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An Analysis of Factors Influencing Household Cooking Energy Choices in Nasarawa State, Nigeria

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ABSTRACT: The study examined the factors influencing household choice of cooking energy in Nasarawa state, Nigeria. The study adopts a survey research design using primary data collected from the field with the aid of structured questionnaire. The study covered the whole population of Nasarawa state, one (1,038,572) and derives sample size of four hundred by employing the taro Yamane (1967). The study employed the logistic regression model estimation to derive robust results. The study revealed some robust findings, as level of income positively determines household choice of cooking energy in Nasarawa state, similarly the study revealed that price of cooking energy positively determines household choice of cooking energy in Nasarawa state, similarly the study revealed that level of education positively determines household choice of cooking energy in Nasarawa state, similarly the study revealed that level of employment positively determines household choice of cooking energy in Nasarawa state, and revealed that nature and ownership of dwelling unit negatively determines household choice of cooking energy in Nasarawa state. The study recommends that government should provide targeted income support and subsidies to low-income households to make cleaner cooking energy options more affordable and accessible. This can help overcome cost barriers associated with switching to cleaner fuels away from traditional biomass. Government should enforce regulations that would restrict the use of traditional biomass fuels in residential settings and promote the adoption of cleaner cooking options.

KEYWORDS: Cooking Energy, Household, fuel, Sustainability, MDG/SDG

1. INTRODUCTION

One of the key indicators of welfare, economic growth, and environmental sustainability of any society/nation is the nature of household energy use. Energy is not only a fundamental household need in Nigeria like every other part of the world; it also significantly influences public investments and policy directions (Arowosoge & Faleyimu, 2011; Abubakar et al., 2024). Essential sectors of the economy like education, health, and social welfare are underpinned by access to affordable, modern, and clean energy services, so fostering human development and economic growth (World Bank, 2006; IEA, 2006). The accessibility of a household to cheap, modern, and clean energy services is widely recognized as a precondition for long-term development and poverty reduction in any nation. Modern energy, due to its safety and low environmental impact, plays an important role in reducing disease prevalence and child death rates. In many countries, including Nigeria, insufficient energy supply has been cited as a major impediment to meeting the Millennium Development Goals (MDGs) and maintaining long-term economic success (World Bank, 2006; UN Energy, 2005). On this note, to achieve the Sustainable Development Goals (SDGs), sufficient clean energy source has been identified to be highly significant. The use of cleaner, less polluting energy sources can lessen the health concerns connected with traditional fuels while also promoting socioeconomic empowerment. Recent studies emphasize that shifting to contemporary energy services can also contribute to more efficient energy consumption, hence improving total household wellbeing (Aminu et al., 2024; Osei-Gyebi, 2023). This paper arises from the realization that modern energy services are essential for lowering health risks, such as indoor air pollution, and for improving general household welfare by lessening the dependence on conventional, inefficient fuels.

In Nigeria, particularly in Nasarawa State, many rural and urban people continue to rely largely on biomass fuels such as wood, charcoal, and agricultural wastes for cooking. This excessive dependency is primarily due to the scarcity of contemporary energy alternatives, which forces people to choose easily available but environmentally and economically wasteful fuels. Such reliance is not without consequences. The widespread use of biomass fuels causes deforestation, destruction of forests, and a chain of natural cum ecological consequences, as well as serious public health risks such as respiratory infections, chronic bronchitis, and other complications, particularly among women and children (Mekonnen & Kohlin, 2008; Sambo, 2009; Bruce, 2000; Matsoso et al., 2020). To respond adequately to the severe environmental and health consequences of biomass fuel consumption, a variety of legislation and international programs have been implemented to encourage the use of cleaner energy sources. The United Nations Millennium Project and different energy agencies have long urged lowering dependency on biomass fuels by encouraging households to switch to cleaner, more efficient energy sources (IEA, 2006; UN Energy, 2005).

The use of biomass is still alarmingly high in areas like Nasarawa State despite a number of government policies and international initiatives to reduce the use of traditional fuels, including recommendations from the United Nations Millennium Project and various energy agencies (IEA, 2006; UN Energy, 2005; Okunade, 2010; Nnaji et al., 2014). This emphasizes a critical knowledge gap regarding the factors that influence household fuel choices, as many studies have described the negative health and environmental impacts of using biomass fuels, but little is known about how socioeconomic, demographic, and infrastructural factors like income, fuel prices, education, employment status, and housing conditions influence household energy decisions (Azuwike et al., 2023; Sani et al., 2024; Osei-Gyebi, 2023; Yunusa et al., 2024). The primary goals of this research are to identify and assess the factors that influence household cooking energy choices in Nasarawa State, as well as to provide evidence-based policy suggestions. The study focuses on a variety of cooking energy sources, including firewood, kerosene, cooking gas, and charcoal, and investigates how different family variables influence energy selection. By addressing critical research questions, such as the impact of income, the effect of alternative fuel prices, the role of education and employment status, and the influence of housing conditions, this study aims to fill the existing knowledge gap and provide a solid basis for more targeted energy policies (Aminu et al., 2024; Osei-Gyebi, 2023; Azuwike et al., 2023).

This study has a wide range of implications. In terms of health, switching from old biomass fuels to healthier choices can dramatically reduce indoor air pollution and associated health hazards, such as respiratory disorders and chronic obstructive pulmonary problems (Matsoso, 2020; IEA, 2006. Reducing reliance on biomass fuels is critical for mitigating deforestation, conserving natural ecosystems, and lowering greenhouse gas emissions (Bello, 2010; UN-Energy, 2005). Furthermore, by reducing the time and effort spent on fuel collection, a work primarily carried out by women, the study has implications for gender empowerment, offering more educational and economic opportunities for women (Sani et al., 2024; Azuwike et al., 2023). In terms of economics, better energy habits may aid households save money on fuel and reallocate it to health, education, and local economic projects, ultimately helping to overall socioeconomic growth. To further investigate these topics, the study covers six Local Government Areas (LGAs): Karu, Keffi, Akwanga, Nasarawa Eggon, Lafia, and Doma, chosen to represent the state's different energy challenges. Data collected from local populations guarantees that the findings are representative of real-life energy behaviors and views, giving policymakers and development partners with crucial insights for shaping effective energy initiatives in Nasarawa State and beyond.

