

Fuelwood Exploitation and its Impacts on Residents of Kakau Daji Village, Chikun Local Government Area, Kaduna State, Nigeria

Dogo Simeon, B. N. Wendock, B. Friday & M. Madaka

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Abstract Majority of rural dwellers in Nigeria still depend on fuelwood as their main source of energy for cooking and heating. The rate of exploitation of fuelwood and its impact on the environment especially in rural areas has attracted much interest recently than ever. This study examines the nature of fuelwood exploitation, quantity of fuelwood consumed per household, quantity sold per household and environmental problems associated with fuelwood exploitation. Primary data obtained in a cross-section survey of 100 household selected across the settlements of the area together with observation and measurements of quality of wood exploited were used. Data were analyzed through the use of descriptive statistical technique tools such as tables and graphs. Key findings show that 57% of fuelwood exploiters in the village are farmers. The fuelwood used by 85% of respondents came from both bush and farmlands. Results also show that 95% of the villagers used fuelwood as primary source of fuel, cooking and heating on daily basis as there is little alternative availability and affordability. About 84% of the respondents said the experience shifts in their income and expenditure level while exploiting and selling fuelwood. The study concludes that the impact of fuelwood exploitation is becoming increasingly

glaring and cannot be overlooked. Rapid efforts should be employed in providing alternative cheap and accessible type of fuel/energy for rural use.

Keywords: Fuelwood, Exploitation, Kakau Daji Village.

D. Simeon

Department of Geography
Kaduna State College of Education
Gidan Waya, Kaduna, Nigeria
Email: simeondogo@gmail.com

B. N. Wendock

Department of Geography
Kaduna State University
Kaduna, Nigeria

B. Friday

Department of Geography,
Kaduna State College of Education,
Gidan Waya, Kaduna, Nigeria.

A. Madaka

Department of Geography,
Kaduna State College of Education,
Gidan Waya, Kaduna, Nigeria

1.0 Introduction

Fuelwood is a source of energy derived by burning wood materials like logs and twigs and is common among the rural dwellers and low-level earners of urban dwellers. It is a traditional source of energy, which has remained the major source of fuel for over half of the world's population (FAO, 2011). According to (IFAD, 2016; Aide, 2012), the share of various energy sources in the total primary energy supply in Nigeria is made up of oil, 10.4%; gas, 6%; hydro, 0.6%; and commercial renewable energy, 83%. Significant sources of income among rural

dwellers in Kaduna state and other localities fuelwood, while other agricultural wastes constitute the remaining smaller portion.

The over-dependence on fuel-wood for energy is chiefly because of its relatively low prices and easy accessibility (Fuwape, 1985; Adedayo *et al.*, 2008). Other reasons are constraints in the supply of the conventional fuels and the growing population with a larger segment still falling below incomes that can afford the cost of conventional fuels (Aide, 2012). In most rural parts of Nigeria where there is a large poor population, poverty is the most significant

parameter that drives extensive traditional use of fuel-wood and residues (UNDP, 2007; Aide, 2012). Fuelwood is consumed in diverse ways and at different levels and the life of the majority of rural dwellers depends either directly or indirectly on fuelwood. However, meeting rural household fuelwood energy needs in the country has become a herculean task due to the enormous quantity of wood required. Daily exploitation of firewood by the rural communities in Nigeria is estimated at 27.5 million kilogram per day (Aide, 2012). In the drive to satisfy fuelwood requirements, most lands have been stripped bare of vegetation cover. This has resulted in soil exposure and erosion thereby placing a heavy burden on the environment and on the resources base. The scramble for fuelwood has resulted in massive destruction of many wood resources leading to deforestation and increasing desertification in parts of Nigeria and other parts of sub-Saharan Africa (Barrott, 1972; Adedayo, *et al.*, 2005).

