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**Efficient Fuelwood Use as a Strategy to Reducing Household Pressure  
on Natural Forests of Guinea Savanna Zone of Nigeria**

**FINAL REPORT**



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## **EXECUTIVE SUMMARY**

The aim of the study is to understand the socio-economic factors in selected rural communities of Guinea Savanna zone of Nigeria that may affect adoption and utilization of efficient cookstove prior to introduction. The project targeted rural households located in the Guinea Savanna zone of Kwara State where charcoal production and firewood collection by households is highly predominant.

Women and girls are most responsible for the firewood collection in the communities. The firewood collections are carried out freely in the wild, twice a week and within the distance of 2 km to the communities. Firewood is mainly used for cooking in the communities. Charcoal was not used by household as much as firewood. Kerosene was only use to start firewood while none of the sampled people indicate the use of agricultural waste, electricity, cooking gas (Liquefied Natural Gas) and briquette for domestic cooking. Further interview revealed that firewood collection is difficult in the rainy season than dry season. However, firewood collection in the nearby forest is decreasing and the people have to travel farther distance to get the firewood.

On location of local cooking stoves (mainly three stones) in households, majority of the stoves are located in kitchen detached from the main building followed by those that have their stove in open space outside the house. Only a few of the households have their cooking stoves in the living room. This means that rain will affect some coming during rainy season and this will be considered during introduction of the improved cookstove to the people.

Almost all the sampled women agreed to change from their current three stones inefficient cookstove to improve and efficient cookstove proposed by the research team. However, the women preferred improved cookstove that is using firewood. The major reasons for this preference were affordability and free accessibility to firewood.

Virtually, all the sample women indicated their interest to participate in the second stage of the project which is on introduction of the improved cookstove to households.

## **1.0. INTRODUCTION**

### **1.1. Background to the Study**

Around the world, over two billion people rely on burning solid fuels (wood, dung, crop residue, garbage, or coal) for cooking, heating, and lighting (IEA, 2010). Generally, fuelwood is used in open fires, which, apart from having low energy efficiency, are a source of indoor air pollution with serious health effects, particularly on women and small children (Barnes *et al.*, 1994; Bates *et al.*, 2005; Saatkamp *et al.*, 2000; Smith *et al.*, 2000). Inefficient cookstoves have been reported to cause air pollution resulting in premature deaths of nearly 600,000 in Africa each year, in addition to other associated implications on environment and biodiversity loss (WEO, 2015).

The main criterion for judging the relative success of diffusion interventions by an intervening or change agency is usually the rate of adoption of an innovation, which is the number of people or families acquiring an innovation (Rogers, 2003). However, the degree of use of innovation is an important but often overlooked component in determining the extent of diffusion of an innovation (Pine *et al.*, 2010).

Over-exploitation of woody species in Guinea Savanna zone of Nigeria for domestic fuelwood is a threat to biodiversity loss. The use of inefficient biomass cooking devices also has direct implications on household health. The study is therefore based on the premise that the use of improved cooking technology by rural households will directly lead to efficient use of fuelwood energy, reduce the quantity of fuelwood used, and subsequently reduce the pressure on natural forests. Furthermore, improved cook stove will contribute to welfare of households by reducing the burden of firewood collection, reduce indoor air pollution and associated health implications.

### **1.2. Problem Statement**

Adoption and utilization rates of improve cookstoves still remain low in developing countries (Manibog, 1984; Rosa *et al.*, 2014; Shankar *et al.*, 2014). Economic barriers to purchasing and maintaining non-traditional stoves have inhibited adoption (Makame, 2007; Gordon, 2007; Edelstein *et al.*, 2008; Bhattari and Risal, 2007; Bazilian, 2011; Person, 2012). In some situations where the efficient stoves were freely given or through subsidies, users do not adopt or sustain exclusive use (Rosa *et al.*, 2014; Troncoso *et al.*, 2007; Romieu *et al.*, 2009). This means that there are other non-economic factors that influence stove adoption and sustain use (El Tayeb Muneer and Mukhtar Mohamed el, 2003; Ruiz-Mercado *et al.*, 2011).

