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ASSESSMENT OF DOMESTIC FUELWOOD UTILIZATION IN TARKA LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

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Abstract

This study has investigated domestic fuelwood utilization in Tarka LGA of Benue State, Nigeria. A quantitative research design was employed, and a structured questionnaire was constructed to collect the required data. Purposive and simple random sampling techniques were used to select five wards and the study population respectively. A total of 396 copies of the questionnaire were administered to household heads randomly while descriptive statistics of frequency counts and percentages were applied to analyze the data collected. The results were summarized and presented in Tables. Results revealed that: over 93% of households solely depend on fuelwood, which was sourced through multiple modes (59%), including forest-bush, purchase and fallow lands. About 69% of households acquired fuelwood as unprocessed firewood, with only 3.0% in the form of wood pellets. Furthermore, about one-half (49.2%) of households consumed 4- 6 bundles of fuelwood weekly, with 47.5% of them expending N1,001- N1,500 weekly to buy. The study recommended the need for the installation of friendly energy sources, afforestation, and mass public awareness about the effects of heavy dependence on fuelwood utilization in the study area.

Keywords: Domestic, fuelwood, Tarka LGA, utilization, environmental, household

1. Introduction

Fuelwood is any combustible organic material derived from unprocessed or partially processed tree parts: trunks, branches, logs, twigs, roots, leaves and bark, usually gathered and used to meet domestic energy needs (Wikipedia, 2013; Ogunsanwo, Attah, Adenaiya & Umar, 2018). It is usually sourced from forest estates, woodlots, plantations, fallow bushes, pasturelands and croplands, where it is utilized either in raw form when dry or processed into wood chips, wood pellets, charcoal and briquettes (Oyelade & Ihuma, 2013). Energy plays an important role in the socio-economic and sustainable development of countries. Reliable,

affordable, accessible, and eco-friendly energy supplies ensure socio-economic development of every nation. This is why the achievement of the United Nations Sustainable Development Goal 7 (SDG-7), which is to "Ensure access to affordable, reliable, sustainable, and modern energy for all" cannot be possible until clean energy is employed to drive industrial, commercial and domestic activities.

Various reports from the literature indicate that between 2.5 to 3.0 billion people, representing 40 to 50% of the world's total population rely on polluted, unclean solid fuels to meet domestic energy needs (Gbadegesin & Olorunfemi, 2011; Ogunsanwo, Attah, Adenaiya & Umar, 2018). Global fuelwood consumption is dominated by Asia, Africa and Latin America; with China, India, Indonesia, Nigeria, and Brazil

accounting for about half the fuelwood and charcoal produced and consumed yearly. The consumption rate in sub-Saharan Africa was estimated at 622 million m³ in 2019; Nigeria's consumption was 88.3 million m³, Ethiopia 45.8 million m³, Democratic Republic of Congo 34.4 million m³, South Africa 12.3 million m³, Kenya 10.3 million m³, Tanzania 9.5 million m³, Uganda 8.1 million m³, Ghana 6.4 million m³, Senegal 4.3 million m³ and Rwanda 3.5 million m³.

