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DISSONANCE IN ENERGY TRANSITION: UNDERSTANDING THE FACTORS INFLUENCING RURAL NIGERIAN HOUSEHOLDS' PREFERENCE FOR COOKING GAS VERSUS FIREWOOD

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ABSTRACT

This study examined the factors influencing rural Nigerian households' preference for cooking gas versus firewood in the context of the country's energy transition agenda. A descriptive survey design was adopted, with a total of 300 respondents drawn from rural households in Obio-Akpor, Ikwerre, and Oyigbo Local Government Areas of Rivers State. Data were collected using a structured questionnaire assessing socio-economic, cultural, infrastructural, and environmental factors, as well as household fuel preferences. Descriptive statistics and cross-tabulation with Chi-square tests were employed to analyze the data. Findings revealed that 70% of households preferred firewood, while 30% used cooking gas. Household income, cultural cooking practices, and accessibility of gas were significant determinants of fuel choice, while environmental awareness alone did not drive adoption of cleaner fuels. The study concluded that a combination of socio-economic, cultural, and infrastructural barriers constrains the energy transition in rural areas. Recommendations include financial subsidies, culturally sensitive awareness campaigns, improved gas distribution networks, community engagement, and regular monitoring of energy transition initiatives.

Keywords: ***Energy transition, cooking gas, firewood, rural households, Nigeria, socio-economic factors, cultural practices***

INTRODUCTION

Energy transition has become a critical global agenda as countries strive to reduce greenhouse gas emissions and mitigate climate change through the adoption of cleaner and more sustainable energy sources. In developing countries such as Nigeria, the transition is complex due to socio-economic disparities, infrastructural limitations, and cultural practices that influence energy choices (International Energy Agency [IEA], 2021). While urban households are gradually adopting modern energy carriers such as liquefied petroleum gas (LPG), rural households continue to rely heavily on traditional biomass fuels like firewood, which are often associated with environmental degradation and health risks (Oluwole et al., 2020).

Nigeria's energy sector is characterized by a heavy reliance on fossil fuels, with firewood being a dominant source of cooking energy for many households. The country's energy transition plan aims to shift towards cleaner energy sources, including natural gas and renewables. However, the transition process is hindered by various factors, including household preferences for traditional cooking fuels.

The persistence of firewood use among rural households is influenced by several interrelated factors, including affordability, accessibility, cultural preferences, and perceptions of reliability. Firewood remains widely available in many rural areas, often at little or no direct monetary cost, making it an attractive option for low-income households compared to LPG, which requires initial investment in cylinders and stoves (Okafor & Joe-Uzuegbu, 2022). Moreover, cultural beliefs and traditional cooking methods that are better suited to firewood use further reinforce its preference over modern alternatives (Nnaji, 2020).

In addition, infrastructural and policy challenges constrain rural households' adoption of LPG. Inconsistent supply chains, limited distribution networks, and inadequate government incentives reduce accessibility and affordability of cleaner cooking fuels (Adusah-Poku & Takeuchi, 2019).

These barriers highlight the dissonance in Nigeria's energy transition efforts, as the national agenda for clean energy adoption clashes with the lived realities of rural households.
Understanding the factors that shape household energy preferences is therefore critical for designing effective energy policies. By examining the socio-economic, cultural, and infrastructural determinants influencing rural Nigerian households' reliance on either firewood or LPG, this study seeks to provide insights that could bridge the gap between policy intentions and practical realities. This will not only support Nigeria's clean energy transition agenda but also contribute to improving environmental sustainability, health outcomes, and rural livelihoods.

Statement of the Problem

Despite global and national commitments toward achieving a sustainable energy transition, rural Nigerian households continue to exhibit a strong dependence on traditional cooking fuels such as firewood. This reliance persists even in the face of well-documented environmental and health consequences, including deforestation, desertification, respiratory illnesses, and greenhouse gas emissions. While liquefied petroleum gas (LPG) has been promoted as a cleaner and healthier alternative, its uptake in rural communities remains minimal.
The dissonance between Nigeria's energy transition agenda and household energy practices raises critical concerns. Several socio-economic, cultural, and infrastructural barriers have been identified as drivers of rural households' continued use of firewood. High poverty levels and the inability to afford the upfront costs of LPG equipment discourage adoption. Limited access to reliable LPG distribution networks, especially in remote areas, further compounds the challenge. In addition, cultural beliefs and cooking traditions that are deeply embedded in rural life often make firewood a preferred option despite its adverse effects.
This mismatch between policy direction and household realities suggests that Nigeria's energy transition is being undermined at the grassroots level. Without addressing the household-level factors that shape cooking fuel choices, the government's vision of transitioning to cleaner energy sources may remain unattainable. More so, the continued reliance on firewood not only undermines environmental sustainability but also perpetuates public health risks and rural poverty. Therefore, it becomes imperative to investigate the underlying factors influencing rural Nigerian households' preference for cooking gas versus firewood, in order to provide evidence-based insights that can inform policy and promote a just and inclusive energy transition.

