

## **Conservation Implications of Firewood Business in Makurdi Metropolis, Benue State, North Central, Nigeria**

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doi: <https://doi.org/10.37745/10.37745/ijecer.16/vol5n13344>

Published December 07, 2023

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**Citation:** Terhemba W.K. (2023) Conservation Implications of Firewood Business in Makurdi Metropolis, Benue State, North Central, Nigeria, *International Journal of Environmental Chemistry and Ecotoxicology Research*,5(1)33-44

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**ABSTRACT:** *The study examined conservation implications of firewood business in Makurdi metropolis, Benue State, North Central, Nigeria. Four research objectives and four research question guided the study using a descriptive survey design. A random sample size of 50 firewood sellers of 5 markets drawn from population of all the 8 major markets in the study area was used for the study using a structured Firewood Business and Conservation Implication Questionnaire (FWBCIQ). The study revealed that early and late adult females were into firewood business in the study area and lowest income earning people in the area occupying the bottom rung of the social ladder. The study revealed that Prosopsis Africana and Terminalia avicennioides are the most used wood species for firewood business. The study showed that firewood harvesters use the most destructive techniques of collecting firewood for sale in the study area. The also revealed consequences of firewood business that it brings soil erosion. The study revealed that firewood harvesting and marketing are activities undertaken on small scale, using mainly family labour and family resource fields. Therefore, the study was recommended that (i) The agencies in charge of conservation such as Federal Environmental protection Agency (FEPA), Federal Ministry of Agriculture and Natural Resources (FMANR), and State Environmental Protection Agency (SEPA) should be set up to ensure that firewood sellers and buyers obey conservation laws in order to protect wood species especially the critically endangered species such as Prosopsis Africana and Terminalia avicennioides. (ii) Governments should provide alternative sources of energy for domestic use such as biogas fuel and solar energy. They should likewise provide job opportunities for both formal and non-formal educated citizens in the society in order to prevent them from venturing into firewood business. (iii) Poverty alleviation programmes should be embarked upon at the local government and community levels so as to improve the socio-economic status of residents of the study area. (iv) Also, to ensure balance and effective utilization of forest resources and attain environmental sustainability, massive awareness should be created particularly, at the grassroots about the adverse effects of over exploitation on the environment.*

**KEYWORDS:** conservation, implication, firewood business, Makurdi metropolis, Benue state, north central, Nigeria

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## INTRODUCTION

Wood is a key source of energy that has been used for ages in cooking, boiling water, lighting and heating. That is why Ortserga and Dam (2019) rightly posit that energy supply is one of the basic needs of all human beings throughout ages. Firewood was probably the earliest source of energy ever used by human beings; and it has remained a dominant source of domestic energy especially in developing countries due to its affordability and social appropriateness of its use. Business Trumpet (2018) has reported that over 70% of the Nigeria estimated population of 180 million depend on firewood for their energy needs. Because of the high demand on firewood as a major source of energy, it offers market, provide primary jobs for those involved in it (Guild & Shackleton, 2018).

The factors that necessitate low-income households into firewood business around major urban centres in developing countries may include the low capital investment required, low technology involved in harvesting wood and transporting it to consumers and the ready market for it that is sustained by urban poverty. Owing to the fact that most urban households in developing countries use firewood for activities requiring energy, marketing it provides a means of livelihood to a large section of the poor within rural-urban fringe zones in developing countries. In all major towns, wheelbarrow loads or head loads of fuelwood from small scale dealers move into urban centres on a daily basis from 'rural belts' which have only limited capacity for supply of the commodity (Ortserga & Dam, 2019).

Despite firewood being the major source of energy in developing countries and the business opportunities it offers, firewood collection has series of environmental implications and it leads to deforestation, habitat loss, adaptability challenges, biodiversity reduction, hunger and starvation for the wild animal, increase danger of prey-predator, soil erosion, climate pattern change.

