

Fuel wood burning and its effect on the environment with Reference to tribal villages of Bolangir, Orissa, India

Authors:

Sarada Prasad Mohapatra

Institution:Lecturer in Botany, S.C.S
College, Puri**Corresponding author:**

Sarada Prasad Mohapatra

Email:

babuni0808@yahoo.co.in

ABSTRACT:

Studies on air pollution due to burning of fuel wood for cooking purpose is alarming day by day in the tribal villages of Bolangir Dist. of Orissa. About 85 household are selected for the study, which burn about 254 tonnes of fuel wood annually. A negative correlation exists between annual income and fire wood consumption of household. Due to heavy use of firewood the health status of women and children are degrading day by day and they are more vulnerable to serious diseases like asthma, skin cancer and other respiratory diseases.

Keywords:

Air pollution, TSP (Total suspended particle), per capita fuel consumption.

Web Address:[http://jresearchbiology.com/
Documents/RA0034.pdf](http://jresearchbiology.com/Documents/RA0034.pdf)**Article Citation:****Sarada Prasad Mohapatra**Fuel wood burning and its effect on the environment with Reference to tribal villages
of Bolangir, Orissa, India.

Journal of research in Biology (2011) 2: 135-139

Dates:**Received:** 21 May 2011 / **Accepted:** 26 May 2011 / **Published:** 23 June 2011

© Ficus Publishers.

This Open Access article is governed by the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which gives permission for unrestricted use, non-commercial, distribution, and reproduction in all medium, provided the original work is properly cited.

INTRODUCTION

Indian tribal villages mainly depends on non commercial fuel such as fire wood, branches, crop residues etc for their cooking purpose due to the availability of fire wood in the near by forests. Due to the heavy use of firewood for cooking the air become polluted in the tribal areas causing a lot of health hazards to the respondents. In the tribal dominated villages of Bolangir, the problems of air pollution associated with burning of fuel wood for cooking have not been systematically studied. Consequently an attempt is made to examine the fire wood consumption and air pollution in rural areas with reference to tribal areas.

OBJECTIVE

The objectives of the present study are

1. To measure the amounts of fuel wood, crop residues and cattle dung used for cooking.
2. To estimate the amount of pollutants emitted from the burning of these fuels.

STUDY AREA

Three tribal panchayats such as Chikalbahal, Kudasingha, Bhutiyarbahal were selected for study consisting eleven villages. It comes under Bolangir district of Orissa, out of the three panchayats, large forest area is seen in Chikalbahal and the total forest area is about 45 ha.

The total population of the panchayats are approximately 2000, more than 65% of the total population belongs to tribal community. Out of 6 million tribal, about 62 notified tribes are seen in Orissa (Mohapatra, 1993). Tribal like sangara, kondha, gond etc. dominates the villages of tribal panchayats. Agriculture is the main stay of the panchayat. Some of the important crops cultivated are paddy, sorghum and ragi. The sole industrial unit located in the panchayat is a rice mill. For transportation villagers rely on bicycle and state owned buses. Private automobile are absent. As a result noise and air pollution from automobile is non-existent.

METHODOLOGY

To measure the level of energy consumption, a survey was conducted at household level in the eleven villages during October and November 2009, the households were selected at random and roughly 10% of the household from each village was included in the survey. In all 85 households were selected. The household and energy consumption detail were gathered from the heads of the household. When the particulars pertaining to cooking energy consumption was

asked, invariably the heads of the family sought their wives help to answer such questions. In some instance, the wives or female in the household intervened and replied to other questions as well. Randomly some household were requested to keep aside the quantity of fuel wood required daily for cooking which was then weighed and the values noted on the schedule. The selective random weighing helped to verify and correct the fuel wood consumption figure. Care was taken to include household from different caste groups, income groups and farm sized holding. From the information collected particulars of the amount of firewood and crop residue consumed for cooking were grouped under village wise and income wise categories.

The direct burning (i.e direct combustion) of fuel wood and crop residue for cooking emits pollutants (Moorthy, 1990). Based on emission factors as reported by Joshi et al, the total amount of pollutants emitted by each village in the panchayats was calculated.