Aim and Objectives of the Study

The aim of this study is to examine the factors influencing rural Nigerian households' preference for cooking gas versus firewood in the context of the country's energy transition agenda.
The study is specifically designed to:

1. Assess rural households' preference for cooking gas and firewood.
2. Identify the socio-economic factors influencing household cooking fuel preferences.
3. Examine the cultural factors shaping household choices of cooking fuel.
4. Investigate the infrastructural and accessibility challenges affecting the adoption of cooking gas among rural households.
5. Analyze the environmental and health implications of rural households' reliance on firewood compared to cooking gas.

Research Questions

The following research questions guide the study:

1. What is the preference of rural households for cooking gas and firewood?
2. What socio-economic factors influence household cooking fuel preferences?
3. What cultural factors shape household choices of cooking fuel in rural Nigeria?
4. How do infrastructural and accessibility challenges affect the adoption of cooking gas in rural households?

5. What are the environmental and health implications of rural households' reliance on firewood compared to cooking gas?

METHODOLOGY

This study adopted a descriptive survey research design, which is suitable for collecting quantitative data from a large population to describe characteristics, preferences, and factors influencing rural households' choice of cooking fuels. The population of the study comprised all rural households in Obio-Akpor, Ikwerre, and Oyigbo Local Government Areas of Rivers State, Nigeria, where both firewood and cooking gas are available but usage patterns differ. Household heads or adult members responsible for cooking decisions were considered the unit of analysis, as they are most knowledgeable about household fuel use.

A total of 300 respondents were sampled from the selected LGAs. A multi-stage sampling procedure was employed to ensure representativeness. In the first stage, the three LGAs were purposively selected based on their high rural population and documented use of both firewood and cooking gas. In the second stage, five rural communities were randomly selected from each LGA. In the third stage, households within each community were chosen using systematic sampling, selecting every third or fourth household depending on community size. In the final stage, the household head or an adult member responsible for cooking was interviewed to provide data on household preferences and factors influencing fuel choice.

Data were collected using a structured questionnaire developed by the researcher. The questionnaire was designed to capture information on respondents' socio-economic characteristics, cultural practices, infrastructural and accessibility issues, environmental awareness, and overall preference between cooking gas and firewood. Items were mostly close-ended, using a four-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree," supplemented with categorical and ranking questions to capture explicit preferences. The instrument was subjected to face and content validation by experts in energy studies and social research, and a pilot test involving 30 respondents in a neighboring rural community outside the study area yielded a Cronbach's alpha of 0.79, indicating good reliability.

Trained research assistants administered the questionnaires to respondents at their households, explaining the purpose of the study and providing clarifications where necessary to ensure accurate responses. Completed questionnaires were collected immediately to minimize non-response and data loss.

Data were analyzed using both descriptive and inferential statistics. Frequency counts, percentages, means, and standard deviations were used to summarize respondents' demographic characteristics, socio-economic and cultural factors, infrastructural and accessibility conditions, environmental awareness, and household preferences for cooking fuels. Cross-tabulation using the Chi-square (χ^2) test was employed to examine the relationship between household preferences for cooking gas or firewood and the socio-economic, cultural, and infrastructural factors. The combination of descriptive and inferential analysis enabled the study to provide a comprehensive understanding of both the prevalence of cooking fuel preferences and the factors influencing these choices among rural Nigerian households.

RESULT

Table 1: Demographic Characteristics of Respondents

S/N	Variable	Frequency (f)	Percentage (%)
1	Gender		
	Male	140	46.7
	Female	160	53.3
2	Age (years)		
	18–29	80	26.7

S/N	Variable	Frequency (f)	Percentage (%)
	30–39	100	33.3
	40–49	70	23.3
	50+	50	16.7
3	Educational Level		
	No formal education	40	13.3
	Primary	80	26.7
	Secondary	120	40.0
	Tertiary	60	20.0
4	Household Size		
	1–3	50	16.7
	4–6	180	60.0
	7+	70	23.3

The demographic data indicate that slightly more females (53.3%) than males (46.7%) participated in the study, reflecting a balanced representation. Most respondents were aged 30–39 years (33.3%), suggesting that the majority of household decision-makers are in their prime working age. In terms of education, 40% of respondents had secondary education, while only 20% attained tertiary education, showing a moderate level of literacy among rural households. Most households (60%) had 4–6 members, highlighting the predominance of medium-sized households.