Firewood business endangered lots of wild animals and extinct many species. It is to be noted that cutting down of trees translates to habitat destruction. Hence, wildlife will be compelled to search for alternative but conducive habitat for survival. Failure of wildlife to find conducive habitat will lead to untimely death. High death rate could eventually lead to extinction. Also, When the animals' habitat is destroyed, the species as a whole cannot adapt fast enough to be able to live in a new area, thus, it can result to biodiversity reduction. Other implication of firewood business on wildlife may include hunger and starvation for the wild animals and the increase danger of prey-predator (Lawal & Gonap, 2015).

Furthermore, some of the environmental implications of firewood business include soil erosion and climate change. Trees are known as agents of soil stability in the ecosystem. However, regular tree felling causes erosion. The roots system of a tree controls water erosion. The firm binding of soil particles with the roots decreases the speed and force of the run-off water. Tree cutting for

firewood disturbed water cycle of the area which is crucial to animal survival. Erosion destroys burrow, underground home and tree on which animals are attached with.

The large-scale removal of tree in Nigeria is one of the principal factors for dust, heavy rain, high temperature and drought in part of the North. Firewood collection increases desert encroachment which in turn is responsible for ozone depletion. Tree cutting is responsible for severe climatic changes and its associated negative impacts on wild animals. The heat stress, abortion and death are common signs of effects of climatic changes on wild animal. Trees increase resilience to climate change, improve air quality, provide economic value to an area and offers some health benefits (Forestry Commission, 2016).

### **Purpose of the study**

The main purpose of this study is to investigate the conservation implications of firewood business in Benue State Nigeria. Specifically, the study seeks to:

- i. Identify the most used wood species for firewood business in Makurdi metropolis.
- ii. Find out the processes involved in making firewood in Makurdi metropolis.
- iii. Determine the awareness on the consequences of firewood business on the conservation of forest resources in Makurdi metropolis.
- iv. Find out the possible methods adopted to conserve forest trees in Makurdi metropolis.