2. LITERATURE REVIEW

2.1 Conceptual Literature

Cooking energy is a broad concept that includes both the thermal energy transferred to food during preparation and the physical labor and resources necessary for cooking. It is characterized in a variety of ways by different scholars; for example, Dorcas (2021) and Saheed (2020) emphasize the energy required to cook food, whilst Adamu, Adamu, Ade, and Akeh (2020) emphasize its function in influencing the nutritional value and digestibility of meals. Moses (2022) adds that cooking energy includes the energy used by cooking appliances such as stoves and ovens. Linking cooking energy to societal norms and gender roles, other scholars/authors including Dictus, Daniel, and Delali (2022) and Hadiza and Abubakar (2022), consider the cultural and social aspects. From quantifiable thermal inputs to the intangible emotional and cultural investments in food preparation, this wide range of definitions emphasizes the complexity of cooking energy (Adeyemi & Adereleye, 2016; Paudel, 2018).

Household cooking energy, a major component of total energy consumption, refers to the energy required by households to meet their food preparation demands. In many poor countries, this need accounts for a large portion of total household energy use, with estimates indicating that cooking consumes up to 90% of energy in some locations (Adeyemi & Adereleye, 2016). The International Energy Agency (2006) divides these energy sources into three categories: traditional, intermediate, and modern, resulting in an energy ladder that depicts the journey from basic biomass fuels to more efficient and clean alternatives. Chidiebere-Mark, Agunanne, and Anyawu (2018) explain that this designation does not indicate a ranking, but rather a spectrum impacted by

socioeconomic level, availability, and government policy. According to Barnes (2011), the use of traditional fuels like firewood not only raises concerns of energy poverty but also reveals some significant challenges which affects man such as indoor air pollution and environmental degradation.

Many households in developing countries, particularly in rural areas, rely heavily on biomass fuels such as firewood, agricultural leftovers, and dung for cooking. These fuels are frequently readily available and serve as the foundation of energy consumption in areas with limited access to modern alternatives (Gumau, 2007; World Bank, 2003). However, reliance on biomass has been linked to negative environmental repercussions such as deforestation, soil erosion, and natural resource depletion, all of which contribute to a cycle of environmental deterioration (Mekonnes & Kohlin, 2008; Sambo, 2009). Furthermore, the widespread use of biomass fuels poses serious health hazards because of the high amounts of indoor air pollution produced during burning, which predominantly affects women and children (Bruce, 2000; IEA, 2006). As a result, biomass fuel usage serves as a perilous indicator of energy poverty and reveals the need for interventions aimed at transitioning to cleaner energy options.

Contrary to biomass fuels, other sources of energy like kerosene, liquefied petroleum gas (LPG), and electricity provide alternate pathways for domestic cooking with distinct benefits and drawbacks. Kerosene, a volatile liquid derived from petroleum, is widely used despite its health risks and the possibility of unintentional poisoning, particularly among children (Amakiri & Owen, 2009). LPG offers a cleaner and more efficient alternative with considerable health and environmental benefits, but its adoption is frequently hampered by high initial prices and safety concerns about storage and potential explosions (Aston-Jones, 1998; Anija-Obi, 2001). Electricity, a secondary energy source that requires significant infrastructure investment, supports a range of domestic, commercial, and industrial activities, but is prone to dependability concerns and distribution inefficiencies (Babatunde & Shuaibu, 2010). These diversified energy sources reflect the broader energy ladder, in which households progress from traditional to modern energy solutions, boosting household welfare and reducing negative consequences (Barnes, 2011).

2.2 Determinants of Household Cooking Energy

The factors influencing household choice of cooking energy are driven by both supply restrictions and a complex set of factors that influence household decisions. Rapid population expansion has exceeded the available supply of cooking energy, resulting in a major demand-supply mismatch, as reported by Fidelis, Uchechukwu, and Gabriel 2014. This disparity needs a thorough understanding of what drives households to utilize certain cooking fuels. Researchers have claimed that investigating these variables is critical for addressing the inefficiencies and environmental consequences connected with present energy methods. As a result, knowing the factors influencing families' energy choices is critical to developing effective policies that can close the supply-demand imbalance.

Multiple factors influence family choice of cooking energy, spanning both physical infrastructure and socioeconomic features. Moses (2022) noted that home facilities ranging from availability to firewood, kerosene, cooking gas, and charcoal to elements like income levels, kitchen arrangement, and the sort of food commonly cooked have a key impact in shaping energy consumption patterns. Moses' (2014) findings suggest that factors such as education level, gender, kitchen type, and even the number of cars possessed have a substantial impact on these choices. Adeyemi and Adereleye (2016) also emphasized that the household head's employment position, living conditions, and monthly expenses are important drivers. These various elements highlight the significance of contextual and localized dynamics in understanding family cooking energy choices.

Firewood is still one of the most popular cooking fuels, especially in rural regions, due to its easy availability and inexpensive cost. Adamu, Adamu, Ade, and Akeh (2020) noted that in areas with plentiful woods, the cost and labor associated with gathering firewood are relatively cheap, making it an appealing option for low-income families. Cultural and traditional traditions also encourage its use, as many societies see firewood cooking as an important element of their culinary legacy. However, Babak (2020) said that limited energy infrastructure frequently causes people to rely on firewood, which reinforces its significance despite its environmental and health risks. Over time, rising environmental awareness and government measures hope to lessen reliance on firewood by promoting cleaner alternatives.

Kerosene's availability and price make it a tempting choice for cooking in many rural and remote places. According to Babak (2020), kerosene's widespread availability and inexpensive cost compared to other modern fuels can persuade households, particularly those with little resources, to adopt it. Chibueze, Ezebuilo, and Jude (2012) observed that the infrastructure supporting kerosene usage, such as appropriate stoves and appliances, promotes its adoption. Furthermore, kerosene is widely regarded as cleaner than conventional biomass fuels because it produces less indoor air pollution, which is an important consideration for homes concerned about health hazards. Despite its benefits, the environmental impact of kerosene, such as its contribution to greenhouse gas emissions, also prompts households to weigh its advantages against cleaner fuel alternatives.

Cooking gas has emerged as a popular option for households seeking convenience, efficiency, and a cleaner cooking environment. Dorcas (2021) emphasized that cooking gas provides quick and customizable heat, making it especially useful and effective for

everyday cooking. Its clean-burning features reduce smoke and soot, which leads to lower indoor air pollution and better kitchen hygiene. Furthermore, cooking gas is frequently available in metropolitan areas, and its versatility in many cooking ways adds to its attractiveness. These features, combined with a lower carbon footprint compared to traditional fuels, encourage homes to utilize cooking gas, while early expenses and safety concerns about cylinder handling may still provide problems.

