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PRODUCTIVITY AND UTILIZATION OF FUELWOOD RESOURCES IN THE SOUTHERN PART OF YOBE STATE, NIGERIA

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Abstract: **The study examined the productivity and utilization of fuelwood in southern Yobe State, Nigeria. The research explored the factors that contributed to the demand for fuelwood and investigated the sources, current methods of fuelwood harvesting and utilization. Data was collected through surveys and visitations to fuelwood sources, markets, observations, interviews with vendors, local households and businesses. Results showed that there is a high demand for fuelwood in the region due to limited access to alternative energy sources such as gas, kerosene and electricity and reliance on traditional cooking methods. Moreover, the unsustainable harvesting practices are leading to loss of biodiversity, soil erosion, deforestation, desertification and environmental degradation. Other effects are extinction of organisms, local climate change and facilitate the release of high amount of carbondioxide into the environment as well as the greenhouse gases, attributing to about 10% of the causes of global warming. The findings suggest the need for implementing sustainable management strategies to meet the growing demand for fuelwood while also preserving the ecosystem. This study provides valuable insights for policy makers and stakeholders to develop effective and sustainable solutions for fuelwood utilization in southern Yobe State, Nigeria.**

Keywords: **Productivity, utilization, fuelwood, harvesting, forest, energy.**

1. INTRODUCTION

The world population is at a high increase on annual basis with a record of 0.91% average growth rate per year, totaling a growth rate of about 73 million people annually. Africa has the highest growth rate of 2.37% per annum and Nigeria recorded 2.41% growth rate (Population Stat 2021; NPC, 2017). The increase in population has resulted to high demand in available resources over the globe. One of such resources is the vegetal resource (World Bank, 2021). It is in line with this, that World Bank (2021) reported that over 2.6 billion people all over the globe do not have access to clean fuel for domestic usages which has necessitated the unwarranted cutting down of vegetation for fuelwood. Furthermore, reliable electricity is out of reach of about 759 million of people all over the world. Nigeria, Ethopia and Democratic Republic of Congo (DRC) ranked the three countries with poor access to electricity in Africa. The inadequate electricity had compelled people to look for other means for cooking, heating and other uses. It is on this note that World Bank (2021) reported that 807 million people residing in Africa depend largely on biomass as alternative sources of energy. The biomass is fuelwood, charcoal, agricultural waste, an industrial by-product, and animal dungs (Cerutti et al., 2015; Sola et al., 2017).

Increase in population and government failure to provide affordable alternative fuel for domestic and commercial uses has seen the increase and production of fuelwood from 1885 million m^3 in 2000 to 1921 million m^3 in 2020 (FAO, 2003; 2020a; 2020b). In Nigeria, about 80% of households use fuelwood for their cooking especially in the rural areas, making it the most used form of cooking energy in the country (Sambo, 2008) and over 58% of all the energy requirements in Africa

(FAO, 2016). In most cases people collect fuelwood freely within their localities while urban people source their fuelwood from rural areas through a commercial system (Mbaya et al., 2021). The high demand and consequently production of fuelwood has resulted to indiscriminate felling of tress and depletion of vegetal resources with about 87% of the total woods excavated from the forest and other woodlands in 2015 (FAO, 2015). Naibbi (2015); Gbonegun (2018); Goldman & Weisse (2019) posited that 8.86 Mha (96%) of the total vegetation of Nigeria has been depleted exposing the land to erosion, loss of biodiversity, desert encroachment and climate change.

Furthermore, Ali et al. (2023) reported that deforestation along in Nigeria is estimated at a rate of 3.5% per annum (about 350,000 ha to 400,000 ha) (Federal Republic of Nigeria, National Forest Policy 2006). It is in this regards that Nigeria ranked the 3rd largest fuelwood producer country after Ethopia and DRC in Africa. The (Energy Commission of Nigeria (2018; 2022); Ndiboi and Dare (2020) are of the view that fuelwood is the main energy employed in Nigeria for cooking and heating and takes the lion share of over 60% of energy used in Nigeria. It serve as employer of labour through availability of markets for implements, labours for rural dwellers, job for drivers and women in the cities who mostly serve as retailers among others (Mbaya et al., 2021; Adewuyi and Olofin, 2014; Naibbi and Haeay, 2015). Similarly, Ndiboi and Dare (2020) are of the view that fuelwood business provides means of livelihood. The unfortunate thing is that most of the activities in the industry are unregulated and therefore are being operated at the detriment of the environment.