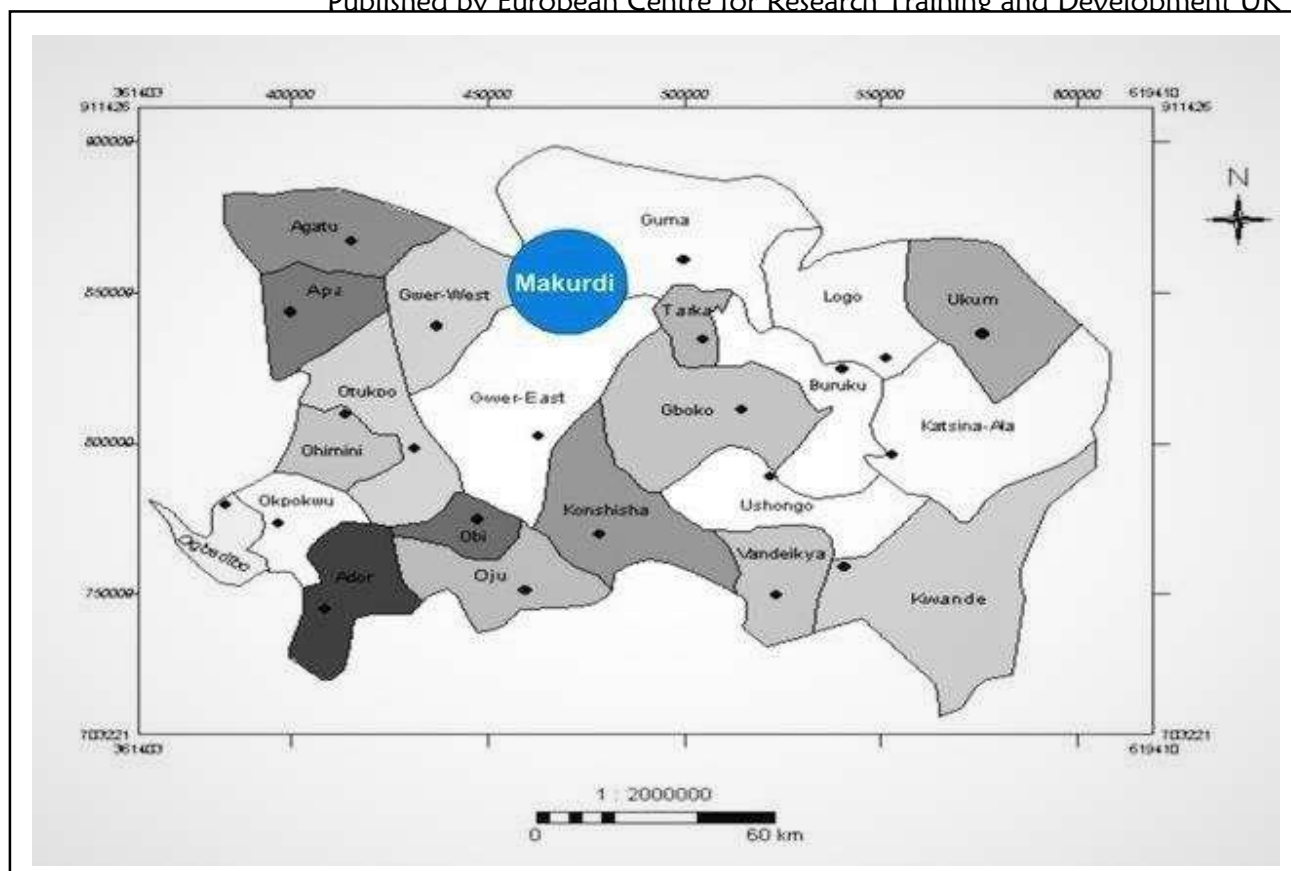
### **Research Questions**

The following research questions guided the study:

- i. What are the most used wood species for firewood business in Makurdi metropolis?
- ii. What are the processes involved in making firewood in Makurdi metropolis?
- iii. What is the awareness on the consequences of firewood business on the conservation of forest resources in Makurdi metropolis?
- iv. Which are the possible methods adopted to conserve forest trees in Makurdi metropolis?

### **METHODOLOGY**

The research design adopted for this work is the descriptive survey. The design is chosen because it attempts to collect information from a number of respondents independently and also involves gathering data about a target group from which findings obtained from the sample can be used to generalize for the entire population. According to Emaikwu (2013), survey research is one in which a group of people or items is studied by collecting and analysing data from only a few people considered to be a representative of the entire population. Hence, information about fire wood business and conservation implications was collected through questionnaire that was issued to individual firewood sellers. The study was carried out in Makurdi metropolis, Benue State, Nigeria. It lies at the latitude of 7° 43' 55.742° North of Equator and the longitude 8° 33' 20.9184 East of Greenwich Meridian.



**Figure 1. Map of Benue State showing the study area, Makurdi.**

The target population of the study comprises all firewood sellers in Makurdi Metropolis. A simple random sampling technique was used to draw out the sample for the study because of the equal chance every firewood seller had to be selected. There are 8 major markets in Makurdi metropolis which include: North Bank Market, Wadata Main Market, Wurukum Market, International Market, Modern Market, High Level Market, Akpehe Market and Markurdi International Market. Five Markets were randomly sampled for the study and 50 firewood sellers were issued questionnaire. A structured Firewood Business and Conservation Implication Questionnaire (FWBCIQ) was developed by the researchers and was subjected to face and content validation.

### **Method of Data Collection**

The researchers went to the markets to collect data from the firewood sellers using the questionnaire.

**Table 1: Distribution of questionnaire and rate of valid return from the markets**

S/N	Markets	Sample allotment	Valid copies returned
1	Wurukum	10	10
2	Modern Main Market	10	10
3	Akpehe	10	5
4	International	10	9
5	Wadata	10	10
	<b>Total</b>	<b>50</b>	<b>44</b>

Source: Field Survey, 2021

Data collected were presented in tables and graphs as well as in photographs. Analysis involved comparison between wood species used mostly for firewood business, the method employed to harvest firewood, the awareness of the consequences of firewood business as well as the method of conserving forest trees in the study area.