Existing research on improved cookstoves has mainly focused on technology development or measuring the environmental effects of burning solid fuels (Johnson *et al.*, 2009; Smith *et al.*, 2000). The low durability of previous improved cookstove designs has also resulted in abandonment by some rural communities (World Bank, 2011). In the cookstove design and production, there has been overlooked of social aspects of rural life such as traditional cooking practices, and understanding of the implication of these practices on adoption and utilization (Manibog, 1984; Ruiz-Mercado *et al.*, 2011; Barnes, 2014; Bielecki and Wigenback, 2014).

From the foregoing, it is pertinent to understand the socio-economic factors in the rural area that may affect adoption and utilization of efficient cookstove prior to introduction. Also, the livelihoods of the rural communities needed to be properly studied and understood. Most

importantly, the design and production of the efficient cookstoves should be adapted to available rural resources and local setting.

### **1.3. Objectives of the study**

The aim of the study is to understand the socio-economic factors in selected rural communities of Guinea Savanna zone of Nigeria that may affect adoption and utilization of efficient cookstove prior to introduction.

Specific objectives of the study include:

- 1) Collect information on person responsible for cooking in households.
- 2) Investigate the type of fuelwood energy as well as available clean alternative energy used by the households.
- 3) Determine sources of fuelwood and frequency of collection by households.
- 4) Investigate location of cooking unit / kitchen and cooking devices in households.
- 5) Deduce the challenges and implication of fuelwood energy use in households.
- 6) Seek consent to participation in Awareness Campaign leading to second stage of the project.

## **2.0. METHODOLOGY**

### **2.1. Project Location and Respondents**

The project targeted rural households located in the Guinea Savanna zone of Kwara State where charcoal production and firewood collection by households is highly predominant. Information obtained was that women are responsible for cooking and collection of firewood in the study area. Hence, the study is focused on women as the main respondents, and they will be sampled in households. However, the location and the targeted respondents will be confirmed through a reconnaissance survey.

### **2.2. Identification and Selection of Communities for the Project**

Visits were made to a number of communities in the Guinea savanna zone of Kwara State. However, the local village that met the stated criteria for implementation of the cookstove project was *Bukola* village. The village is located in Ilorin East Local Government Area with headquarters in Oke Oyi.

*Bukola* village has three communities under it and they include *Oha Meje* Community, *Budo Are* Community, and *Akewusola* Community. The three communities share a lot in common from their location in the remote area to culture which is mainly Yoruba, and religion mainly Islam. The road leading into the communities are untarred and rough. The communities jointly owe a secondary school. They also jointly share electricity lines; although the people informed that they rarely have constant electricity supply.

With about 150 houses, *Oha Meje* is the most advanced of the three communities. The community has a primary school, modern building, and mosques constructed with cement blocks. The community gets its water from manual borehole. There are also modern toilets in some of the buildings. The community also has a central diesel generator bought and donated by descendants of the community based and working in the cities. Other smaller communities that

together form *Oha meje* include *Oha Issa*, *Oha Gbagi*, *Oha Igbanan*, *Oha Osin*, *Oha Gbogun*, *Oha Temidire*, and *Oha Ajanaku*. Each of the *Oha*'s has its leader known as "*Mogaji*" and subject to the superior leader known as "*Baale*".

*Akewusola* community is next in term of development to *Oha Meje* community with about 60 houses comprising both concrete blocks and mud houses. The community has a big overhead water tank with borehole and electric water pump. The community is headed by a *Baale* and two *Magaji*'s each for its smaller communities: *Araromi* and *Obate*.

*Budo Aare* on its own is the least developed with about 30 houses dominated with mud houses. It has its *Baale*, and one community, *Isale Osin* with its *Mogaji*. The community also has manual borehole as one of the sources of his domestic water.

### **2.3. Meeting with the Community Leaders**

On arriving at each of the communities, the house of the community leaders, mainly the *Baale*, was first requested for. On meeting the *Baale*, the project goal is properly explained. Most especially, the leaders were informed of the advantage of the proposed efficient cookstove to be introduced. Some of the advantages of the cookstove include cooking convenience for women, reduction or prevention of pollution through smoke from firewood, reduction in the frequency of firewood collection, among others. The project also has the potential of contributing to community development through the incorporation of youth in the later part of the project that involves the production of efficient cookstove compactible to available local resources.