In Nigeria, fuelwood consumption is higher in the Northern States due to the unavailability of fossil fuels when compared with the Southern States. The annual consumption of some States are Benue 1.3 million m³, Kaduna 1.1 million m³, Kano 0.8 million m³, and Ogun 0.5 million m³ (Isah, Shamaki, Yakubu, Babangida & Musa, 2016; Nigeria Energy Outlook, 2019). 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%, which indicates high dependence on fuelwood and other biomass (Momodu, 2013). Drivers of over-dependence on fuelwood consumption by households can be ascribed to its relatively low prices, sometimes freely harvested, easy accessibility, highly reliable, flexible, and it is 99% flammable if dry, hence faster to achieve the desired result (Ogunsanwo, Attah, Adenaiye & Umar, 2018). Besides, patronage of fuelwood by households is attributed to constraints in the regular supply of conventional clean fuels, increased poverty, and high costs of modern clean energy sources (Momodu, 2013).
Furthermore, fuelwood is a vital source of energy used in the cottage and small-scale industries such as bakeries, tea shops, fish and meat smoking, barbecuing, cassava and palm oil processing, as well as in public institutions like correctional centres, hospitals and in boarding schools and colleges. This explains in part why more than 30 million households, with over 100 million people are depending on fuelwood usage (Maton, Maqual, Binbol, Audu, Awari & Baklit, 2020; Ali et al., 2023).
The quest for fuelwood and timber has however, given rise to increased and serious environmental degradation which is threatening the sustainability of natural resources and people's health (Sogbon, Olugbamila, Akinrinmade & Oloketuyi, 2017; Maina, Umar, Egbedimame, 2020). It has resulted in soil exposure and erosion, thereby placing a heavy burden on the environment and the resource base. Fuelwood harvest and use is responsible for the loss of 350,000-400,000 hectares of forestland, reduction in soil nutrients, soil erosion, biodiversity loss, temperature rise, desertification, rise in carbon dioxide, global warming and climate change, among others (Gbadegesin & Olorunfemi, 2011; Adamu, Adamu, Ade & Akeh, 2020; Maina, Umar & Egbedimame, 2020). More so, Adedigba (2019), as quoted in Maton et al. (2020), reports that smoke from fuelwood combustion causes premature annual deaths of 3.5 million people in Asia and sub-Saharan Africa, with Nigeria recording about 95,000 deaths of women and their children under five years old. The heavy reliance on biomass in developing countries raises global concerns about the consequences, such as forest degradation, soil erosion, and indoor air pollution. In developing countries, indigenous plants have been relied on for livelihood, food security, and everyday products. Alhassanand's study on the Effan Forest Reserve in Kwara State found a decrease in the Gmelina arborea plantation, converting part of the reserve to shrubby saplings, indicating forest degradation. Fuelwood exploitation is a global concern and a key issue for several United Nations Organizations (UN), including the UN Convention on Biological Diversity, the UN Forum on Forests, the UN Convention to Combat Desertification, and the UN Framework Convention on Climate Change. Recent climate negotiations have initiated the

concept of reducing emissions from deforestation and forest degradation (REDD) to mitigate climate change through forest management and the restoration of degraded forests.

In Nigeria, the current national afforestation project in the frontline border States of Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto and Zamfara, tagged "The Great Green Wall Project" is an immediate response to mitigate the problems created by people's heavy dependence on trees for fuelwood and timber (Ogunsanwo, Attah, Adenaiya & Umar, 2018). Since meeting households' energy needs in the country is a herculean task, there is a need to investigate households' fuelwood utilization patterns to guide relevant authorities in making informed decisions (MID) in concord with the SDG-7, which is to "Ensure access to affordable, reliable, sustainable and modern energy for all". Benue State falls within the Guinea Savanna woodland, having deciduous trees that are interspersed with tall grasses which cover all the 23 local Government areas (LGAs). Tarka LGA is characterized by poor road infrastructure for efficient distribution of clean modern energy sources, has limited access to electricity, lacks alternatives to fuelwood and the inhabitants are peasant farmers. Their over-dependence on fuelwood could be linked to the fact that fuelwood is affordable and easily accessible, compared to alternatives like bottled gas, kerosene, or electricity. The availability of trees and shrubs which sometimes are obtained free from the bush abound for poor households to harness to meet basic energy needs. A reasonable number of studies have been carried out in different parts of Nigeria on fuelwood consumption (including Gbadegesin & Olorunfemi, 2011; Momodu 2013; Isah et al., 2016; Simeon et al., 2019; Adamu et al., 2020; Ali et al., 2023) however, none of such a study has been carried out in Tarka LGA of Benue State. Therefore, the gaps in knowledge concerning the fuelwood situation in Tarka LGA prompted the present study. The study sets to find answers to the following questions:

1. To what extent do households depend on fuelwood usage in Tarka LGA?
2. How do households acquire fuelwood for domestic activities?
3. In what form is fuelwood utilized by households in the study area?
4. How much quantity of fuelwood is consumed weekly by households?
5. How much money do households spend on fuelwood weekly?

