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Electricity Conservation among Rural Households in Bunkpurugu-Nakpanduri District in the Northeast Region of Ghana

Liyialib Laari
Student, Energy Policy Pan African University, Institute of Water and Energy Sciences, Ghana
Ahmed Owolabi Olajuwon
Student, Energy Policy Pan African University, Institute of Water and Energy Sciences, Ghana

Abstract:
Residential energy use contributes significantly to the world's energy demand. It makes up 20% of all energy use. It is expected to rise by 40% by 2040 in developing nations due to urbanization. The adoption of energy conservation measures presents the possibility of reducing electricity consumption by reducing the price and quantity of electricity required by households. This paper examines the nature of electricity conservation among rural households in Ghana. The study was conducted through the administration of questionnaires to 156 households in six rural communities. The findings revealed that the average household size in the study area is above the national average, which affects electricity conservation practices. Level of education was found to have an influence on conservation practices; those who have attained some form of formal education adopted conservation practices. Many of the households did not know that a change in electricity saving behaviour reduces electricity consumption. Therefore, there is a need for the Ghanaian government and the electricity service providers to conduct periodic awareness campaigns in rural areas to educate them about electricity conservation and save energy waste.

Keywords: *Electricity conservation, conservation behaviour, Bunkpurugu-Nakpanduri, rural, households, conservation awareness, Guangbiang, Duuk-Latuk, Konmong Gberuk*

1. Introduction

Residential energy use worldwide contributes significantly to the world's energy demand, making up about 20% of all energy use (Song et al., 2019; OECD, 2024; IEA, 2022). Based on the International Energy Agency predictions, between 2019 and 2040, it is expected that energy use will increase by more than 40%. This pattern is more prominent in emerging nations where electricity demand is rising due to increasing urbanization (IEA, 2017). In developing countries, where urbanization is advancing swiftly, an estimated rise in residential energy consumption will be about 90% between 2020 and 2040 (IEA, 2019; Perry, 2018). It is worth noting that efficient utilization of electricity boosts the industrial growth of a nation and people's livelihoods (Tan, 2022; Naushad et al., 2020). The adoption of energy-efficient technologies and measures, like the use of energy-saving bulbs and refrigerators, the installation of tinted films for windows, the use of insulated roofs, and behavioural changes like reducing lighting and plug loads in buildings, are energy conservation and efficiency measures are recipes for saving energy (Zhao et al., 2012; Sharma et al., 2024; Adams, 2014). Ghana's major energy customers are households, which consume about 73% of all the power produced nationwide (Ghana Business News, 2013). With the rising electricity prices in Ghana, households resort to the use of biomass which has several health and environmental hazards (Acheampong et al., 2019).

However, the adoption of energy conservation measures presents the possibility of reducing electricity consumption between the price and the quantity of electricity required by households (Baido et al., 2024). Studies suggest that Ghana has implemented various mechanisms to promote electricity conservation (Nunoo et al., 2019). Danquah and Pappinen (2013) argued that various measures have been initiated to create awareness and educate people on electricity conservation and how to utilize electricity judiciously (Danquah et al., 2013). The education and awareness campaign initiatives initiated to educate these people are low, as many households do not know what electricity conservation entails (Baidoo, 2023). However, there is little research in Ghana that evaluates the contributions made by rural households to electricity conservation. These studies have largely focussed on the urban areas and, to some extent, on Ghanaian universities by examining the students' behaviours towards electricity conservation (Abrefa-Danquah et al., 2022; Kwakwa et al., 2024). The objective of this study is to determine the nature of electricity conservation among rural households by assessing the level of awareness and conservation practices among rural households in the Bunkpurugu-Nakpanduri District. This study will not only strengthen the understanding of rural households about electricity

conservation, awareness, and practices but also serve as a call to duty by electricity service providers to introduce special education initiatives targeted at improving electricity consumption in rural areas.

2. Literature Review

2.1. The Concept of Electricity Conservation

Electricity conservation focuses more on changing behavioural actions and habits to use less electricity. As a way to conserve power, use it just as it is essential and avoid wasting it (Painter, 2019; Zhu et al., 2021). Reduced electricity use forms part of electricity conservation. This could take the form of using less energy-intensive services or equipment. Avoiding services and products is one of the ways to save electricity, but you may also do so by selecting products that are more energy-efficient than their conventional counterparts. Conserving electricity is a critical component of sustainability and development. Long-term energy sustainability incorporates power conservation as a critical component.

