Cooking in a semi-rural area in Sudan, A case study in al-Sororab

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Key word: Solar, Cookers, Biomass, Stoves, Environment

Abstract: Billions cook by burning biomass fuels in conventional stoves, which results in the release of smoke that causes many diseases, and excessive tree cutting. But, what is the adequate cooking solution in countries where people can not afford to buy a cleaner type of fuel? The fact that most of those who use biomass for cooking live in hot countries makes solar cooking perhaps the most suitable technique.

Introduction:

One of the most important usages for energy is food preparation. Approximately half of the world and up to 90% of the rural areas in developing countries do not have access to clean fuel for cooking and they depend on biomass energy (WRI,1999), as a result of the high cost of other types of energy. The lack of clean and cheap cooking fuel affects environment, national development and people's health and financial status. People in poor areas who use traditional biomass fuel suffer from bad indoor air quality as they burn it in inefficient traditional stoves. The provision of adequate supplies of energy in suitable forms and at acceptable prices is an essential prerequisite for most socio-economic development activities.

The reason behind searching for a clean and environmentally friendly alternative for biomass fuel is not just to improve the health through reducing the level of smoke produced by burning the fuel but also to; decrease the expenses of fuel, ensure the availability of fuel as sometimes people face a deficiency on biomass fuel, reduce the environmental problems related to the excessive trees cutting and burning like; deforestation, desertification, global warming, etc

It is thought that solar energy is a good cooking fuel option that can be used besides or instead of the biomass fuel, as it is free an environmental friendly fuel. But, are the achieved benefits of using solar cookers enough to encourage people to use them instead of what they used to use? Some trials on using of solar cookers had failed and concluded that sometimes the great expectations on the use of renewable resources may be unrealistic.

Study aims:

The principal aim of this study is to test the use and acceptance of solar cookers, as a possible solution for reducing the use of biomass. It is concentrates on the sustainability aspects of such a change, by covering, social, environmental and economic impacts considering impacts on end users to the entire country. Secondary aims are to discover the level of indoor air pollution from the use of traditional ways of cooking and its effects, through the monitoring of carbon monoxide (CO) in households and the level of exposure according to; different types of cookers and fuel used, differences between seasons, house ventilation, cooking behaviours and personal differences.

Sudan:

The area of the study (Al-Sororab) is a semi-rural area in Sudan which is one of the top 20 countries that have a good potential for the use of solar cookers according to the international solar cooker community. It is a semi-desert place where plants rarely found and some tribes herd camels.

Sudan has signed: 1) Convention on Biological Diversity, 2) United Nations Framework Convention on Climate Change, 3) Kyoto Protocol, Convention to Combat Desertification , 4) and CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna)

According to (FOA), from 2005 deforestation is a serious problem in the country. Forests, about 97.7% of them are public, cover about 28.4% of Sudan's land area; about 67,546,000 hectares. Of these 44.9% are classified as production forest that contains natural exploitable forests and plantation forests. Between 1990- 2005, Sudan's total deforestation rate was about 0.8% per year; meaning it lost an average of 589,000 ha of forest annually. During 2005 about 22 million m^3 wood has removed, 20 million m^3 of this was used as wood fuel.

Methodology:

Literature review: The wide ranging literature review gathers data on studies of the effect of using biomass fuel and stoves on health, people life and the environment.

Pilot study: was made to assess the current situation in homes in Al-Sororab, between (1st of June & 31st of Aug- 2005), test and develop the adequacy of research instruments, establish whether the sampling frame and technique were effective, identify logistical problems which might occur by using proposed methods, determining what resources (finance, staff) were needed for the planned study and to help in finding funding bodies by showing that the research team was competent and knowledgeable and that the main aims of the study are feasible and worth funding.

Survey methods;

Following the pilot study the tested methods to be used in the main study are:
a) Monitoring for the level of CO beside the cooking areas.
b) Monitoring of level CO that cooks are exposed to.
c) Interviews with cooks

Main study: Based on the results of the pilot study, this is going to be carried out in two stages;

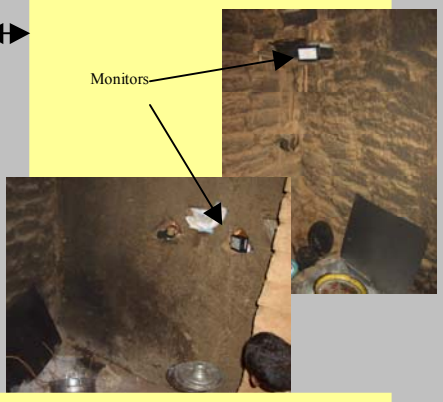
1st stage: repeating the tested and modified methods of the pilot study in a wider sample and for a year (2006) to see differences during two seasons; winter (December to February) and summer (April to July) .

