

Fuelwood Utilization among Rural Households and It's Environmental Implications in Imo State

Okoroh, Juochi P.

Department of Agricultural Economics,
Extension and Rural Development,
Imo State University, Owerri
Email: okorohjuochi@yahoo.com
+234-806-639-5506

<https://doi.org/10.56201/ijaes.vol.12.no10.2026.pg10.19>

Abstract

The study investigated fuel wood utilization among rural households and its environmental implication in Imo State, Nigeria. A multi-stage sampling procedure was used to select one hundred and twenty rural households' heads for the study. Primary data were used for the study using structured questionnaire and analyzed using percentages, frequencies and mean score. The results revealed that the major source of domestic energy used among the rural household was fuelwood (100%) and the type of fuelwood used was firewood (100%). It was revealed that rural households highly utilized fuel wood ($\bar{x}=2.5$). Rural households perceived deforestation ($\bar{x}=4.0$), Increased occurrence of wind storm ($\bar{x}=3.6$), loss of some varieties of trees ($\bar{x}=3.1$), and increased climate change effect ($\bar{x}=3.1$) among others as the effect of fuel wood utilization on the environment. Rural households identified alternative energy sources likeliqidity petroleum gas (LPG), kerosene (22%) as the only strategy they have adopted to mitigate the effect of fuel wood utilization on the environment. The study concluded that fuel wood was highly utilized by rural households in the study area. Governments can support clean energy use by subsidizing LPG so that it should be affordable to the rural households.

Key words: fuelwood, utilization, environment

Introduction

Access to reliable energy remains one of the fundamental necessities of human development most especially in rural areas of developing countries like Nigeria. In Nigeria, more than 70% of the population particularly in rural communities depend heavily on biomass fuel mainly fuel wood as their primary source of domestic energy (United Nations Development programme, 2016). Among the various forms of biomass energy, fuel wood is the most commonly used primarily for cooking, heating and agricultural purposes like Crop Drying, Livestock Feed Preparation and fish Smoking etc (FAO 1997). This is particularly the case in south eastern Nigeria including Imo State where a combination of poverty, inadequate infrastructure and limited access to alternative energy source forces households to rely on wood from nearby Forest and Farmlands (Akinbami et al, 2003). Fuel wood which is also known as firewood locally, refers to the wood that is harvested from either the forest or farmlands, and it's been utilized for different purposes particularly in rural households that do not have access to advance energy method for heating proposes. Fuel wood utilization is the process of harvesting and using wood

as fuel source, primarily for cooking heating and in some cases for industrial purposes and charcoal production. It encompasses the entire cycle from harvesting the wood (often from forest or other sources of woody biomass) to its final combustion for energy (FAO 2017). Fuel wood in general and its utilization on the environment has made several impacts on the environment be it negative or positive impact, but has made more negative impact on the environment (Numbere&Obanye, 2023). The negative impacts include deforestation and habitat loss, all this happens as the result of biomass harvesting, and it has already created a room for Climatic change and lastly loss of ecosystem services, which includes Water Cycling, Soil Conservation and Carbon Sequestration or Isolation. All this and more happens as a result of fuel wood Utilization among Rural Households (Vihi, 2018). Fuel wood while serving as immediate energy source has a long-term environmental consequence, the indiscriminate harvesting of trees without sustainable replacement and biodiversity loss is what Fuel wood Utilization has caused and might cause further damage to the environment if there is not a stoppage towards such exercise (Chukwu, 2015). The increase removal of vegetation cover in Imo State has exposed land surface to erosion which is an already wide spreading problems in the south eastern part of Nigeria and has also altered local Climatic conditions due to reduced Carbon dioxide sequestration or isolation in order to reduce environmental pollution by carbons and for the climate to be Clement (Nnaji et al, 2021). With increasing pressure on lands and forest resources in the state there is an urgent need to understand the extent fuel wood utilization and the perceived impact among rural households in Imo State. This study aims to fill the knowledge gap by investigating the inter play between Fuelwood Utilization and its environmental implications in rural communities across Imo State. This gap in knowledge limits the ability of policy makers and development agencies to implement effective interventions that promote sustainable energy use while protecting the environment. With this there is an urgent need to examine Fuel wood Utilization among rural households along with its environmental implications to guide informed policy decisions and sustainable energy strategies. The broad objective of the study was to investigate the perceived impact of fuel wood utilization among rural households in Imo State. The Specific Objectives were to:

- i) identify the type and sources of fuel wood used among rural households;
- ii) assess the extent of fuel wood utilization among rural households and
- iii) investigate the perceived environmental impacts of fuel wood utilization among rural households and
- vi) identify the strategies adopted by rural households to mitigate the impact of fuel wood utilization on the environment

Methodology

The study was carried out in Imo State, Nigeria. A multi-stage sampling procedure was used to select rural households for the study. In the first Stage the three agricultural zones in Imo State (Orlu, Owerri and Okigwe Agricultural Zone) were selected to have a good representation of the Study. In the second stage, Four local government areas (LGA's) were purposively selected to capture rural areas from each selected agricultural zone resulting in a total of 12 LGA's namely Nkwere, Njaba, Ideato South, Ideato North, Ngor-Okpala, Ikeduru, Ahiazu Mbaise, Ezinihitte Mbaise, Obowo, Ehime Mbano, Isiala Mbano and Ihitte- Uboma. In the third Stage 1(one) community was purposively selected from each of the 12 select LGA's making it total of 12 communities, this was done in order to capture areas where fuel wood utilization is highly prevalent. Finally, a random sampling technique was used to select 10 rural households' heads

from each of the 12 selected communities. This approach yielded a total sample size of 120 rural households' heads. The sample for the study comprised of 120 rural households' heads. Primary data were collected through the use of structured questionnaires and interviews, Data were analyzed using descriptive statistics such as frequencies, and percentage, means and standard deviation were used to summarize the socioeconomic characteristics of the rural households. Objective i, iii and iv were realized using descriptive statistics such as frequency count, mean, and percentage. Objective (ii) was achieved using mean score analysis through a four-point likert-type scale of Not Utilized (NU;1), Slightly Utilized (SU;2), Moderately Utilized (MU;3), and Highly Utilized (HU;4). Using a discriminating index of 2.5, the decision rule was that items with $\bar{x} \geq 2.5$ was adjudged as greatly utilized and items with $\bar{x} < 2.5$ was adjudged as less utilized. Objective(iii) which is to investigate the perceived environmental impacts of fuelwood utilization among rural households will be realized using a mean score analysis through a four point likert-type scale of Strong Disagree (1), Disagree (2), Agree(3) and Strongly Agree(4). For positive worded items and the Reverse, Strongly Disagree (4), Disagree (3), Agree (2), and Strongly Agree (1). For the Negative worded items, the mean score will be calculated by multiplying the scores of the frequencies with the scale point for every rating and dividing by the total number of respondents

Results and Discussion

Types and Sources of Fuel wood used among rural households

Types of fuel wood used among rural households

Table 1 shows the rural households distribution based on the types of fuelwood used in the study area. The primary type of fuel wood used among rural household in the study area was firewood (100%). This was followed by charcoal (58.3%), sawdust (30%) and wood shavings (20%). This result implies that all the rural households were using one form of fuel wood or the other for domestic cooking. Netshipise and Semanya (2020) observed that the most common fuel wood used among rural households is firewood. A study by Uhunamure et al. (2017) revealed that firewood is generally consumed by low-income households as they have limited options and recourses to switch to modern technologies fully. Alternatives and substitutes to fuelwood are often too scarce, expensive and yet to be commercially viable in Nigeria, resulting in the use of any available biomass degradation and hazards (Ampitan&Oyerinde, 2015).

Table 1:Type of fuel wood used.

Types of Fuelwood	Percentage
Firewood	100
Charcoal	58.3
Sawdust	30
Wood Shavings	20

**Multiple responses were recorded; Source: Field Survey Data, 2025*

Major Sources of Domestic Energy Used by Rural Households

The findings revealed that the major source of domestic energy used among the rural household was fuelwood (100%). This was followed by kerosene (42.5%), cooking gas (21.6%) and electricity (11.7%). This result is expected that rural household will use more of fuelwood than any other source of energy for cooking and heating. This study consistent with the findings of Danlami et al. (2018) and Egwuonwu and Nweke (2019) that the most commonly source of

energy used in the rural areas are fuelwood. Abanikanda and Dantani (2022) observed that fuelwood is the primary source of energy accounting for over 90% of the total energy used for domestic purposes in Nigeria. Nigeria's fuel wood consumption is about 80 million indicating that biomass fuel is the commonest source of household energy in Nigeria (Ojo, 2019). This is particularly true in Nigeria where the increase in the cost of kerosene and its attendant scarcity has forced many low-income urban dwellers to resort to the use of fuelwood /charcoal as their major cooking energy source (Ekande and Akpovwovwo, 2024; healey, 2013).