The fact still remains that despite the glaring effects of production of fuelwood through cutting of vegetation; it is one the basic sources of energy in many homes in Nigeria and the production will continue to go on. This is because the government has done little in providing alternative sources of energy for cooking and other uses in rural and urban centres (Mbaya et al., 2021). Yobe State is one among many Nigerian States that is at disadvantage of modern means of energy such as gas, electricity and thermal energy has been depending on fuelwood for cooking and heating. The fuelwood is also used in small scale and cottage industries such as blacksmith workshop, bakeries, tea shops and fish smoking. The high dependence on fuelwood is ascribed to poverty, poor electricity supply, inadequate other sources of energy, poor road network, cultural beliefs and poor governance as well as the attitudinal will to embrace modern methods of using energy.

Geographical location of Yobe State in the Sahel and Sudan savanna places the state among that have fuelwood production and utilization at a very high scale. About 80% of households in the State make use of fuelwood for cooking and heating (Bukar and Abba, 2022; Naibbi, 2015). The forest reserve occupies a total land mass of about 386,710 ha Bukar and Abba (2022) and that about 90% of the all fuelwood production is obtained from natural forests (Alkali, 2014). No doubt, Mongabay, Deforestation Statistics for Nigeria (2020) reported that 95.1% of vegetation cover which comprises of trees in Yobe State got depleted as from 2001 to 2020. Fuelwood harvesting is on increase and the economy continues to bite hard on the people. Hence, environmental consequences are enormous unless deliberate actions and sustainable use of the vegetal resources in the region in are monitored and attended to (Mongabay, Deforestation Statistics for Nigeria 2020). This is worrisome and calls for immediate action for sustainable practice in the fuelwood industry to safe guard the environment.

2. STATEMENT OF PROBLEM AND JUSTIFICATION

The National Energy policy plan of Nigeria has continued to discourage the use of fuelwood and to promote the use of alternative energy sources to fuelwood (Energy Commission of Nigeria, 2018). However, this seems unrealistic owing to inadequate and high cost of supply of other energy options in the country such as oil, natural gas, tar sands, coal, nuclear, hydropower, solar and wind. For instance, the cost of 12.5Kg of gas in Yobe State today is about N16, 000. This could only be afforded by few household and further increases in the demand of fuelwood, making people to indiscriminately cut down trees for fuelwood without recourse especially in Southern Yobe where there are few communal and reserved forests.

Similarly, Nigeria's forest area has a coverage of total land mass of 10% while the fuelwood utilization per day is about 120,000 tonnes which greatly surpasses its production, making it the only energy source in the country where utilization outweighs production (FAO, 2011), Naibbi and Healey, 2013). This is potentially catastrophic given that the country has been experiencing problems with its forest management (FAO, 2003), and most areas in the north have been declared unsustainable in terms of fuelwood production. Sambo (2008); Mbaya *et al*., 2021) were of the view that several factors like population growth, poverty, unreliability in the supply of alternatives to fuelwood, high cost of other fuel, corruptions, refusal to adopt new innovations by local communities and inadequate enlightenment on the other sources of energy. Furthermore, Yobe state Ministry of Environment reported that about 70% to 85% of fuel wood use in urban centers of Yobe state and a sizeable percentage use in Borno, Kano and Jigawa states come from the clearance of natural forest land of southern part of Yobe state. This assertion may likely be possible considering the concentration of fuelwood deports

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existing along Potiskum-Maiduguri Road and Damaturu-Biu road as well as rail line heading to Maiduguri (Naibbi, and Healey, 2013; Naibbi et al., 2014; Mbaya *et al*., 2021).

Several studies have been conducted on fuelwood. Naibbi and Healey (2013; 2014) studied Northern Nigeria's dependence on fuelwood and using geographically weighted regression to estimate the spatial patterns of fuelwood utilization in Nigeria respectively. Mbaya *et al.*, (2021) studied assessment of factors influencing choice of tree species and firewood consumption in Bare-Bari ward of Potiskum LGA, Yobe State, Nigeria and many more. Ehiemere (1996) in his study of fuel wood issue in neighboring Borno State shows that commercial suppliers collect both dry and live wood (the live woods are felled and allowed to dry). He further asserted that the fuelwood extractors do not have any conscious of replanting or afforestation exercise in mind. Thus, the cut down trees are not even allowed to regenerate before they are prematurely harvested again. This indicated that there is an increasing utilization no in-depth investigation that considered the productivity and utilization of fuelwood resources in Southern part of Yobe State to assess the production and consumption rate with the view to stem the need for the sustainability of vegetal resources in the State. It is on this basis that the study aimed to examine the productivity and utilization of fuel wood resources in southern part of Yobe State with a view to providing valuable ideas or knowledge on sustainable use of vegetal resources and environmental sustainability as advocated by the Sustainable Development Goals (SDGs 15): Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss (UN 2016).