Price, income level, education, and home features are all important factors in influencing household energy decisions. Hanna and Oliva (2015) and Ali (2022) stated that price influences the affordability and operational expenses connected with various energy sources. Higher income levels allow households to invest in contemporary and efficient cooking methods, whilst those with lower incomes frequently use cheaper, conventional fuels. Education helps by raising awareness of the health and environmental benefits of cleaner energy sources, advocating a change to more sustainable habits. Furthermore, factors such as the nature and ownership of the dwelling and the work position of the household head further determine access to infrastructure and affordability, eventually dictating households' choices in cooking energy. (Adeyemi & Adereleye, 2016; Francis, Geofrey, & Gemma, 2014). Based on available literature, the factors that influence the household choice of cooking energy are summarized and listed as follows:

i. Access to different energy sources
ii. Income levels and monthly expenditures of household head
iii. Employment status of the household head
iv. Level of education
v. Number of cars owned
vi. Kitchen setting or type
vii. Type of food typically cooked
viii. Nature and ownership of the dwelling
ix. Cultural and Traditional Practices
x. The cost of energy sources
xi. Perceived safety
xii. Gender
xiii. Distance between household and cooking energy source

2.3 Empirical Literature

Empirical research on household cooking energy choices in developing countries demonstrates that socio-economic and demographic characteristics are important predictors of fuel preferences. In Nigeria, Aminu et al. (2024) and Abubakar et al. (2024) found strong evidence that household income, education, and overall economic well-being have a significant impact on the transition from traditional biomass fuels to cleaner alternatives such as liquefied petroleum gas (LPG) and electricity. In addition to income and degree of education, Ali (2022) discovered that households with older heads, larger family sizes, and rural people use more conventional energy sources. Cross-country investigations by Zi et al. (2021) and Gafa and Egbendewe (2021) had earlier indicated in their studies that these trends are observable in other developing regions where energy poverty remains a pressing issue.

Socio-economic characteristics such as income level, educational achievement, household size, and employment status have all been highlighted as relevant. Moses (2022) revealed that increasing household wealth increases the likelihood of using modern fuels, whereas lower-income households frequently employ fuel stacking, which combines traditional and modern energy sources. Popoola and Ibrahim (2023) and Sani et al. (2024) provided more evidence that income and education have an important role not only in influencing fuel transitions, but also in affecting energy consumption intensity. According to Osei-Gyebi (2023), external revenue sources such as remittances can help to promote the use of cleaner cooking fuels. The argument over the energy ladder and fuel stacking models has gained empirical support. While the energy ladder theory suggests a linear progression from traditional to modern fuels as incomes rise, Moses (2022), Tucho and Kumsa (2020), and Azuwike et al. (2023) found that households frequently use a combination of fuel types to manage cost fluctuations and supply uncertainties. This conclusion implies that transitioning to contemporary fuels does not necessitate the entire abandonment of conventional energy sources.

Regional and rural-urban differences can have a considerable impact on family energy decisions. Rural households, as highlighted by Ali (2022), Oluwole et al. (2024), and Yunusa et al. (2024), rely more on biomass fuels due to limited infrastructure and accessibility, a pattern reinforced by cultural practices and supply-side constraints identified in studies by Zi et al. (2021) and Gafa and Egbendewe (2021). Affordability and accessibility are identified as significant determinants. According to Saheed (2020) and Mubarik and Seidu (2018), the cost and availability of LPG are significant predictors of adoption, with affordability being a major hurdle for many homes. Furthermore, Baraya et al. (2023) and Ogbanga (2024) emphasizes and stressed the relevance of efficient

distribution networks and government subsidies in influencing fuel choices, implying that targeted policy actions could boost the adoption of cleaner cooking energy.

The health and environmental consequences of cooking energy choices have also been well investigated. Chidiebere-Mark et al. (2018) and Martinson et al. (2021) discover that reliance on traditional biomass fuels is associated with negative health outcomes such as respiratory illnesses and indoor air pollution, emphasizing the importance of promoting cleaner cooking technologies to improve household welfare and mitigate environmental degradation. Further evidence from research in Lesotho and Northern Sudan supports these conclusions. Matsoso, Retselisitsoe, and Moeketsi (2022) show that in Lesotho, characteristics such as the age and education of the home head, household size, income level, and availability to electricity are important predictors of clean energy adoption. In Northern Sudan, Philbert et al. (2021) highlight that improved credit access and higher education significantly boost the likelihood of switching from traditional fuels to cleaner options like LPG.

This perspective is broadened by research from West and Southern Africa. Martinson, Yuansheng, and Dennis (2021) found that household education, internet access, off-farm work, and asset ownership are important predictors of clean cooking energy use in rural Ghana, whereas Yibettal, Meley, and Muyiwa (2021) found that income, family size, and location have a significant impact on both cooking and lighting energy choices in Southern Ethiopia. Other studies from different regions provide more context. Adamu, Adamu, Ade, and Akeh (2020) in Nigeria support the energy ladder hypothesis, although they observe that households frequently engage in fuel stacking rather than complete fuel replacement. Paudel (2018) in Afghanistan and Maheshwar and Binog (2018) in Nepal found that wealthier, better-educated households are more likely to switch to cleaner cooking fuels, which is further influenced by dwelling qualities, availability to electricity, and cultural traditions. Finally, findings from urban studies in Nigeria (Olugbire et al., 2016; Danladi, Aondoyila, & Humphrey, 2016), Cameroon (Njong & Johannes, 2011), and India (Farsi, Filippini, & Pachauri, 2015; Hanna & Oliva, 2015) consistently show that household cooking energy choices are influenced by a combination of economic, demographic, and infrastructural factors.

2.4 Theoretical Framework

This study's theoretical foundation is based on a dual approach that incorporates the Energy Ladder and Fuel Stacking theories. The Energy Ladder Theory is a useful paradigm for understanding how households move from traditional, inefficient cooking fuels to contemporary, cleaner energy sources as their incomes and living standards rise. This theory, first proposed by Schneider (1993) and expanded on by Hosier and Kipondya (1993), is based on the economic theory of consumer behavior, which holds that traditional fuels such as wood, crop residues, and animal dung are inferior goods, whereas modern fuels such as LPG, kerosene, and electricity are considered normal goods. As household incomes improve, economic substitution and income effects are predicted to encourage a shift towards higher-quality fuels, lowering the health hazards and environmental degradation associated with older cooking methods. However, the energy ladder theory has been attacked for its simple, linear perspective of fuel switching, which fails to account for the numerous social, cultural, and infrastructural aspects at play.

The Fuel Stacking Theory, which acknowledges that households frequently do not discard conventional fuels fully while adopting contemporary alternatives, supplements the energy ladder. According to Mekonnes and Köhlin (2008) and Dickson (2015), households typically use a combination of fuels, a practice known as fuel stacking, to increase flexibility in meeting their cooking demands. This approach better describes real-world behaviour, in which economic, cultural, and practical concerns force households to adopt multiple energy sources concurrently rather than sequentially. By combining both theories, the discussion provides a comprehensive framework for investigating household cooking energy dynamics in Nasarawa State, Nigeria, recognizing that while socioeconomic progress can drive the adoption of cleaner fuels, infrastructural constraints and cultural practices frequently result in a continued reliance on traditional sources. This dual-theory method gives useful insights for policy formation and future study by balancing macroeconomic factors with micro-level decision-making processes.