RESULTS AND DISCUSSION

Type and amount of fuels used for cooking:

All the 85 households use firewood for cooking. Only two households buy firewood while the rest collect firewood from the surrounding forest free of cost. Only one household uses crop residue (0.12 ty^{-1}) along with firewood for cooking, hence it has not been included in **Table 1 to 3**.

The household consumes 254tonne of firewood (Table-1) and 0.12tonne of crop residue per year. It was observed that the practice of burning dung cake for cooking is absent in the villages of the panchayats. Per capita consumption of fuel used for cooking is 590 kg annually. The high level of per capita consumption of firewood can be attributed to altitude, prevailing climate, availability of fuel wood free of cost and prevailing water condition. When the respondents were asked to give reason for the high level of fire wood consumption they replied that enough fuel wood was available in their area and also due to hardness of water more time was required to cook food.

Fuel wood consumption and air pollution-village wise results

Among the eleven villages Rajamunda has the highest level of emission because it consumes the maximum fuel wood (Table-1). 10 household in Rajamunda burn 33tonne of fuel wood, there by emitting Carbon Monoxide in the range of $427\text{-}2234 \text{ ty}^{-1}$ and TSP (Total suspended particle) of 36-



Table 1. Village- wise fuel wood consumption in the panchayat

Sl. No.	Name of the Village	Number of sampled Households	Members in the Households	Annual fuel wood consumption (Kg)	Annual per capita fuel consumption (Kg)
01.	Chikalbahal	12	49	31025	633
02.	Phatkera	3	15	12775	852
03.	Bandha Keda	5	32	19717	616
04.	Kuda Singha	10	51	30660	601
05.	Nuapada	9	55	30295	551
06.	Dhanaradadar	5	24	13140	548
07.	Siris	5	24	12410	517
08.	Kuthurla	10	44	27080	616
09.	Nuniadhipa	4	18	12045	669
10.	Raja munda	10	50	32850	657
11.	Bhutiarybahal	12	69	32485	471
Total		85	431	254482	591

125 kgy⁻¹ (Table-2). For Bhutiarybahal village the estimate of CO and TSP range from 422-2209 kgy⁻¹ and 36-123 kgy⁻¹ respectively. It is interesting to observe that Bhutiarybahal does not rank first in fuel wood consumption or in the emission of pollutants even though the village has the highest number of members i.e. 69 in the sampled houses.

Its per capita fuel wood consumption is also low (471 kg y⁻¹) when compared to other villages of

the panchayat. As far as emission of pollutant is concerned Nuniadhipa village has the lowest level of emission because the fuel wood consumption is the least in this village. The average emissions of CO and TSP for the panchayat are 3308-17305 kgy⁻¹ and 280-968 kgy⁻¹ respectively.

It is an established fact that pollutants emitted by firewood burning can cause eye ailments, respiratory diseases and cancer (Parikh,

Table 2. Village- wise emission of major pollutants in the panchayat

Sl. No.	Name of the Village	Range of amount of pollutants emitted by fuel wood burning (Kg)					
		Carbon Monoxide			Total suspended particles		
01.	Chikalbahal	403	-	2110	34	-	118
02.	Phatkera	166	-	869	14	-	49
03.	Bandha Keda	256	-	1341	22	-	75
04.	Kuda Singha	399	-	2060	34	-	117
05.	Nuapada	394	-	2060	33	-	116
06.	Dhanaradadar	171	-	893	14	-	50
07.	Siris	161	-	844	14	-	49
08.	Kuthurla	352	-	1841	30	-	103
09.	Nuniadhipa	157	-	819	13	-	46
10.	Raja munda	427	-	2234	36	-	125
11.	Bhutiarybahal	422	-	2209	36	-	123
Total		3308	-	17305	280	-	968

Note: Estimates of pollutants based on emission factors reported by Joshi et al., 1989.