3. METHODOLOGY

Yobe State is located on Latitude 11^0 N of the Equator and Longitude 13.5^0 E of the Greenwich Meridian. It has an estimated population of about 3.4 million (Population Stat, 2021). The southern part which consists of Fika, Fune, Nengere and Potiskum are characterized by mountainous and undulating hills and has more annual rainfall than other parts of the State which support vegetal resources. The southern part of the state forms the study area. Yobe State, though an agrarian is found in the Sudano-Sahelian vegetation zone which consist of the Sudan Savannah and Sahel Savannah vegetation zones. The southern part of the state is characterized by denser vegetation, higher rainfall of about 713mm usually of duration of 3 - 4 months of rainfall compared to the northern parts which has scanty scattered trees of about 5m, shrubs, short grasses and experience shorter period of rainfall of 275mm annual average. Yobe State has distinct dry and wet seasons, with the dry season extending from October to June, and the wet season beginning in but real onset rainfall normally starts in June/July and ends in September. In terms of the mean annual temperature, 35^0C was reported in (Oruonye, 2009).

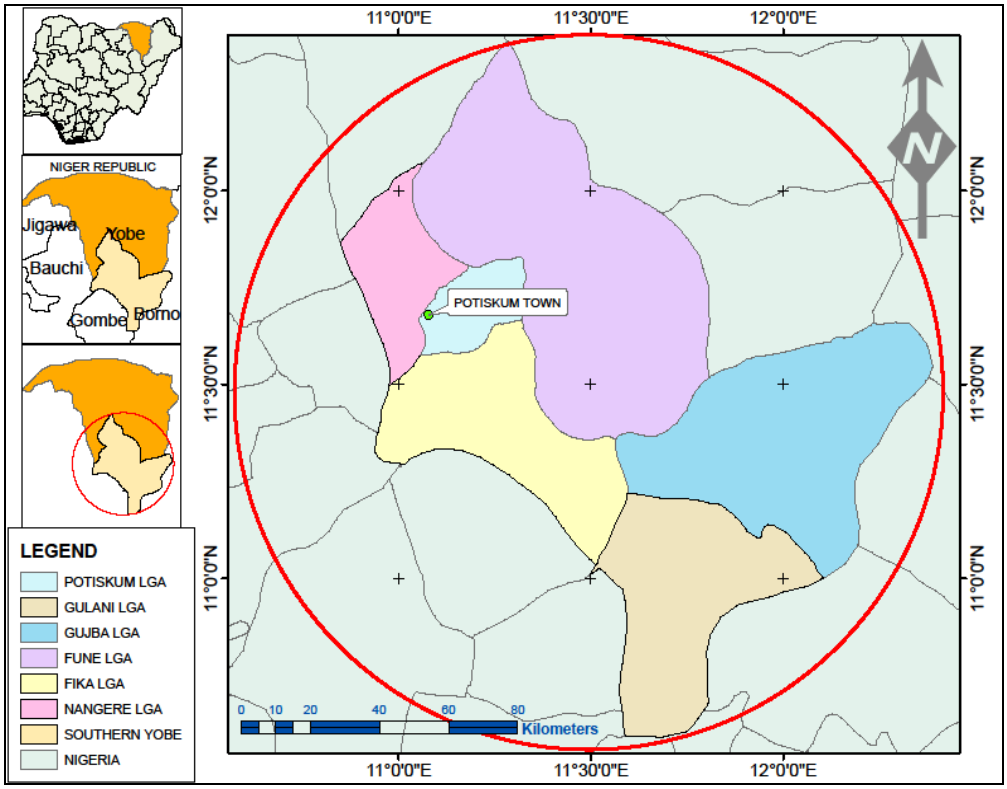

Figure 1: Study Area Map (Source: Author's work, 2022)

A stratified cluster design and simple random sampling procedure in combination of cluster sampling were employed in collecting of household data while rapid rural appraisal technique was also applied in the identification and selection of key informants in each selected settlement. Semi- structured purposeful interviews was equally conducted. The respondents were opportunistically selected owing for the fact that the fuelwood as local as it may look, it is very sensitive and requires careful approach for reliable and meaningful data. A total of 30 respondents made of 20 men and 10 females from each of the selected communities were interviewed. They were specifically chosen because of the cultural influence of male over the female in the study area as well as ease to access despite the fact that women are the base of fuel utilization in Yobe State.