Electricity conservation aims to lessen reliance on non-renewable resources like fossil fuels (Tara Energy, 2023; Zhang, 2024). Effectively cutting overall electricity demand is an intricate issue that goes much beyond the two technology problems that are often studied: energy efficiency and grid stability. Multiple studies and real-world instances show that technology's ability to lower energy demand via increased energy efficiency has limited macro-level effectiveness (Shove, 2018; Piano et al., 2022). Effective ways to increase productivity include energy-saving techniques. Conservation of electricity may be induced by worries about the environment, a desire to reduce the impact on the environment, or a desire to use less energy (Broek et al., 2019; Papilloud, 2023).

An important area of focus for reducing electricity consumption is households. Besides using energy directly, they also use it indirectly (Benjamin et al., 2020). The household has habitual energy-saving behaviour that can be controlled and changed by people's subjective motivations (Wang, 2018; Niehoff, 2021; Webb et al., 2022). Many people want to save electricity for economic or environmental reasons. Saving electricity results in both financial and environmental benefits by minimizing energy costs and carbon footprints (Schwartz et al., 2015; Caitlin, 2023; Ogletree, 2024). The implementation of informational approaches has been especially successful in the field of electricity conservation (Delmas et al., 2013; Enni et al., 2022). Around the world, energy use is responsible for 40% of greenhouse gases, and successful conservation initiatives might significantly help the environment. Several informational approaches have been used in numerous energy-efficient experiments to lower the consumption of electricity. These include offering users financial advice, data on past individual usage, energy usage in real-time, and peer usage. Despite the growing body of experimental evidence, studies of the efficiency of such tactics have produced conflicting findings. While some experts contend that more information has little to no impact on energy use, others believe that information campaigns could reduce energy use (Delmas et al., 2013). For Fischlein and Asensioto (2013), the information approach to energy conservation increases electricity consumption. They believe that pecuniary feedback and incentives lead to a relative increase in energy use (Fischlein et al., 2013). According to Chen et al. (2017), an information-based approach can only influence consumers to conserve energy when energy consumption poses serious environmental and health threats (Chen et al., 2017). Information-based intervention may also reduce energy consumption (Nemeti et al., 2020; Yang et al., 2020). Other researchers argued that information feedback encourages the consumer to cut the rate of household electricity consumption (Du et al., 2017; Juan et al., 2020; Li et al., 2021). Studies have attributed this to the fact that the residential sector has the greatest potential to minimize consumption of electricity and reduce greenhouse gas emissions in the long run (BPIE, 2014; Rock et al., 2022). Electricity cost, household and housing features, accessibility to electricity, climate home appliance kinds and efficiency, energy sources, and energy-related policies are only a few of the variables that affect how electricity is utilized in residential buildings. However, tenant behaviour and attitudes towards residential energy conservation have been thoroughly investigated in a wide range of different fields and have attracted a growing interest in different governmental energy conservation initiatives (Fateh et al., 2020; Piao et al., 2022; Lia, 2023).

2.2. Electricity Conservation in Ghana

From 2013 to 2015, Ghana faced energy challenges, which led to load management schedules, which are referred to as "dumsor" in the local tongue. In 2014, Ghana's total electricity production was 2,831 megawatts, with hydro contributing 64%, thermal power for 34.75%, and solar power for 0.05% (Energy Commission, Ghana, 2015). Between 1980 and 2014, Ghana's electricity peak demand was 2,061 megawatts and 2,300 megawatts, respectively (GRIDCO, 2014). However, one of the main contemporary energy sources is electricity, which supports Ghana's economy. To achieve full energy security and middle-income status, Ghana is predicted to require between 5% and 7% more generation capacity. One cannot overstate the importance of practices for conserving electricity among Ghanaians in light of the escalating energy crisis. The industrial sector uses electricity the most, followed by the residential and commercial sectors. The proportion of all electricity used in 2010 by the industrial, residential, and business communities was 46%, 40%, and 14%, respectively (Apeaning, 2012; Pelizan et al., 2019; Energy Commission Ghana, 2020). Consumer education regarding energy-saving techniques has been greatly aided by the Energy Commission. Consumers now have access to some contemporary technology to aid in forming energy-saving behaviours. Recently, a technology known as “Smart Energy Monitor" (SEM) was developed in order to assist consumers in energy efficiency and the effective use of electricity when necessary (Anthony et al., 2018).