All the leaders of the three visited communities welcomed the project idea and gave their full support for its implementation.

### **2.4. Design of Tool for Data Collection**

The tool adopted for data collection is a structured questionnaire. The questionnaire was adapted from the toolkit developed for the baseline in-person user social impact survey (Global Alliance for Clean Cookstoves, 2016). Mainly the questionnaire focused on the following:

- Demographic information of the respondents;
- Cooking dynamics, and tasks in household;
- Fuel procurement (including expenditure, time use, drudgery, and safety);
- Alternative clean energy;
- Income earned through use of current cookstove;
- Level of satisfaction with their current cookstoves;
- Cooking safety and health; and
- Consent to participation in Awareness Campaign leading to second stage of the project.

### **2.5. Pre-test of the Drafted Questionnaire**

Pre-test of the structured questionnaire was carried out in the three communities during the reconnaissance survey. This is to confirm the validity and reliability of the drafted questionnaire. Focus group discussion was adopted for the pre-test survey.

## **2.6. Data collection**

The data collection was carried out in *Bukola* community, which comprises of other communities such as *Oha Meje*, *Budo Are*, and *Akewusola*. Base on the information obtained during the reconnaissance survey, the visits to the communities for data collections were scheduled on days and periods that the women will be available. Most importantly, the visits were not fixed for market days when the women will not be available. The contacts obtained in the communities also assisted in fixing the visit days. On the days of visit to the communities, the *Baale* (Local Chief) in each community was first visited. The *Baale* then assisted in creating awareness of the presence of the research team and assembling of the women for the data collection. In most cases, women were assembled under trees and the research team attends to them one-on-one for questionnaire administration. For women who cannot come out due to reasons such as old age, among others, the research team met them in their respective homes for the questionnaire administration and interview. The data obtained through the questionnaire were supplemented through the interview.

## **2.7. Sampling Population**

In all, 74 women were sampled from households in the three (3) communities. The sampled women were the one that carried out cooking in the households.

## **2.8. Proposed mud stove**

Based on the lessons learned in the previous cookstove projects, mud stove was adopted for this project. This was due to its ease of construction using available local resources. The mud stove is also effective more than the three stone and easy to maintain. For easy understanding of the proposed mud stove technology the research team plan to introduce, picture of the mud stove (Figure 3) was produced and shown to the women prior to the questionnaire administration.

## **3.0. RESULTS**

### **3.1. Foods cook and eaten by households**

All the visited households eat mainly starchy food. These are made from rice, corn, cassava, yam, millet, sweet potatoes, guinea corn and plantain. The people plant almost all the food they eat, except few like rice. They also plant and eat some vegetables such as okra, spinach, tomatoes, pepper, among others.

All the vegetable soups are also cook by the households before eaten. An average family indicated that they eat starchy foods almost every day of the week. Some of these foods, for example fresh maize and potatoes, are eaten mostly during rainy season. Some raw foods are further processed to make their availability all year round. For instance, maize, yam, cassava, potatoes, guinea corn are dried and grind into powder to last longer and available all year round. Cassava could be processed and cooked over fire to form dry rough power popularly called gari. This is popular across the country. When it's time to eat these processed food stuff, they have to be cooked over fire.

Processed and packaged starchy food such as Semovita, spaghetti and noodles are also eaten by majority of the households. Major sources of protein include beans, fish, meat (chicken, cow and

goat). Chicken and goats are kept by the people and raised under free range system. All these foods are also cooked before eaten. Some fruits like plantain are also fried or cooked.

In summary, all the foods eaten by the people, except fruits, undergo cooking and take quite some time as well as biomass energy to cook. On the average, most of the food cooked for as much as one to two hours.

### **3.2. Who is responsible for cooking in households?**

Since the project is based on cooking in households, the question on who is responsible for cooking was first asked. About 81.1% of the sampled women indicated that women (wives) are responsible for cooking in their respective households. This was followed by female teenagers and/or girls who either carried out the cooking or assisted their mothers in cooking. None of the women indicated that their husband carry out cooking (Table 1).