The rate of deforestation in Nigeria is estimated at 400,000 hectares per annum. Popoola (2000) observed that the country's forest reserve which was estimated to be at 10% of the total land area in 1970 has been reduced to just 5% in 1999, which is alarming. In Katsina state, which is located in Northern Nigeria, it was reported that the major source of firewood is farm trees, whose density is diminishing (Aide, 2012). In Benue state, the total land area covered by forest reserve is put at 2%. This falls far short of the 20% standard of the total land area set by the federal government for each state as minimum target for self-sufficiency in forest goods and services. With its small percentage (2%) of reserved forests, the projected wood deficit in Benue state is placed at about three million cubic metres by the year 2010. By implication, all the stakeholders in fuelwood exploitation will have to find alternative sources of fuel for energy supply, if the environmental quality and energy supply are to be sustained (Popoola, 2000).

It therefore becomes necessary to examine the fuelwood exploitation and its impacts on the residents of Kakau Daji village of Kaduna state.

Energy is one of the basic and most critical economic, environmental and developmental issues facing the world today. Clean, efficient, affordable

and reliable energy services are indispensable for global prosperity (Olatinwo and Adewumi, 2012). The demand for energy today is far greater than ever in our highly technological world. It is a well-known fact that high rate of industrial growth of any country is a function of the amount of energy available in that country and the extent to which this energy is utilized (Chukuezi, 2009).

According to Nabinta *et al.*, (2007), 87 percent of rural households are primarily dependent on biomass as their source of energy with about 90 percent of the total annual round wood products serve as fuelwood and 60 percent of this total is used for household exploitation. The rural populaces do not have access to sustainable energy and therefore depend on biomass which include twigs, branches, animal residues, crop residues, fuelwood, charcoal, wood shavings and sawdust. This has therefore created a huge shortage in the supply of fuelwood that might be needed for other industrial and commercial purposes. These fuelwood supply and demand imbalances now constitute a real threat to the energy and livelihood security of many rural communities.

Indeed, many states are experiencing period of rapid urban population growth with a parallel rise in fuelwood exploitation in which Kaduna State is inclusive. It has never gotten any better in rural areas especially among residents of Kakau Daji settlement in Chikun Local Government Area. It is little surprising that the study of exploitation rate of fuelwood even though important has received comparatively little attention in the past. This gap is to be filled by this study. This paper seeks to formulate these stated objectives below to achieve the goal of the work. The specific goals of this research are to: identify the sources of fuelwood and pattern of fuelwood sourcing, examine the volume of sales and usage of fuelwood in Kakau Daji, examine the impact and economic implications of fuelwood exploitation in the area and assess the environmental problems associated with the fuelwood exploitation.

2.0 Materials and Methods

2.1 Study Setting

Kakau Daji is in Chikun Local Government area of Kaduna state, in Northern Nigeria, which lies between latitudes 10°23'11.5" and 10°23'21.1"



North of the equator and longitudes $7^{\circ}27'39.9''$ and $7^{\circ}27'10.9''$ East of the Greenwich meridian showing the square coordinate of the village. The elevation of Kakau Daji is 638 metre above sea level. The Village is within Kakau District in Chikun Local Government Area of Kaduna state. The coordinate of the village was collected using a conventional survey method, which GPS instrument was used in capturing the data in the field by the researcher.

The area experiences a near temperature climate with average annual rainfall of 164mm while its highest temperature ranges between $27^{\circ}\text{C} - 32^{\circ}\text{C}$ ($90^{\circ}\text{F} - 105^{\circ}\text{F}$) in April, and lowest between $14^{\circ}\text{C} - 18^{\circ}\text{C}$ ($45^{\circ}\text{F} - 60^{\circ}\text{F}$) in January. The water table is quite high, and wells are sunk to a depth of about 2092ft. The water used for agricultural and domestic activities is sourced from various protected and non-protected wells, bore holes together with seasonal rivers around (UNDP, 2006).

According to National population (2006), Kakau Daji comprises of few scattered settlements with a population of about 3000 people. The dwellers of Kakau Daji largely depend on fuelwood exploitation, and also agricultural farming.

