


## Chapter 36

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# Gendered Household Energy Transition in Nigeria: Implication for Regulatory Framework

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### Abstract

This study assessed the drivers of household cooking energy transition across genders to gauge the effectiveness of the Nigerian regulatory framework in engendering inclusive energy transition. The study adopts descriptive analysis using the separate waves of the National Living Standard Survey for 2003/04 and 2018/19 by the National Bureau of Statistics. The findings indicate a minimal adoption of modern energy amongst households in 2003/04 compared to 2018/19, but prominent amongst male-headed households. By 2018/19, more rural households, irrespective of the head's gender, consumed traditional fuel compared to 2003/04, possibly because of access to free solid biomass. However, the proportion of urban female-headed households that switched to modern fuel consumption in 2018/19 increased significantly compared to 2003/04. Overall, the socioeconomic environment favoured male-headed households, while location and lack of economic capabilities inhibited female-headed households' energy transition. This situation suggests that national clean energy transition policies favour male-headed households more than their counterparts. Also, the situation is more severe amongst female-headed households in rural areas than their urban counterparts. The empirical evidence may contribute to policymaking in scaling action towards achieving Sustainable Development Goals (SDGs) five and seven and the energy transition in Nigeria. Thus, a regulatory framework that incentivises women can facilitate a just and fair clean energy transition.

**Keywords:** Energy Transition, Gendered Households, Nigeria, Regulatory Framework



## Introduction

Energy transition, encapsulated in Sustainable Development Goal 7 (UN, 2015); entails energy-efficient technology adoption and the integration of clean energy in all sectors, including the residential sector. Nevertheless, the global energy transition is because of the dual need for economic development and climate change mitigation. In developing and energy-poor countries like Nigeria, the energy transition is driven equally by the demand for increased modern energy access. This situation is evident in government commitments in setting strategies that facilitate behavioural shifts towards clean and low-carbon energy consumption. Some of these strategies include the 2017 National Gas Policy (NGP) (Federal Republic of Nigeria, 2017), with broad objective towards a gas-based economy, giving primary attention to local demand. Further, the Nigerian Gas Master Plan (NGMP) (Federal Republic of Nigeria, 2020) was initiated in 2020 to enhance investment in the gas sector from 2021 to 2030. The plan is a decade roadmap for domestic gas market utilisation for energy services across relevant activities, including cooking. Also, like previous plans, the 2015 National Renewable Energy and Energy Efficiency Policy (NREEEP) (Federal Republic of Nigeria, 2015) provides renewable electricity penetration targets through on-grid and off-grid initiatives. The overarching objective is to enhance clean energy penetration for an accelerated transition across relevant sectors, including residential households.

The Nigerian residential sector consumed more energy than the transport and industrial sectors. The residential energy consumption is for cooking, lighting, cooling, and small-scale commercial production from the traditional and modern energy sources. For instance, the Nigerian residential sector accounts for over 70% energy consumption (IEA, 2020). Evidence indicates that household decisions about modern energy transition are complex and based on individual differences across socioeconomic dimensions (Sheng et al., 2018). This situation is also valid in Nigeria since household energy choices depend on individual heterogeneity that may impact their transition. Thus will the socioeconomic and cultural construct of the Nigerian economy enable a just and equitable clean energy adoption, especially amongst the most vulnerable, including women. While the unserved and underserved population may be affected, the impact of the lack of access to clean energy may be disproportional across genders because of differential capabilities and roles played by men and women in the households. In Nigeria specifically, most women are associated with the burden of cooking, which is mainly through traditional solid fuels. This and other barriers of homecare restrict their engagement in productive activities while limiting them to embrace clean fuels. Also, a lack of economic

capability, like income-generating opportunities, could incentivise women to continue indulging in traditional biomass consumption because of its free access and cultural beliefs. Although the environmental cost, often neglected, outweighs the direct monetary benefits of traditional biomass consumption, this knowledge gap may inhibit energy transition, especially amongst women compared to their male counterparts.