The visited communities are typical Yoruba communities where women (mainly wives) are responsible for cooking in homes for their husband and children. Female teenagers and girls are expected to assist their mothers in cooking. Teenage female and girls are to be involved in cooking as a way of training them for the future responsibility in their respective homes. Husbands and male children are seen as “household head” or “head in making” respectively and are not to involve in cooking. Some women added that it will be consider a “taboo” to see their husbands carrying out cooking for them.

Table 1: Who is USUALLY responsible for cooking in your household?

Person responsible	Frequency N=74	Percent
Women (wives)	60	81.1
Men (husbands)	0	0
Female teenager / girls	12	16.2
Male teenager / boys	2	2.7
Everyone in the house	0	0

### **3.3. People living in household**

From the result presented in Table 2, the overall households have more female (131 individuals) than male (99 individuals). In terms of number of individuals per households by age, the highest was one adult female (51 individuals), followed by one adult male (36 individuals). For the offspring, there were more one female teenager (20 individuals) between ages 10 and 17 years, followed by one child ((16 individuals)) between ages 0 to 9 nine years.

From these results, it could be inferred that majority of the sampled households have more female adult, teenager and children than the male counterpart.

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**Table 2: Number of people living in household**

Number of individual in household	Male									Female							
	Teenagers		Children		Adults		Total for Male		Total for Female	Children		Teenagers		Adult		Total for Female	
	(10-17 years)		(0-9 years)		(18 and above)		Freq	Percent		(0-9 years)		(10-17 years)		(18 and above)			
	Freq	Percent	Freq	Percent	Freq	Percent			Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq
1	12	38.7	13	41.9	36	97.3	61	61.6	16	21.6	20	27	51	68.9	87	66.4	
2	10	32.3	10	32.3	1	2.7	21	21.2	5	6.8	3	4.1	17	23	25	19.1	
3	4	12.9	6	19.4	0	0.0	10	10.1	4	5.4	4	5.4	3	4.1	11	8.4	
4	2	6.5	1	3.2	0	0.0	3	3.0	4	5.4	2	2.7	1	1.4	7	5.3	
5	1	3.2	1	3.2	0	0.0	2	2.0	0	0	0	0	0	0	0	0.0	
6	0	0.0	0	0.0	0	0.0	0	0.0	0	0	1	1.4	0	0	1	0.8	
7	2	6.5	0	0.0	0	0.0	2	2.0	0	0	0	0	0	0	0	0.0	
Total	31	100.0	31	100.0	37	100.0	99	100.0	29		30		72		131	100.0	



### 3.4. Cooking stoves used in homes

As presented in Table 3, majority of the households (70.3%) use “three-stone” as their main cookstove. This was followed by traditional charcoal cook stove (12.2%). None of the households use cooking gas and electric stove. From this results, it could be deduced that majority of households used firewood for cooking in their homes. Only few used charcoal and kerosene while none use electricity and cooking gas.

Table 3: Cooking shoves used by households

Types of cooking stove	Frequency N=74	Percent
Three-stone fire	52	70.3
Fixed mud stove	5	6.8
Local improved cook stove	1	1.4
Traditional charcoal stove	9	12.2
Kerosene stove	7	9.5
Cooking gas	0	0
Biogas stove	0	0
Electric stove	0	0
Briquette stove	0	0

### 3.5. Location of cooking device in households

More than 40% of the households have their cooking stove located in kitchen detached from the main building. This is followed by those that have their stove in open space outside the house (31.1%). A few of the households (6.8%) have their cooking stoves in the living room (Table 4).

Table 4: Location of cooking stove in households

Locations	Frequency N=74	Percent
Inside living room	5	6.8
Open space outside the house	23	31.1
Under shelter outside the house	7	9.5
Kitchen attached to the house	6	8.1
Kitchen detached from the house	30	40.5
Combination of two of the above	3	4.1

### 3.6. Fuelwood Utilisation by the Households

#### 3.6.1. Firewood collection

From the results of people responsible for collection of firewood in household (Table 6), women and girls (80%) were most responsible for the firewood collection. Many of the sampled women (more than 90%) indicated that the distance of the firewood collection is below 2 km to their respective communities. Majority of the sampled women indicated that they collect firewood from the wild twice a week (70.3%). Those that collected once were 20.3%. None of the women indicated daily collection of firewood (Table 5).

On the exception, men (husbands) do not normally collect firewood. Some old women were assisted by their neighbours and other people to collect firewood.