3. METHODOLOGY

The study will adapt survey research design. According to Cohen (2003), survey design is a process of collecting data in order to test hypothesis or to answer the questions of the current status of the subject under investigation. In this study, this design will be used to explain the factors influencing household choice of cooking energy in Nasarawa state. It will also use primary sources through the administration of questionnaire as an instrument of data collection from the respondents in the study area. The use of survey design in this study is preferable, as the research questions posed utilizes data from the primary sources. It relies heavily on funding or the recruitment of participants, which may be costly. This justified the used of the design.

3.1 Study area: Nasarawa State.

The study area in Nasarawa State but some selected Local Government Area were specifically used for the study, they include; Karu, Keffi in Western senatorial district, Akwanga, Nassarawa Eggon in Northern senatorial district and Lafia and Doma in

Southern senatorial district respectively. These Local Government Areas spread across the three (3) senatorial zones of the state. The selection was done randomly so as to give all segments of the Local Government equal chance of being selected. (See Fig. 1).

Fig. 1: Map of Nasarawa State showing Three Senatorial District



Source: Nassarawa State Town Planning Commission

The study selected Six (6) Local Government Areas of Nasarawa State. The total population of the study area according to the 2006 population census is 1,038,572 people. The guiding principle in drawing sample is that it must adequately represent or reflects the target population and must be random. Sample size is a small amount of the total population. As a result, the sample size for this study has been derived using Taro Yamane Formula as stated below;

$$n = \frac{N}{1 + N(e)^2}$$

Where;

n = Sample size

N = Population of the study area

(e) = Level of significance

1= Unit (a constant)

Note that (e) = 0.05

$$n = \frac{1{,}038{,}572}{1 + 1{,}038{,}572(0.05)^2} = 399.9$$

Using the above formula, the sample size for the study was obtained to be approximately 400. The population and sample size of the six (6) selected Local Government Areas according to the 2006 population census is given in table 1 below;

Table 1: Population and Sample Size of the Selected Six L.G.A in Nasarawa State.

S/NO	L.G.A.	Senatorial District	Population	% of total population approximate	Sample Size (as a % Of Total sample size)
1	Karu	Western	216,230	$\frac{216{,}230}{1{,}038{,}572} \times 100 = 21\%$	$\frac{9}{100} \times 400 = 84$
2	Keffi		92,550	$\frac{92{,}550}{1{,}038{,}572} \times 100 = 9\%$	$\frac{21}{100} \times 400 = 36$
3	Akwanga	Northern	111,902	$\frac{111{,}902}{1{,}038{,}572} \times 100 = 11\%$	$\frac{11}{100} \times 400 = 42$
4	Nassarawa Eggon		148,977	$\frac{148{,}977}{1{,}038{,}572} \times 100 = 14\%$	$\frac{14}{100} \times 400 = 57$

5	Lafia	Southern	329,922	$\frac{329,922}{1,038,572} \times 100 = 32\%$	$\frac{32}{100} \times 400 = 128$
6	Doma		138,991	$\frac{138,991}{1,038,572} \times 100 = 13\%$	$\frac{13}{100} \times 400 = 53$
	TOTAL		**1,038,572**	**100%**	**400**

Source: Author's computation, 2025

The choice of this aforementioned Local Government Area (LGAs) for the study is due to the fact that some local governments are urban while others are rural so as to reflect the entire state. The analytical tools in this study were descriptive statistics and Logistic regression model by utilizing the Maximum Likelihood (ML) estimation technique through STATA version 14 software on the factors influencing household choice of cooking energy in Nasarawa state. Before the estimation, the data was coded and analysed using descriptive statistic. A normality test was carried out on the collected data to check whether it was normally distributed or not, the test would be done using Shapiro-Wilk tests. The null hypothesis states that the residuals are normally distributed. If the p-value of the JB statistic in the application is sufficiently low, which can occur if the value of the statistic is very different from zero, one can reject the null hypothesis otherwise we do not reject the null hypothesis (Gujarati, 2005).

3.2 Model Specification

The model to be estimated is given as follows:

$$Log\left[\frac{p}{1-p}\right] = HCE = \beta_0 + \beta_1 IHH + \beta_2 PCE + \beta_3 EHH + \beta_4 EMH + \beta_5 NOH + \mu_t$$

Where:

HCE= Household choice of cooking energy
PCE= price of the cooking energy
IHH = income of the household
EHH = education of the household
EMH = Employment status of the household
NOH = Nature and ownership of dwelling house/unit

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, are the parameters of the model to be estimated and μ_t is the error term

4. RESULTS AND DISCUSSION

The data of the study was coded in a tabular form and presented in Appendix A and the study's findings are presented in this chapter. The study examined the factors influencing household choice of cooking energy in Nasarawa State, Nigeria. Data was obtained from primary sources utilizing a questionnaire in order to achieve the objectives of the study. The questions focused on the respondents' demographic traits, household level of income, household price of energy, household level of education, household level of employment and nature and ownership of dwelling unit.

i. Descriptive Statistics

Table 2: Descriptive Statistics Results

Descriptive Statistics				
Variable	**Mean**	**Std. Deviation**	**Skewness**	**Kurtosis**
Choice of cooking energy	.4713	.24974	.012	-.399
Level of income	.5573	.39955	-.209	-1.404
Price of energy	.7134	.31405	-.698	-.677
Level of education	.7516	.26081	-.481	-1.212
Level of employment	.8301	.23112	-1.007	-.273
Nature and ownership	.7006	.29715	-.801	-.077

Source: Field Survey, 2025

Choice of cooking energy has a mean score of 0.4713 and standard deviation of 0.24974 which its normal curve was skewed to the right 0.012 with a kurtosis of -300. Level of income has a mean score of 0.5573 and standard deviation of 0.39955 with its normal curve skewed to the left (-0.209). Price of energy has a mean score of 0.7134 and standard deviation of 0.31405 with its normal curve skewed to the left (-0.698). Level of education has a mean score of 0.7516 and standard deviation of 0.26081 with its normal curve skewed to the left (-0.481). Level of employment has a mean score of 0.8301 and standard deviation of 0.23112 with its normal curve skewed to the left (-1.007). Nature and ownership of dwelling unit has a mean score of 0.7006 and standard deviation of 0.29715 with its normal curve skewed to the left (-0.077).

ii. Normality Test results

The test of normality was conducted using Kolmogrov-Smirnov or Shapiro-Wilks statistics. The Kolmogrov-Smirnov and Shapiro-Wilks statistic with a lilliefors significance level for testing normality is produced with the normal probability. If the significance level is greater than 0.05%, then is assumed normality.