The Energy Commission of Ghana has launched a campaign to educate consumers about the need to use energy-efficient electrical equipment in collaboration with the UNDP. The campaign included raising Ghanaians' awareness of the high utilization of out-dated appliances like refrigerators. The campaign urged electricity users to trade their out-dated

electric appliances, such as refrigerators, for new ones and adopt more energy-efficient models (Anthony et al., 2018; UNDP, 2024).

2.3. Regulatory Framework for Electricity Conservation in Ghana

Ghana has enacted four laws to control the proliferation of refrigeration and to guarantee that light bulbs, air conditioning, and other appliances adhere to the minimal performance standard (Tamakloe E., 2022; GCI, 2022). There are various regulatory frameworks that govern the energy sector and electricity conservation in Ghana. The technical operations of service providers in the electricity and natural gas supply industries are governed by the Energy Commission. The Commission carries out these regulatory duties by formulating and enforcing technical regulations. The Commission's regulatory responsibilities include creating the National Electricity Grid Code (Energy Commission, 2020). The Electricity Regulations (LI 1937) set forth minimum requirements and procedures for the construction and upkeep of facilities and installations, the protection of electrical installations and services, and the protection of life, property, and the environment. They also regulate the wholesale electricity market and the technical operations of the Electricity Transmission Utility (ETU) (Agyepong, 2019).

2.4. Energy Conservation Initiatives in Ghana

The Ghana Energy Commission promotes energy-saving measures through the initiative to replace out-dated refrigerators with updated models and to switch domestic power users from 40 W fluorescent lighting to 36 W energy-efficient fluorescent lamps. This strategy was intended to maximize energy consumption while protecting consumers' monetary savings (Gboney, 2009; Ackah, 2017; Tamakloe, 2022).

Regarding its energy efficiency policy objectives, Ghana executed an effective lighting project (the CEF exchange scheme) in 2007. In order to replace the projected six million incandescent lamps, the government purchased and gave out over six million compact fluorescent lamps (CFLs) on the advice of the Ghana Energy Commission. Through the implementation of this policy, the highest electricity demand across the country fell by 125 MW, and its peak electricity consumption decreased by 72.8 GWh annually. This saved the country approximately USD 39.5 million in annual energy costs and an estimated 105,000 metric tonnes of carbon dioxide (Tamakloe E., 2022).

With assistance from the Global Environment Facility, Montreal Protocol Multilateral Fund, and United Nations Development Programme, the Ghana Energy Commission introduced the national refrigerator turn-in and rebate programme in September 2012. The goal of the programme, which enticed customers to trade their out-dated refrigerators for new, more capable models, was to offer households 50,000 efficient refrigerators at a discounted price to promote the usage of more energy-efficient models and completely transform the nation's refrigerator sector. 10,472 units of out-dated, energy-inefficient appliances had been swapped out nationwide by mid-June 2016 to replace them with new, energy-efficient models. Customers who took part in the experiment saw a reduction in annual electricity consumption (Ghana Energy Commission, 2016; U4E, 2020; UNDP, 2021). Energy conservation in homes and companies has been promoted by the Ministry of Energy and other organizations. Despite these initiatives, the country has not adopted energy conservation on a widespread basis. However, the ministry wanted to raise energy prices to compel consumers to adopt energy-saving practices and use energy effectively (Ministry of Energy, 2010). This led the Electricity Company of Ghana (ECG) to raise electricity rates by 148% alone in 2022. The review came about as a consequence of the operation's rising expenses and the increased demand for electricity (BBC News, 2022; PURC, 2022; NanaAma et al., 2023).