Kaduna. Kakau Daji community is served, by a single centrally located Government primary school built and operated primarily by the local government, a private school operated by an individual, a private clinic that provides basic preventive and curative services to the people of the community (Chief of Kakau Daji, 2019).

Economically, Kakau Daji is a village that the majority are agro farmers, and few civil servants. They exploit much of fuelwood during the dry season and also cultivate crops like ground nut, soya beans, white beans, guinea corn, millet, maize, potatoes and some other crops during rainy season. The fuelwood and crops are sold out to neighboring settlements, which from the fuelwood exploited and crops cultivated they make their living. Some of their farm lands are sold out to people to farm and build on them. These farm lands are inheritance giving to some members of a family which is very much that they can't cultivate it all, so they sell out part to generate income for themselves (Populaces of Kakau Daji, 2019).

2.2 Data collection

A cross sectional research design was adopted for the study. It involves the selection of a sample to represent the target population of households in the study area. Hundred (100) respondents were selected out of 3000 (NPC, 2006) population that makes up Kakau Daji was selected through simple random sampling technique to cover the study area. A wide range of primary data required for the study include: demographic characteristics of respondents; nature of fuelwood exploitation; quantity of fuelwood consumed per household; quantity sold per household of fuelwood; and impact of fuelwood exploitation. The responses sought for were through a series of questions with a number of options for the respondents to tick appropriately the ones that appeal to them, but may freely make comments. Other information for the study, such as population of the study area were obtained from National Population Commission, Kaduna Office, map of Kakau Daji was obtained from Kaduna Geographic Information Service, while relevant literature was gotten from textbooks, articles in academic journals and through internet searches.

A semi-structured questionnaire was constructed for the data collection exercise from the field, which

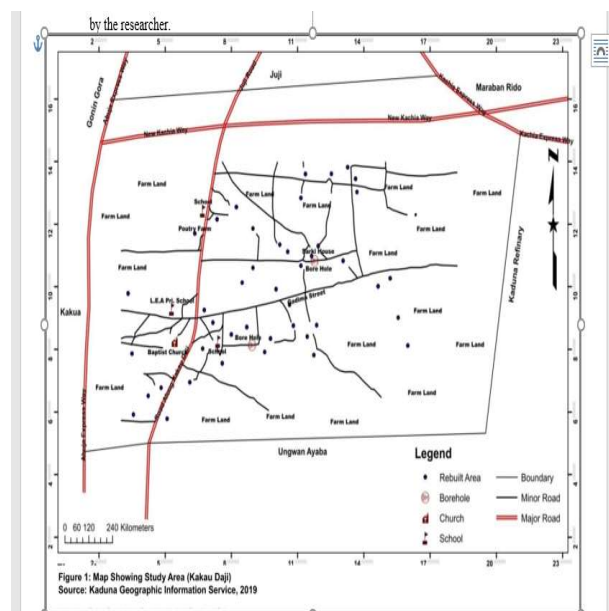


Fig. 1: Map of the study area

Gbagyi people are the dominant ethnic groups in the area and few other tribes who are from southern



served as the main instrument. In order to test the validity of the instrument, a pilot study was conducted in the study area, to detect ambiguous questions and difficult expressions to make amends before the real field exercise.

100 copies of questionnaire were distributed to household heads, selected randomly from the study area; all the questionnaires were dully filled and returned for analysis.

Descriptive statistical technique was employed, facilitated through the use of software, Microsoft excel 2010. Data from the field were collated, summarized and presented in frequency counts, percentages, and chart. Other information was obtained from secondary sources particularly, textbooks, articles in learned journals and internet searches.

3.0 Results and Discussion

This section presents and discuss the findings of the study using descriptive statistical technique, particularly, frequency counts, percentages, and charts.

3.1 Demographic characteristics of respondents

The profile of the respondents were determined and is presented in Table 1 and Fig. 2.