Table 3: Normality Test Result

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Choice of cooking energy	0.219	314	.065	0.915	314	.098
Level of income	0.248	314	0.059	0.793	314	0.012
Price of energy	0.284	314	0.119	0.800	314	0.064
Level of education	0.295	314	0.087	0.770	314	0.090
Level of employment	0.374	314	0.098	0.699	314	0.071
Nature and ownership	0.244	314	0.012	0.816	314	0.015

a. Lilliefors Significance Correction

Source: Field Survey, 2025

All the variables revealed that their respective significance levels was greater than 0.05%, which mean that the H_0 is rejected and conclude that the data was normally distributed except level of income and nature and ownership of dwelling unit that their significance level was less than 0.05 which means H_0 was accepted and conclude that those variables are not normally distributed.

iii. Multicollinearity Tests

Table 4: Multicollinearity Test Result

Variables	Collinearity Statistics	
	Tolerance	VIF
Level of income	0.646	1.549
Price of energy	0.393	2.545
Level of education	0.356	2.805
Level of employment	0.900	1.111
Nature and ownership	0.555	1.802

Source: Field Survey, 2025

The result reveals that all the variables of the study has tolerance values (TV) greater than 0.1 and not exceeding 0.9 which indicates absence of collinearity in the study. Their variance inflation factors (VIF) were between common thresholds of 1 to 5, which also indicates that there was no Multicollinearity among the variables of the study.

iv. Logistic Regression Model Result

Table 5: Regression Result

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	4.323633	1.194742	3.618884	0.0011
IHH	7.574405	1.712405	4.421277	0.0001
PCE	0.689463	0.327017	2.108338	0.3050
EHH	2.200176	0.079689	2.511959	0.0120
EMH	3.999898	2.318578	3.138633	0.0017
NOH	-0.071540	0.021204	-3.373642	0.0013

No. of obs	314
R-squared	0.823128
Adj. R-squared	0.719294
F-statistic	29.18694
Prob(F-statistic)	0.0009
Mean dependent var	0.665919

Source: Field Survey, 2025

The estimated model is as follows:

HCE = 4.323633 + 7.574405IHH + 0.689463 PCE + 2.200176 EHH + 0.999898EHM + 0.071540NOH

The intercept (β0) has a positive sign (4.323633) which indicates that, if all the regressors are fixed to zero, the dependent variable – household choice of cooking gas of the respondents, would increase by 4.3 in the study area.

The coefficient of level of income (7.574405) is positive which indicates a positive determinant of household choice of cooking energy in Nasarawa state, a unit change in level of income lead to an increase of 7.57 in household choice of cooking energy in Nasarawa state during the period of review.

The coefficient of price of cooking energy (0.689463) is positive which indicates a positive determinant of household choice of cooking energy in Nasarawa state, a unit change in price of cooking energy led to an increase of 0.69 in household choice of cooking energy in Nasarawa state during the period of review.

The coefficient of level of education (2.200176) is positive which indicates a positive determinant of household choice of cooking energy in Nasarawa state, a unit change in level of education lead to an increase of 2.2 in household choice of cooking energy in Nasarawa state during the period of review.

The coefficient of level of employment (3.999898) is positive which indicates a positive determinant of household choice of cooking energy in Nasarawa state, a unit change in level of employment lead to an increase of 3.99 in household choice of cooking energy in Nasarawa state during the period of review.

The coefficient of nature and ownership of dwelling unit (-0.071540) is negative which indicates a negative determinant of household choice of cooking energy in Nasarawa state, a unit change in nature and ownership of dwelling unit lead to a decrease of -0.07 in household choice of cooking energy in Nasarawa state during the period of review.

Furthermore, R^2 (R-Square) is the coefficient of determination and it helped to measure the goodness of fit of the estimated model of the study. In other words, the model was reasonably fit by the value of .680 reported. It showed that 68% of the variation in dependent was explained by the dependent variables, while 32% unaccounted variations were captured by the white noise error term. The reasons for this uncounted variation are due to the fact that there are other determinants of household choice of cooking gas, which were not identified in the present study.

Also, by examining the overall fit and significance of household choice of cooking gas model, it was found to have a good fit, as indicated by the high *F*-statistic value of 29.18694 and it is significant at the 5.0 per cent level. That is, the F-statistic p-value of 0.0009 is less than 0.05.

All the standard errors of the individual variables are minimum thereby producing high Z– statistic and below 0.05 probability values which indicate that, all the variables are statistically significant at 5% level of alpha except PCE.

The (Mean dependent variable) of 0.665919 indicated the reliability of the explanatory variables with regards to the dependent variable and the minimum value of the standard errors of regression proved the robustness of the model.

v. Discussion of Findings

Findings from the study revealed that level of income was found to have had a positive and significant determinant of household choice of cooking energy in Nasarawa state. It showed that a percentage increase in level of income, on the average increased determinant to household choice of cooking energy in Nasarawa state by 7.57 during the period under review. The reason for the positive findings could be attributed to the fact that level of household income is a strong factor influencing the household choice of cooking energy due energy price variations and income play a vital role in choosing energy cooking choice options. The findings are in agreement with Onyekuru and Eboh (2011), Olugbire, Aremu, Opute, Ojedokun and Adisa (2016), Adeyemi and Adereleye (2016), Olugbire, Aremu, Opute, Ojedokun and Adisa (2016), Maheshwar and Binog (2018), Aisha, Muyinatu, Adefunke & Kehinde (2018), Moses (2022) Hadiza and Abubakar (2022), Yibettal, Meley and Muyiwa (2021) who found level of income as a positive determinants of household choice of cooking energy.

Finding from the study revealed that price of cooking energy was found to have had a positive and insignificant determinant of household choice of cooking energy in Nasarawa state. It showed that a percentage increase in price of cooking energy, on the average increased determinant to household choice of cooking energy in Nasarawa state by 0.69 during the period under review. The reason for the positive findings could be attributed to the fact that price of cooking is a strong factor influencing household choice of cooking energy due energy price variations and play a vital role in choosing energy cooking choice options. The findings are in agreement with Ampitan and Oyerinde (2015), Olugbire, Aremu, Opute, Ojedokun and Adisa (2016), Mubarik and Seidu (2018), Hadiza and Abubakar (2022) who found price of cooking energy as a positive determinants of household choice of cooking energy.