It is important to note that vast and in-depth field investigation was conducted by visiting and interacting with all parties involved in fuelwood productions mostly in the rural and forested areas of the Southern Yobe State. Similar method was employed by Naibbi (2015). In addition, the researchers also interacted with fuel wood vendors in Potiskum. The transporters were not left out as well as the communities and individuals that make use of the fuelwood as the major source of energy in the State (consumers). Trips to Janga-siri, Chana, Godowoli, Boza, Lalewa, Maiduwa, Gudi and Jajere communities were carried to have access to their respective forest reserves in table 2 below, and observed how fuelwood are being produced, harvested, cut into logs gathered and transported to urban centers. The observations and visitation along with questioning was done from 2021 – 2023. The frequent visits, observations and interactions with the formal and informal actors helped in gaining acceptability where liable and nearly perfect information were obtained from the actors as well got real and firsthand information on the fuelwood productivity and utilization in the area.

Information were generated on the occupation of the respondents, proceses of fuelwood production in Yobe, where fuelwood are in abundant, processes involved in the production of the fuelwood, people involved in the production, where the fuelwood is transported to, major fuelwood markets, categories of those that use the fuelwood, consumptions rate and environmental implications.

4. RESULT AND DISCUSSION

Sources of Fuelwood

Fuelwood in Yobe State especially in the southern part is obtained from the surrounding forests also known as communal forest areas (CFAs), farmland and local bushes around settlement. The forests in the area which serve as fuelwood includes: the natural forest, communal and urban forests. The studies also showed that locally consumed fuelwood can also be produced at home within the households from unwanted branches of planted trees obstructing electric wires, satellite dishes/antenna, and roof of houses as well as from death logs of trees. These categories of trees purposely planted for economic values (mangoes, guava, moringa, neem trees, geisha and mahogany among others), economic and social values are cut and chip it different sizes for fuelwood purposes. This finding is also in agreement with the report of Arora (2019) who is of the view that fuelwood is got from woodlands, forests and surrounding communities which comprises of the rural and urban areas and that of Oguntoye et al., (2020) posited fuelwood as products of a forest that are not timber but are unpolished woods that looks rough in nature obtained from shrub areas, dead trees, trimmed live branches of trees and usually catted in different sizes for sale as observed in Buni Yadi forest and other forests in Southern Yobe.

Furthermore, the outcome of the interviews with the locals, farmers, households and fuelwood vendors and merchants showed that the fuelwood especially the ones transported to the urban areas are obtained from the Janga-siri, Chana, Godowoli, Boza, Lalewa, Maiduwa, Gudi and Jajere forests and environment (see Figure 2). Table 1 showed forests in southern Yobe which are legal or illegal sources of fuelwood in Yobe State it is the most exploited being that they are communal forest areas (CFAs) where individuals or group can harvest fuelwood mostly with the permission of the Village Heads. Fuelwood are also sourced from close communities, shrubs, clumps, farmlands and nearby bushes. This is in agreement with the work of Audu et al., (2023) who were of the view that different sources of fuelwood for collection made up of the natural forest that recorded the highest respondents of 51.5% where fuelwood is mostly collected in Yobe State. Nearby bushes recorded 20% of total collection of fuelwood while farmlands, forest reserves and other unrecognized sources recorded 15%, 8.3% and 4.5% respectively.