2. The Study Area (TARKA LGA)

Tarka LGA is one of the 23 LGAs of Benue State and lies between Latitudes 7°30' N & 7°45'N; and Longitudes 8°45'E & 9°00'E of the Prime Meridian (see Figure 1). Tarka LGA covers a land area of 377.679km². Tarka LGA lies in the transitional zone between the North and South Nigeria.

The LGA falls within the Tropical Climate with two distinct climates, namely, wet and dry seasons. The wet season spans from April to October, with an annual rainfall total of about 1500mm. The dry season spans for 6 months, from November to March, which is usually dry and dusty. Temperature ranges from 23° -30°C, being highest around April and May.

The relief of the area is characterized by undulating low-level land, which lies 300m above mean sea level. Many streams form tributaries to River Benue. Tropical Ferruginous soil is the main soil type that supports the Guinea Savanna Woodland. Besides, alluvial soil occurs along riverbanks which support gallery forests. Both soil types favour the cultivation, growth and development of root and grain crops simultaneously. The presence of gallery forest and the Guinea Woodland are fuelwood and timber stock. The agrarian communities

harness the vegetational resources to make charcoal for commercial purposes and as firewood to meet basic energy needs.

Tarka LGA was created on December 8th, 1996 by the late President of Nigeria, General Sani Abacha's administration, with its headquarters located at Wannune town. The LGA has a total population of 79,280 people, as per the 2006 Census figure. Tarka LGA is a geographical microcosm of the Nigerian super-structure. Though the major ethnic group is the Tiv, there are a substantial number of other ethnic groups including, but not limited to: Hausa, Fulani, Igbo, Urhobo, Ijaw and Yoruba. A typical Tiv settlement is dispersed and surrounded by farmlands, but today, there are nucleated fast-growing peri-urban centres like Wannune, Asukunya, Uchi, Tarhembe and Tiortyu.

Most residents of Tarka LGA are agrarian, with crop production being the major economic activity. Domestic animals such as goats and sheep are kept within fences and some of them may be tethered to posts and trees near dwelling units. The creation of the LGA attracted many people who have come mainly for trade and public service jobs like the career civil service work, the Police, the Immigration, the State Security Service, and other private white-collar jobs. It is quite informative that most of these salary earners are often found using more than one energy source to meet basic energy needs because some of the residents live in Government low-cost housing, where the use of conventional energy sources are encouraged.

3. Methodology

This work applied a quantitative research design, involving a cross-sectional survey. The researchers surveyed a sample of the population to understand their attitudes, opinions, behaviours, and characteristics. This design allows for data collection at a single point in time and provides information within a short time frame, making it more reliable for gathering information on various geographical and environmental issues. Data for this study were collected through a well-structured questionnaire. The questionnaire was structured and validated by two experts and contains items for respondents to fill. Some of the relevant information sought includes dependence on the use of fuelwood and sources, forms of fuelwood being used, quantity of fuelwood utilized per week and the accompanied cost price, among others. A sample size of 396 households was determined through the application of Krejcie and Morgan's (1970) formula:

$$S = X^2NP\ (1\text{-}P)\ d^2(N\text{-}1) + X^2\ P(1\text{-}P)$$

Where,

S = required sample size; X^2= the table value of Chi-Square for 1 degree of freedom at the desired confidence level; N= the population size; P = population proportion (.05); d = the degree of accuracy expressed as a proportion.

A population of 396 households were chosen for questionnaire administration. Household heads constituted the study target. Randomization technique was applied in the distribution of the 396 copies of the questionnaire to household heads from the five Wards of the LGA, purposively selected. All copies of the questionnaire were duly filled and retrieved afterwards for data analysis (find a breakdown of the distributed questionnaire based on the population of the areas in Table 1).

