

**UNIVERSITY OF EDUCATION, WINNEBA**  
**COLLEGE OF TECHNOLOGY EDUCATION, KUMASI**

**AN APPROACH TO ENHANCE WELFARE IN UPPER EAST REGION OF  
GHANA THROUGH RURAL ELECTRIFICATION**



**DECEMBER, 2016**



**UNIVERSITY OF EDUCATION, WINNEBA**  
**COLLEGE OF TECHNOLOGY EDUCATION, KUMASI**

**AN APPROACH TO ENHANCE WELFARE IN UPPER EAST REGION OF  
GHANA THROUGH RURAL ELECTRIFICATION**



**A Thesis in the Department of ELECTRICAL AUTOMOTIVE TECHNOLOGY  
EDUCATION, Faculty of TECHNICAL EDUCATION, submitted to School of  
Graduate Studies, University of Education, Winneba, in partial fulfillment of the  
requirement for the award of Master of Technology in (Electrical/Electronics  
Technology Education) degree**

**DECEMBER, 2016**

## DECLARATION

### STUDENT'S DECLARATION

I hereby declare that this Dissertation is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

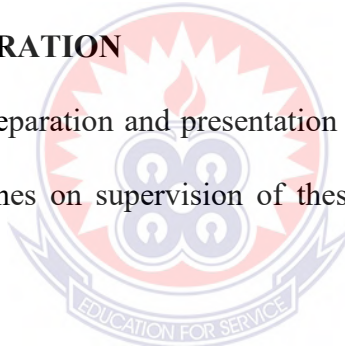
Signature: .....

Date: .....

**DUUT JOHN BIIMI**

### SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this Dissertation was supervised in accordance with guidelines on supervision of thesis laid down by the University of Education, Winneba.



### SUPERVISORS

**PROF. W.K. OFOSU**

(Department of Electrical Engineering Technology, Penn State Wilkes-Barre, USA2)

Signature: .....

Date: .....

**MR. SEKYERE FRANCOIS**

Department of Electrical/ Electronic Technology Education (UEW-K)

Signature: .....

Date: .....

## **DEDICATION**

This thesis is affectionately dedicated to my lovely wife and family for their love and support.



## ACKNOWLEDGEMENTS

My profound gratitude of all goes to the Almighty God who has endowed me with knowledge, strength, wisdom and ability for making the project a reality.

I owe a debt of gratitude to all the staff of the department of design and technology Education of the University of Education Winneba, Kumasi Campus for their immense assistance to me throughout the duration of the course.

My special gratitude goes to Prof. W.K. Ofori who supervised my thesis very well, his vigorous comment and corrections which helped greatly to put this manuscript into its final shape. My sincere thanks to Dr. Martin Amoah and Mr. Affum Emmanuel Ampoma (KNUST) for their support and understanding making it possible for the success of this work and also throughout the cause of my studies.

I must also especially acknowledge Mr. Affum Emmanuel Ampoma for his guidance and counseling throughout the cause of my studies and to all authors whose books and publications I made references to. Finally, I would like to thank my parents, my wife and children for their encouragement, love, care and support throughout the cause of my education.

## TABLE OF CONTENTS

<b>CONTENT</b>	<b>PAGE</b>
Declaration	ii
Dedication	iii
Acknowledgements	iv
Table of Contents	v
List of Tables	viii
List of Figures	x
Abstract	xi

### **CHAPTER ONE**

#### **INTRODUCTION**

1.1	Background of the Study	1
1.2	Problem Statement	3
1.3	Research Objectives	4
1.4	Research Question	5
1.5	Scope of the Study	5
1.6	Significance of the Study	6
1.7	Organization of the Study	6



## **CHAPTER TWO**

### **REVIEW OF RELATED LITERATURE**

2.1	Health Benefits	8
2.2	Indoor Air Quality	9
2.3	Knowledge and Fertility Improvement	9
2.4	Education Benefits	10
2.5	Economic Growth due to Entrepreneurial Activities	10
2.6	Economic Impacts on Households	11
2.7	Setting Up of Micro-Enterprises	13

