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Fuelwood Exploitation and Species Depletion in Northern Cross River State, Nigeria

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Abstract

The purpose of this study was to investigate the relationship between fuelwood exploitation and species depletion in northern Cross River State, Nigeria. To achieve the purpose of the study, one null hypothesis was generated to direct the study. The literature review was done according to the variables under study. Survey research design was adopted for the study. A sample of four hundred and thirty-two (432) respondents was randomly selected for the study. The selection was done through the census sampling technique. The questionnaire was the instrument used for data collection. The instrument was subjected to face validity by experts in measurement and evaluation in the Faculty of Education, University of Calabar. The reliability estimate of the instrument was established through the Cronbach Alpha reliability method. Regression analysis was the statistical analysis technique adopted to test the hypothesis under study. The hypothesis was subjected to testing at .05 level of significance with relative degrees of freedom. The result of the analysis revealed that fuelwood exploitation is a significant predictor of species' depletion. Based on the findings of the study it was recommended that other means of domestic energy such as kerosene, natural gas, biogas as well as energy saving stoves should be made available and affordable by the government, so as to reduce over reliance of households and small scale enterprises on fuel wood.

Introduction

One of the contemporary issues that generates global concern is environmental change arising mostly from anthropogenic activities. Man is his attempt to exploit environmental resources to meet his livelihood needs, has been engaging in activities that are degrading the immediate environment in which he operates. Oyediji and Adenika (2022) pointed out that One of such activities that is a significant and emerging concern to species conservation is fuelwood exploitation.

Abanikannda and Dantani (2021) viewed fuelwood as a source of energy that is derived from burning of wood materials such as logs and twigs and is common among the rural dwellers. Usman (2018) supported that fuelwood accounts for nearly half of global wood use and more than 2 billion people depend on it as a principal source of heating and cooking fuel,. Fuelwood is often available as logs, chips, pellets and sawdust which are used to fuel small open fires especially for cooking or heating. There are many sources of domestic fuels such as kerosene, domestic gas, solar energy and wind energy. However, of all these, fuelwood remains the most commonly used fuel because of its cheapness and availability compared with conventional fuels. In addition, it does not require high level of technology and education to harvest and utilize.

Orimoogunje and Asifat (2015) pointed out that fuelwood consumption in Africa has greatly surpassed other clean sources of energy such as natural gas and electricity and about 58% of the energy supply in the continent comes from fuelwood. This is a very serious issue as the percentages for Latin America and Asia are 15% and 11% respectively, but cannot also be neglected as potential sources of ecosystem's disturbance and species' depletion. They further stated that in developing countries such as Nigeria, fuelwood has become very essential as the survival of majority of both rural and urban dwellers depend highly on finding enough wood to cook their meals. Several studies have linked fuelwood exploitation and consumption with poverty. Olumide and Awolalado (2019) observed that the poorer a country is, the greater her dependence on fuelwood. This assertion was corroborated by the United Nations Centre for human settlement when it pointed out that despite the availability of modern energy sources to some urban dwellers, majority of them cannot afford them. Wood still remains their fuel, but instead of collecting it from dead trees, branches and twigs, they now buy it from vendors who cut down forest trees and any available tree without any consciousness for regeneration.

According to Abanikannda and Dantani (2021), the 2011 United Nations Development Programmes (UNDP) assessment of the Millennium Development Goals (MDGs) included Nigeria among the countries that require significant effort towards improving their energy situation. The foregoing report tallies with that of the Nigeria's Federal Ministry Power as

seen in the 2024 Nigeria's Residential Energy Demand-Side Survey (NREDSS) by the country's National Bureau of Statistics which stated that more than 175 million Nigerians lack access to clean cooking energy where about 90% of households depend on fuelwood as their principal source of energy. Evidence shows that the widespread consumption of fuelwood in the country is attributed to various factors, including poverty, the absence of good political will to come up with policies that will regulate the proper use of energy, inadequate funding, and the high cost of alternative sources of energy such as cooking gas and kerosene.