2.5. Benefits of Electricity Conservation

The nation and consumers stand to gain from increased electricity conservation, which is becoming a crucial component of economic growth (Vidyut et al., 2008; Sharma, 2023; Banna et al., 2023). Electricity and power costs can be considerably decreased by energy savings. Utilizing energy-efficient appliances and making home improvements can help lower utility costs, which make up a large chunk of monthly expenses (Ashley, 2024; Vishnubhotla, 2024). As a homeowner, electricity prices might contribute significantly to your regular monthly spending. The US Department of Energy estimated that switching to energy-efficient appliances can help you save anywhere between 5% and 30% on your utility bills (Energysage, 2023).

Electricity conservation is important in this era, especially in this period when the world is facing a series of energy problems. Climate change is one of the biggest challenges that have bedevilled the world and conserving and using electricity wisely would have adverse effects on environmental problems and help prevent posterity from this crisis. The concern over the rapid depletion of non-renewable energy sources in various parts of the world has made conserving electricity more important to protect the ecosystem and the earth from global warming. Energy use has been linked to the acceleration of global warming. We can lessen the consequences of global warming and our carbon footprint by conserving electricity. Conserving electricity can lessen reliance on fossil fuels and greenhouse gas emissions in the atmosphere (Min et al., 2022; Zach, 2023; Kara, 2023). Conserving electricity improves the quality of the air we breathe, the water we drink, and the food we eat while reducing the negative consequences on the environment, such as greenhouse gases, oil spills, and strip mining (Deziel, 2017; Ritchie, 2023).

An essential component of development is energy. Communities without it suffer from deficits in the most fundamental services, like health and education, and it becomes a barrier for investors and enterprises, which results in unemployment and poverty. According to World Bank statistics, close to 1 billion people still do not have access to electricity, and hundreds of millions do not have enough of it. The most developed nations, on the other hand, waste up to 98% of their energy in their urbanized zones. One of the most important aspects of using energy resources is saving on electricity. It would help reduce energy dependence by reducing consumption (Gil, 2021).

2.6. Theoretical Framework

2.6.1. Theory of Planned Behaviour (TPB)

The TPB is counted among the influential works in the domain of psychology. It has been used often to investigate the behavioural predispositions of consumers and their buying behaviour (Abou-Zeid et al., 2011). The TPB can be considered an extension of work on the Theory of Reasoned Action (TRA) and contends that the behaviour of a person can be predicted with the help of behavioural intention, which again depends on three determinants: attitude, subjective social norms, and perceived behaviour control (Ajzen, 1991). This theory considers both volitional and non-volitional control as explanations for conduct (Soliman, 2019). According to TPB, the individual's goal or repeated intentions are the engine of humans (Abbasi et al., 2020). Several studies have used the TPB model to explore the environmentally responsible behaviour of buyers. Nayum and Klockner used the TPB model to establish the relationship between brand loyalty, household size, and income with electronic vehicle (EV) purchases (Nayum et al., 2014). While et al. (2016) conducted comprehensive research wherein TPB theory determinants along with moral norms were utilized to determine the intention of Chinese people to adopt HEVs. In addition to EVs, TPB has also been mentioned in other research fields. The TPB model is also used to describe consumer behaviour in various scenarios, including using smartcards and artificial intelligence for financial investments (Belanche et al., 2019) and adopting self-service technologies (Flavian et al., 2020). Similarly, some studies have used this approach solely for tourism (Meng et al., 2020). This study used this theory to examine perceived behaviour control, subjective norms, and attitudes towards conserving electricity. In the context of this study, attitude was defined as the evaluation of behavioural intention towards electricity conservation practices (evaluations and beliefs about the benefits and costs of conserving electricity, taking into consideration their perception of the impact on their daily lives and financial savings). Subjective norms define social expectations from the government regarding electricity conservation, and behavioural control is defined as the rural members' willingness to implement electricity conservation measures, which can be influenced by the level of awareness campaigns and education. The theory was expanded to include household sizes, age structure, and occupation, which can influence conservation practices.