Table 2 Major Sources of Domestic Energy used by Rural Households

Major sources of domestic energy	Percentage
fuel wood	100
kerosene	42.5
Cooking Gas	21.6
Electricity	11.7

**Multiple responses were recorded; Source: Field Survey Data, 2025*

Extent of Fuelwood Utilization among Rural Household

The result in Table 3 that firewood ($\bar{x}=3.8$) was the highly utilized among rural household in Imo State as it is the primary source of fuel wood for cooking. This finding corroborates with EPA (2017) that the most utilized fuel wood among rural household is fire wood. Although, charcoal ($\bar{x}=2.3$), wood shavings ($\bar{x}=2.3$) and sawdust ($\bar{x}=1.7$) were used among rural households in Imo State they were less utilized considering the discriminating index of 2.5. This finding signifies that the respondents greatly utilized fire wood but sometimes use charcoal, wood shaving and sawdust. The grand mean of $\bar{x}=2.5$ indicates that there is fuel wood is greatly utilized among rural households in Imo State. this result is in line with Izekor and Amaindahmen (2017) who found out that most of the fuel wood utilized among the rural people within the study was fire wood followed by charcoal. Charcoal, derived from the carbonization of wood, is used for cooking, heating, and industrial process (ICPC, 2022)

Table 3: Extent of Fuelwood Utilization among Rural Household

Fuelwood utilization	Highly utilized(4)	Moderately utilized (3)	Less utilized (2)	Not utilized (1)	($\bar{x}$)	SD
Firewood	101	19	0	0	3.8	0.3
Charcoal	16	24	60	20	2.3	0.9
Sawdust	0	21	19	80	1.5	0.7
Wood shavings	16	24	60	20	2.3	0.9
Grand mean					2.5	

**Multiple responses were recorded; Source: Field Survey Data, 2025, Mean score (MS ≥ 2.5 ; Greatly Utilized; <2.5 Less utilized (L), Discriminating index 2.5; Grand mean 2.5*

Perceived environmental impacts of fuelwood utilization among rural households

The result in Table 4 shows that rural households perceived the following as the impact of fuel wood utilization on the environment; Cutting down of trees has led to deforestation ($\bar{x}=4.0$), Increase occurrence of wind storm ($\bar{x}=3.6$). Increase in erosion is noticed in the area due

to continued usage of fuel wood ($\bar{x} = 3.5$), Fuel wood utilization contributes to loss of animals in the bush ($\bar{x} = 3.5$), many varieties of trees are lost due to continuous usage of fuel wood\ loss of valuable trees ($\bar{x} = 3.1$), It increases the temperature ($\bar{x} = 3.3$), and drying up of sources of water such as pond is experienced in this area in places where trees are cut down ($\bar{x} = 2.7$).

The utilization of fuel wood contributes significantly to deforestation and environmental degradation. Household extraction for fuel is a chronic pressure on forest resources, particularly in densely populated or fragmented landscapes where demand exceeds growth; local wood fuel hotspots show measurable forest loss and degradation linked to harvesting. These findings are in line with the study of Tchobasala ([2022) and Environmental Protection Agency (2023) that the effect of fire wood utilization on the environment manifest itself, in particular, by the disappearance of ecological niches, climate change, change in rainfalls, erosion of soil, reduction of the infiltration which causes the increase of the runoff which, in its turn, can cause floods. Also, Feyisa et al. (2017) viewed that unsustainable harvesting of fuel wood can lead to significant imbalances of natural resources, as it deprives the ecosystem of nutrients that are necessary for fertility and growth. In many rural areas , unsustainable fuel wood harvesting leads to forest loss, soil erosion , and reduced biodiversity (Nwaiwu , 2017; FAO, 2017), Adetunji (2020) also observed that deforestation and continuous fetching of fuel wood for domestic cooking have driven some animals away, deforestation, in turn, disrupts local ecosystems and reduces carbon sequestration, contributing to climate Change (IPCC , 2021). Many varieties of trees are lost due to continuous usage of fuel wood\ loss of valuable trees. Selective harvesting of preferred species that alters forest composition that can reduce biodiversity, especially when collection focuses on specific high-energy or easy-to-gather species.