Darazo and Babayo (2016) noted that the high cost of cooking gas and kerosene coupled with the eroding purchasing power of majority of Nigerians have resulted to a reversal to the use of readily available and affordable fuelwood. In addition, over 50% of people who were using cooking gas and kerosene in both rural and urban areas have switched back to fuelwood because of the continued increment in the prices of cooking gas and kerosene across the country. Following this, the trade on fuelwood and charcoal have become lucrative businesses in the country and different models of charcoal stoves have been invented for average Nigerians which are gradually replacing gas cylinders and kerosene stoves. Fuelwood consumption compared with other fuel alternatives in Nigeria is shown on table 1.

Table 1

Fuel Type	Annual consumption of energy (ton/year)	Tons of energy unit (Toe)	Percentage consumption	Consumption per capita
Fuel wood	4,300,000	$16.454*10^6$	92.2	461.18
Household	1,266,370	$1.304*10^6$	7.3	13.18
Kerosene	66,046	$0.070*10^6$	0.4	0.79
Liquefied natural gas (LNG) Coal	18,100	$0.013*10^6$	0.1	0.19

Source: Energy Comm. of Nigeria (ECN) in Abanikannda and Dantani (2021)

Toe = tones oil equivalent

Table 2: Poverty rate and percentage of wood as fuel source by geopolitical zones

Region	Poverty rate	Percentage of ____ as fuel source
North East	72.2	95.9
North West	71.2	95.3
North Central	67.2	86.4
South West	43.0	54.9
South East	26.7	78.0
South South	35.1	72.7

Source: Energy Comm. of Nigeria (ECN) in Abanikannda and Dantani (2021)
Toe = tones oil equivalent

Northern Cross River State which covers five local government areas (Yala, Ogoja, Bekwarra, Obudu and Obanliku) is primarily endowed with scanty forests. It falls within the Southern forest and guinea Savannah agro-ecological zone of Nigeria. The few places with forest cover in the area include: Gabu and Aliforkpa in Yala Local Government Area, Winniba-Ekajuk and Mbube in Ogoja Local Government Area, Afrike and Ukpa in Bekwarra Local Government Area, Alege and Okorshie in Obudu Local Government Area and Busi and Becheve in Obanliku Local Government Area. It is worthy of note that most of the tropical rainforest cover in the area infringe from the neighbouring tropical rainforests of Boki Local Government Area of Cross River State and the Republic of Cameroun, especially in areas that share borders with them such as Mbube,, Okorshie and Becheve (Matiki, 2008).
According to Ibol (2023), fuelwood is the primary source of energy supply for both domestic use and small scale industrial activities in northern Cross River State. Majority of people in the area are rural dwellers who have less access to clean energy sources or cannot afford them. Therefore, they source for fuelwood from nearby scanty forests, farmlands and abandoned fallow lands.

Fuelwood exploitation has become a profitable enterprise in the area because of its demand for domestic use and small scale industrial activities such as locust beans processing, cassava processing, fish smoking, bakeries, food canteens, blacksmith, burnt brick factories and institutions like hospitals, prison and boarding schools. The most preferred fuelwood tree species in the area include: African locust beans (Parkia bicolor), Gmelina (Gmelina arborea), Bush mango (Irvinga gabonensis), Teak (Tectonia grandis), Iroko (Militia excelsa), Moringa (Moringa Oleifera), African Mahogany (Afzelia africana), etc.

Usman (2018) pointed out that the use of fuelwood as a major source of energy presents the double sides of a coin. This means that in as much as wood is a very vital source of energy and income for the poor people, intensive and indiscriminate harvesting of wood for fuel,

especially in commercial quantities impose a heavy environmental burden. Parts of Northern Cross River State are transitioning into derived savannah dues to the depletion of vegetation cover through fuelwood harvesting and other related anthropogenic activities. This has far reaching consequences for the economy, public health, deforestation and climate change. Evidence shows that some indigenous species in the area are disappearing, some feeder springs and streams are drying up, temperatures are rising dramatically, climate patterns are changing drastically, soil fertility is declining through loss of nutrients, and crop yields are decreasing considerably. In addition, there are longer dry periods in the area caused by climate change and it is now a clear scenario where people are relying on vanishing, reduced and fragmented forest cover to meet their demands for fuelwood (Ibol, 2023).