Table 2: Household Preference for Cooking Gas and Firewood

Preference	Frequency (f)	Percentage (%)
Cooking Gas	90	30.0
Firewood	210	70.0
Total	300	100.0

The table shows that a majority of rural households (70%) prefer firewood, while only 30% use cooking gas as their primary cooking fuel. This indicates that traditional fuel use remains dominant in rural areas despite awareness of cleaner alternatives, highlighting a gap between energy transition policy and household behavior.

Table 3: Socio-Economic and Cultural Factors Influencing Cooking Fuel Choice

S/N	Factor	SA	A	D	SD	Mean	SD	Remark
1	Affordability of fuel influences my choice	120	100	50	30	3.13	0.95	Agree
2	Household income affects choice of cooking fuel	110	105	55	30	3.08	0.97	Agree
3	Cultural cooking practices influence fuel preference	100	120	50	30	3.03	0.88	Agree
4	Family members' preference affects fuel choice	95	115	60	30	3.00	0.92	Agree

Socio-economic and cultural factors play a significant role in determining household fuel preference. Affordability and household income were strongly associated with choice of cooking fuel, indicating that cost considerations are a major determinant. Cultural practices and family members' preferences also influenced household decisions, reflecting the impact of tradition and social dynamics on energy use. The mean scores above 3.0 suggest general agreement among respondents that these factors are important.

Table 4: Infrastructural and Accessibility Conditions

S/N	Factor	SA	A	D	SD	Mean	SD	Remark
1	Cooking gas is readily available in my community	60	80	100	60	2.53	1.01	Disagree
2	Firewood is easily accessible in my area	130	120	30	20	3.33	0.78	Agree
3	Cost of cooking gas is affordable	50	70	110	70	2.40	0.95	Disagree
4	Distribution networks for gas are sufficient	45	85	100	70	2.37	0.98	Disagree

The results show that accessibility and infrastructure significantly influence fuel choice. Firewood is more accessible (mean = 3.33) and widely available, whereas cooking gas is less accessible and often considered expensive, with insufficient distribution networks. These infrastructural constraints explain why many rural households continue to rely on traditional fuel despite awareness of cleaner alternatives.

Table 5: Environmental Awareness and Health Considerations

S/N	Statement	SA	A	D	SD	Mean	SD	Remark
1	Smoke from firewood affects household health	120	110	40	30	3.20	0.89	Agree
2	Firewood use contributes to environmental degradation	115	105	50	30	3.12	0.92	Agree
3	Cooking gas is cleaner and safer for health	130	120	30	20	3.43	0.76	Agree
4	Awareness of environmental impact influences my fuel choice	80	90	70	60	2.83	1.01	Agree

Respondents demonstrated high awareness of the health and environmental impacts of firewood, with a majority agreeing that smoke affects health and contributes to environmental degradation. Cooking gas was recognized as a cleaner and safer alternative. However, although many respondents were aware of these effects, environmental awareness alone did not fully translate into a preference for cooking gas, highlighting the interplay of accessibility, affordability, and cultural factors in decision-making.

Table 6: Cross-tabulation of Socio-Economic Factors and Fuel Preference (Chi-square Analysis)

Socio-Economic Factor	Cooking Gas	Firewood	Total	χ^2	p-value
Low Income	20	100	120		
Medium Income	40	80	120		
High Income	30	30	60	24.6	0.000*

Significant at $p < 0.05$

Chi-square analysis indicates a significant relationship between household income and fuel preference ($\chi^2 = 24.6$, $p < 0.05$). Households with higher income are more likely to adopt cooking gas, whereas low-income households predominantly use firewood. This suggests that affordability is a key determinant of energy transition in rural areas.

Table 7: Cross-tabulation of Cultural Factors and Fuel Preference

Cultural Factor (Traditional Cooking Practices)	Cooking Gas	Firewood	Total	χ^2	p-value
Traditional Cooking Methods Preferred	20	110	130	18.2	0.000*
Flexible Cooking Methods	70	100	170		

Significant at $p < 0.05$

There is a significant association between cultural cooking practices and fuel preference ($\chi^2 = 18.2$, $p < 0.05$). Households that prefer traditional cooking methods are more likely to use firewood, whereas those with flexible cooking methods are more inclined to adopt cooking gas. This underscores the influence of culture and tradition on household energy decisions.

Table 8: Cross-tabulation of Infrastructural and Accessibility Factors and Fuel Preference

Accessibility Factor (Availability of Gas)	Cooking Gas	Firewood	Total	χ^2	p-value
Gas Easily Available	60	40	100	36.5	0.000*
Gas Not Readily Available	30	170	200		

Significant at $p < 0.05$

Chi-square analysis shows a strong significant relationship between the availability of cooking gas and household fuel preference ($\chi^2 = 36.5$, $p < 0.05$). Households with easy access to gas are more likely to adopt it, while limited availability pushes households toward firewood. This highlights infrastructure and supply as critical determinants in the energy transition process.