## RESULTS AND DISCUSSION

### Characteristics of Respondents

The dominant characteristics of firewood sellers in Makurdi Metropolis revealed the gender and age bias of the business, involving mainly early and late adult females in the study area. The reason could be that it is a low-income generating activity that requires no special skills; and it is an energy exacting engagement which suits mainly the able-bodied young people. The characteristics of firewood sellers in the area are shown in Table 2

**Table 2: Characteristics of Firewood Sellers in Makurdi Metropolis**

Characteristic of fire wood sellers	Frequency	Percentage (%)	Cumulative %
<b>Gender</b>			
Male	12	27.3	27.3
Female	32	72.7	100.0
<b>Total</b>	<b>44</b>	<b>100.0</b>	
<b>Occupation</b>			
Farming	23	52.3	52.3
Trading	15	34.1	86.4
Civil Service	1	2.3	88.6
Others	5	11.4	100.0
<b>Total</b>	<b>44</b>	<b>100.0</b>	
<b>Age</b>			
0-10	0	0	0
11-21	2	4.5	4.5
22-31	14	31.8	36.4
32-41	9	20.5	56.8
42 and above	19	43.2	100.0
<b>Total</b>	<b>44</b>	<b>100.0</b>	

<b>Marital Status</b>			
Single	3	6.8	6.8
Married	31	70.5	77.3
Divorced	1	2.3	79.5
Widow	9	20.5	100.0
Widower	0	0	100.0
<b>Total</b>	<b>44</b>	<b>100.0</b>	
<b>Level of Education</b>			
Non-formal Education	12	27.3	27.3
Primary	10	22.7	50.0
Secondary	9	20.5	70.5
Tertiary	6	13.6	84.1
Still attending School	3	6.8	90.9
Dropout	4	9.1	100.0
<b>Total</b>	<b>44</b>	<b>100.0</b>	

Source: Field Survey, 2021

It is apparent from Table 2 that the people involved in firewood business are the lowest income earning people in society occupying the bottom rung of the social ladder. In terms of gender, they are predominantly females (72.7%); in terms of age, they are mainly early and late adults between the age of twenty-two and forty-two and above constituting 75.0% sample studied. Considering the marital status, married and widows engaged more into the business constituting 91.0% of the sample studied. The reason could be as a result of unemployment and lack of support. It is clear from their educational status that they are disadvantaged as they either do not possess formal education or have too little education to be relevant in other income generating portfolios. They are therefore left with no other choice outside subsistence agriculture than harvesting and selling fuelwood for an income.

### **Research question 1: What are the most used wood species for firewood business in Makurdi Metropolis?**

To answer the research question, the analysed result is presented in table 3.

As shown in the table 3 below, *Prosopis Africana* and *Terminalia avicennioides* are the most used wood species for firewood business with the frequencies and percentages of 42 (95.5%) and 38 (86.4%) respectively. As interviewed, these preferred wood species burn for a longer time and produce high quality charcoal.

Additionally, *Burkea Africana*, *Pericopsis laxiflora*, *Vitellaria paradoxa*, *Parkia biglobosa*, *Khaya grandifoliola*, *Bridelia ferruginea*, *Cochlospermum, planchoni* are commonly used for firewood business in Makurdi metropolis.