Findings from the study revealed that level of education was found to have had a positive and significant determinant of household choice of cooking energy in Nasarawa state. It showed that a percentage increase in level of education on the average increased determinant of household choice of cooking energy in Nasarawa state by 2.2 during the period under review. The reason for the positive findings could be attributed to the fact that education is a strong factor influencing household choice of cooking energy due cooking energy variations and play a vital role in choosing energy cooking choice options. The findings are in agreement with

Bello (2010), Yonas, Abbe, Gunnar and Alemu (2015), Adeyemi and Adereleye (2016), Tafadzwa, Ayodeji & Isaac (2018), Paudel (2018), Maheshwar and Binog (2018). Aisha, Muyinatu, Adefunke & Kehinde (2018), Martinson, Yuansheng and Dennis (2021), Yibettal, Meley and Muyiwa (2021) who found level of education as a positive determinants of household choice of cooking energy. While the study disagree with the study by Adetunji (2007) who rather found level of education as a negative determinant of household choice of cooking energy.

Findings from the study revealed that level of employment was found to have had a positive and insignificant determinant of household choice of cooking energy in Nasarawa state. It showed that a percentage increase in level of employment on the average increased determinant to household choice of cooking energy in Nasarawa state by 3.99 during the period under review. The reason for the positive findings could be attributed to the fact that level of employment is a strong factor influencing household choice of cooking energy due different level of earnings which play a significant role in choosing cooking energy choice. The findings are in agreement with Bello (2010), Onyekuru and Eboh (2011), Adeyemi and Adereleye (2016) who found level of employment as a positive factor influencing household choice of cooking energy. While the study disagrees with the study by Adetunji (2007) who rather found level of employment as a negative determinant of household choice of cooking energy.

Findings from the study revealed that nature and ownership of dwelling unit was found to have had a negative and significant determinant of household choice of cooking energy in Nasarawa state. It showed that a percentage increase in nature and ownership of dwelling unit on the average, decreases determinant of household choice of cooking energy in Nasarawa state by -0.07 during the period under review. The reason for the negative findings could be attributed to the fact that nature and ownership of dwelling unit is a weak factor influencing household choice of cooking energy due to the fact ownership and rented apartment of households has no role in deciding cooking energy choice in Nasarawa state. The findings are in disagreement with the study of Pundo and Fraser (2006), Njong and Johannes (2011), Olugbire, Aremu, Opute, Ojedokun and Adisa (2016), Adeyemi and Adereleye (2016), Aisha, Muyinatu, Adefunke & Kehinde (2018) who found nature and ownership of dwelling unit as a positive determinants of household choice of cooking energy.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

According to the study, income level was found to be a positive and statistically significant factor of household cooking energy choice in Nasarawa state, Nigeria, as evidenced by the positive coefficient and p-value greater than 0.05%. Furthermore, while the price of cooking energy had a favourable effect, it was statistically inconsequential, with a positive coefficient and p-value less than the 0.05% level of significance. Education and job levels were found to have positive and statistically significant effects on household cooking energy choices, as evidenced by a positive coefficient and a p-value of less than 0.05%. In contrast, the nature and ownership of the dwelling unit were found to have a negative impact on the household's choice of cooking energy, although being statistically significant. The study examined the factors influencing household choice of cooking energy in Nasarawa state, Nigeria, using reliability tests, descriptive statistics, normality tests, multicollinearity tests, and logistic regression analysis, which justified the application of the model; the regression estimate revealed that all the explanatory variables are positive determinants except nature and ownership of dwelling unit, which adversely affects the choice, and all variables are stable. Based on these empirical results, the study recommends that government should provide targeted income support and subsidies to low-income households; enforce regulations to restrict the use of traditional biomass fuels; implement price regulations or market interventions to ensure competitive pricing for cleaner cooking energy; increase education and awareness programs especially for rural households; invest in skill development and create employment opportunities in the clean cooking energy sector; and formulate and implement programmes to improve the nature and ownership of dwelling units to further promote cleaner cooking technologies such as LPG connections or electric stoves, including providing incentives for landlords to upgrade their properties.

REFERENCES

1) Abott, M. M. (2001). Theory and Problems of Thermodynamics; Schaum's Outline Series in Engineering, McGraw-Hill Book Company.
2) Adamu, M.B, Adamu, H, Ade, S.M & Akeh, G.I (2020). Household Energy Consumption in Nigeria; A Review on the Applicability of the Energy Ladder Model; Journal of Applied Science and Environmental Management 24 (2) 237-244.
3) Adetunji, M. O; Adesiyan, I. O, &Sanusi W.A (2007).Household Energy Consumption Pattern in Osogbo Local Government Area of Osun State. Pakistan Journal of Social Sciences 4(1):9-13.
4) Adeyemi, P.A & Adereleye, A. (2016). Determinants of Household Choice of Cooking Energy in Ondo State, Nigeria; Journal of Economics and Sustainable Development, 7(9);1-13.