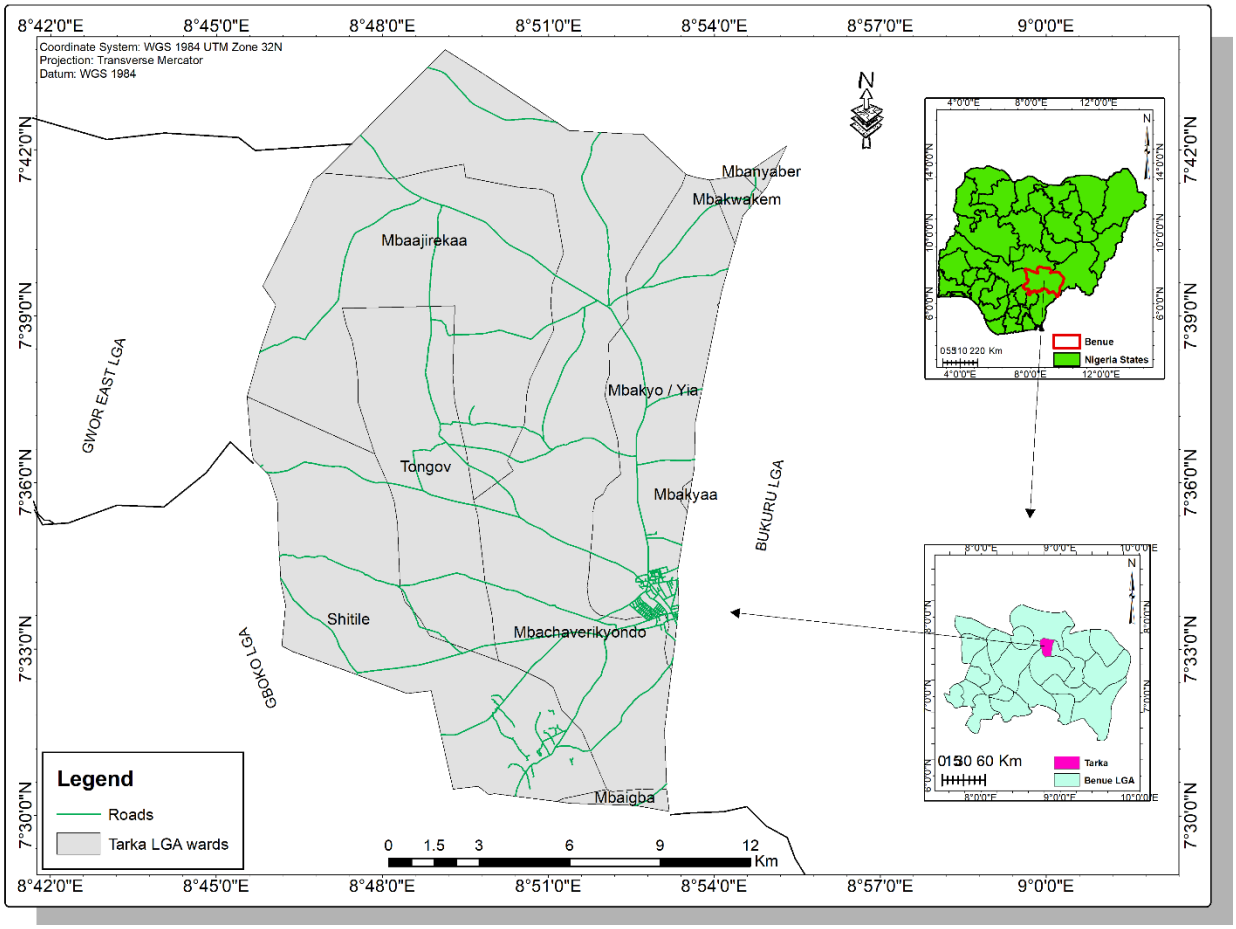

FIG 1: Benue State of Nigeria showing Tarka Local Government Area

Source: GIS Unit, Dept of Geography, University of Calabar, Calabar (2024).

Table 1: Sampled Wards and Questionnaire Distribution

S/N	Political Ward	Questionnaire	Percentage (%)
1	Mbajir	109	27.5
2	Mbaigbya	104	26.2
3	Mbachaverikyondo	79	20.0
4	Mbaikyo	49	12.4
5	Mbanyagber	55	13.9
	Total	**396**	**100**

Source: Author's fieldwork (2024)

The collected data were analyzed using frequency tables and percentages.