Table 4 Perceived environmental impacts of Fuelwood Utilization among rural households

Perceived environmental impacts of Fuelwood Utilization	SA[4]	A[3]	D[2]	SD[1]	($\bar{x}$)	SD
Cutting down of trees has led to deforestation	120	0	0	0	4.0	0.0
Fuel wood utilization contributes to climate Change	0	0	101	19	1.8	0.3
Increase in erosion is noticed in the area due to continued usage of fuel wood	81	20	81	1	3.5	0.7
Fuel wood utilization contributes to loss of animals in the bush	70	40	8	2	3.5	0.7
Continuous utilization of fuel wood/ felling down of trees affects grazing of animals	0	20	17	19	2.0	0.8
It increases the temperature	61	48	9	10	3.3	0.9
Many varieties of trees are lost due to continuous usage of fuel wood\ loss of valuable trees	60	20	28	12	3.1	1.0
Loss of soil fertility	0	2	47	71	1.4	0.5
Drying up of sources of water such as pond is experienced in this area in places where trees are cut down.	7	78	30	5	2.7	0.6
Increase occurrence of wind storm	92	16	2	10	3.6	0.8
Grand mean					2.5	

Key; SA; Strongly Agreed; A; Agreed; SD; Strongly Disagreed; D; Disagreed; Discriminatory index; 2.5 accepted; Grand mean =; Field survey Data, 2025.

4.6 Strategies adopted by rural households to mitigate the impact of fuel wood utilization on the environment

Result in Table 5 shows the strategies adopted by rural households to mitigate the impact of fuel wood utilization on the environment Liquefied petroleum gas (LPG). Rural households often depend on fuel wood because it is cheap and accessible. Providing affordable alternatives can greatly reduce its use. Examples include: Liquefied Petroleum Gas (LPG), Biogas from animal waste, solar cookers / solar home systems, Kerosene and ethanol stoves (Smith, 2006). These alternatives reduce pressure on forests and improve indoor air quality. Clean, high-quality combustion fuels like LPG remove most household air pollution risks when used exclusively; scaling requires stable supply chains, affordability measures, and safety/regulatory frameworks.

Table 5: Strategies adopted by Rural Households to mitigate the impact of fuel wood utilization on the environment

Strategies adopted by Rural Households to mitigate the impact of fuel wood utilization on the environment	Percentage
Alternative energy sources e.g LPG, kerosene, solar cooker	21.7
Use of improved cooked stove	4.2
Community forest management	0.0
Education and awareness programme on impact of fuel wood utilization on the environment	0.0
Income generating activities	16.7
Afforestation programme	7.5

**Multiple responses were recorded; Source: Field Survey Data, 2025*

Conclusion and Recommendation

The study concluded that rural household's major source of domestic energy was fuelwood and the type of fuelwood used most was fire wood in Imo State; however fuel wood was greatly utilized among rural households in Imo State. The major factors that influenced fuel wood utilization among rural households included the following; high cost of other energy sources like LPG Fuel wood is cheap and affordable, Fuel wood cooks food faster, Use of fuel wood adds good taste and aroma to the food, poverty, serves as a source of family income and availability of fire wood. Rural households perceived environmental impacts of Fuel wood Utilization as cutting down of trees has led to deforestation, Increase occurrence of wind storm, Increase in erosion is noticed in the area due to continued usage of fuel wood, Fuel wood utilization contributes to loss of animals in the bush, many varieties of trees are lost due to continuous usage of fuel wood\ loss of valuable trees, It increases the temperature and drying up of sources of water such as pond is experienced in this area in places where trees are cut down. Only few Rural Households identified alternative energy sources e.g LPG, kerosene as the only strategy they have adopted to mitigate the impact of fuel wood utilization on the environment but complained of the affordability of such a strategy. Therefore, the study concluded that rural households' socio-economic characteristics significantly influenced their extent of fuel wood utilization in Imo State.

5.1 Recommendations

Based on the major findings of the study, the following recommendations were made;

1. There should be sensitization exercise on the environmental implication of fuel wood utilization among rural households by the Environmental Experts.
2. The Extension agent should encourage the rural households to use alternative energy sources like LPG. Kerosene, ethanol etc
3. Adoption of Improved Cook stoves should be promoted by Extension Agents
4. Afforestation Programme should be encouraged by Extension Experts.
5. Governments can support clean energy use by subsidizing LPG so that it can be affordable by the rural households.
6. The Government should enforce laws against illegal logging.
7. Income-generating activities such as women empowerment schemes, skill acquisition etc should be promoted by the Government.