Selling  
Not selling

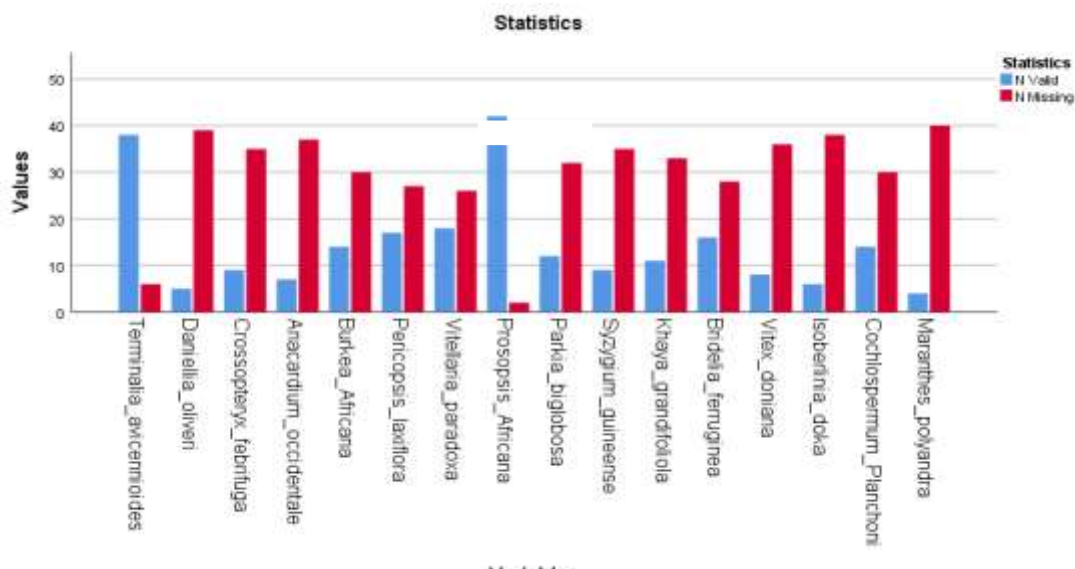


Figure 2. Bar Chart showing the Frequencies of most preferred wood species for firewood Business

Table 3: Species of trees commonly harvested for sale in Makurdi markets

Local name	English name	Botanical name	Frequency		Percentage		Total Respondents
			Selling	Not selling	Selling	Not selling	
Kuegh	Narrow long-leafed Terminalia	Terminalia avicennioides	38	6	86.4	13.6	44
Chaha	African copaiba balsam	Daniellia oliveri	5	39	11.4	88.6	44
Irkwar	African bark	Crossopteryx febrifuga	9	35	20.5	79.5	44
Shase	Acajou	Anacardium occidentale	7	38	15.9	84.1	44
Gbagbongom	Makarati timber tree	Burkea Africana	14	30	31.8	68.2	44
Jiagba	Savanna Afrormosia	Pericopsis laxiflora	17	27	38.6	61.4	44
Chamegh	Shea butter tree	Vitellaria paradoxa	18	26	40.9	59.1	44
Gbaaye	Nigerian ironwood	Prosopsis Africana	42	2	95.5	4.5	44

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Nune	Locust bean tree	Parkia biglobosa	12	32	27.3	72.7	44
Mho	Watercherry	Syzygium guineense	9	35	20.5	79.5	44
Haa	African mahogany	Khaya grandifoliola	11	36	25.0	75.0	44
Kpine	Ferruginous Bridelia	Bridelia ferruginea	16	28	36.4	63.6	44
Hulugh	Savanna black plum	Vitex doniana	8	36	18.2	81.8	44
Kovor	Doka	Isoberlinia doka	6	38	13.6	86.4	44
Ngaji	Savanna Cochlospermum	Cochlospermum Planchoni	14	30	31.8	68.2	44
Ibua	Savanna maranthes	Maranthes polyandra	4	40	9.1	90.9	44