## **CHAPTER THREE**

### **METHODOLOGY**

3.1	Study Area	17
3.2	Research Design	21
3.3	Target Population and Sampling Technique	22
3.4	Instrumentation	24
3.5	Data Analysis	26



## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

4.1	Demographic Characteristics of the Respondents	28
4.2	Energy Use in the Home	34
4.3	How the Lack of Electricity Affects the Economic Activities of Rural People	36



4.4	Welfare Enhancement through Rural Electrification	43
4.5	Challenges in Taking up Electricity	54

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

5.1	Summary	56
5.2	Conclusion	58
5.3	Recommendations	59
5.4	Suggestion for Further Studies	61

<b>References</b>	<b>62</b>
-------------------	-----------

<b>Appendices</b>	<b>68</b>
-------------------	-----------



## LIST OF TABLES

<b>TABLE</b>	<b>PAGE</b>
Table 1: Communities with and without electricity	21
Table 2: Communities sampled	23
Table 3: Sample size across selected communities	24
Table 4: Gender of respondents	28
Table 5: Descriptive statistics of the ages (years) of the respondents	29
Table 6: Marital status of respondents	30
Table 7: Educational background of the respondents	31
Table 8: Descriptive statistics of monthly income (GH¢) of respondents	32
Table 9: Employment sector of the respondents	33
Table 10: Amount earned by respondents without electricity	38
Table 11: Embarking on business if the community is electrified	39
Table 12: The extent to which electricity will affect economic empowerment	42
Table 13: Descriptive of amount respondents make before and after electrification	45
Table 14: Extent of income increase with the introduction of electricity	45
Table 15: Business has grown significantly as a result of the presence of electricity	47
Table 16: The number of micro-enterprises has grown as a result of the electrification projects	48
Table 17: Access to electricity increases use of equipment and tools in the business	49

Table 18: The introduction of electricity has significantly reduced the financial savings on energy expenditure in the business	50
Table 19: The expenditure on lightening has rather gone up after the electrification	51
Table 20: Introduction of electricity does not automatically stimulate economic growth for rural folks	52
Table 21: Although electricity is vital, lack of complementary development programmes such as markets and sufficient credits hinder the economic growth of the business	53
Table 22: Most expensive challenge in taking up electricity services for the rural folks	54



## LIST OF FIGURES

<b>FIGURE</b>	<b>PAGE</b>
Figure 1: Location of Garu-Tempene on the map of the Upper East	18
Figure 2: Age of respondents	29
Figure 3: Source of energy used in the home across the respondents	35
Figure 4: Engagement in business	37
Figure 5: Interest in engaging in business after the electrification of the area	40
Figure 6: Use of electricity for business	44



## ABSTRACT

The study was on an approach to enhance welfare in Upper East Area of Ghana through Rural Electrification projects. The study used both the qualitative and quantitative designs. The research instruments used were questionnaires, and focus group discussion. The population for the study was 317 respondents of which 161 were residents from rural communities with electricity and 156 were residents from rural communities without electricity. Quantitative data analysis was performed using the Statistical Package for social sciences (SPSS), version 18 and Microsoft Excel. The study results indicates that, the absence of electricity has limited the rural people from engaging in income generating activities especially those that use electricity to become economically empowered. Moreover, majority of the respondents were interested in engaging in some form of business after the introduction of electricity in their communities. The specific way in which the lack of electricity affects the economic activities of the people included high expenditure on fuel, restriction in the number of hours of work, as well as restriction on the kind of businesses to venture into. Furthermore, rural electrification had an impact on economic activities of micro-businesses in the study area. The most significant changes which rural electrification had brought for micro-enterprise is that, the number of micro-business has grown as result of rural electrification, and that access to electricity has increased the use of modern equipment and tools by micro-business. The study recommended that the Government of Ghana and other energy stakeholders such as VRA/NEDCO and ECG should extend the rural electrification projects to other remote areas to improve their economic, education, health and social livelihoods. Moreover, the provision of other complementary development programmes such as markets and access to credit will be critical to the economic growth of businesses in the communities.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background of the Study**