Table 1: Sex of Respondents

Variable	Frequency	Percentage (%)
Male	49	49
Female	51	51
Total	100	100

Table 1 reveals that 51% of the respondents were female, while only 49% of the respondents were male. The result implies that female where the major constituent in the study area engage in fuelwood exploitation for domestic purpose while some of the male carried out fuelwood exploitation for commercial purpose.

Table 2 shows that 75% of the respondents were married. About 15% of the respondents were single, 9% were widows while only 1% of the respondent says divorced. Findings from the result above show that married ones were those fully engaged in fuelwood exploitation in the study area.

Table 2: Marital Status of Respondents

Variable	Frequency	Percentage (%)
Single	15	15
Married	75	75
Divorced	1	1
Widow	9	9
Total	100	100

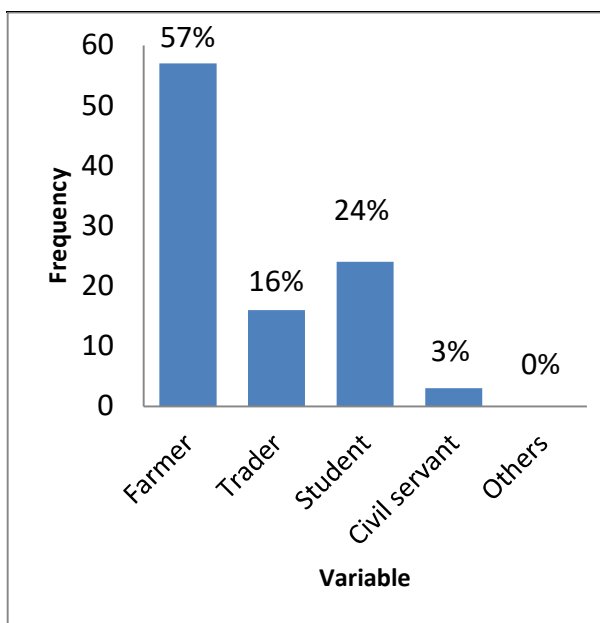


Fig. 2: Histogram showing occupations of respondents

From Fig. 2 it is evident that 57% of the respondents were farmers and 24% of the respondents were students. About 16% of the respondents were traders while only 3 % of the respondents were civil servants. The major occupation of people in the area is farming, which justify their dependence on fuelwood exploitation as it brings shift in their income and expenditure level.

Fig. 3 shows that 48% of the respondents attended the level of primary education. About 26% attended secondary school, 14% attended tertiary level of education while only 12% had no formal education.

3.2 Nature of fuelwood exploitation

This section looks at the source region of fuelwood in Kakau Daji village. Respondents were required to respond to those identifiable variables. Detail results is shown in Table 3.



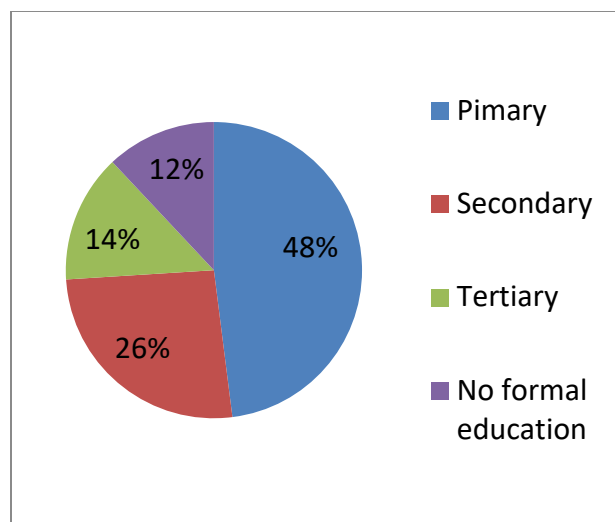


Fig. 3: Level of education of respondents

Table 3 reveals that 95% of the respondents use firewood as their primary type of fuel, 3% indicated their preference for charcoal as their primary type of fuel, 2% used kerosene as their primary type of fuel while none of them used gas as primary type of fuel. Results show that 95% of the villagers used fuelwood as primary source of fuel for cooking and heating on daily basis at there's little alternative availability and affordability were the main factors surrounding the dependence and heavy use of fuelwood in the area.