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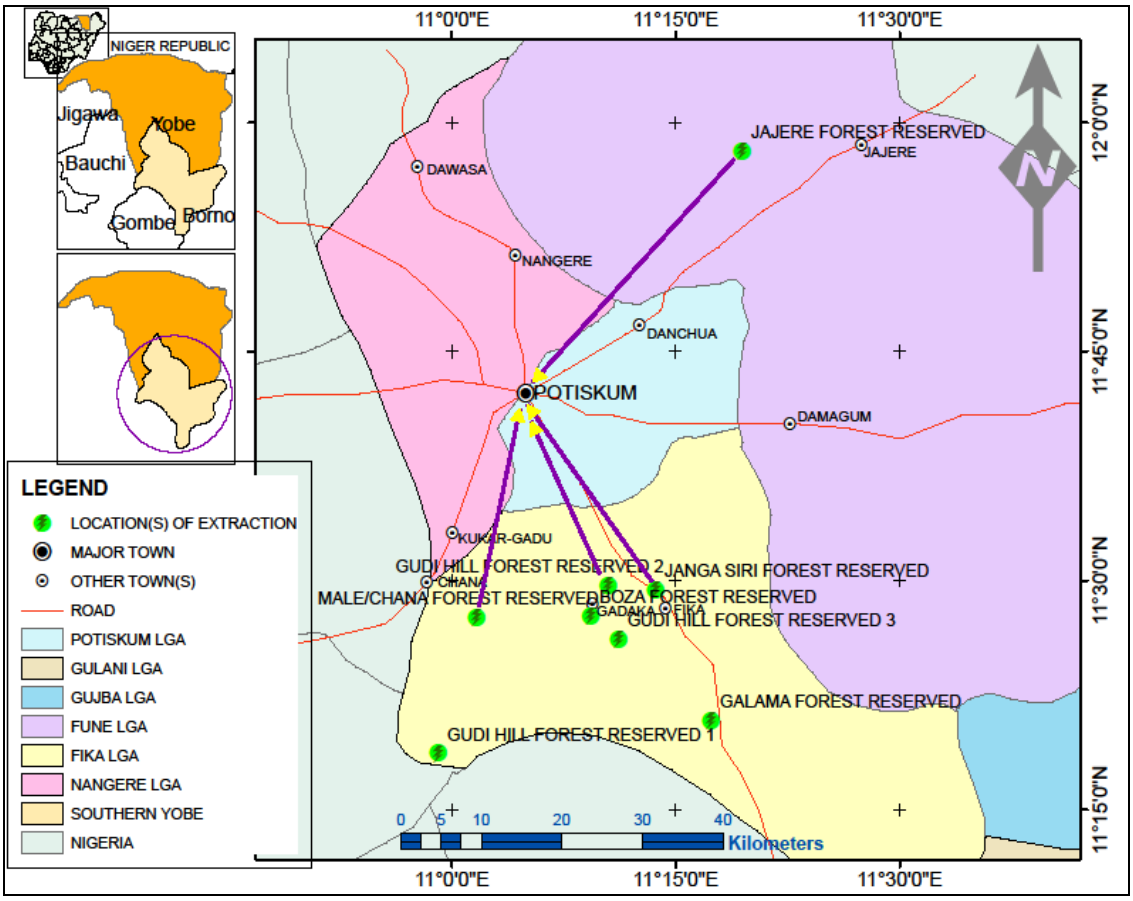

Figure 2: Forest Reserves in Southern Yobe. (Source: Author's work, 2022)

Table 1: Communal Forest Areas (CFAs) in Southern Yobe

S/N	COMMUNITIES(VILLAGE{S})	LATITUDE	LONGITUDE	FOREST RESERVED (LAT/LONG)
1	JANGA SIRI	11.49068˚	11.22724˚	JANGA SIRI FOREST RESERVED (11.521859˚,11.226222˚)
2	CHANA	11.46011˚	11.02758˚	MALE/CHANA FOREST RESERVED (11.398529˚,10.997873˚)
3	BOZA	11.46107˚	11.15477˚	BOZA FOREST RESERVED (11.456902˚,11.155647˚)
4	GODOWOLI	11.31171˚	10.98461˚	GUDI HILL FOREST RESERVED (11.426240˚,11.191822˚)
5	LALEWA	11.49444˚	11.17462˚	GUDI HILL FOREST RESERVED (11.426240˚,11.191822˚)
6	GUDI	11.43597˚	11.18594˚	GUDI HILL FOREST RESERVED (11.426240˚,11.191822˚)
7	MAIDUWA	11.34734˚	11.28924˚	GALAMA FOREST RESERVED (11.355741˚,11.351960˚)
8	GARIN GADA	12.09300˚	10.95800˚	GARIN-GADA FOREST RESERVED (12.178363˚,11.097042˚)
9	JAJERE	11.96900˚	11.32400˚	JAJERE FOREST RESERVED (12.005927˚,11.479903˚)

Source: Field Survey, 2022.

Production and Harvesting of Fuelwood

The production of fuelwood in the Yobe State as in most of the Northern States in Nigeria are mostly done using local implements such axe, cutlass, harvesters, diggers, and digging out the stump of dried trees and deadwoods. Only on rare occasion that chain saw is used in cutting down trees for fuelwood purposes (Puentes Rodriguez et al., 2017). Other methods, mostly used by the formal actors are crow bar, coppicing and selective felling and salvage operation. Though, mostly consumed in the urban centres as a result of high population, the production is mostly done in the rural areas that have the bushes, forest, farmlands. The major dealers or set of people that see fuelwood marketing as a means of business and economic upgrade mostly employ the services of the residents within the low income class to cut trees, gather dried ones and produce them into logs of sizable form that could be transported to the town or markets.