In the light above, Asifat (2015) carried out a research on fuelwood consumption and species degradation in South-Western, Nigeria: the ecological relevance. The study utilized both primary and secondary data. Information was obtained from topographic map on the scale of 1:50,000 and satellites images that over the study area. The methods adopted for data collection were: questionnaire, administration, field observation and weight measurement of fuelwood. The results revealed that the sources of fuelwood for domestic used were forest, nearby bushes and abandoned farmlands. Domestic energy were: Fuelwood – 61.17%, Charcoal – 27%, Kerosene – 10%, electricity – 1.33% and gas 0.5%. Fuelwood for small scale industries were: forest – 49.23%, farmland – 34.62% and fallow land – 16.15%. The trend of fuelwood consumption was on the high trend of fuelwood consumption was on the high side from 1995 to 2011. It was 58% in 1995, 70% in 2000, 82% in 2005 and 92% in 2010 and 2011 respectively. Following this, many valuable economic tree species (preferred fuelwood) such as Triplochiton scleroxylon, Neso gordonia papa verifera and cordial spp are near extinction. While monkeys, grasscutter and rabbit were endangered in the study area. The study concluded that the patterns of fuelwood consumption presents a great danger for biodiversity products and services.

World Wide Fund for Nature (WWF, 2022) reported that estimates show that in 2010, world's forest had 289 gigatones (GT) of carbon stored in their biomass alone. However, it has been observed that a decrease of 0.5GT of the carbon stock has been recorded annually since 2005, due mainly to a reduction in global forest area caused by human activities such as fuelwood exploitation. Food and Agriculture Organization (FAO, 2015) supported that unsustainable fuelwood exploitation account for up to 7% of global greenhouse gas emissions as it reduces the number of trees available to absorb carob-dioxide (CO_2) in the atmosphere. This has been recognized as one of the main causes of global warming and climate change with it's attendant consequences.

Furthermore, besides the depletion of species, indoor air pollution from the use of fuelwood for cooking has devastating negative health effects with an estimated 95,000 deaths annually in Nigeria from associated health problems such as pneumonia, cancer, and chronic lung diseases due to exposure to pollution from biomass combustion.

Purpose of the study

The purpose of the study was to ascertain whether fuelwood exploitation significantly influences species depletion in Northern Cross River State, Nigeria.

Research questions

A research question was posed to guide the study. It is stated as follows:

1. To what extent does fuelwood exploitation influence species depletion?

Research hypotheses

A research hypothesis was formulated to give answer to the research questions. It is stated thus; Fuelwood exploitation does not significantly influence species depletion.

Research Methodology

Survey research design was adopted for the study. This design is considered because it is directed towards determining the nature of a situation as it exists at the time of an investigation. The research area for the study is Northern Cross River State of Nigeria. The study area is located in the northern Cross River State, which comprises of five local government areas namely: Yala, Ogoja, Bekwarra, Obudu and Obanliku Local Government Areas. It lies between latitudes 6° 39' 6° 41'North of the equator and longitude 8° 47'and 8° 58' East of the Greenwich Meridian and covers a total landmass of 972km^{2} (375square metres). The population of this study consisted of all registered farmers in northern Cross River State. The population of the study is 1,597 according to the Agricultural Services Department, Ministry of Agriculture, Cross River State. A multi-stage sampling approach involving the stratified, purposive and accidental sampling was adopted for the study. The stratification was based on the Local Government Areas. This to ensure each Local Government Area was adequately represented in the study. Purposive sampling was used as the researcher intentionally decided to use only farmers. The accidental sampling was adopted as the researcher administered the instrument to only the farmers he met at the time of data collection. In this method there is no provision for the estimation of the representativeness of the sample. The sample of this study consisted of four hundred and thirty-two (432) respondents selected from registered farmers in the five Local Government Areas of Northern Cross River State, Nigeria. The instrument used for data collection in the study is a structured questionnaire which was designed by the researcher. The questionnaire was divided into two

sections, sections A and B. Section A was designed to collect respondents' personal data such as sex, occupation, age, among others. Section B was designed using modified four point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). It contained fifteen items measuring the variables of the study. Face validity was established for the instrument by experts who scrutinized the research instrument and eliminated vague and ambiguous items and replaced them with more appropriate ones. Cronbach Alpha reliability method was adopted in ensuring the reliability of the research instrument. The researcher administered fifty (50) copies of the questionnaire to respondents in two forest communities in Ikom Education Zone that were part of the study. The researcher administered the instrument once to the respondents and retrieved them. Following this, Cronbach Alpha coefficient was employed to ascertain the internal consistency of each item in the questionnaire. The Cronbach coefficient obtained from analysis of data was between 0.73 to 0.78, which was a clear indication that the instrument was reliable for gathering data for the study. Data which was used for the study was gathered directly from respondents through the use of questionnaire. The researcher visited all the Local Government Areas to administer copies of the questionnaire.