Although, further interview revealed that the nearby firewood are getting decrease and the distance is increasing farther from the communities. Collection of firewood is also affected by season of the year. During dry season, firewood collection is easier than rainy season. Also, the distance of collection is less when compared with rainy season. The reason is that people can easily get dry wood in dry season, and when wet wood are left for few days, it can quickly dry up and use as firewood.

Table 5: Firewood collection by the households

Firewood collection	Frequency N=74	Percent
People mostly gather firewood in households		
- Men (husbands)	0	0
- Women (wives)	20	27.0
- Female teenager and girls	14	18.9
- Women and girls	25	33.8
- Boys and male teenagers	11	14.9
- Others (neighbor, helpers, etc)	4	5.4
Distance to firewood collection (Km)		
- 0 - 0.5	56	75.7
- 0.6 - 1.0	9	12.2
- 1.1 - 1.5	3	4.1
- 1.6 - 2.0	3	4.1
- 2.1 - 2.5	1	1.4
- 2.6 - 3.0	1	1.4
- 3.1 - 3.5	1	1.4
- 3.6 - 4.0	0	0
- More than 5.0	0	0
Frequency of collection per week		
- Once	15	20.3
- Twice	52	70.3
- Thrice	7	9.5
- Everyday	0	0

### 3.6.2. Firewood purchase

Only about 20% of the sampled women purchased firewood for their domestic cooking. The average amount spent on purchase of firewood on weekly basis by the households was ₦50.95 (Table 6). Follow-up interviews revealed that those that purchase firewood are old people and people that engage in use of the firewood for commercial activities (e.g. food sellers, etc). Moreover, purchase of the firewood is used to complement those collected freely from the wild.

Table 6: Firewood rainy purchase

Purchase of firewood	Frequency N=74	Percent
Yes	15	20.3
No	59	79.7
Amount spent weekly by households on firewood purchase		
Minimum amount (₦)	100	
Maximum amount (₦)	1,000	
Average amount (₦)	50.95	
Std. Error	16.02	
Std. Deviation	137.8	

USD1 = ₦250

### 3.6.3. Charcoal utilization by households

As indicated in Table 7, only 32.4% of the households purchase and use charcoal. Out of those that purchase the charcoal, more than half (58.3%) purchased on monthly basis while 83.4% procured a bag (about 50 kg) on monthly basis.

Further interview revealed that charcoal was not produced by households but have to be purchased. However, purchase of the charcoal by households is influenced by season and income. More households tend to purchase charcoal in dry season than rainy season due to rain which may render wood and open stove outside the house wet. Also, firewood collection in the wild may not be easy during rainy season. On income, households with extra income tend to purchase charcoal than those who are struggling with income. The charcoal is sold in sack bags (about 50 kg) and cost about ₦1,200 per bag (about USD3.4). Hence, quite a number of the households still rely on firewood collection. The charcoal is purchased directly from the producers or from those that sold it in the community at wholesale or retail prices. The charcoal is produced in the wild from most species of trees. The process of the charcoal production is unsustainable. Many trees are felled and are not replanted by the producers.

Table 7: Purchase of Charcoal by households

Variables on purchase of charcoal	Frequency	Percent
Purchase of charcoal by household		
- No	50	67.6
- Yes	24	32.4
Sub-total	74	100
Frequency of purchase per month		
- Once	14	58.3
- Twice	10	41.7
Sub-total	24	100
Quantity of charcoal purchased per month		
- Full bag (about 50kg)	20	83.4
- Half bag	2	8.3
- Retail quantity	2	8.3
Sub-total	24	100

### 3.7. Alternative Cooking Energy

#### 3.7.1. Alternative cooking energy used by households

As shown in Table 8, the only alternative cooking energy to firewood and charcoal that some of the sampled households used was kerosene/paraffin (52.7%). None of the households indicate the use of agricultural waste, electricity, cooking gas (Liquefied Natural Gas) and briquette for domestic cooking.