3. Research Methodology

3.1. Study Design

The design used for the study was a survey method where questionnaires and interviews were employed to engage the target population within the study communities in the Bunkpurugu-Nakpanduri District. This study design allows the researcher to collect feedback information about customer satisfaction, identify areas for improvement, and gain more insights about attitudes and opinions that can inform decision-making (Subhajit, 2023). Through stratified random sampling, the district was divided into six zones. Samples from the population were chosen at random with equal allocation. This design was used because it reduces sampling variability and increases the precision of estimates by ensuring that each subgroup is adequately represented. It ensures the inclusivity of diversity within the population and draws more concrete conclusions from the data collected. This allows for informed decision-making and improved outcomes (Mike, 2024; Lauren, 2020). The communities were divided into six zones, and one community was chosen from each zone using simple random sampling.

3.2. Inclusion and Exclusion Criteria

The selection criteria were drawn from a pool of target communities connected to electricity over the last three years. The inclusion criteria were communities connected to electricity within the district, communities connected to electricity, and villages. The exclusion criteria focused on communities not connected to electricity, communities connected to electricity outside the district, and any community connected with electricity but not a village in the district.

3.3. Background of the Study Area

Bunkpurugu-Nakpanduri District was curved out of the then Bunkpurugu-Yunyoo District. It is located in the North-East Region of Ghana. It shares borders with Garu-Timpani to the north, Togo to the east, East Mamprusi District to the west, and Yunyoo and Cheriponi Districts to the south. It has a population density of 154.1/km^2.

3.4. Sample Size Determination

According to the district's annual action plan for 2019, there were 9,823 household beneficiaries of the national grid. Out of the number of households connected to electricity in the district, a sample of 156 households was considered to participate in the field data for the study. Six communities were selected, and 26 households were considered for the study in each community. In each community, the participants were identified using systematic sampling with an interval of three from the start. The six sampled communities for the study were Bimbagu, Binde, Guangbiang, Duuk-Latuk, Konmong Gberuk, and Jilik.

The mathematical formula below, given by Millar and Brewer (2003), was used to calculate the sample size.

That is:

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

Where: 'n' is the sample size to be determined, 'N' is the sample frame, and 'α' is the margin of error, which in this case is 8%. The 92% confidence interval was chosen for this study because it deals with human beings whose accuracy of

information is subject to biases, unlike the physical sciences, which have a high degree of certainty. By the formula, N = 9,823 and α = (0.08).

Therefore, $n = \frac{9823}{1+9823(0.08)^2}$ $n = \frac{9823}{1+9823(0.0064)}$ $n = \frac{9823}{63}$ n = 156

3.5. Sources and Method of Data Collection

The study relied on primary data sources. The primary data were obtained through direct interviews with the participants using a structured questionnaire. These structured questionnaires were used to collect primary data from households in the communities within the study area. The data that were collected included but were not limited to gender of household, educational background, household sizes, and occupation.

3.6. Data Analysis

The data analysis involved coding and entering the data into the Statistical Package for Social Sciences software (SPSS version 23). However, frequency distribution and simple percentages were used to analyze the data, which were subsequently presented in the form of tables and figures.

4. Results

4.1. Profiles of the Respondents

Table 1 represents respondents' economic and demographic characteristics. The study analyzed the gender of the respondents as a key attribute of demography, as household energy decisions are influenced by both genders. However, women conserve more electricity than men, as 80% of the respondents were males and 20% were female. The study also shows that age has an impact on electricity conservation behaviours. The youth are more likely to adopt conversational practices (Baidoo, 2023), as they constitute 66% of the study. Analysis of the study shows that the majority of the respondent's household size is between 7 and 10 persons, which is above the national average of 3.6 (Ghana Statistical Service, 2021). This hurts electricity conservation behaviour since it would put pressure on electricity demand, limiting conservation practices among households. There is a link between perceived behavioural control and energy-saving behaviour. People with higher educational attainment have a greater intention to conserve energy (Lindsey et al., 2014). The results of this study are in line with this assessment, as 29% and 19% of the respondents who have attained tertiary and senior high education, respectively, practised electricity conservation. The study looked at the various forms of occupation in households. From the responses obtained, 85% of the majority are self-employed as seasonal workers in farming, local masons, carpentry, and petty trading, among others. Only 12% are employed in the public sector. This could have the potential to affect the ability of households to routinely pay electricity bills since they are seasonal workers, and their flow of income is dependent on the availability of jobs.