References

- Adamu, C.O. (2013). Perceived effect of fuelwood utilization on climate change: study among rural dwellers in Kebbi, Sokoto and Zamfara, Nigeria. *African Journal / regional study*
- Agarwal, B. (2009), forest Farm and Fuelwood Measuring Changes in Fuelwood Collection and Consumption Behavior from a Clean Cooking Intervention (2021). *Journal of Cleaner Production*. 6(2): 145-171
- Akinbami, J.F. K ilori, M.O & Onyebisi T.O (2003). Renewable energy resources in Nigeria; A Review of current Status, Future Prospect and Policy Framework. *Migration and adaptation Strategies For Global Change*, 6(2): 155-181
- Alirigia, R. (2019). Fuelwood collection and children's school attendance in the Kassena-Nankana Districts (MSc thesis). (University thesis).
- Arnold, J. E., Köhlin, G., & Persson, R. (2006). Woodfuels, livelihoods and policy interventions: Changing perspectives. *World Development*, 34(3): 596–611. Retrieved from CIFOR resources.
- Bapfakurera, E. N.(2024). Fuelwood use and household appreciation of improved cookstoves: empirical evidence. *Energy for Sustainable Development*. *Journal of Sustainable Energy*, 6(1): 12-20.
- Brooks, C. (2008). *Introductory Econometrics for finance*. New York, USA: Cambridge University Press. Retrieved on 25th July, 2025 <https://doi.org/10.1017/CBO9780511841644>
- Chukwu, J.O (2015) Deforestation and Environmental degradation in Imo State, Nigeria. *Journal of Environmental Science and Water Resources*, 4(1):1-6.
- Chukwuone, N.A, Okeke C.C & Ekwe K.C. (2006). Determinant of Fuelwood Demand Among Rural Households in Nsukka Local Government Area of Enugu State, Nigeria, *Agro Science; Journal of Tropical Agricultural Food, Environmental and Extension*, 5(1):1-6.
- CIFOR-ICRAF. (various). Wood fuels, livelihoods and policy interventions / Fuelwood revisited. Center for International Forestry Research resources and working papers.
- Clean Cooking Alliance. (2021). *A Strategy for Universal Adoption of Clean Cookstoves and Fuels*. (Program and policy guidance).
- Cooke, P. (2008). Fuelwood, forests and community management — evidence from household studies. *Environment and Development Economics* (review).
- DeVellis, R.F. (2003). *Scale Development: Theory and Applications*, Thousand Oaks, CA: Sage (on building Likert scales).
- Eshetu, S. (2024). Fuelwood from natural forests' contribution to household energy and carbon emissions. *International Journal of Forestry Research*. 2(3):70-82
- Eshetu, S. (2024). Fuelwood from natural forests' contribution to household energy and carbon emissions. *International Journal of Forestry Research*. <https://doi.org/10.1155/online> Library.
- FAO (Food and Agricultural Organization) (1997) "*Wood fuel consumption in Agricultural Processing And Rural Industries*.
- Food and Agricultural Organization of the United Nations (FAO) (2017). *The charcoal Transmission.Greening the Charcoal Value Chain to Mitigate Climate Change and Improve Local Livelihood*. Rome; FAO. ISBN.
- IPCC (2019). *Climate Change and Land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. 2019.(p. 906).