4. Results

This section focused on the summary of data collected, analysis and presentation of results. Descriptive statistics, particularly frequency counts and percentages were used, with highlights of comparative findings of previous works in the literature.

4.1 Households' Fuelwood Dependence

Data on fuelwood-dependent- households were collected, analyzed and presented in Table 2. Results showed that 93.2% of participants at the study were solely dependent on it, while only 6.8% applied the energy mixed principle. The mixed principle involves using fuelwood to meet domestic energy needs and can be alternated with other optional energy sources like agricultural and wood wastes, and clean cooking gas available to households.

Table 2: Fuelwood Dependence Level

S/N	Option	Frequency	Percentage (%)
1.	Sole fuelwood use	369	93.2
2.	Fuelwood with other options	27	6.8
	Total	**396**	**100**

Source: Author's fieldwork (2024)

4.2 Sources of Fuelwood Acquisition

Data on sources of fuelwood acquisition by households were obtained, analyzed and presented in Table 3. Results revealed that nearly three-fifths (58.9%) of the respondents claimed they usually acquire fuelwood from all kinds of sources, followed by those who used to acquire the product from forest and bush (28.5%), purchase from commercial wood vendors (11.1%), and from surrounding fallow lands (1.5%). Low gathering of fuelwood from surrounding fallow lands could imply that the residents are aware that trespassing on someone's property can lead to litigation because it is an offence in Nigeria.

Table 3: Major Sources of Fuelwood Acquisition

S/N	Option	Frequency	Percentage (%)
1	Forest & bush	113	28.5
2	Surrounding fallow lands	6	1.5
3	Purchase from wood vendors	44	11.1
4	All kinds of sources	233	58.8
	Total	**396**	**100**

Source: Author's fieldwork (2024)

4.3 Forms of Fuelwood Acquired for Used

Data concerning the form of fuelwood acquired for use were collected, analyzed and presented in Table 4. Results showed that the majority (68.7%) of the households in the study area acquired fuelwood in its raw form known as firewood for use, followed by those who usually obtain the product in all forms (15.4%), charcoal (8.3%), sawdust (4.5%), and wood pellets (3.0%). The different forms of fuelwood obtained and used by households indicate fuelwood caters for different needs, appliances, and uses, thereby making wood a versatile and widely used fuel source.

Table 4: Forms of Fuelwood Acquire for Use

S/N	Option	Frequency	Percentage (%)
1.	Charcoal	33	8.3
2.	Sawdust	18	4.5
3.	Wood pellets	12	3.0
4.	Firewood	272	68.8
5.	All forms	61	15.4
	Total	**396**	**100**

Source: Author's fieldwork (2024)

4.5 Quantity of Fuelwood Consumed Weekly

Table 5 displays the size of fuelwood being consumed by respondents. Results revealed that nearly one-half (49.2%) of households used 4- 6 bundles of fuelwood weekly, followed by: 7-9 bundles (36.4%), 1-3 bundles (11.6%), lastly and 10 + bundles (2.8%).

Table 5: Quantity of Fuelwood Consumed Weekly

S/N	Option	Frequency	Percentage (%)
1.	1-3 bundles	46	11.6
2.	4-6 bundles	195	49.2
3.	7-9 bundles	144	36.4
4.	10 +	11	2.8
	Total	396	100

4.4 Weekly Expenditure on Fuelwood

The consumption of fuelwood usually imposes a financial burden on users. Data about the financial cost households spent for the of fuelwood were collected, analyzed and presented in Table 6. Results indicated that nearly one-half (47.5%) of households spent N1,001 - N1,500, followed by the N501- N1,000 (33.1%), N200- N500 (8.3%), N1,501- N2,000 (8.3%) and N2,000 (2.8%). It is safe to assert that those who spent a higher amount on fuelwood purchases are likely the ones who depend solely on its use without necessarily using other options for fuelwood like agricultural waste or cooking gas.