Profiles of the Respondents		
Gender	**Frequency**	**Percentage**
Male	124	80
female	32	20
total	156	100
Age	**Frequency**	**Percentage**
21-30	24	15
31-40	80	51
41-50	42	27
51-60	5	3
61 above	5	3
Household Size	**Frequency**	**Percentage**
1-3	32	21
4-6	48	30
7-10	76	49
Level of Education	**Frequency**	**Percentage**
No education	46	30
Primary	21	13
JHS	14	9
SHS	30	19
Tertiary	45	29
Occupation	**Frequency**	**Percentage**
Public servant	19	12
Private/ self-employed	133	85
unemployed	4	3
	156	

Table 1: Profiles of the Respondents
Source: Author, Field Survey 2023

4.2. Knowledge of Electricity Conservation, Practices and Awareness

The analysis of the data in table 2 presents the respondent's understanding, awareness, and practices of electricity conservation. According to the analysis, 62% of the respondents have never heard of electricity conservation. This number is quite significant and presents a challenge that requires intervention. They are largely people who have no education or have only attended school up to junior high level, as shown in table 1. This points to the fact that there are limited awareness campaigns in the rural areas of the district. Thirty-eight percent have heard of electricity conservation, and this is associated with their level of education. However, 61% of the responses indicate that the residents within the rural environs of the district do not practice electricity conservation. According to a 45-year-old household head, his understanding of electricity conservation is that *"for me, my understanding of electricity conservation is to turn off the light when you are going out of the room."* A mother of three children was asked about her understanding of electricity conservation, and this was her reply: *"When you are about to go to sleep at night, you have to turn off the light because, if you don't turn it off, you are wasting the light."* The same question was asked of other households, and their responses were quantitatively analyzed, as shown in table 2. From the responses obtained, 39% understood the concept in one way or another, while the rest of the respondents did not have knowledge about electricity conservation and what they do to save energy. According to a 56-year-old father, *"I don't switch off the light; I just leave it on. That is the way to know when there is light or not."*

Electricity Conservation Awareness	**Frequency**	**Percentage**
Aware	59	38
Not Aware	97	62
Electricity Conservation Practices	**Frequency**	**Percentage**
Practice	61	39
No practice	95	61
Household Understanding of Electricity Conservation	**Frequency**	**Percentage**
Efficient use of electricity	30	19
Keep the light off when not in use	12	8
Use energy-efficient appliances	19	19
I don't know	95	61

Table 2: Knowledge on Electricity Conservation, Practices and Awareness among Respondents
Source: Author, Field Survey 2023

4.3. Electricity Conservation Education among Rural Households

A well-designed electricity conservation educational campaign initiative incentivizes people to promote electricity conservation behaviours that reduce energy use (Brian et al., 2022). Respondents were asked if they had received some form of electricity conservation education since they got connected to the national grid. As presented in figure 1, data from the study revealed that there is a wide margin between those who have received electricity conservation education and vice versa. From the responses, 70% have not received any form of education, while 30% did receive conservation education.

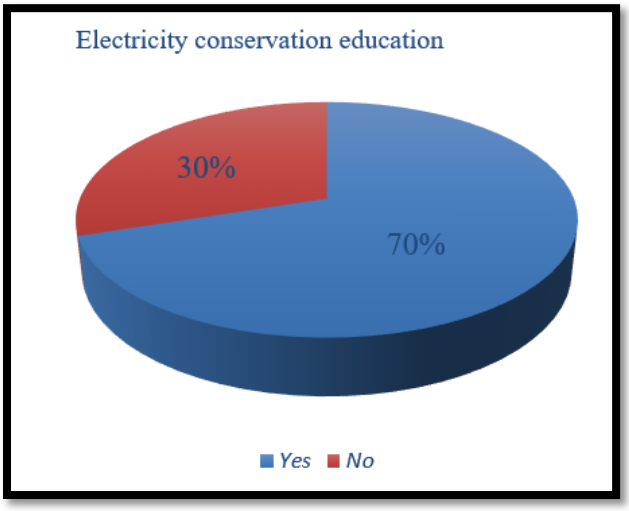

Figure 1: Electricity Conservation Education among Rural Households
Source: Author, Field Survey 2023

4.4. Conservation Practices after Receiving Conservation Education

Figure 2 underscores the impact of electricity conservation among households after receiving conservation awareness education. The responses of those who have received education on electricity conservation and afterwards implemented those measures affirmed that there is a positive relationship between awareness campaigns on electricity

conservation and electricity consumption. The results affirm that 77% of the respondents saw a reduction in electricity consumption after implementing the conservation measures. This implies that education can play a crucial role in saving energy use among rural households.