2nd stage: This is the intervention part of the study, solar cookers will be provided to half of the sample the other half remains as a control group. Solar cookers will be introduced in two different ways after divided the solar group in two to see the effect of the different ways of introducing new technology in peoples' acceptance and use. Both solar and control groups will be followed for a year.

1) Interviews with twenty-five cooks were carried out to understand their personal, household, fuel consumption and health conditions which help to find out if health problems, personal differences, patterns of cooking and the fuel consumption were related to indoor air pollution. Also sketch plans of kitchens were drawn to show layout, fire & opening location, number and size.

2) To evaluate the indoor air quality in the cooking area, CO mini-loggers (ICOM) had been used to monitor the twenty-five cooking areas used by the cooks that were interviewed. The ICOM carbon monoxide monitoring device is a low cost, highly accurate, data logger. It monitors carbon monoxide (CO) every minute and stores an average CO reading every 15 minutes. Also it records air temperature. It is physically small, approximately the size of 2 cigarette packets. It is rechargeable and requires no programming to start, just switching on (Croxford, Fairbrother, 2005).

Each monitor had been located near a fire or cooker for a period between 7 to 10 days. Some times it was not easy to find a good location as the fire was on the ground and there were no shelves, decks or anything to suspend or carry monitors, besides, children and small animals; like chickens entered the area and might damage monitors.



Results:

Summary of carbon monoxide and temperature monitoring results for 15 houses.

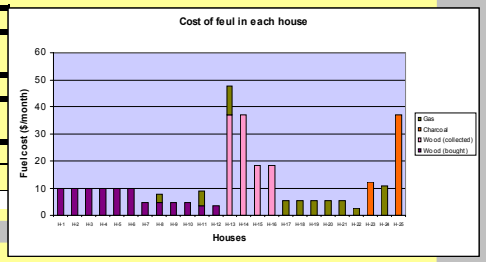
Type of cooking	Average CO (ppm)	Max. CO (ppm)	WHO 8 hour excee-dances (hrs)	WHO 1hour excee-dance (hrs)	WHO 30min exceed-ances (hrs)	Avg. Temp. (deg C)
Open-fire (7houses)						
Average	6.8	57.4	49.4	12.2	5.9	34.0
Improved stove (Canoon) fuelled with wood or coal (2 houses)						
Average	3.8	51.2	17.1	6.3	3.5	36.5
Gas Cookers + open-fire (2 houses)						
Average	6.6	73.5	69.1	12.2	6.8	34.8
Gas Cooker (4 houses)						
Average	1.3	15.6	0.0	0.0	0.0	36.3
Avarages						

* only 15 monitors had succeed to read level of CO inside the kitchens

The majority of the houses used more than one, both coal and wood were considered expensive fuel. It seemed that the movement towards cleaner fuel was fast in the area as about 60% of the sample was using open fire only before their current cookers and only 12% had gas cookers but at the time of the study houses which had gas cooker were 44% and houses which used open fire only was 28%.

Drinking tea was very important in the area and it was made all through the day, starting in the early morning (5 or 6 am). The average provision of food was three meals per day. Breakfast was cooked between 8 - 9.30 am, lunch was cooked between 12 - 3.30 pm, and supper was prepared at 6 - 7.30 pm which was usually milk or a cold meal. Boiled food was the main food in the area, 32% of the cooks made fried food and about 12% only cooked baked food

Comparing health with the type of fuel showed that people in the houses that used gas fuel only had better health than people lived in houses used wood only.



Conclusions

People in the area did not care about the effect of cutting trees and burning traditional biomass on the environment, they only concern about the cost which was expensive for them. This could be noticed from the poor utilization of the freely collected wood. Cooks did not kill the fire after they finished cooking and they would use a lot of wood even though they did not need it, if they were not going to pay for having wood.

On the other hand, women and children were at high risk of smoke exposure from burning biomass as cooks and most infants spent all the cooking period near the fire. The risk decreased in male children between 1 to 5 years as only 20% of this group still stayed near their mothers during the cooking period. Moreover, comparing health with the type of fuel showed that health appeared better, if people used cleaner fuel. People in the houses that used gas fuel only had better health than people lived in houses using wood only. People in wood houses seem to suffer more from diseases related to indoor air pollution; like ARI or ALRI.

From the monitoring result we conclude that to reduce the level of CO in cooking areas; people should stop using open-fires even if they were using it with another type of cookers. E.g. the average CO in housing used open-fire and open-fire with gas-cooker was similar.

We also assumed that solar cookers might be implemented in the area easily as:
Most CO peaks which showed the time of cooking happened during the sunny hours between 5.30am and 6.00 am which made the use of solar cookers very acceptable as most of cooks did not cook at night time.
People already used to deal with more than one cooker, which means they will find it easy to use the solar cookers at day times and use other type of cookers at night times.
The movement towards cleaner fuel (gas) is very fast in the area, this means people might accept to have new technologies very easy.

Selected references: Smoke – the killer in the kitchen. Indoor air pollution in developing countries. Hugh Warwick and Alison Doig.
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