In line with the above finding, the study also discovered two ways of collection of fuelwood at different forests in the Yobe South referred to as *dandi* and *dab* as observed by Naibbi (2015) in his work on traditional energy discourse that place emphasis on sourcing of urban in Northern Nigeria. The *dandi* is the collection of fuelwood that deals with hiring of a vehicle usually trucks and able men as labourer for a period of one day by individual in the fuelwood business in which they move to a particular forest for the production and collection of fuelwood. It is usually a day business where the fuelwood collected are transported to the town and sold to firewood vendors. One of the respondent who also double as a labourer reported that they use to go to the forest very early in the morning immediately after morning prayers *fajr* and collect stumps, deadwoods through digging out the stumps and cutting or splitting into logs to be easily transported to the market. This process was also noted in Naibbi (2015) where the researcher visited the Burai forest and observed the activities of fuelwood production and harvesting. The *daba* on the other hand involves the relocation of labourers to the forests for some days or weeks. They harvest fuelwood in large quantity which are conveyed to town in big vehicles or numbers of trucks are hired depending on the quantity of the stocked fuelwood. Daba which is most practice in Buni Yadi forest is done with caution nowadays as a result of the Boko haram menace in the area.

The study also showed that many people in the area sees fuelwood production as means of employment which brings income to the formal and informal actors. In the local communities of urban settings and virtually in the rural areas, women are the major players in production and collection of fuelwood. While the women and their children go to the outskirt of the urban areas and scout for dry wood, shrubs and any stumps the women in the rural areas most often go to the forest and farmlands where they collect available fell down trees, deadwoods and dried branches. The woods are either allowed to dry in the open land or conveyed to the house for used when dried.

Factors that Influence Fuelwood Harvesting

Harvesting wood of different types to produce fuelwood for domestic use and local industries is one of the basic economic activities next to farming and animal husbandry in the poor communities close to the forest areas. Various fuelwood users comprise of domestic usage and commercial users such as restaurateurs, bakers, brick molders and institutions such as schools and prisons across the country rely on fuelwood. Therefore, the high demand emanated as a result of population growth, economic deterioration, and high cost of others sources of cooking energy such as kerosene and gas. For instance, the price of 1kg of cooking gas and kerosene cost one thousand five hundred naira each (1500) and mores still, are not available in most rural areas. Therefore, people are left with little or no option but to continue to harvest, excavate and fell down trees for fuelwood and consequently use for cooking and heating among other uses. Availability, cost effective, high rate of poverty, ease to access, poor attitude to change to adopt innovations are some of the factors that influence fuelwood harvesting in Southern Yobe as revealed by the study. This is in agreement with the work of Audu et al., (2023) who is of the view that firewood, if always available and affordable considering its nature, is within a few km radius, and suppliers can obtain it via foot by the households for their consumption. It is also interesting to note that some respondents, especially the elderly said that food cooked using gas cooker and kerosene stove do not use to do well especially “tuwo” ‘‘swallow’’ as when used fuelwood.

Transportation of Fuelwood

Most of the forests are far away from major towns where the demand is high. For instance, the Burai forest located on Latitude 11.460734 N and Longitude 11.329507 E, near Jangadole Village on the southern part of Potiskum (Naibbi, 2015) is about 37km. It is also about 120km from Buni to Potiskum and 53km to Damaturu.

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Table 2: Fuelwood major depots in Potiskum Town, Southern Yobe.

SERIAL NUMER	DEPOT	LATITUDE	LONGITUDE
1	NPN MARKET DEPOT	11.70571	11.07567
2	NAHUTA EID GROUND DEPOT	11.69294	11.07706
3	MAIN MARKET DEPOT	11.71594	11.07769
4	YARIMARAM DEPOT	11.72539	11.09577

Source: Field Survey, 2022.

This means that the harvested fuelwood must be transported to the markets found in the urban areas. In this regards, three types of vehicles are mostly used for the transportation of fuel wood to different depots within the town of Potiskum and other towns in the state. These are: Toyota open body; Mitsubushi open body and Peugeot pick up. The study also noticed in practice *daba* kind of fuelwood harvest, heavy duty vehicles such as lorries and trailers are used to transport the stocked fuelwood in the forest. On daily basis, an average of 11 Mitsubushi, 3 Toyota open body and 10 Peugeot pick up are being transported through Gombe and Bauchi Roads to fuel depots and to the dealers. The major fuelwood depots are located in different parts of Potiskum town which is the major commercial centre in the area (see Table 3 and Figure 3).