The unequal distribution of energy has the largest impact on the vulnerably poor, especially poor women and children in rural areas. Inadequate access to modern energy is both a determinant and a manifestation of poverty. In light of these challenges, electricity provision to the world's rural poor calls for a committed and long-term action plan. The benefits that electricity access brings to households and communities are justified not only on economic grounds but also on grounds of equity. Lack of studies in rural electrification has eluded the nation in getting to know the benefits people derived from it.

It is widely accepted that, households' access to sustainable energy do not only contributes to improving the living conditions within the family, but also represents an opportunity for small-scale income generating activities. According to Reddy, et al, (2000), poverty alleviation and development depends on universal access to energy services that are affordable, reliable, and of good quality. Electrification is widely believed to contribute to the achievement of the Millennium Development Goals (MDGs), based on the assumption that sustainable access to modern energy services fosters economic and social development, and leads to improvements in the quality of life (Bensch, et al, 2010).

Ghana has an ample reputation with regards to electricity access, recording more than 70% of nationwide access as of 2010. In addition, the National Electrification Scheme (NES) has a great target of achieving universal electricity access (90% of national electricity access) in 2020. In spite of the sound records of Ghana's electricity access and high aspirations, there are significant challenges that inhibit development.

One of the major challenges in the NES is the extension of electricity to the rural areas in Ghana. This concern has been elaborated by the Director of Renewable Energy in a speech that as one of the key challenges, —there exist over 2000 lakeside and island rural communities in Ghana not likely to be connected to the national grid in the foreseeable future (Togobo, 2012). Consequently, Togobo also called for intervening solutions of decentralized renewable energy with off-grid and minigrid options. This call is in line with the fact that, grid electricity connection to the rural communities is expensive mainly due to lack of access roads and geographical remoteness. In addition, low population rates coupled with high poverty level of the rural populates make grid extension of electricity to rural communities increasingly ineffective.

The Government of Ghana, however, is devoted to rural electrification and is currently one of the prioritized strategies on the policy agenda of the NES. Since grid extension to most of the isolated rural areas is currently not cost effective, solar photovoltaic (PV) systems have emerged as prominent solutions to rural electrification in Ghana. The Ghana government in collaboration with international organizations and non-governmental organizations (NGOs) have implemented a number of solar PV systems for electrification and other energy solutions in the rural communities (Togobo, 2012). The emergent of solar PV system as an intervening solution to rural electrification in the country is not only due to the fact that renewable energy sources (RES) have increasingly

become the plausible solution for sustainable energy access in rural communities, as emphasized by Glemarec (2012), but is also consistent with the fact that, Ghana is raising its effort to utilize its well-endowed solar radiation, which is abundant in all parts of the country. In addition, this era has become concurrent with Ghana's commitment to increasing its renewable energy sources in the national energy mix (Glemarec, 2012).

Generally, rural electrification projects are often characterized by frequent failures. According to García et al (2010), the failure of rural electrification solutions from renewables is most often related to the design and implementation of the systems. Other factors for the failure of rural electrification systems include funding and commercialization mechanisms (García et al., 2010). This situation is not different from Ghana. The country's rural electrification efforts have yielded tremendous results with the introduction of many rural electrification projects based on renewables, especially solar PV systems. However, most of the projects do not see the light of the day after implementation. As a result, the government and other sponsoring agencies are discouraged from extending such projects into other communities. Since the government of Ghana is highly committed to rural electrification with renewables, finding solutions to the underlined challenges would be crucial for sustainable rural electrification solutions in Ghana. Therefore, this study examined the impact of rural electrification in the Upper East Region of Ghana.