Table 3. Income group-wise fuel wood consumption and emission of major pollutants in the panchayat

Total monthly income (Rs)	Number of households sampled	Annual fuel wood Consumption (Kg)	Range of amount of pollutants emitted by fuel wood burning (Kg)	
			Carbon Monoxide	Total suspended particless
Upto 300	15	34310	446 - 2110	34 - 130
301 - 600	25	72453	942 - 4927	80 - 275
601 - 1200	29	89308	1161 - 6073	98 - 339
1200 - 2400	14	51472	669 - 3500	57 - 196
above 2400	2	6940	90 - 472	8 - 26
Total	85	254482	3308 - 17305	281 - 966

Note: Estimates of pollutants based on emission factors reported by Joshi et al., 1989.

1976). Housewives and children are especially vulnerable because during the period of cooking they are mostly confined to the houses. The WHO has cautioned the developing countries including India, Bangladesh, Burma, Fiji, Nepal and Thailand against fuel wood consumption and health hazards.

Fuel wood consumption and air pollution- Income group wise

An exercise was undertaken to ascertain which income group consumes the largest amount of fuel wood and there fore emits higher amounts of pollutants. The households were grouped according to the income level. Care was taken to include income from all sources and income of all earning members in each family. Only a few respondents in this tribal belt get their income in kind. Such income was converted to monetary terms. After making five arbitrary income groups, the fire wood consumption and the emission of the pollutant in each income group were calculated (**Table-3**)

Result of the survey indicates that 29-house holds with a monthly income between Rs 601-1200 burn 89 ty^{-1} of CO and $98\text{-}339 \text{ kgy}^{-1}$ of TSP. The two households under the category of income more than Rs 2400 per month emit lesser amount of CO ($90\text{-}472 \text{ kg y}^{-1}$) and TSP ($8\text{-}26 \text{ kgy}^{-1}$) by burning 7tonne of fuel wood per annum. A correlation analysis of the relationship between income level and fire wood consumption shows that the income and the fire wood consumption are negatively correlated($r = - 0.11$). Since fuel wood consumption is directly related to emission of pollutant it can be concluded that income and emission of pollutant are negatively correlated.

CONCLUSION AND SUGGESTIONS

In the panchayat (predominantly a tribal area) almost 99% of the house hold use fire wood for cooking which is procured free of cost from the forest. The practice of burning dung cake for cooking is non-existent. The sampled 85-house holds (sample size 10%) emits $3308\text{-}17305 \text{ kgy}^{-1}$ of CO and $280\text{-}968 \text{ kgy}^{-1}$ of TSP from burning of 254tonne of fuel wood.

The following suggestions can be considered to minimize the air pollution and health hazards owing to fuel wood combustion.

1. To avert the health hazards related to fuel wood consumption, the poorer section of the tribal area can be given improved stoves with chimneys (i.e. smoke less earthen stoves) free of cost through Integrated Rural Energy Planning Scheme. The other groups can be provided with subsidized improved stoves.
2. The villagers should be educated on the role of proper ventilation in controlling smoke and health hazards.
3. To reduce fuel wood consumption and its related air pollution problems, the low and middle income group can be desisted from using earthen pots instead they can be given energy saving utensils (made of Aluminium), pressure cooker and energy efficient stoves. The higher income group can be encouraged to switch over to biogas and provided with loans and subsidy to buy cattle and install biogas plants.



ACKNOWLEDGEMENT

We are thankful to the tribal of the villages, revenue officer, panchayat secretary of the study area for their valuable information about the use of fuel wood and the source of fuel wood, Sincere thanks to staff of Rajendra College, Bolangir for their active co-operation.

REFERENCE

Joshi V, Venkatraman C, Ahuja DR. 1989. *Emission from burning bio-fuels in metal cook-stoves*, Environment Management 13(6):763-772.

Mohapatra S 1993. The tangled web tribal life and culture, Orissa sahitya Academy publ. BBSR 1-148.

Moorthy RC 1990. Indian Energy Scenario, Yojna, 34:4-6.

Parikh J. 1976. *Environmental Problems in India and their future trends*, New Delhi, Department of Science and Technology, Government of India.