg |
| | | 4. Consumption per person per day | 0.47 Kg | 0.35 Kg |
| | Total | 1. Total wood consumed weekly | 730 Kg | 5554 Kg |
| | | 2. % of Total wood consumption | 11.61 % | 88.38 % |
| | | 3. Total wood consumption / day | 104.29 Kg | 793.43 Kg |
| | | 4. Total wood Consumption per person per day | 1.32 Kg | 1.17 Kg |

**Table 5.** Showing % of healthy, unhealthy, treated, untreated population

| S.No | | Percentage |
|---|---|---|
| 1 | % of healthy people | 93.13% |
| 2 | % of unhealthy people | 6.86% |
| 3 | total diseased | 52/757 |
| 4 | People taking treatment | 53.84% |
| 5 | People not taking treatment | 46.15% |

**Table 6**. Showing number of people infected with different types of diseases

| S.No | Types of diseases | No of people | Percentage |
|---|---|---|---|
| 1 | Lung diseases | 9 | 17.30% |
| 2 | Eye diseases | 25 | 48.07% |
| 3 | Both | 0 | 0% |
| 4 | Other | 18 | 34.61% |
| | Total | 52 | |

sumed maximum and *Azadirachta indica* is consumed the minimum in Manjheeva Sani.

Table 4 shows that per person per day consumption of *Mangifera indica* by BPL category is 0.27Kg which is more than the APL consumption ie 0.22Kg, *Azadirachta indica* is consumed less among BPL i.e. 0.027Kg than that of APL i.e. 0.03Kg.Consumption of *Ipomoea carnea* among BPL is less i.e. 0.081Kg than among the APL i.e. 0.092Kg.Again *Zizyphus mauritiana* is consumed 0.12Kg and 0.13Kg among BPL and APL respectively. *Madhuca longifolia* and *Acacia nilotica* are also consumed more i.e. 0.33Kg and 0.47 Kg respectively by the BPL families in comparison to APL families using 0.325Kg and 0.35Kg per day per person respectively. Total consumption per person per day of all types of wood is calculated to be 1.32Kg in BPL families which is more than 1.17Kg consumed by APL population. This clearly proves that per person per day consumption is done more by the BPL person in comparison to the APL man.

## Health outcomes

Biomass fuels in the form of wood crop residues, animal dung cake continue to be the dominant source of cooking energy in India according to the National family health survey for 2005 -06 NFHS (IIPS 2007).

Currently dominant biomass energy technologies for cooking in households and institutions are largely traditional chulhas i.e. mud, stove along with some metal, cement and pottery or bride stoves normally with no operating chimneys or hoods. They have low thermal efficiency i.e. poor extraction of energy contained in the fuel and significant emissions of pollutants which have negative impacts on human health in the households, regional air pollution and climate.

India's stove programme are now focusing in reducing fuel wood consumption and secondarily smoke reduction in Kitchens through chimneys.

The ideal data for the analysis would be the actual exposure levels of individuals but very few studies have conducted personal monitoring of exposures (Schinding et al., 2002).

Smith et al., (2000) writes that the case – control study in Nigeria showed that children with ALRI who came from homes that burnt wood were 12.2 times more likely to die than those from homes that burnt Kerosene / Gas.

Bloom and Zaidi (2002) found that use of traditional biomass fuel is positively and significantly associated with infant mortality, child mortality, crude birth rate, total fertility population growth rate. They show that 10% point reduction in biomass fuel use would decrease the child mortality rate by 4.9 deaths / 10000 live births.

The poor air quality leads to poor health outcomes for both adults and children. The mechanisms by which air quality affects health is usually thought to be through reduced pulmonary functioning leading to acute respiratory symptoms. (Bruce et al., 2000).

According to the data collected through questionnaire number of diseases were reported, some of them are due to indoor air pollution while others are not. They have been categorized into lung diseases, eye diseases, both types of diseases, other diseases (e.g. normal cough and cold, headache, fits, viral fever) etc.

During the visit to these people, it has been noticed that though people are suffering from these diseases since a long time, but even then most of them have never been to the doctor for their treatment. Majority 93.13% of the population was recorded healthy as per their information and only 6.86% were found unhealthy. This

may be due to their unawareness about their health condition.

Among all 757 people only 52 people were reported diseased .Among all the diseased population 53.84% people consulted the doctor whereas 46.15% never went for their health checkup even when they are suffering from either of the diseases mentioned above. (Table 5, 6)

Lung disease includes lung cancer, asthma, tuberculosis, acute respiratory diseases etc and eye diseases noticed are cataract, hypermetropia, myopia, running tears from eyes, itching ofeyes something strange but true that many of them have one or the other problem but they are not aware of their disease.

Regarding this researchers have also found a strong relationship between indoor air pollution and pre-term delivery (Xu et al., 1995) and low birth weight(Wang et. al .1997).Low birth weight was also found to be associated with household exposure to biomass smoke in Guatemala (Boy et.al.2002)

## DISCUSSION

Studies have shown consistent evidence that indoor air pollution from traditional biomass fuel sometimes become so severe that they also badly affect the person's health ultimately leading to death. Indoor air pollution caused by burning traditional biomass fuel especially affects women making food at home and the small children / infants around them while making foods.

The information through survey clearly shows the results of vomiting in infants due to heat in the kitchen and eye, lung diseases to the women involved in kitchen work. The lung and eye problems were more prominent among women in comparison to the man who don't do work in the kitchen. Asthma and other respiratory disorders in Gents are mostly due to use of Cigarette or smoking. The sex ratio in Manjheeva Sani village is found to be 697women:1000 men i.e. women are less in comparison to men.

It was also observed in this village very few only 2% families use LPG for cooking inspite of the fact that the people have better health (Related to eye / lung diseases) in comparison to the women using traditional biomass fuel. Cataract was found to be very common among the ladies using biomass fuel for cooking.

Now practices were done to make people aware of the adverse effects of biomass fuel and to use improved chulhas and LPG and kerosene etc which are less harmful in comparison to biomass fuel. For a country like Kenya in which roughly three – fourths of total energy consumption is supplied by biomass fuels, the implication is that switching completely to non – biomass fuel would definitely lower its child mortality rate by 38% and prevents 54,000 deaths to children before the age of 5 or above 5 years.

Excess use of biomass traditional fuel is not only affecting our health and environment but also indirectly responsible for cutting trees, shrubs etc. The wood demand for cooking only is very high. We can say that if the demand for cooking wood is lowered by adopting any other substitute of fuel, we can conserve our forest also. Near to Banda district there is a district named Manikpur where everyday many quintals of wood is cut down from the forest and sold by them for cooking as well as other purposes which in indirectly affecting our atmosphere and is a serious threat for our health and environment.

Many households also use multiple cooking devices like Kerosene, LPG, stoves in addition to biomass fuel and no current surveys adequately capture this information, leading to uncertainty of fuel – use estimates.

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