5) Aisha, O.A, Shakirat, B.I, Muyinatu, M.S, Adefunke, F.O.A & Kehinde, M.S (2018). Household's Cooking Energy Preferences and Determinants of Transition to Non-Biomass Fuels in rural Nigeria; Journal of Sustainable Development in Africa, 20(1); 1-20.
6) Alemu Mekonnen, & Gunnar Kohlin (2008). Determinants of Household Fuel Choice in Major Cities in Ethiopia. Environment for Development; Discussion Paper Series, August 2008.
7) Amakiri, A. O; Owen O. J, & Iboh, I.I (2009). Effect of Refined Petroleum Product (kerosene) Flame and Fumes on the Performance of Broiler Chicken. International Journal of poultry Science 8(2) 188-191.
8) Amin, K & Runar, B. (2013). Functional Form and Aggregate Energy Demand Elasticities; A non-parametric panel approach for 17 OECD Countries; Energy Economic Journal, 2(36), 19-27.
9) Amin, K. (2011). Impact of Economic and Non-economic Factors on Gasoline Demand; a time varying parametric model for Sweden and the UK. Energy Economic Journal 2(43) 123-141.
10) Amin, K. (2012). Effects of Demography and Labour Supply on Household Gasoline Demand in Sweden; a semi-parametric approach.
11) Amin, K. (2013). Cooking Fuel Preferences among Ghanaian households; an empirical analysis, Energy Economic Journal, 4(3), 119-127.
12) Ampitan, U, & Oyerinde, O. (2015). Fuel Choices in Urban Indian Household. International Journal of Academic Research, 5(6) 151-155.
13) Anija-Obi, I. N (2001). Fundamentals of Environmental Education and Management. University of Calabar Press, Calabar Nigeria: 92-101.
14) Arnold, J. E. M., Kohlin, G. & Persson, R. (2006). Woodfuels, livelihoods and policy interventions: Changing perspectives. World Development, 34 (3), 596-611.
15) Arowosoge, O. G. E & Faleyimu, O.I **(**2011). Assessment of Household Energy Utilized for Cooking in Ado-Ekiti Metropolitan Area of Ekiti State, Nigeria. International Journal of Academic Research, 3(5) 151-155.
16) Aston-Jones, N (1998). The Human Ecosystem of the Niger Delta. An Era Handbook, Environment Right Actions Lagos: pp 136-138.
17) Babak, V. (2020). Introducing Energy Consumption Theory and its Positive Impact on the Economy, Journal of Energy and Innovations, 2(3) 2-10.
18) Barnes, D.F., & Floor, W.M. (1996). Rural energy in developing countries: a challenge for economic development. Annual Review of Energy Environment, 21, 497-530. .
19) Bello, M (2010). Impact of Wealth Distribution on Energy Consumption in Nigeria: A case of selected households in Gombe State. International Association for Energy Economics, 30th Conference, Washington D. C.
20) Bisu, D. Y., Kuhe, A., & Iortyer, H. A. (2016). Urban household cooking energy choice: an example of Bauchi metropolis, Nigeria. Energy, Sustainability and Society, 6(1), 1–12.
21) Boukary Ouedraogo (2006). Household Energy Preference for Cooking in Urban Ouagadougou, Burkina Faso. Ouedraogo Energy Policy.www.elsevier.com
22) Cheng, C. Y. & Urpelainen, J. (2014). Fuel Stacking in India: Changes in the cooking and lighting mix, 1987–2010. Energy, 76, 306–317.
23) Chibueze, N, Ezebuilo, U & Jude, O.C (2012). Determinants of Household Energy Choices for Cooking in Rural Areas; Evidence from Enugu state, Nigeria; Continental Journal of Social Sciences, 5 (2); 1-11.
24) Chidiebere-Mark, N.M, Agunnane, U.T & Anyawu, U.G (2018). Determinants of Cooking Energy Consumption among Farming Households in Owerri Agricultural Zone, Imo State, Nigeria, International Journal of Energy and Environmental Research, 6(2); 55-62.
25) Danladi, Y.B Aondoyila, K & Humphrey, A (2016). Urban Household Cooking Energy Choice; An Example of Bauchi Metropolis, Nigeria; Journal of Energy, Sustainability and Society 6(15) 1-37.
26) Dave, W (2004) Thermodynamics by Dave Watson; Macmillan Publishing Company.
27) Davis, M. (1998). Rural household energy consumption: The effects of access to electricity evidence from South Africa. Energy Policy, 26, 207-217.
28) Dictus, A. A, Daniel, K, T & Delali, B.K.D (2022).The Impact of Household Cooking Fuel Choice on Health care Expenditure in Ghana; Journal of Frontiers in Environmental Science, 10(6) 61-204.
29) Dorcas, W, K (2021). Socio-economic Determinants of Household Continued Use of Solid Biofuels (Fuel wood and Charcoal) for Cooking, Purpose in Sub-Saharan Africa; Africa Journal for Economics and Sustainable Development, 3 (1), 292-300.

30) ECN (Energy Commission of Nigeria).(2003). National Energy Policy, Federal Republic of Nigeria, Abuja.
31) Egbuna, D. O (1987). The Environmental Hazards of Nigerian Gas Industry. The 1987 Nigeria National Petroleum Corporation's seminar, Lagos, Nigeria, pp: 35-47.
32) Ehuemelo, O. Gakline, R &Okodu, R. (2015). Household Energy Utilization in Mikang Local Government of Plateau State, Nigeria. International Journal of Energy Review; 5 (7) 12-20.
33) Ekholm, T. (2010). Determinants of Household Energy Consumption in India. Energy Policy 38:5696-5707.
34) Elias R.J. & D.G. Victor (2005). Energy Transition in Developing Countries: A Review of Concepts and Literature. In: Program on Energy and Sustainable Development, Working Paper. Stanford University.
35) Farsi, M. (2007). Fuel choices in urban Indian households. Environment and Development Economics, 12, 757-774.
36) Fidelis, O.O, Uchechukwu, M.O & Gabriel, A.A (2014). Household Energy Use and Determinants; Evidence from Nigeria; International Journal of Energy Economics and Policy, 4(2) 248-262.
37) Foley, G. (1995). Photovoltaic applications in the rural areas of the developing world. World Bank technical paper 304, Energy Series. World Bank, Washington DC.
38) Francis, M. Geofrey, O & Gemma A. (2014). Determinants of Household's Choice of Cooking Energy in Uganda, Economic Policy Research Centre.
39) Gumau, A. W (2007). A perspective on world renewable energy and non-renewable resources; An unpublished post graduate Ph.D seminar paper presented at the Environmental Management Technology, Abubakar Tafawa Balewa University Bauchi, Nigeria.
40) Gupta, G. & Kohlin, G. (2006). Preferences for domestic fuel: Analysis with socio-economic factors and rankings in Kolkata, India. Ecological Economics, 57, 107-121.
41) Hadiza, N.I & Abubakar, H, D (2022). Households and the Choice of Cooking Fuel in Kano State, Nigeria. Department of Economics, Faculty of Social Sciences, Bayero University, Kano.
42) Hanna, R., & Oliva, P. (2015). Moving Up the Energy Ladder: The Effect of an Increase in Economic Well-Being on the Fuel Consumption Choices of the Poor in India. American Economic Review, 105(5), 242–246.
43) Heltberg, R. (2005). Factors Determining Household Fuel choice in Guatamala. Environment and Development Economics, 10, 337-361.
44) Hosier, R.H. & Dowd, J. (1989). Household fuel choice in Zimbabwe: An empirical test of the energy ladder. Resources and Energy, 9, 347-361.
45) IEA (International Energy Agency). (2006). World Energy Outlook, Paris.
46) Inayatullah, J. Humayun, K & Shakeel, H (2012). Determinants of Rural Household Energy Choices; An example from Pakistan; Polish Journal of Environmental Studies, 21(3), 635-641.
47) Karekezi, S. & Majoro, L. (2002). Improving modern energy services for Africa's urban poor. Energy Policy, 30, 11–12.
48) Maganga, M.A, Beston, B.M & Gebrelibanos, G.G (2015). Non-price Determinants of Household's Choice of Cooking Energy in Malawi, International Journal of Development and Sustainability 4(1) 18-28.
49) Maheshwar, G. & Binog, G (2018). Determinants of Household Choice of Fuel for Cooking in Developing Countries; Evidence from Nepal, Journal of Development Policy and Practice 3(2); 10-17.
50) Martins, J. (2005). The impact of the use of energy sources on the quality of life of poor communities. Social Indicators Research, 72, 373-402.
51) Martinson, A.T, Yuansheng, J. & Dennis, A (2012); Determinants of Household Choice of Cooking Energy and the Effect of Clean Cooking Energy Consumption on Household Member's Health Status; The Case of Rural Ghana; Journal of Sustainable Production and Consumption 2(28);484-495.
52) Masera, O.R. (2000). From linear fuel switching to multiple cooking strategies: A critique and alternative to the energy ladder model. World Development, 28(12) 2083-2103.
53) Matsoso, M, Retselisitsoe, T & Moeletsi, M (2020). Determinants of Household Energy Fuel Choice in Lesotho; Journal of Energy in Southern Africa; 33 (2); 241-245.
54) Mekonnen A. & Kohlin G. (2008). Determinants of household fuel choice in major cities in Ethiopia. Working papers in economics no. 399, University of Gotenburg.
55) Mirza, B. & Kemp, R. (2009). Why rural rich remain energy poor. UNU-MERIT Working Papers, ISSN 18719872.
56) Moses, A.J (2022). The effect of household income on cooking fuel demand of Nigeria, Ibadan. Journal of Applied Economics and Business 10(3); 46-67.
57) Mubarik, S. & Seidu, A. (2018). Determinants of Liquefied Petroleum Gas (LPG) Use among Households in Northern Ghana; Journal of Energy Technologies and Policy 8(6), 1-10.