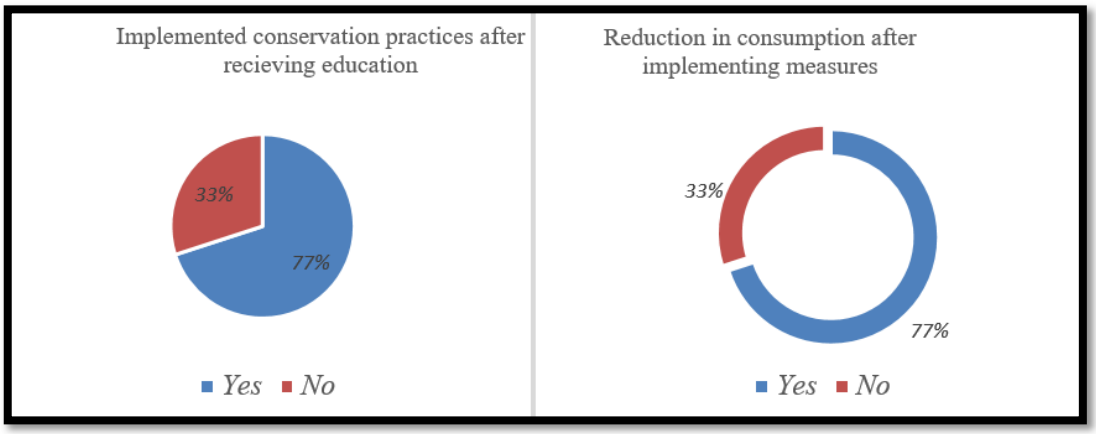

Figure 2: Effects of Electricity Conservation Practices
Source: Author, Field Survey 2023

4.5. Type of Lighting System Used by Households

In table 3, the respondents were asked about the different types of lighting they used. From the responses obtained, 56% could not tell the kind of bulbs they are using for lighting at home, and 35% used LED as lighting bulbs. This highlights the fact that they may be using energy-inefficient bulbs, as this could have an impact on the rate of electricity consumption. Electrical appliances consume energy on standby, and households were also asked about their knowledge of electronic devices that consume electricity on standby. Responses obtained indicate that 63% do not know that standby electronic devices consume electricity. They were also asked about the benefits of electricity conservation, as this is one of the factors encouraging electricity consumers to save energy, and 58% responded positively to its benefits. However, 60% of the respondents do not know the current price lap for electricity in Ghana. The electricity price lap as of June 2023 was 1.43 Ghana cedis, equivalent to 0.12 US dollars per kilowatt hour for households, while industrial energy was priced around 1.32 Ghanaian cedis per kilowatt hour, equivalent to 0.11 US dollars (Sasu, 2023). The knowledge of electricity pricing will help households better manage their energy consumption rate to reduce energy bills. However, this is not the case among the respondents, as they do not know how much they are charged per kWh. The star rating on electrical appliances is another way to distinguish energy-efficient appliances from inefficient appliances. The respondents were asked about their knowledge of the star ratings on electrical appliances and their importance. The results obtained were encouraging. As shown in table 3, 87% responded that they knew the implications of the star ratings on electrical appliances for energy consumption.

Type of Light Bulbs Used		
Number	**Frequency**	**Percentage**
LED bulbs	56	35
Florescent bulbs	13	8
Don't Know	87	56
Awareness That Standby Electronics Devices Waste Energy		
Yes, I know	57	37
No, I don't know	99	63
Awareness of the Benefits of Electricity Conservation Practice		
Yes, I am aware	65	42
I Don't Know	91	58
Knowledge about the Current Pricing Lap for Electricity Bills		
Yes, I know	62	40
No, I don't know	94	60
Knowledge about Star Ratings on Electrical Appliances and Their Importance		
Yes, I know	21	87
No, I don't know	135	13

Table 3: Electricity Conservation Awareness Characteristics
Source: Author, Field Survey 2023

4.6. Monthly Electricity Bill

The study analyzed the monthly income of the respondents. The income level of households determines their choice of electricity use. From the results shown below, a greater number of respondents (111) have their monthly electricity bill between GHC 20 and 99, which is equivalent to USD 1.48 and 7.36, respectively. However, the average

monthly electricity bill per household is GHC 102.72 (UDS 7.72). Even though this amount is not expensive for households to bear, with proper conservation education and awareness creation, households can further reduce their electricity bills, which is the sequel to saving electricity.