In 2013, about 70% of Nigeria's households relied on solid fuel such as charcoal, firewood, and animal dung, amongst others, as cooking fuel (NDHS, 2013). The share declined marginally to about 69% in 2018 (NDHS, 2018). The difference remains wide between urban and rural dwellers in the same periods. Rural households using solid fuel for cooking in 2013 were almost 88% compared to 44% in urban areas. In 2018, the ratio of rural households using solid fuel was 87% against 48% for urban households. Further, the choice of modern fuels like liquefied petroleum gas (LPG) and electricity in household energy choice remains less than 30%. The continuous use of traditional energy, such as solid fuels, is associated with environmental and socioeconomic concerns arising from deforestation, land degradation, loss of productive time, and indoor and outdoor air pollution (Mekonnen & Köhlin; 2008; Han et al., 2018). An estimate shows that Nigeria has used 36% of its trees for logging, agricultural activities, and fuelwood (McDermott, 2020). However, access to modern energy is associated with a reduction in time-wasting activities because of the 'liberation effect' enabled by the adoption of time-saving energy technologies, especially amongst women (Coen-Pirani. et al., 2010; Dinkelman, 2010; Grogan & Sadanand, 2013).

Elsewhere, empirical studies have revealed the underlying factors of the transition from traditional to modern energy. This strand of studies was analysed within the energy ladder and stacking frameworks. The theories depict the switching process of households' energy choices (Han et al., 2018). For instance, studies revealed that an increased income level engenders households to transit from traditional to modern energy (Rahut et al., 2014; Wassie et al., 2021). Some households switch between traditional energy and modern energy in response to price changes and accessibility (Leach, 1992). However, some households rely on a combination of traditional energy and modern energy because of their socioeconomic and demographic characteristics (Masera et al., 2000; Wassie et. al., 2021). While these underlying factors of the energy transition are evident in the literature, differences across demographics, such as gender and policy factors may play a dominant role in identifying the method and causes of energy transition in a specific context. The study by Kronsell (2013) revealed that masculine norm is so dominant in the gender landscape and it gives legitimacy to all actions, including permeating energy transition strategies. Also, Musango and Bassi

(2021) show that energy transition policy may support modern energy consumption but not enough to bridge the gender energy-poverty gap.

In Nigeria, existing studies considered the determinant of household energy consumption (Nnaji et al., 2012; Ogwumike et al., 2014; Bisu et al., 2016; Onyekuru et al., 2020; Emodi, et al., 2022) without consideration for the gendered effects. Specifically, existing studies focused on small units, like a single rural community or state, single data, or panel assessment to analyse the drivers of household energy transition; without considerations for heterogeneity that may inform individual decisions. Differently, this study assessed the drivers of household cooking energy transition across gender. Both energy transition and gender inclusiveness are at the core of SDGs five and seven. Thus, the study findings may facilitate the action towards these agenda. Also, this study adopts the separate waves of the National Living Standard Survey (NLSS) to understand the dynamics of gendered household energy transition across time. This is required to assess policy trends and the plausible impact on household energy transition vis-à-vis underlying factors. The analysis becomes pertinent since Nigeria has climate neutrality pathways culminating into various strategies, including energy transition. While Nigeria continues to chart the path for energy transition, conscious considerations for limiting the gendered energy-poverty gap in the policy strategies may engender a just and fair transition. Thus, the outcomes will strengthen existing energy transition regulatory framework and related ones.

Including the introduction, the study is in five sections. Section two presents the literature review. The data and methodology are provided in Section three. The empirical results and discussion of findings are presented in Section 4. The last section concludes.

## **Literature review**

The Energy Ladder and Energy Stacking theories explain the pattern of energy transition in societies. The Energy Ladder Theory, as postulated by Leach (1992), asserts that energy transition occurs in a linear and upward movement from traditional fuels to modern fuels. The framework is an applied version of the Consumer Theory, where a rise (fall) in income shifts household consumption pattern to a high (lower) quality good (Hosier & Dowd, 1987), demonstrating household socioeconomic status (Masera et al., 2000). The energy ladder describes the fuel switching process from traditional fuels to transitional fuels and finally to clean fuels. The progression is driven by income, government policies, energy resource availability, and relative costs (Barnes et al., 2004; Schlag & Zuzarte, 2008). The explicit assumption is that households replaced less efficient fuels through an upward progression

to a more efficient fuel, making the transition a unidirectional and linear process (Mehetre et al., 2017). However, the energy stacking framework entails a combination of fuels in the energy consumption portfolio (Masera et al., 2000; Pachauri et al., 2013). The framework assumes that households only partly switch to a different fuel or accumulate multiple fuels. Thus, households will rely on traditional fuels for certain activities in addition to adopting clean fuels. Fuel stacking occurs because of the high cost of modern energy sources, cultural preferences, resource availability, and concerns around energy security to avoid total dependence on one fuel because of price and supply distortions (Chang et al., 2017; Alem et al., 2016; Leach, 1992; Masera et al., 2000). The household may adopt traditional fuels for base energy needs and some modern fuels to complement demand if accessible and affordable. The situation is a complex decision-making process in household energy transition and the use of multiple fuels (Kowsari & Zerriffi, 2011).