Table 3: Primary type of fuel in households

Variable	Frequency	Percentage (%)
Firewood	95	95
Kerosene	2	2
Charcoal	3	3
Gas	0	0
Others	0	0
Total	100	100

Table 4 shows that 34% of the respondents harvest 4-6 bundles of fuelwood with their family members in a week.

Fig. 4 also shows that 85% of the respondents obtained most of their fuelwood from the bush. About 11% of the respondents fetch their fuelwood from their farmland. The table also shows that 1%

of the respondents indicate that he/she buys fuelwood from the roadside, while 3% of the respondents reveal that they obtained their fuelwood from all the above sources. The fuelwood used by 85% of respondents in the study area came from both bush and farmlands.

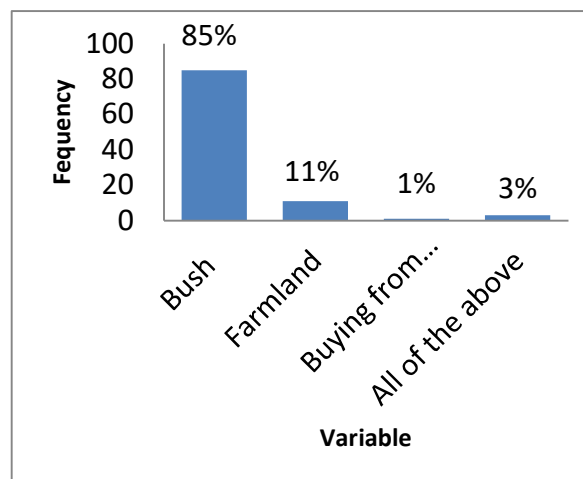


Fig. 4: Bar chart showing percentage sources of fuel

Table 4: Quantities of fuelwood family members harvest in a week

Variable	Frequency	Percentage (%)
1-3 bundles	31	31
4-6 bundles	34	34
7-9 bundles	30	30
10 bundles and above	5	5
Total	100	100

3.3 Quantity of fuelwood harvest per household per week

This section presents data on the quantity of fuelwood consumed per household per week in Kakau Daji village. Below is a table showing detail of results.

31% of the respondents indicated that they harvest 1-3 bundles of fuelwood with their family members in a week. About 30% of the respondents harvest 7-9 bundles of fuelwood with their family members in



a week while only 5% of the respondents harvest 10 bundles and above with their family members in a week. It was observed from the results above that 74% of the respondents involving all family members harvest 4-9 bundles of fuelwood in a week.

Fig. 5 reveals that 83% of the respondents harvest 1-2 pickup trucks of fuelwood with their family members in a month. About 16% of the respondents harvest 3-4 pickup trucks of fuelwood with their family members in a month while only 1% of the respondents harvest 5 pickup trucks and above with their family members in a month. From the result above it implies that 1-2 pickup trucks is what most family members in the study harvest in a month in the study area.

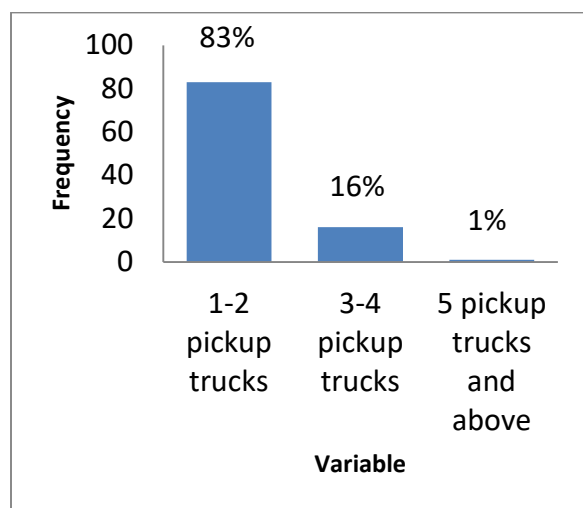


Fig. 5: What quantities of fuelwood do you and your family members harvest in a month?