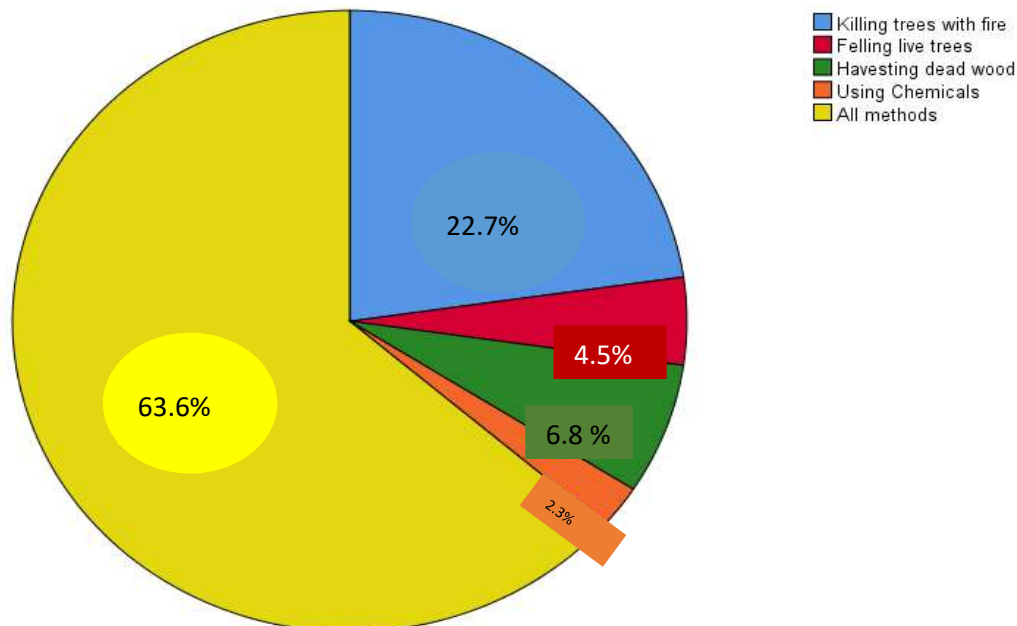
**Source: Field survey, 2021**

### **Research Question 2: What are the processes involved in making firewood?**

As denoted from figure 3, firewood harvesters use the most destructive techniques of collecting firewood for sale in the study area. Killing trees by putting fire around their bases or using chemicals does not only kill a tree, but destroys its capacity for quick regeneration. The heat from the fire affects even nearby woody trees and shrubs that are not ripe for exploitation. The chemicals can be washed into the water bodies as pollutants which are harmful to aquatic habitat.

Nevertheless, killing trees with fire was reported to be the second most prevalent technique of preparing trees for fuelwood harvesting. Felling of live trees with hand axes or saws is equally unhealthy to the environment especially when done without replanting new ones in replacement. The data revealed that the firewood harvesters use all the methods more often constituting 63.6% of the sample studied.





**Figure 3: Processes or methods of harvesting firewood**

**Research question 3: What is the awareness on the consequences of firewood business on the conservation of forest resources in Makurdi metropolis?**

The table 4 below shows that 52.3% of the respondents revealed that the consequences of firewood business bring about soil erosion. 68.2% agreed that it brings about loss of animals’ habitats. While 54.5% of respondents agreed that they are aware of forest trees as ‘the lung of the earth’. Hence, the depletion of woods for the business could result into unbalanced ecosystem. Furthermore, 65.9% agreed that harvesting of wood species for firewood business could lead to increase in global heat and 68.2% of respondents also agreed on the desertification as one of the consequences of firewood business. The interpretation of this is that firewood demand has great negative implication on our forest conservation and brings about further environmental degradation.

**Table 4: Awareness on the consequences of Firewood business.**

ITEMS	Frequency		Percentage (%)	
	Yes	No	Yes	No
soil erosion	23	21	52.3	47.7
Loss of animals’ habitats	30	14	68.2	31.8
The ‘lung of the earth’	24	20	54.5	45.5
Increase in global heat.	29	15	65.9	34.1
Desertification.	30	14	68.2	31.8

**Source: field survey, 2021**

**Research question 4: Which are the possible methods adopted to conserve forest trees in Makurdi metropolis?**

As clearly revealed in table 5 below, 68.2% of respondents do not practice planting of new trees in replacement. 61.4% confirmed that there are community restrictions against harvesting of wood species for firewood business. More so, 59.1% responded that they did not receive any education/awareness to conserve forest trees. In addition, 72.7% and 56.8% of respondents agreed that they practice sustainable agriculture and cut down trees leaving behind the stem for regeneration respectively.