Table 8: Other alternative energy used by households

	Frequency	Percent
Agricultural waste		
- Yes	0	0
- No	74	100
Kerosene (Paraffin)		
- No	35	47.3
- Yes	39	52.7
Electricity dry purchase		
- Yes	0	0
- No	74	100
Cooking gas (LPG)		
- Yes	0	0
- No	74	100
Briquettes		
- Yes	0	0
- No	74	100

#### 3.7.2. Use of Kerosene (Paraffin) by households

Majority of the people buy one or two litres of kerosene per month. Further interviews reveal, rather than using of the kerosene directly in kerosene stove for cooking, majority of the local people normally add little quantity of the kerosene to firewood to facilitate quick burning. This means that most of the people use the kerosene to initiate quick burn of firewood rather than using it as domestic cooking fuel.

The kerosene is purchase mainly in cities such as Ilorin and Oke-Oyi which are about 12 kilometers to the community. The people purchase the kerosene when they either go to the city personally for other activities or send someone they found going to the city. Specifically, the people use the opportunity of sending their family members or neighbors going to sell their goods at Oke-Oyi on market days. Some community members also sell the kerosene in retail quantities within the community.

Table 9: Purchase of kerosene (paraffin) by households

Kerosene (Paraffin) purchase	Frequency n=39	Percentage
Frequency of kerosene purchase per month		
- Once	22	56.4
- Twice	7	17.9
- Three times	3	7.7
- More than 3 times	7	17.9
Unit (Litre) of kerosene purchase per month		
- Half	1	2.6
- One	14	35.9
- Two	18	46.2
- Three	2	5.1
- Four	2	5.1
- More than 4 Litres	2	5.1
Where do you purchase kerosene?		
- In the city	28	71.8
- In the next village	6	15.4
- In this village	5	12.8
- Total	39	100.0

### 3.8. Improved Cookstove

#### 3.8.1. Acceptance and preference for improve cookstove

The best strategy used in selecting the type of improve cook stove to introduce to the community is to first determine their preferred cooking energy. As shown in Table 10, about 70.2% of the people preferred improved cook stove that is using firewood. As a follow-up to the question on energy preference, major reasons for preference of the energy were asked. Affordability (43.6%) ranked topmost, and this was followed by accessibility (30.9%). Affordability means cheapness of the fuelwood while accessibility means free and availability of the fuelwood for collection to the households. The question on preference for improved cookstove and energy was followed by presentation of the picture of prototype of the improve cookstove to be introduced to the communities. Almost 95% of the households agreed to change from their current cooking to improve cookstove (Table 10).

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Table 10: Preference for improve cookstove by households

Preference for improved cookstove	Frequency	Percent
Preferred energy for improved stove:		
- firewood	59	70.2
- charcoal	16	19.0
- kerosene	8	9.5
- cooking gas	1	1.2
- briquette	0	0
- Sub-total	84	100.0
Reasons for preference		
- Affordable (cheap)	24	43.6
- Accessibility (free and ease of collection)	17	30.9
- Firewood easy to use and cook fast	5	9.1
- Small family size/children at home	2	3.6
- Cook fast	2	3.6
- Health wise	2	3.6
- Cook for large people	1	1.8
- Best for my cooking business (locust bean production)	1	1.8
- To avoid smoke	1	1.8
Sub-total	55	100
Ready to accept improve cooking stove		
- Yes	70	94.6
- No	4	5.4
Sub-total	74	100.0

### **3.8.2. Negative impacts of cooking with firewood by households**

Table 12 presents feedbacks from the respondents on the negative impacts of cooking with firewood in their households. From all the responses, more than half of the sampled respondents were always affected by eye irritation (74.3%) followed by coughing and sneezing (63.5%) and irritation of nose and throat (44.6%). The respondents also indicated that considerable number of their households was also affected by these negative impacts of firewood.

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Table 12: Cooking related sicknesses encountered within the last 6 months by the key respondents and other household members