Table 5 reveals that 90% of the respondents together with members of their families harvest 10-20 pickup trucks of fuelwood in a year, 6% of the respondents harvest 50-60 pickup trucks of fuelwood with their family members in a year. About 3% of the respondents harvest 30-40 pickup trucks of fuelwood with their family members in a year while only 1% of the respondents together with family members harvest 70 pickup trucks and above in a year. In a year 10-20 pickup trucks of fuelwood are what most of the family members in the area harvest.

Table 5: What quantities of fuelwood do you and your family members harvest in a year?

Variable	Frequency	Percentage (%)
10-20 pickup trucks	90	90
30-40 pickup trucks	3	3
50-60 pickup trucks	6	6
70 pickup trucks and above	1	1
Total	100	100

Fig. 6 shows that 58% of the respondents do sell fuelwood monthly, 19% of the respondents do sell fuelwood weekly. The table shows that 12% of the respondents do sell fuelwood daily. About 6% of the respondents do sell fuelwood seasonally while 5% of the respondents do sell fuelwood on yearly basis. From the result, most of the respondents have 58% sales of fuelwood monthly as most of the fuelwood harvested by them are for domestic use. That why they don't sell fuelwood every day.

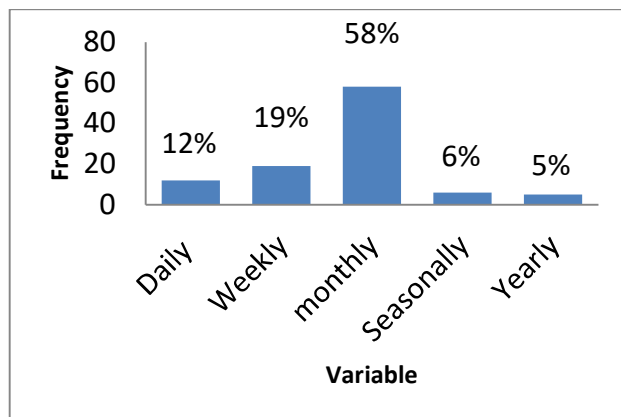


Fig. 6: Do you sell fuelwood daily, weekly, seasonally or yearly?

Table 6: When there is scarcity of fuelwood for your use, do you buy fuelwood?

Variables	Frequency	Percentage (%)
Yes	34	34
No	66	66
Total	100	100



Table 6 shows that 66% of the respondents do not buy fuelwood for their use when there is scarcity, while, 34% of the respondents do buy fuelwood for their use when there is scarcity. Result shows that people in the study area do not buy fuelwood they use during scarcity as majority of the respondents harvest fuelwood from their farmland and bush for their use during scarcity.

Table 7: What quantity of fuelwood do you buy?

Variables	Frequency	Percentage (%)
In cords	15	15
Bundles	14	14
Pickup trucks	13	13
All of the above	9	9
None	49	49
Total	100	100

(Source: Field Survey, 2019)

Table 7 shows that 49% of the respondents do not buy fuelwood in any quantity when there are scarcities, 15% of the respondents do buy fuelwood in cords, and 14% of the respondents do buy fuelwood in bundles. The table also reveals that 13% of the respondents do buy fuelwood in pickup trucks while 9% of the respondents admitted that they do buy fuelwood during scarcity in all of the above mentions quantity. From the result, 49% of the respondents admitted that they buy fuelwood in cords, bundles, and pickup trucks based on those that said they buy fuelwood during scarcity.