Table 6: Weekly Expenditure on Fuelwood

S/N	**Cost (N)**	Frequency	Percentage (%)
1.	200-500	33	8.3
2.	501-1,000	131	33.1
3.	1,001-1,500	188	47.5
4.	1,501-2,000	33	8.3
5.	2,001+	11	2.8
	Total	**396**	**100**

Source: Author's fieldwork (2024)

5. Discussions

This study has investigated domestic fuelwood consumption in Tarka LGA of Benue State, Nigeria. The study has established heavy dependence of households on fuelwood utilization, as over nine-tenth of households claimed sole dependence on it (see Table 2). Despite the availability of clean energy (LPG, solar energy, electricity) many households continue to depend on fuelwood as a source of energy, fuelwood remains the primary energy source in the study area. This finding compares well but is higher than the reported result obtained in Kano, where 75.5% of the residents depended on fuelwood to meet

basic domestic energy needs (Naseer & Kanayo, 2020). Heavy dependence on fuelwood utilization has led to over-exploitation of forests, which often results in deforestation, loss of fauna and flora, and exacerbating severe climate events like flooding, drought and gullying that Nigeria is experiencing currently.

The result of this study has revealed that fuelwood is acquired from diverse sources: forest, bush, and purchase from vendors who travel down to rural areas weekly and pay people to cut down trees for fuelwood, without recourse to afforestation (see Table 3). This result compares well with findings of fuelwood exploitation in Kakau Daji village of Chiku LGA, Kaduna State, where 85% of residents acquired the product from the bush (Simeon, Wendick, Friday & Madaka, 2019).

The result obtained on forms of fuelwood demanded and used by households in the study area has revealed that nearly seven-tenth (68.7%) of households in the study area used fuelwood, as firewood, which is unprocessed, produces a lot of smoke and creates carbon dioxide build-up that exacerbates global warming and adverse climate change (see Table 4). Simeon et al. (2019) reported that 95% of residents of Kakau Daji in Chikun LGA of Kaduna State use firewood as a primary type of fuel for domestic activities, with devastating effects on home users' health and the environment.

The result of how much households spent weekly on fuelwood; it was found that nearly one-half (49.2%) of the households consumed 4-6 bundles but only 2.8% of the population consumed over 10 bundles (see Table 5). However, this category of households consuming many bundles is likely to have large household members. The proportion of households consuming 4-6 bundles (49.2%) weekly is higher than the 34% reported from Kakau Daji village in Chikun LGA of Kaduna State (Simeon, Wendock, Friday & Madaka, 2019). The finding of this study also revealed that nearly one-half (47.5%) of households in the study area spent a paltry sum of N1,001-N1,500 weekly for the purchase of fuelwood (see Table 6). The amount paid for the acquisition of fuelwood is relatively low, compared to the price of kerosene, which presently sells at N1,500/litre in Nigeria.

6.Conclusion

Fuelwood plays a pivotal role in meeting basic energy needs in most households of the residents of Tarka LGA of Benue State. The study found heavy dependence on fuelwood, which is being utilized in its raw form, which emits a lot of pollutants inimical to our inhabited Earth. Heavy dependence leads to over-exploitation of forests, as many households acquire the products from the bush with little or no heavy financial cost. Sometimes the gift of fuelwood makes it easier to access by most people in the study area. Consequently, this has been found to exacerbate health and environmental problems that are affecting the nation adversely. Unless urgent actions are taken by the relevant authorities, to mitigate the effects, the achievement of the SDG- 7 of the United Nations, of ensuring citizens get access to affordable, reliable and sustainable eco-friendly energy sources will be a mirage.

7. Recommendations

Sequel to this, the study's recommendations are:

1. Relevant Government agencies should encourage the use of clean, eco-friendly modern energy sources like cooking gas and gasifiers by lowering the installation costs through reinstatement of subsidies.
2. Non-governmental organizations should help in the provision of improved pellet stoves to vulnerable households to curtail the health and environmental risks of continued use of firewood that usually emits a lot of smoke and other harmful pollutants, inimical to the inhabited Earth.

3. There should be mass public awareness campaigns on the disastrous consequences of heavy dependence on fuelwood harvest and consumption.
4. Afforestation programme should be encouraged among communities that show commitment should be incentivised.

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