58) Murphy, J. T. (2001). Making the energy transition in rural East Africa: is leapfrogging an alternative? Technological Forecasting & Social Change, 68 (2), 173-193.
59) Nasarawa State Ministry of Health (2016). Public lecture on Negative health impact on cooking energy in Nasarawa State.
60) Nelson, J.P. & Kennedy, P.E. (2009). The use (and abuse) of meta-analysis in environmental and resource economics: an assessment. Environmental and Resource Economics, 42, 345-377.
61) Njong, M. A & Johannes. T. A (2011). An Analysis of Domestic Cooking Energy Choices in Cameroon. European Journal of Social Sciences, 20(2), 22-31.
62) Nnaji, C. E, Ukwueze, E.R & Chukwu, J.O (2014).Determinants of Household Energy Choice for Cooking in Rural Areas; Evidence from Enugu State, Nigeria, Continental Journal of Social Sciences 5(2) 1-11.
63) Okunade, E. (2010). Charcoal as an Alternative Energy Source Among Households in Ogbomoso Metropolis of Oyo State, Nigeria.4th International Conference on Appropriate Technology Held in Ghana on 27th - 30th.
64) Okunade, O. (2010). Empirical Analysis on Charcoal Energy Source among Urban Households in Ogbomosho Metropolis of Oyo State, Nigeria. Journal of Economics and Development Studies, 2(4) 2-20.
65) Olugbire, O.O, Aremu, F.J, Opute, O.H, Ojedokun, C.A & Adisa, A. (2016). Determinants of Household Cooking Energy Choice in Oyo state, Nigeria, Department of Economics & Extension Services, Obafemi Awolowo University, Ile-ife, Nigeria.
66) Onyekuru, N.A & Eboh E C (2011). Determinants of Cooking Energy Demand in Rural Households of Enugu State; An Application of the Bivariate Probit Model. Asian Journal of Biological Science, 2(2), 332- 335.
67) Ouedraogo, B. (2006). Household Energy Preferences for Cooking in Urban Ouagadougou Burkina Faso. Energy Policy, 34, 3787-3795.
68) Pachuari, S. & Spreng, D. (2004). Energy Use and Energy Access in Relation to Poverty. Economic and Political Weekly, 39(3), 271-278.
69) Paudel, U. (2018). Understanding the Determinants of Household Cooking Fuel Choice in Afghanistan: A multinomiallogit estimation. Energy, 156, 55–62.
70) Philbert, O.O, Huan, R, Rucong, O,Jiaxin, O, & Mohammed, U, (2016). Examine Factors that Influence the Households Cooking Fuel Choice in Northern Sudan. International Journal of Energy Economics and Policy, 6 (4).148-200.
71) Pundo, M. O & Fraser G. (2006). Multinomial Logit Analysis of Household Cooking Fuel Choice in Rural Kenya: The Case of Kisumu District. Agrekon, 45, (1)112-120.
72) Rahut, D.B (2016). Household Energy Choice and Consumption Intensity; Empirical Evidence from Bhutan; Renewed Sustainability and Energy Review Journal 2(10); 201-220.
73) Rajimoha, T. & Wereahewa, R. (2020). Pattern of Household Energy Consumption among Urban and Rural & estate Sectors in Sri Lanka. International Journal of Energy and Innovations, 4 (6), 112-145.
74) Saheed, O.L (2021). An Analysis of Liquefied Petroleum Gas Adoption for Household Cooking in Nigeria; Walden University scholars works, Walden Dissertation and Doctoral Studies Collection.
75) Sambo, S.A. (2009). Strategic Development in Renewable Energy in Nigeria. International Association for Energy Economics,3rd quarter.
76) Shittu, A. M; Idowu A. O; Otunaiya A. O & Ismail A. K (2004). Demand for Energy Among Household in Ijebu Division, Ogun State, Nigeria. Agrekon, Vol. 43 No1.
77) Tafadzwa, M, Ayodeji, P. I &Isacc, T.R (2018).Household Cooking Fuel Use Patterns and Determinants across Southern Africa; Journal of Energy and Environment 29(1), 29-48.
78) Twumasi, M.A. (2020). The Impact of Credit Accessibility on Rural Households Clean Cooking Energy Consumption; the case of Ghana energy report journal, 2(4); 20-40.
79) UN-Energy (2005). The Energy Challenges for Achieving the Millennium Development Goals (MDGs). United Nation; UN-Energy, 2005.
80) Yibettal, T. W, Meley, M.R & Muyiwa, S.A (2021). Determinants of Household Energy Choices in Rural Sub-Saharan African; An Example from Southern Ethiopia; Journal of Economics and Sustainable Development, 2(3) 13-19.
81) Yonas, A, Abbe, M, Gunnar, K, &Alemu, U. (2015). Modelling Household Cooking Fuel; Uses Panel Multinomial Logit Approach in Ethiopia, Journal of Economics and Sustainable Development, 4(5) 21-31.
82) Ali, M. (2022). Determinants and Implications of Household Pattern of Cooking Energy Mix on the Health of Consumers in Nigeria's Federal Capital Territory. The Nigerian Journal of Energy & Environmental Economics (NJEE) Vol. 13(1).