**Table 5: Methods of conserving forest wood species in the study area.**

ITEMS	Frequency		Percentage (%)	
	Yes	No	Yes	No
Planting of new trees	14	30	31.8	68.2
Community legislation	27	17	61.4	38.6
Education/awareness	18	26	40.9	59.1
Sustainable agricultural practices	32	12	72.7	27.3
Preserving stem for regeneration	25	19	56.8	43.2

**Source: field survey, 2021**

**DISCUSSION OF FINDINGS**

The study examined the firewood business and conservation implications in Makurdi Metropolis, Benue state, Nigeria. The informal business is dominated by the female gender. The study revealed that firewood harvesting and marketing are activities undertaken on small scale, using mainly family labour and family resource fields (farm plots and fallow lands). As an informal activity, it showed no form of formal organisation in terms of administration, techniques of wood collection and marketing arrangement.

The study found that fuelwood trade is a coping strategy to augment income from farming, farm produce processing and selling of cooked food as main activities in the area. The combined effect of agriculture and wood harvesting has already distorted flora diversity in the area, such that tree species like *Prosopis Africana* and *Terminalia avicennioides* which were mostly preferred for firewood because of their efficient heat generation have been critically endangered. Firewood harvesters who must continue in the trade resort to heat inefficient wood species with the implication that more quantities of wood have to be supplied to satisfy the energy requirement of poor urban households who depend on firewood for domestic energy. Similar findings on loss of species diversity were made by Ortserga and Dam (2019) in a study carried out on the assessment of fuelwood exploitation and marketing within rural-urban fringes of Makurdi town in central Nigeria and Orimoogunje and Asifat (2015) in a study on fuelwood consumption in South-western Nigeria. Another study by Zubairu and Zubairu (2016) reported declining fuelwood supplies in the Guinea savannah zone of Nigeria, explaining the depletion by population pressure and poverty. In

Makurdi metropolis, the increased firewood harvesting is likely to rise even further as no sign of developing alternative energy strategy for the rural and urban poor households is in sight.

Methods of harvesting wood species for firewood business were considered to be harmful enough to destroy the maximum sustainable yield of the ecosystem and render the business ruin-bound as most sellers agreed that they use fire and chemicals in killing trees. This likely would result to soil erosion, unbalanced ecosystem, increase in temperature of the earth, desertification and loss of biodiversity.

The study found out that the people in the area do not practice planting of trees. Hence, there should be strong commitment to afforestation among policy makers and leaders at the federal, state, local government and village levels, including traditional leaders to educate firewood sellers into planting of new trees. This is very important because 59.1% of firewood sellers in the study area were not educated on the importance and how to plant new trees.

In conclusion, the study has revealed that firewood is the major source of energy for the residents of the study area. It is utilized for a variety of purposes such as cooking, boiling water, lighting and heating. There is a widening demand for firewood, with increasing pressure in the remaining forest trees. In view of this background, it is necessary for the government to further intensify efforts towards encouraging, and if possible, enforcing tree planting. However high-level illiteracy coupled with poverty with weak or lack of environmental protection awareness constitute a serious challenge to the sustainable and conservation of our forest resources. On the basis of these findings the following recommendations are hereby made towards solving identified problems with a view to achieving sustainable forest conservation in the study area.

1. The agencies in charge of conservation such as Federal Environmental protection Agency (FEPA), Federal Ministry of Agriculture and Natural Resources (FMANR), and State Environmental Protection Agency (SEPA) should be set up to ensure that firewood sellers and buyers obey conservation laws in order to protect wood species especially the critically endangered species such as *Prosopis Africana* and *Terminalia avicennioides*.
2. Governments should provide alternative sources of energy for domestic use such as biogas fuel and solar energy. They should likewise provide job opportunities for both formal and non-formal educated citizens in the society in order to prevent them from venturing into firewood business.
3. Poverty alleviation programmes should be embarked upon at the local government and community levels so as to improve the socio-economic status of residents of the study area.
4. Also, to ensure balance and effective utilization of forest resources and attain environmental sustainability, massive awareness should be created particularly, at the grassroots about the adverse effects of over exploitation on the environment.

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