Empirical studies have tested the theoretical assumptions to identify household energy consumption determinants. For instance, Han et al. (2018) identify the determinants of household energy transition in rural China with province-level panel data for 1991 to 2014. The study finds that household wealth (number of motorcycles), appliances, and size have a positive correlation with advanced energy consumption; while the number of firewood-saving stoves, education, number of energy management institutions, and the price of advanced energy positively correlate with traditional energy consumption. However, education level is correlated negatively with traditional fuel. Their study also realised that energy stacking characterised household energy transition because of consumption inertia effects of the traditional, transition, and modern fuels. In India, Cheng and Urpelainen (2014) assessed the household energy transition between 1987 and 2010. The outcome of their two-stage Probit model analysis revealed that income reduces fuel stacking for lighting in 1987 but not in 2010. Also, the proportion of households using firewood as the primary fuel for cooking reduced as expenditure increased, while the percentage of households that use kerosene rose as households moved to a higher expenditure level. Their results showed evidence of energy stacking.

Wassie et al. (2021) examined determinants of household energy choices in rural Ethiopia using a cross-sectional survey. Their findings revealed that location is a significant determinant of household cooking fuel. Likewise, the household income level positively relates to the choice of cooking fuel. As income increases, household preference for cleaner fuel increases and vice versa, although fuel stacking remains prevalent even amongst the wealthiest households. Household size significantly and

positively influences the choice of fuelwood because of the increase in the availability of family labour.

In Nigeria, Ogwumike et al. (2014) investigated household energy use and its determinants using the 2004 Nigeria Living Standard Survey data. The analysis was based on descriptive statistics and a multinomial logit approach. The determinants of household cooking fuels include parents' educational level, per capita expenditure, and household size. Also, Baiyegunhi and Hassan (2014) examined the determinants of households' cooking energy choice using a multinomial logit (MNL) technique to analyse cross-sectional data collected through household interviews. Their results indicate that the age of the household head, educational level, household size, income, type of house, and the price of fuelwood determine household cooking fuel choice. In a mixed outcome, Adamu et al. (2020) found that households at the lowest rung of the energy ladder are there because of the rising poverty level, which makes the result consistent with the energy ladder hypothesis but disagrees with the notion of total fuel substitution.

Ai et al. (2021) used a panel data analysis of the determinants of household energy transition in large countries from 1990 to 2016. Income, urbanisation, demographics, and resource endowment enhances household energy transition. Akrofi and Antwi (2020) studied energy diversification and transition patterns in some of Africa's largest economies. Their results show that most countries fuel-stack. Although there is a gradual adoption of clean energy fuels, conventional fuel still plays a dominant role in the energy mix. The slow pace of clean energy penetration in countries with high energy consumption is mainly because of high fossil fuel dependence and subsidies. Heltberg (2004) examined the determinants of fuel use and fuel switching in eight developing countries using the national household survey. The study finds that per capita expenditure is positively related to the household energy use of clean fuels, but negatively related to solid fuels in all countries investigated. Also, household electrification, usage of tap water, and increasing level of education engender switching to modern fuel in most cases. However, household energy transition to modern fuels is quite predominant in urban areas, except in Ghana. Also, switching to modern fuel is confined to households with higher income in rural areas, hence the use of solid biomass is predominant in rural areas.

Different from the general perspectives, a few studies also considered the gender dimension of energy transition. In Musango and Bassi (2021), findings showed that understanding the changes in urban household energy consumption and gendered measures because of energy transition interventions is essential for urban policy planning. While energy subsidy policy increases total energy consumption, it might lead to socio-

environmental impact that increases inequality. A study by Chicombo and Musango (2022) revealed that existing energy transitional frameworks lack a gender perspective and a theoretical framework to address solid fuels dependence in urban environments.