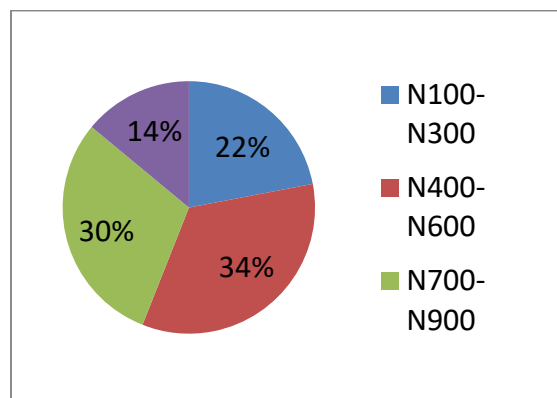


Fig. 7: Proportion of expenditure on fuel
(Source: Field Survey, 2019)

Fig. 7 shows that 34% of the respondents do spend N400-N600 on fuelwood purchase daily, 30% of the respondents do spend N700-N900 on fuelwood purchase daily. Also about 22% of the respondents spend N100-N300 on fuelwood purchase daily while only 14% of the respondents do spend N900 and above on fuelwood purchase daily. From the result, those that buy fuelwood spend lesser amount of money in the range of 400-600 naira in purchasing their fuelwood daily for their use.

3.5 Impact of fuelwood exploitation

This section examines the impact of fuelwood exploitation in Kakau Daji Village. Below is a table showing the result in detail.

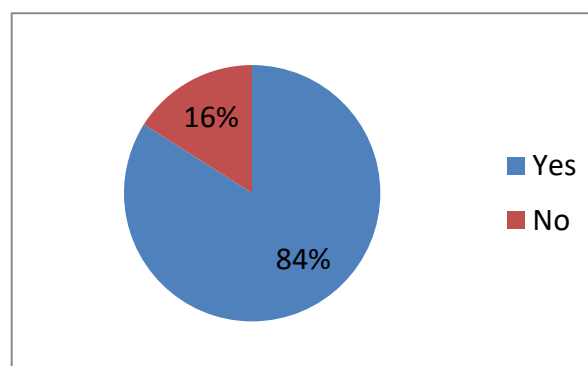


Fig. 8: Opinions on shift in your income and expenditure level while exploiting and selling fuelwood?

From Fig. 8, it is indicative that 84% of the respondents admitted that they experience shift in their income and expenditure level while exploiting and selling fuelwood. The table also reveals that 16% of the respondents do not experience any shift in their income and expenditure level while exploiting and selling fuelwood. The result indicates that majority of the respondents involve in exploiting and selling fuelwood do experience a positive shift in their income and expenditure level. The Table 8 shows that 55% of the respondents make up to N20000-N30000 on sales of fuelwood in a month. About 23% of the respondents make up to N5000-N10000 on sales of fuelwood in a month. Only 16% of the respondents make up to N40000-N50000 on sales of fuelwood in a month while 6% makes up to N60000 and above on sells of fuelwood in a month. From the result above it implies that those engaged in the sales of fuelwood in the area do



make 20,000-30,000 naira from fuelwood sales in a month which brings about their shift in income and expenditure level.

Table 8: How much money do you make from fuelwood in a Month?

Variable (Naria)	Frequency	Percentage (%)
5000-10000	23	23
20000-30000	55	55
40000-50000	16	16
60000 and above	6	6
Total	100	100

Fig. 9 also reveals that 50% of the respondents use the money they get on sales of fuelwood to buy fertilizer, 20% of the respondents use the money to pay their children school fees, 15% of the respondents use the money to build house. About 10% of the respondents use the money to buy food stuffs while 5% of the respondents use the money on saless of fuelwood to buy motor cycle. Due to the respondents, money made from sales of fuelwood, is used to buy fertilizer and pay children school fees.