Cooking related sicknesses		Key respondents					Other households members				
		Affected		Frequency of occurrence			Affected		Frequency of occurrence		
		Yes	No	Always	Sometimes	Rarely	Yes	No	Always	Sometimes	Rarely
Burns	Freq	35	3	28	5	6	21	3	21	3	2
	Percent	48.6	4.1	37.8	6.8	8.1	28.4	4.1	28.4	4.1	2.7
Eye irritation	Freq	55	2	46	8	2	30	1	25	6	2
	Percent	74.3	2.7	62.2	10.8	2.7	40.5	1.4	33.8	8.1	2.7
Coughing and sneezing	Freq	47	2	32	12	4	20	2	16	4	2
	Percent	63.5	2.7	43.2	16.2	5.4	27.0	2.7	21.6	5.4	2.7
Chest pain	Freq	18	2	14	2	2	11	1	12	0	0
	Percent	24.3	2.7	18.9	2.7	2.7	14.9	1.4	16.2	0	0
Shortness of breath	Freq	19	2	16	2	2	12	1	12	0	1
	Percent	25.7	2.7	21.6	2.7	2.7	16.2	1.4	16.2	0	1.4
Irritation of nose and throat	Freq	33	1	23	8	2	13	1	12	2	0
	Percent	44.6	1.4	31.1	10.8	2.7	17.6	1.4	16.2	2.7	0

Note: The figures in the tables are respondents that are affected by the sicknesses out of the total respondents sampled (n=74).

#### 4.0. AWARENESS CAMPAIGN

The awareness campaign is to get the community aware of the project goal and get their consent for participation in the next stage of the project, which is the introduction of the improved cookstove. The selected villages were visited as a follow-up to the data collection. Through the contact and relationship earlier built in each of the communities, the leaders assisted in assembling the women together for the awareness campaign. feedback and interaction.

After the women have been gathered together in each of the communities, they were once again briefed on the goal of the project as well as the second stage which is targeted at introducing the improved cookstove to the households. Out of the 69 women that participated in the awareness campaign, 68 (98.5%) indicated their interest in participating in the second stage of the project (Table 13).

The women leaders also gave their full support for the second stage of introduction of the improved cookstove. They also asked questions on the logistics and sought assurance of the researchers' coming back to fulfill the promise of the introduction of the cookstove.

Table 13: Response of the women participation in the household introduction of improved cookstove

Participate in the project on introduction of improved cookstove	Frequency	Percentage
- Yes	68	98.5
- No	1	1.5
Total	69	100.0

#### 5.0. SUMMARY AND CONCLUSION OF THE STUDY

From the field survey of this first stage of project on “Efficient Fuelwood Use as a Strategy to Reducing Household Pressure on Natural Forests of Guinea Savanna Zone of Nigeria”, the following are summary of the study:

- Women (mainly wives) are responsible for cooking in households of the selected communities. Female teenagers and girls assist their mothers in the cooking as a way of training them for the future responsibility in their respective homes. Husbands and male children do not to involve in cooking. Also, more female adult, teenager and children are present and more than the male counterparts in households. This further support the significant role that female plays in cooking and domestic energy utilization in homes.
- All the foods eaten by the people, except fruits, undergo cooking and take quite some time as well as biomass energy to cook.
- Firewood is mainly used for the cooking in the communities. Charcoal was not used by household as much as firewood. The charcoal is not produced by households but have to be purchased. However, the purchase of charcoal is influence by season (mainly use in



rainy season) and household income (only purchase by those with extra income). Lastly, kerosene is only use to start firewood while none of the sampled people indicate the use of agricultural waste, electricity, cooking gas (Liquefied Natural Gas) and briquette for domestic cooking.

- Women and girls are most responsible for the firewood collection in the communities. The firewood collections are carried out freely in the wild, twice a week and within the distance of 2 km to the communities. Further interview revealed that firewood collection is difficult in the rainy season than dry season. However, firewood collection in the nearby forest is decreasing and the people have to travel farther distance to get the firewood.
- On location of cooking stoves in households, majority of the stoves are located in kitchen detached from the main building followed by those that have their stove in open space outside the house. Only a few of the households have their cooking stoves in the living room. This means that rain will affect some coming during rainy season and this will be considered during introduction of the improved cookstove to the people.
- Almost all the sampled women agreed to change from their current cooking stove to improve cookstove proposed by the research team. However, the women preferred improved cookstove that is using firewood; the major reasons for this preference were affordability and free accessibility to firewood.
- More than half of the sampled women indicated that they were always affected by eye irritation during cooking with firewood. This was followed by coughing, sneezing and irritation of nose and throat. Considerable number of the household members was also affected by these negative impacts of firewood.
- Virtually, all the sample women indicated their interest to participate in the second stage of the project which is on introduction of the improved cookstove to households.