Results and Discussion

Hypothesis: Fuelwood exploitation does not significantly influence species' depletion. The independent variable in this hypothesis is fuelwood exploitation; while the dependent variable is species depletion. Simple regression analysis was employed to test this hypothesis. The result of the analysis is presented in Table 3.

Table 3: Simple regression result of the relationship between fuelwood exploitation and species' depletion

Model	R	R. square	Adjusted R. Square	Std error of the estimate	
1	.704(a)	.496	.495	2.21842	
Model	Sum of square	df	Mean square	F	p-value
Regression	2081.806	1	2081.806	423.013	.000(a)
Residual	2116.192	430	4.921		
Total	4197.998	431			

* Significant at .05 level.

The simple regression analysis of the relationship between fuelwood exploitation and species' depletion yielded a coefficient of multiple regression (R) of .704 and a multiple regression R-square (R^2) of .496 and an adjusted R^2 of .495. The adjusted R^2 of .495 indicated that fuelwood exploitation accounted for 49.5% of the determinant species' depletion in the study area. This

finding is a critical indication that fuelwood exploitation is relatively high in the area of the study. The F-value of the Analysis of Variance (ANOVA) obtained from the regression table was F = 1423.013 and the sig. value of .000 (or $p<.05$) at the degree of freedom (df) 1 and 430. The implication of this result is that fuelwood exploitation is a significant predictor of species' depletion.

Discussion of findings

The result of the hypothesis indicated that, fuelwood exploitation significantly influences species' depletion. The finding of this study agrees with that of Ogeh (2023) who observed that the increasing dependence on fuelwood as a primary source of energy in developing countries such as Nigeria is exacerbated by poverty and lack of access to clean energy sources as the survival of majority of the rural and urban population depend highly on finding enough wood to cook their meals.

The finding of this study is also in support of that of Usman (2018) who pointed out that the use of fuelwood as a major source of energy presents the double sides of a coin. This means that in as much as wood is a very vital source of energy and income for the poor people, intensive and indiscriminate harvesting of wood for fuel, especially in commercial quantities impose a heavy environmental burden. Furthermore, the finding of the study supports that of (FAO) who opined that Using clean energy sources such domestic gas and kerosene as well as fuel - efficient stoves instead of open fires could reduce energy requirements, protect wood resources, reduce the time and money needed to obtain fuelwood and improve the health of people because they would breathe less wood smoke.

Conclusion

The essence of this study was to ascertain the finding of the study showed that species have extensively been degraded in the study area as a direct result of human activities such as fuelwood exploitation. The survey concluded that majority of the people in the area are poor who cannot afford alternative sources of energy and this implies that more trees are to be consumed, thus aggravating the situation of species' depletion in the area. The most resultant effects of this include, loss of indigenous biodiversity, loss of soil fertility and increase in temperature leading to climate change. Based on the findings, it was concluded that the government and non-governmental organizations should make efforts towards stabilizing the provision of accessible and affordable alternative sources of energy such as electricity, natural gas and kerosene as well as address the underlying issues of poverty and clean energy deficits in order to reduce over dependence on fuelwood as primary source of energy for domestic and industrial needs.

Recommendations

On the basis of the finding of this study, the following recommendations were made:

1. Other means of domestic energy such as kerosene, natural gas, biogas as well as energy saving stoves should be made available and affordable by the government, so as to reduce over reliance of households and small scale enterprises on forests for fuel wood.
2. Afforestation and reforestation programmes should be carried out by government, non-governmental organisations and community dwellers, and made a continuous process especially in the areas that have experienced severe depletion of species.
3. The government should intensify effort towards Public enlightenment campaigns and programmes on the negative impacts of excessive fuelwood exploitation on the environment.

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