The above review shows that energy transition occurs because of an interconnectedness of several factors that operate in a context. Even though the two theoretical frameworks explain the energy transition concept, the energy ladder framework suggests a displacement effect, while the stacking model advocates the predominant use of modern energy in the energy fuel portfolio. There is no empirical evidence to show the drivers of energy transition across gender in Nigeria. Existing studies fail to provide a profound basis for the gendered energy switching process. First, while existing studies may identify factors that engender energy transition, lack of gender perspectives and measures in these assessments may limit or obstruct how gender is framed in the energy switching process. How the gendered dynamics of the energy transition evolve is also considered in this study. This approach provides a channel through which policy responses are addressed.

## **Data and methodology**

### **Data**

The data needs for the study were met by utilising the 2003/04 and 2018/19 National Living Standard Survey (NLSS) from the National Bureau of Statistics. The survey represents the large-scale household survey showing the living conditions of the population. The sample is representative at the national and zonal levels, with urban and rural estimates. It obtained a comprehensive and diverse set of socio-economic and demographic data on basic needs, and household housing, energy use and living conditions. The inclusion of 2018/19 data makes the period of observation more recent than what exists in other studies. Secondly, the choice of separate data points allows for capturing changes that occur across time. This is required to understand how the development of national energy transition strategies shapes household energy preferences, especially for clean fuels that are more environmentally friendly.

### **Methodology**

The aim of this study is to identify the drivers of household energy transition across gender. The emphasis herein is on cooking fuel, which remains the dominant type of Nigerian household energy use, accounting for 80% of total consumption (Gujba et al., 2015). Specifically, the study revealed the

underlying factors of household cooking energy transition and the dynamics of the switching process.

The analysis was carried out within the energy ladder and energy stacking frameworks. Following the conventional approach (Heltberg, 2004; Gassmann & Tsukada, 2014; Sabyrbekov & Ukueva, 2019), cooking energy is categorised into three: traditional, transitional, and modern. The traditional energy is solid or high-carbon-emitting fuels. In this study, traditional fuel is the aggregation of all solid fuels comprising firewood, charcoal, straw, crop residue, and animal dung. The selected energy type is the main source of traditional fuel in Nigeria. While the transitional energy is dirty or high-carbon-emitting fossil fuel. The relevant transitional fuel adopted in this study is kerosene. The modern fuel is clean cooking energy including gas (LPG) and electricity. Because of the epileptic nature of electricity supply the analysis is limited to LPG, which represents clean and Nigeria's transition fuel. The gender of the household head is expected to influence the choice of cooking fuel decision. This is particularly true as women are mostly confronted with the time effect of energy access and the burden of cooking; hence, women may probably play a more pertinent role in cooking fuel transition than men (Pachuari & Rao, 2013). Consequently, the study analysed household cooking energy consumption across male- and female-headed households along the three categories of energy forms mentioned above.

The study adopts a descriptive analysis. This study adapts relevant underlying factors identified in extant literature (Han et al., 2018; Cheng & Urpelainen, 2014). Since the NLSS did not collect data on income, following the literature (Rao & Reddy, 2007; Cheng & Urpelainen, 2014), this study adopts household real expenditure (*Expend*) as a measure of income. Other factors are a vector of potential factors influencing household fuel choice, which includes the control for land ownership status, which is also a measure of wealth. Household level of education; categorised along no education, primary, secondary, vocational, and tertiary education are included. A better-educated household head is likely to adopt an advanced fuel given a higher level of awareness. Also, a control for household location is included to capture the role of access and proximity to energy forms. Thus, the study considers transition across urban and rural locations.

### **Empirical Results**

The study utilised the 2003/04 and 2018/19 National Living Standard Survey (NLSS) from the National Bureau of Statistics. The survey represents a large-scale household survey showing the population's living conditions. The sample is representative at the national and zonal levels, with urban and rural estimates. It obtained a comprehensive and diverse set of socio-economic

and demographic data on basic needs, household housing, energy use, and living conditions. The inclusion of 2018/19 data makes the observation more recent than what exists in other studies. Secondly, the separate data points capture changes that occur across time. This is required to understand how the development of national energy transition strategies shapes household energy preferences, especially for clean fuels that are more environmentally friendly.