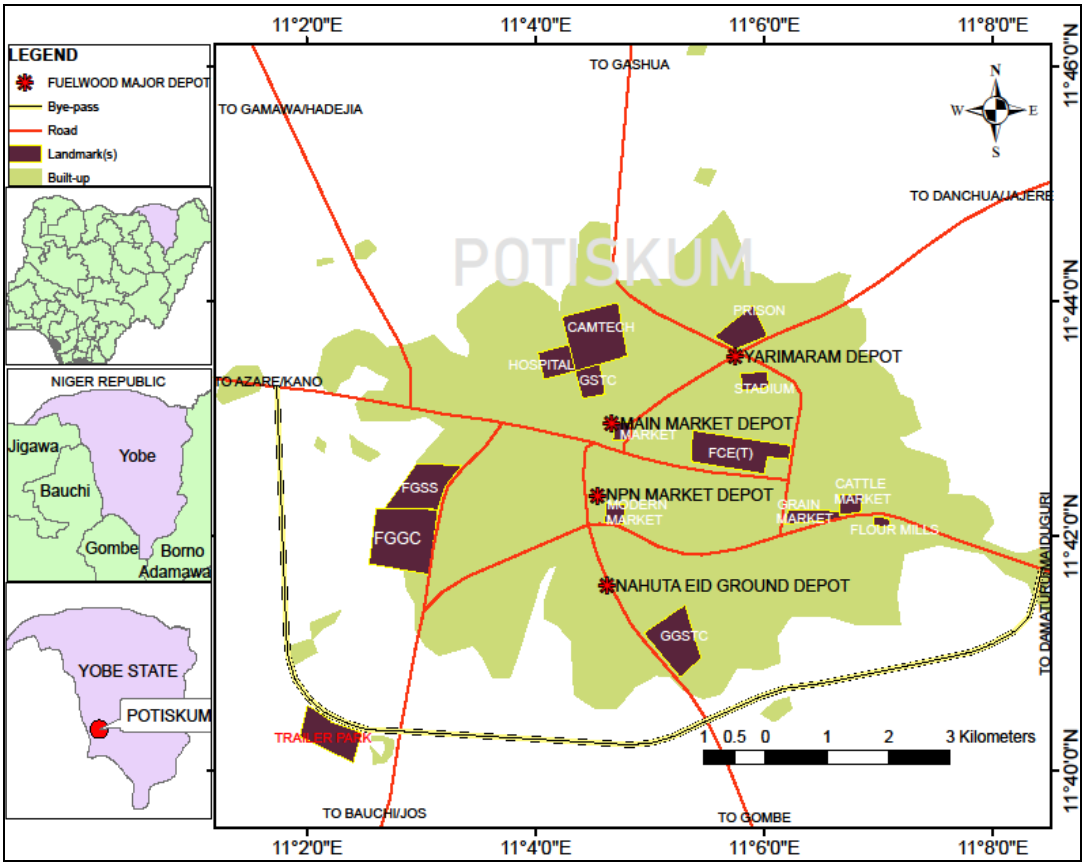

Figure 3: Fuelwood major depots in Potiskum Town, Southern Yobe. (Source: Author's work, 2022)

Utilisation of Fuelwood in Yobe State

The study shows that about 80% of people in the Southern Yobe use fuelwood as their main source of energy for cooking. Other uses of fuelwood in the area are heating, baking, smiting and metal fabrication among others. The high dependence on this form of energy is attributed to the location of Yobe in the arid and semi-arid region that experience desertification and other harsh climatic condition has contributed to the fast drying and death of trees and shrubs over time and provide the harvesters with the logs, stumps, branches and wood required for the fuelwood. Its affordability and liability, where household could purchase with little amount as low as 100 and 200 Naira, unlike the cooking gas and kerosene which are expensive (Wulaningrum et al., 2022; Muhammad and Salisu, 2019; Bede–Ojimadu and Orisakwe, 2020).

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The study also reported that most food vendors, institutions such as Government Secondary Schools, Correctional Centres, large family size (extended) which is typical to the northern family setting are also some of the reasons that necessitate the use of fuelwood over other forms of energy in the area. Fuelwood is not use for cooking alone but it also provides people in both the rural and urban communities with income and means of livelihood.

Fuelwood for Commercial and Domestic Utilization

The extraction of fuel wood from its source is done to be used either for domestic or commercial purpose. Information gathered through personal interview in NPN market depot in Potiskum shows that there are 12 species of fuelwood sold for commercial and domestic utilization. These are presented in the Table 2.

Table 3: Species of fuelwood sold for commercial and domestic utilization

Serial Number	Local (Hausa) Name	Scientific Name
1	Kargo	Piliostigma retculatum
2	Marke	Anogeissus leocarpus
3	Sabara	Guira senegalensis
4	Kanya	Diospyros mespiliformis
5	Giyayya	Mitragyna inermis
6	Farin-Ruwa	----------
7	Moromoro	Crotom amabilis
8	Gamafada	Cassia arereh
9	Aduwa	Balanites aegyptiaca
10	Taura	Detarium microcarpum
11	Qiriya	Prosopis Africana
12	Madubiya	----------
13	Tsamiya	----------
14	Zarzare	----------
15	Matsagi	----------

Source: Field Survey, 2022.
Note: "----------" means "Not found" .