- Iiyama, M., (2014). The potential of agroforestry in the provision of sustainable woodfuel. (Review article on agroforestry and woodfuel production).
- Iyeh, O.P, & Jenkwe, E.D (2020). Assessment of Fuelwood harvesting and Its Implication on Vegetation Loss in Ofu Local Area, Kogi State, Nigeria. *FUDMA Journal of Science*, 4(2): 308-316
- Jumbe, C. B. L., Angelsen, A., & Enters, T. (2011). Modeling choice of fuelwood source among rural households and environmental consequences. *Social Science & Medicine / Energy Economics* (article).
- Konaré, A., (2010). Rural community perception of fuelwood usage by families living in Wassorola, Mali. *Journal of Agriculture & Rural Development* 12(5): 637–645.
- Lee, M. S., (2022). Household use of crop residues and fuelwood for cooking and newborn outcomes (Bangladesh). *Environmental Health Perspectives / PLOS*.
- Lewis, J. J. (2012). Who adopts improved fuels and cookstoves? A systematic review. *Environmental Health Perspectives*, 120(5): 637–645.
- Link, C. F., & others. (2011). Household energy consumption: community context and consequences. PMC/Environmental Health literature discussing health and environmental links.
- Maina Y.B, Umar, N.K & Egbedimame, A B (2020). An Empirical Analysis of the Impact of Households Fuelwood Consumption on The Environment in Nigeria. *Futy. Journal of the Environment*, 14(3):89-100
- Malla, S. (2014). Factors influencing household cooking fuel choices (World Bank Policy Research Working Paper WPS6903). Retrieved from World Bank.
- McCarron, A., (2020). Solid fuel users' perceptions of household air pollution: a systematic review of empirical studies. *Environment International*
- Mehetre, S. A. (2017). Improved biomass cookstoves for sustainable development. *Renewable and Sustainable Energy Reviews*.
- Mekonnen, A., & Köhlin, G. (2008). Biomass fuel consumption and dung use as manure. *Resources for the Future / EFD discussion paper* (on tradeoffs).
- Mekonnen, A., & Köhlin, G. (2008). Determinants of household fuel choice in major cities in Ethiopia. (EFD). *Journal of Agriculture & Rural Development* 3(5):78-90
- Muller, C., (2018). Household fuel use in developing countries: Review of determinants and outcomes. *Social Science & Medicine / Energy & Health review*.
- National Population Commission (NPC) (2006). Population and Housing Census of the Federal Republic of Nigeria. *National and State Population and Housing Tables, Priority Tables* (Volume1). NPC, Abuja.
- Nigeria Meteorological Agency (NIMET) (2016) *Geographical description of Imo State 4°5'N and 7°15'N and Longitude 6°50'E and 7°25'E* (NIMET, 2011)
- Njenga, M. & Gitau, J.K (2017) Gender and Household Energy in Africa. A Review of The Evidence. *This Review Examines the gender dimensions of households Energy in Africa, Including The Burden of Fuelwood Collection on Women and Children*.
- Nnaji, C.E, Ukwuoma, A.A & Agbo C.P (2021). *Assessment of Households Energy Use and Deforestation in Southeastern Nigeria*. Entergy Reports, 7, 1245-1254.
- Nwaiwu, J.C. (2017), Farmers' perceived effects of soil Degradation on the yield of improved cassava varieties in South East Nigeria. *Agricultural Research Journal*. 7 (3):122-128

- Numbere ,A.O &Obanye ,C.J (2023). Environmental Impact of Bush Burning on the Physico-Chemistry of Mangrove Soil at Eagle Island, Nigeria Delta, Nigeria. *American Journal of Plant Science*, 14(2): 191-201
- Nwachukwu, I.N ,Umeh O.J (2019) Fuelwood Consumption and Deforestation in Imo State, Nigeria Implications for Environmental Sustainability. *Nigeria Journal of Forestry*,49(1)20-30
- Quinn, A. K., et al. (2018). An analysis of efforts to scale up clean household energy and lessons learned. *Energy for Sustainable Development*.
- Rosenthal, J., (2017). Clean cooking and the SDGs: Integrated analytical approaches. *Environmental Health Perspectives / Lancet-type cross-sectoral analyses*.
- Smith, K.R. (2006). Health impacts of household fuelwood use. *Energy for Sustainable Development*.
- Specht, M. J. (2015). Burning biodiversity: fuelwood harvesting causes forest degradation. *Scientific reports / journal article on forest impacts*.
- U.S. Forest Service / Mercer, D. E. (2002). Fuelwood problems and solutions *Journal of Environment* 4(5)98-100.
- United Nations Development programme (UNDP) (2016). *Sustainable Fuelwood Management* (Project Nigeria; January 2016- December 2022)
- Vihi, S.V (2018). *Households Fuelwood Consumption and It's Environmental Implications in vandeikya Local Government Area of Benue State, Nigeria*.
- World Health Organization (WHO) (2016). *Burning Opportunity; Clean Households Energy for Health, Sustainable Development and wellbeing of Women and Children*. WHO Press
- World Health Organization (WHO) (2018). *Indoor Air Pollution and Health; Solid Fuel Use and it's Implication*, On Food and Agricultural Organization.