## **Empirical Results**

The results in this section show the drivers of household cooking energy transition across male and female-headed households. The results in Tables 58 and 59 show the findings of drivers of household transition based on 2003/04 and 2018/19 NLSS data. The distribution of energy consumption indicates most households, irrespective of gender, depended on traditional and transitional fuel in 2003/04, suggesting a negligible consumption of clean fuel (less than 1% across genders). Specifically, amongst the entire households surveyed, about 84% and 15.5% of male-headed households relied on traditional and transitional cooking energy. Likewise, about 82.8% and 15.9% of female-headed households adopted traditional and transitional cooking fuels in the period. By 2018/19, the consumption of traditional and transitional cooking fuel declined across household types; but modern energy adoption became prominent. Overall, the minimal adoption of modern energy suggests that more households have embraced LPG in 2018/19 compared to 2003/04, but prominent amongst male-headed households. The development may be because of increased awareness about climate change challenges and the introduction of domestic initiatives to mitigate the negative environmental impact.

In 2003/04, a significant proportion of male-headed households in urban (79.6%) and rural (81.6%) locations relied on traditional cooking fuel, with the situation severe in rural locations. Similarly, the consumption of traditional cooking fuel is prevalent amongst rural female-headed households (83.9%); however, their urban counterparts relied more on transitional fuel (21.8%). The same pattern subsisted in 2018/19 but became severe as more rural households plunged into consumption of traditional fuels across genders (87.5% male-headed households and 90.7% female-headed households). Firstly, the situation may be because of free access to solid fuel, which enables rural dwellers, irrespective of gender, to embrace these high-carbon-emitting fuels. Secondly, that rural female-headed households use more traditional fuel may align with the notion that women are likely to be financially constrained, thereby engendering more traditional fuel consumption than their counterparts (Ogwumike et al., 2014). The

trend has implications for the environment, being the source of traditional energy. Despite the high emission content and prices, households adopted transitional fuel to complement other fuels in both periods. In 2003/04, the transition to modern fuel was high amongst urban female-headed households (0.53%), although the proportion of households that switched was less than 1%. By 2018/19, the proportion of urban female-headed households that switched to modern fuel had increased by 28.83%. Although the consumption of modern fuel is not as high as other fuels, and the likelihood of adoption amongst urban female-headed households is significant, possibly to lessen the burden of homecare (Pachuari & Rao, 2013).

Interestingly, education seems to influence households' fuel choice decisions, especially amongst female-headed households where a significant proportion of those with no education (101.1%), primary (109.1%), and secondary (84.7%) education depended on traditional solid fuel in 2003/04. Irrespective of the level of education, male-headed households had a higher preference for solid fuel. However, female heads with tertiary education adopted modern cooking fuel more than others in 2003/04 but not in 2018/19. The reason may be because of the one stated earlier or the awareness of the dangers of consuming traditional and transitional energy, engendering clean energy transition (Rao & Reddy, 2007).

Economic factors, such as household income had a negligible impact on household energy transition in 2003/04. Irrespective of households, the adoption of traditional and transitional cooking fuel was predominant amongst households earning less than N500,000. However, by 2018/19, households earning less than N1 million adopted traditional, transitional, and modern fuel. Surprisingly, a significant proportion of the female-headed households at the lower rung of income consumed traditional fuel. While there seems to be some switch to modern fuel across households within the first- and second-income level, the movement is significant amongst male-headed households. This implies that income level facilitates male-headed household energy transition.

Higher income does not engender a clean energy transition, negating the energy ladder hypothesis. Thus, irrespective of gender, income alone may not be sufficient to facilitate energy transition (Mesara et al., 2000). These findings should be taken with caution since the NLSS survey significantly considered low-income earners. However, while about 81.6% of male-headed households with land ownership consumed traditional fuel, 83.9% of their female counterparts without land ownership adopted the traditional cooking fuel in 2003/04. Irrespective of the household land ownership status, more male-headed households consumed modern fuel than their counterparts in

2018/19. Overall, the economic indicators assessed show that female-headed households without capabilities may be affected from adopting modern fuel.

## Conclusion

This study investigated the drivers of household cooking energy transition across genders using the 2003/04 and 2018/19 NLSS while drawing implications for the existing and future regulatory framework. Presently, Nigeria is a signatory to the Kyoto Protocol and the Paris Agreement on climate change. Thus, the country has various strategies, including energy transition, towards achieving these agreements while also domesticating the gender-inclusive transformation as contained in SDG five. For instance, the 2022 national energy transition plan and 2017 natural gas policy provide the legal framework for domesticating the global agreements towards climate change mitigation. These national strategies aim to facilitate clean energy access amongst the poorest, including women, and to address the challenge of infrastructure deficit, amongst others. In this regard, the frameworks are to enhance gender-inclusive clean energy transition.