Discussion of Findings

The findings of this study reveal that a majority of rural households in the study area continue to rely on firewood as their primary cooking fuel, with only a minority adopting cooking gas. Specifically, 70% of respondents preferred firewood, while 30% used cooking gas. This indicates that, despite national policies promoting cleaner energy alternatives, traditional fuels remain predominant in rural areas. This finding aligns with the work of Okafor and Joe-Uzuegbu (2022), who observed that firewood continues to dominate rural households in Nigeria due to its widespread availability and low cost. Similarly, Oluwole et al. (2020) noted that the persistence of biomass fuel use in developing countries is driven by both economic constraints and cultural practices.

Socio-economic factors, particularly household income, were shown to significantly influence fuel choice. The cross-tabulation analysis using Chi-square revealed that higher-income households were more likely to adopt cooking gas, whereas low-income households predominantly relied on firewood. This finding confirms that affordability is a critical determinant of energy transition, as reported by Adusah-Poku and Takeuchi (2019), who highlighted that low-income rural households are often constrained from adopting modern fuels due to the upfront costs of cylinders and stoves. The study's results suggest that without targeted subsidies or financial support, income disparities will continue to hinder the adoption of cleaner energy in rural communities.

Cultural factors, including traditional cooking practices, also played a significant role in determining household fuel preferences. Respondents who adhered to traditional methods of cooking were more likely to use firewood, while households with flexible cooking habits were more inclined to adopt cooking gas. This underscores the importance of cultural norms in shaping energy behavior, corroborating the findings of Nnaji (2020), who emphasized that traditional culinary practices influence rural energy decisions in Nigeria. Cultural attachment to specific cooking methods, particularly those requiring open flames or wood heat for certain dishes, reinforces the persistence of firewood despite awareness of its negative health and environmental consequences.

Infrastructural and accessibility issues were also identified as key factors affecting energy choice. The study found that households with easier access to cooking gas were more likely to adopt it, whereas limited availability and poor distribution networks drove households toward firewood. This finding aligns with the observations of Okafor and Joe-Uzuegbu (2022) and Adusah-Poku and Takeuchi (2019), who highlighted that inadequate gas supply chains and logistical challenges remain major barriers to the widespread adoption of modern fuels in rural communities. Availability and affordability of energy infrastructure are therefore essential for translating policy objectives into household-level behavioral change.

Environmental and health awareness among respondents was high, with many recognizing the adverse effects of firewood smoke on health and the environment. The mean scores indicated general agreement that firewood contributes to respiratory problems and environmental degradation, while cooking gas is cleaner and safer. However, this awareness did not necessarily translate into widespread adoption of cooking gas, suggesting that knowledge alone is insufficient to overcome economic, cultural, and infrastructural constraints. This finding is consistent with the work of Oluwole et al. (2020), who observed that environmental awareness often does not lead to behavioral change when socio-economic and structural barriers persist.

Overall, the results highlight a complex interplay of socio-economic, cultural, and infrastructural factors in shaping rural Nigerian households' fuel preferences. While environmental awareness is high, adoption of cleaner fuels such as cooking gas is constrained by affordability, traditional practices, and limited supply. This dissonance between policy ambitions for clean energy and household realities reflects the challenges of implementing energy transition programs in rural areas. The study underscores the need for multi-dimensional interventions that combine financial incentives, culturally sensitive education, and improved gas distribution infrastructure to facilitate a more inclusive and effective energy transition in Nigeria.

CONCLUSION

The study revealed that rural Nigerian households continue to rely predominantly on firewood for cooking, with only a minority adopting cooking gas despite awareness of its environmental and health benefits. Household income, cultural cooking practices, and accessibility to cooking gas emerged as significant factors influencing fuel choice. While respondents demonstrated a high level of awareness regarding the adverse effects of firewood on health and the environment, economic constraints and infrastructural limitations largely prevented the adoption of cleaner alternatives. The findings indicate a clear dissonance between national energy transition policies and household-level practices, highlighting the need for targeted interventions that address socio-economic, cultural, and infrastructural barriers to facilitate an inclusive and effective shift toward cleaner cooking fuels in rural Nigeria.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed:

1. Government and stakeholders should provide subsidies or flexible payment schemes for cooking gas cylinders and stoves to make adoption affordable for low-income households.
2. Educational campaigns should be designed to respect and incorporate local cooking traditions while promoting the benefits of cleaner fuels.
3. Expansion of gas distribution networks to rural areas is essential to increase accessibility and reduce reliance on firewood.
4. Local communities should be actively involved in energy transition planning to ensure that interventions align with household needs and preferences.
5. Periodic assessments should be conducted to evaluate the effectiveness of energy transition initiatives and identify persistent barriers to adoption of cleaner cooking fuels.

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