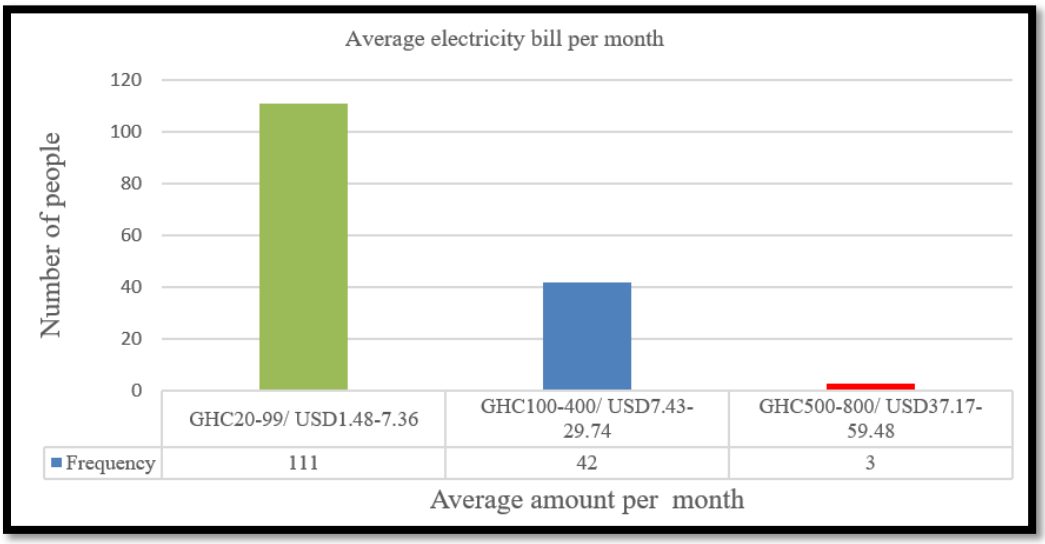

Figure 3: Household Electricity Bill
Source: Author, Field Survey 2023

4.7. Limitation of the Study

This study is not immune to limitations. One limitation of this study is the relatively small sample size. The study was conducted with one hundred and fifty-six sampled participants, and this may not give a full representation of the complexity of issues in the study area regarding the topic of study. For this reason, the findings may not be applicable in certain areas, given the societal diversity and geographical differences. The small sample size reduces the level of statistical power of the study. This could potentially affect the relationship between variables. As a result of this, the findings of this study should be interpreted carefully, especially when extrapolating into a population not represented in this study. A future study should focus on replicating this study with a large sample size to give reliable and generalized results. Again, conducting multi-site studies could give more insights into the nuances of the study and increase the robustness of the study findings.

5. Conclusion and Recommendations

The analyses of the study show that the average household size of the study area is above the national average, as this has an effect on electricity demand and negatively affects conservation practices. With regard to the level of education, the study revealed that the level of educational attainment can help influence conservation behaviour. This implies that the higher the level of education among rural people, the greater it would help to promote conservation practices to save electricity in rural communities. The results also show that there is a lack of electricity conservation awareness campaigns and conservation practices among rural households in the district. The study further reveals that many of the households do not know what energy-efficient appliances are since the majority of them are not educated. This highlights the possibility that they are utilizing inefficient electrical appliances that use more electricity, resulting in energy waste. Even though electricity is a public service and vital for socioeconomic growth, it should not be wasted. They would be educated on the need for power conservation, practices, and the use of energy-saving appliances in order to reduce their electricity use and expenditures. Electricity service providers and the government need to introduce these measures in remote areas to empower them to conserve electricity.

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