This study empirically assessed the plausibility of heterogeneity between male and female-headed households' energy transition vis-à-vis socioeconomic factors. The analysis provides insights into the effectiveness of clean energy regulatory framework. The findings indicate a minimal adoption of modern energy amongst households in 2003/04 compared to 2018/19, but prominent amongst male-headed households. By 2018/19, more rural households, irrespective of the head's gender, consumed traditional fuel compared to 2003/04, possibly because of access to free solid biomass. However, the proportion of urban female-headed households that switched to modern fuel increased significantly compared to 2003/04. Overall, the results suggest that national clean energy transition policies favour male-headed households more than their female counterparts. Also, the situation is more severe amongst female-headed households in rural areas than their urban counterparts.

Thus, the study suggests a revised gendered-aware energy transition regulatory framework to facilitate clean energy access. Specifically, policies that provide incentives for women can serve as a lever towards the adoption of modern energy. Although some of these strategies are in various national regulatory frameworks, they lack synergy with other related policies and local conditions. Thus, the gap from historical gender inequalities will enable policymakers to consider and implement energy transition strategies that are gender-balanced.

**Table 58:** Drivers of Household Energy Transition in 2003/04

Factors	Indicator	Male-Headed Households			Female-Headed Households		
		Traditional	Transitional	Modern	Tradition	Transition	Modern
Distribution	Share of total (%)	83.95	15.52	0.11	82.76	15.86	0.13
	Urban (%)	81.56	18.06	0.09	0.30	21.82	0.53
Demographic	Rural (%)	79.62	14.40	0.11	83.90	14.63	0.05
	None (%)	81.27	17.89	0.06	101.08	22.60	0.08
Social	Primary (%)	70.52	19.76	0.05	109.14	12.40	0.05
	Secondary (%)	88.48	11.24	0.07	84.74	24.40	0.07
	Vocational (%)	92.85	6.30	0.67	17.68	9.66	0.20
	Tertiary (%)	91.54	7.37	0.83	12.16	8.53	4.50
	Below 500000 (%)	93.46	168.28	0.12	99.19	18.98	0.16
Economic	500000-1m (%)	6.52	0.21	0.00	0.79	0.18	0.00
	1000001m-5m (%)	0.02	0.00	0.01	0.00	0.00	0.00
	5000000 above (%)	0.00	15.52	0.11	0.00	15.86	0.13
	Land ownership __Yes (%)	81.56	18.06	0.09	0.30	21.82	0.53
	Land ownership __No (%)	79.62	14.40	0.11	83.90	14.63	0.05

Source: Author's computation with 2003/04 NLSS data

**Table 59:** Drivers of Household Energy Transition in 2018/19

Factors	Indicator	Male-Headed Households			Female-Headed Households		
		Traditional	Transitional	Modern	Tradition	Transition	Modern
Distribution	Share of total (%)	74.32	13.58	11.93	77.67	11.55	10.39
Demographic	Urban (%)	45.00	57.76	0.00	47.54	24.29	29.36
	Rural (%)	87.52	8.32	0.00	90.69	6.04	0.33
Social	None (%)	1.14	0.20	0.18	1.08	0.16	0.08
	Primary (%)	35.15	4.99	3.47	32.63	4.65	3.80
	Secondary (%)	27.89	8.55	5.49	24.94	6.99	5.06
	Vocational (%)	11.53	0.34	0.34	12.49	0.23	0.33
	Tertiary (%)	5.03	2.39	5.03	4.83	2.02	4.23
Economic	Below 500000 (%)	11.06	10.87	8.10	76.44	10.39	8.12
	500000-1m (%)	5.64	2.70	3.76	1.23	1.15	2.34
	1000001m-5m (%)	0.01	0.01	0.06	0.00	0.01	0.02
	5000000 above (%)	0.01	0.01	0.00	0.00	0.00	0.00
	Land ownership_Yes (%)	81.90	9.19	8.77	84.36	9.10	7.62
	Land ownership_No (%)	49.10	28.17	22.43	54.52	24.38	20.80

Source: Author's computation with 2018/19 NLSS data

## Limitation

The availability of the 2008/09 NLSS may have increased the dynamism and robustness of the analysis presented herein, but this was not accessible because of some biases reported by the NBS. Further, the descriptive statistics from the NLSS indicate that the survey skewed towards low-income households (about 93% in both cases); thus, limiting the level to which the relationship between energy consumption and income was assessed. Nevertheless, the findings conform to similar ones in the literature.

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