### **Plans to continue this work**

We plan to continue the project with the introduction of improved cookstoves to selected households in the rural communities. The community people are already motivated and in highly expectant of seeing the research team for implementation of the second stage of the project. The leaders have given their full support. We also plan to engage the youth in the project, and incorporate conservation education activities in primary and secondary schools in the communities.

During the second stage of the project, there is plan to carry out conservation education programme in which seminars will be organised in primary and secondary schools located around the communities. During these seminars, findings of the first stage of this project will be shared with the students and teachers. This will also assist in the introduction of locally produced improved cookstove.

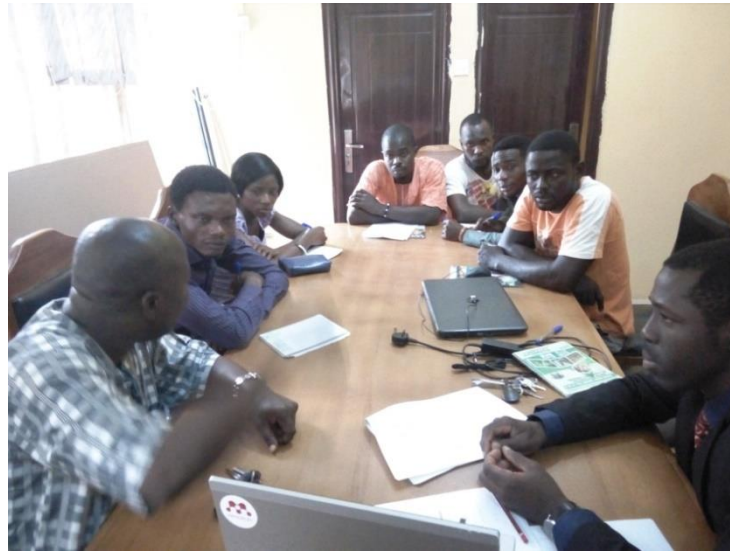
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There is also plan to present findings of the projects at local and international conference and workshop. This will also be published in reputable journal. Most importantly, as lecturer and researcher, lessons of the project will be incorporated into research and teaching of students.

### **Appreciation**

The project team wishes to appreciate Rufford Small Grant for providing the fund used in carrying out the project. Our special appreciation also goes to all the village heads and community members that partook in the datacollection.

**Photo from the Study**



Interactive Sessions among the Project Team on Literature Review and Watching of Videos on Previous Cookstoves Projects



The Principal Researcher addressing Local Leaders on Project Goal at *Akewusola* Community



Explanation of the Project Goal to the Community Leaders, Women Leaders, and some Household Heads at *Akewusola* Community



Typical detached Kitchen at *Akewusola* Community



A typical open fire cooking in the communities with three stones stove



Open fire cooking at *Oha Meje* Community



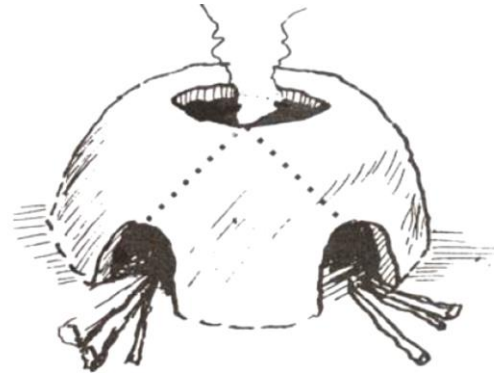
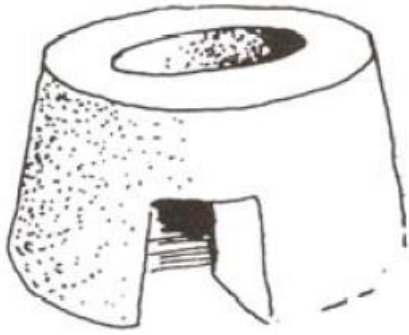
Samples of wood displayed for sale at Akewusola Community



Women assembled under tree for questionnaire administration



Meeting of an elderly woman at home for questionnaire administration



Sample of mud stove proposed by the Research Team (Picture credit: Gitonga, undated)



Some picture sessions of Awareness Campaign Meeting with Women

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