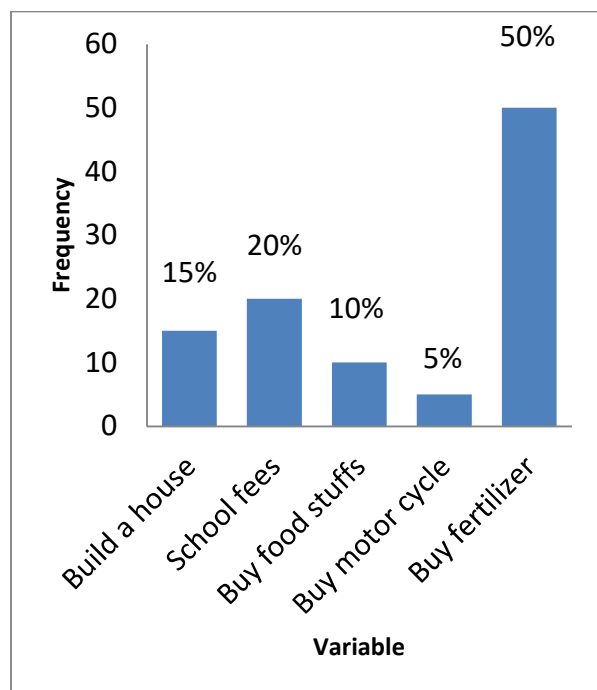


Fig. 9: What do you use the money for?

Table 9 shows that 86% of the respondents admitted that fuelwood exploitation affects their environment in many ways, while 14% of the respondents do not admit that fuelwood exploitation affects their environment in any way. From the result 86% of the respondents deduced that the effect of fuelwood exploitation on their environment is desertification, soil erosion, and atmospheric imbalance.

Table 9: Does fuelwood exploitation affect your environment in any way?

Variable	Frequency	Percentage (%)
Yes	86	86
No	14	14
Total	100	100

From Table 10, it is evident that 50% of the respondents admitted that atmospheric imbalance causes overheating, seasonal rainfall, and drought. The table also shows that 43% of the respondents admitted that atmospheric imbalance causes overheating. About 4% of the respondents admitted that atmospheric imbalance causes drought while 3% admitted that atmospheric imbalance causes seasonal rainfall. The result above implies that overheating, seasonal rainfall, and drought were the major atmospheric imbalance experienced in the environment of the respondents in the study area.

Table 10: What kind of atmospheric imbalance does it cause?

Variable	Frequency	Percentage (%)
Overheating	43	43
Seasonal rainfall	3	3
Drought	4	4
All of the above	50	50
Total	100	100

4.0 Conclusion

From the study, it can be concluded that the bulk of wood exploited in the study area are rural dwellers and also farmers. Wood is their main source of energy because of availability, affordability, nearness to source and cost-friendly. As fuelwood continues to be exploited and consumed, deforestation and consequence reduction in forest reserves is eminent unless the process is regulated and brought under control. Currently, fuelwood sites,



especially around the settlement in the study area have been shifting inwards over time, indicating progressive deforestation; further delay in pursuing the development or provision of alternative fuels will further degenerate the already poor landscape, eventually leading to total wood depletion. This place the future of fuelwood at stake in the area.

From the findings of this research and the conclusion therein, the following recommendations are made:

- i. Other substitute or alternative fuels such as kerosene and gas should be adopted for use. This means that fuelwood should be replaced with gas, kerosene or electric cooking devices. These devices have higher efficiency than fuelwoods. Alternative fuel that can be developed for rural use is solar energy since most Rural Area lack electricity. Solar energy is energy harnessed through direct use (passive solar) and also through using solar photovoltaic cells (PV's) to convert light to electricity. Kakau Daji village like most parts of the savannas has abundant supply of sunlight that can be harnessed to accomplish this purpose.
- ii. Careful management of natural forests especially in their bush and farmlands will help reduce or alleviate the problem of uncontrolled exploitation of "free" wood resources in such forests. It maybe necessary to involve the participation of the community representatives, who will eventually be the beneficiaries of this system. Bush and farm forest reserves are land use system which tries to address the need for trees and food products in a multi-disciplinary manner. Here, trees and other woody perennials, food crops and livestock can deliberately be grown using the same piece of land. This system has the advantage of minimizing the time required to travel to the fuelwood supply sources when the wood sources are located on lands where people live and farm, reducing the income expended by the rural households on transporting or acquiring fuelwood.
- iii. Proper awareness on positive and negative impacts of fuelwood exploitation on the environment should be carried out by the government to the people.

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