(Source: Photograph by Author, 2022)

Plate 1: Logs of Fuelwood in NPN Market Depot to be sold for Commercial and Domestic Users.

a. Fuelwood for Domestic Utilization

The following are fuel wood sell to domestic users:

i. Marke (Anogeissus leocarpus)

ii. Qiriya (Prosopis Africana)

The above species are mostly required by the buyers for domestic use. Marke (Anogeissus leocarpus) is required almost all the seasons while the other specie which is Qiriya (Prosopis Africana) is highly needed for domestic use during raining season.

b. Fuelwood for Commercial Utilization

The fuelwood are also used for production in the following commercial areas:

i. Rice mill

ii. Bread factory

iii. Gypsum processing factory

iv. Blacksmith workshop

Qiriya type of fuel wood is highly needed by rice mills for their production, while Marke (Anogeissus leocarpus) is suitably used by bread and gypsum processing Table 3 shows the list of different types of fuel wood based on their cost in ascending order.

Table 4: Different types of fuel wood based on their cost in Yobe South

SERIAL NUMBER	TYPE(S) OF FUEL WOOD	COST RANKING ORDER
1	Marke (Anogeissus leocarpus)	1
2	Madubiya	2
3	Tsamiya	3
4	Zarzare	4
5	Matsagi	5
6	Dandan	6
7	Qiriya (Prosopis Africana)	7
8	Kadanya	8
9	Kanya (Diospyros mespiliformis)	9
10	Kargo (Piliostigma retculatum)	10
11	Sabara (Guira senegalensis)	11
12	Dorawa	12
13	Hararrabi	13
14	Taura (Detarium microcarpum)	14

Source: Field Survey, 2022.

Note: Lower values have higher cost and vice versa.

Environmental Implication of Fuelwood Production

Overdependence on fuelwood has commonly been identified as one of the biggest threat to forestry ecosystems. The effects of loss of cutting vegetal resources varied on the natural environment such as loss of biodiversity, soil erosion, land degradation and desertification. Similarly, Mshelia et al., (2020) posited that felling dawn of trees for whatever purpose leads to intense heat due to high evaporation, stormwater runoff and erosion, stronger greenhouse effects, causing global warming and climate change as well as decline in water and air quality. Stewart et al., (2021) and Ray (2011) are also of the view that one factor responsible for deforestation as a result of fuelwood production and that affects the natural balance of ecosystems giving room for extinction of organisms, local climate change and facilitates the release of high amount of carbondioxide into the environment as well as the greenhouse gases, attributing to about 10% of the causes of global warming. More still, loss of forest has negative effects on water cycle which is very significant for the continuous development of vegetal resources. The environmental effects of fuelwood consumption is not only limited to loss of forest

and its resources but also the burning of the fuelwood at homes, bakeries and small scale industries produce smokes which invariably affect air quality, lead to poor visibility and make utensils and houses dull and unclean. In view of the above, it is pertinent that the forests are protected from depletion as also viewed by Mshelia et al., (2020) agreed that conservation, prevention, securing by creating buffer zones and planting of trees assist in the soil stabilization, sedimentation ecosystem maintenance by checkmating erosional activities and consequently increase groundwater recharging capacity in order to key into SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss (UN 2016).

5. CONCLUSION

The study examined the productivity patterns and utilizations of fuelwood in Southern Yobe through the use of mixed approaches and found out that about 80% of the people make use of fuelwood as their major source of energy for cooking. Other uses are heating, baking and use in small scale industries. Fuelwood is mainly sourced from communal forest areas and the forest reserved such as Burai, Bambam, Kukuri, Babale, Zayi, Gada, Buni Yadi, Jajeri, Gudi, Chana, Maiduwa and Godowoli forests among others. Local implements such as axe, digger, cutlass, pincher and hoes are used to harvest fuelwood in the forest. The logs, branches, stumps and deadwood are cut into different sizes for easy conveyance to market urban areas. Fuelwood in the area is produced at commercial rate and provide jobs, income and means of livelihood. Thus, its availability, affordability, ease to use, low income status and cultural reasons resulted to its preference to gas, kerosene and other biomass in the region. The fuelwoods when produced or harvested in the forests are transported to fuelwood deports through Mitsubushi, Toyota open body and Peugeot pick up. The study also found out that the continuous excavation of fuelwood in Yobe South unabated will certainly lead to environmental consequences such as deforestation, loss of biodiversity, erosion, intense heat due to high evaporation, stormwater runoff and stronger greenhouse effects causing global warming and climate change as well as decline in water and air quality. Therefore, the study recommends sustainable fuelwood extraction, afforestation projects, strong legislation, provision of affordable sources of energy for cooking and enlightenment.

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