## **1.2 Problem Statement**

In relation to the study population; Garu-Tempane, out of the 25 communities, only 11 have been electrified. Thus 56% of the community is not connected to the national grid while 44 percent of the communities have been connected to the national grid. This



research is planned to study groups, and to make recommendations that will bring enhancement to the 56% through rural electrification.

According to Azumah (2010), the Member of Parliament (MP) for Garu-Tempane in the Upper East Region, the government of Ghana has secured a \$100 million credit facility from the General Capital Corporation of the United States of America, for the financing of the national rural electrification scheme for the Upper East Region. That is, some efforts are been taken to get these communities electrified. However, irrespective of these efforts, there is the need to empirically assess the impacts the electrification of these communities have on the economic empowerment of the rural folks.

### **1.3 Research Objectives**

The main objective of this study is to assess the impacts of rural electrification on the economic development of rural folks. Specifically, the study seeks to:

- i. examine how the lack of electricity affects the economic activities of rural people;
- ii. identify the most significant changes brought to micro-enterprises by the taking up of electricity services;
- iii. asses the general challenges rural folks encounter in the taking up of electricity; and
- iv. make recommendations on the benefits associated with getting rural communities electrified.

#### **1.4 Research Question**

The study seeks to obtain answers to the following research questions in relation to the study's objectives:

- i. How does the lack of electricity affect the economic activities of rural people?
- ii. What are the most significant changes brought to micro-enterprises by the electricity services provided to the 44% of the rural people?
- iii. What are the general challenges rural folks encounter in the lack of electricity? and
- iv. What recommendations can be made to ensure that the economic gains associated with rural electrifications are fully tapped?

#### **1.5 Scope of the Study**

This study examines the impact of rural electrification in the Upper East Region of Ghana. Therefore, the study is geographically limited to the Upper East Region of Ghana. The study is conceptually limited to the impact of rural electrification programmes. Additionally, the economic empowerment of rural electrification is limited to only households and micro-enterprises. That is to say that the economic impact of rural electrification on the national economy is beyond this study. This could be explored in other studies by future researchers. For proximity, the lack of resources and time constraints, the study covers only the Garu-Tempene District of the Upper East Region of Ghana.

## **1.6 Significance of the Study**

The research findings from this study will serve as tools to stimulate the understanding of the linkages between grid electricity services and rural folks' development, allowing stakeholders such as the Volta River Authority/Northern Electricity Distribution Company (VRA/NEDCO) and Electricity Company of Ghana (ECG) to develop strategies to support rural electrification programmes, and also increase awareness for entrepreneurs about the impact of electricity services on income generating activities. Thus the availability and reliability of information from this study could enable decision-makers, government, donor organisations, and other energy stakeholders to support efforts to increase accessibility of electricity for the informal sector. Additionally, it is also expected that, this study will propose a sustainable electrification system and implementation plan for communities with and without electricity in the Garu-Tempene district, and Ghana as a whole.

On the academic front, the findings from this study are expected to add up to the existing literature on rural electrification and economic empowerment, while indicating some direction for future researchers.

## **1.7 Organization of the Study**

The study is organised into five chapters. Chapter One talks about the background of the study, statement of the problem, research objectives, research question, scope of the study, significance of the study and organization of the study. Chapter Two is the review of related literature. Specifically, the chapter reviews literature on the impact of rural electrification on economic empowerment of rural communities. Chapter Three presents the research methodology, study area, study design, target population, sampling technique,

instrumentation and data analysis. Chapter Four focuses on the results and discussions of findings. In this chapter, the discussion of the findings will be done in relation to the literature review in Chapter Two, while Chapter Five presents the research summary, conclusions, and recommendations.



## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

The main domestic uses of electricity include things such as lighting, grinding mills, small town water pumping systems. In the World Bank's economic analysis (IEG, 2008), the valuation of the benefits of lighting have typically been based on the willingness to pay (WTP), which is calculated on the basis of the cost of lighting using the existing source, usually a kerosene lamp. There are other benefits of rural electrification

#### 2.1 Health Benefits

The health benefits from RE operate through a number of channels:

- Improvements to health facilities.
- Better health from cleaner air as households reduce use of polluting fuels for cooking, lighting, and heating (Hutton and others 2006)
- Improved health knowledge through increased access to television
- Better nutrition from improved knowledge and storage facilities from refrigeration cooking, lighting, and heating (Hutton and others 2006)
- Improved health knowledge through increased access to television

The (IEG) findings support the view that there are health benefits from RE, including fertility reduction.

## **2.2 Indoor Air Quality**

The use of traditional solid fuels such as fuel wood crop residue and dung exposes people—especially women and young children—to indoor air pollution, with consequent health risks: principally acute lower respiratory infections, but also low birth weight, infant mortality, and pulmonary tuberculosis. A review of existing studies by (IEG, 2008) showed that exposure to indoor cooking using traditional methods increased the risk of premature death by a factor between two and five. These diseases caused by indoor air pollution cause between 1.6 and 2 million excess deaths each year, 5 more than half of them among children younger than five. This figure accounts for 2.7 percent of the global burden of disease. There is also a fire risk. In addition, fuel collection imposes a costly time burden of up to 8 hours a week, once again usually mainly on women. In principle, RE can tackle both of these issues, promoting better health through reduced indoor air pollution and reducing the time burden on women of fuel collection.

## **2.3 Knowledge and Fertility Improvement**

IEG's impact evaluation of health outcomes in Bangladesh (IEG 2005) found a significant impact of household electrification on mortality. One possible channel for this effect is that access to media improves health knowledge. IEG analyzed DHS data for eight countries to examine how access to media (radio, TV, and newspapers) affects women's health knowledge

The causal chain for the first possible health impact is as follows:

- Access to electricity increases time spent watching TV and listening to the radio.
- Increased access to media increases awareness of health issues.

- This increased awareness would result in changed health behavior.
- Changed behavior improves health outcomes and reduces fertility.

## **2.4 Education Benefits**

The main channels through which electrification may affect education are by improving the quality of schools, either through the provision of electricity-dependent equipment, or increasing teacher quantity and quality; and time allocation at home, with increased study time, though the availability of Television (TV) may decrease that time (but at the same time it may also possibly provide educational benefits).

In low-income countries rural schools often lack basic equipment, such as furniture and adequate textbooks—the presence of electricity does not affect these important constraints. The failure of teachers to take up posts in remote locations and frequent absenteeism from such postings are problems in many countries, and the evidence presented in the last chapter, albeit for just one country, supports the argument that the availability of electricity makes rural positions more attractive to teachers. This is thus one possible reason for the higher education levels, with improved school quality encouraging students to stay on longer or enabling them to do so as their grades improve from better teaching.

## **2.5 Economic Growth due to Entrepreneurial Activities**

Historically, the use of electricity has been almost linearly associated with rising incomes and productivity (Guyol, 1969). Today, developing countries with higher per capita incomes typically consume more electricity per capita (Strout, 1977) and also devote more investment resources to rural electrification than do poorer countries.

Electricity generally produces a greater improvement in lighting for lower income households than richer households, as they cannot afford as much lighting from kerosene and candles. One kilowatt hour (kWh) of electricity used in a 60 W electric light-bulb produces the same amount of light as about 12 litres of kerosene burned in a kerosene lantern, which, at typical prices, makes electric lighting about 100 times cheaper than kerosene lighting (Foley, 1990).

However, Foley (1990) hold a different view. According to Foley, the introduction of electricity does not automatically stimulate economic growth. Its effect is dependent upon a number of complementary factors, including the level of development in the area, the availability of capital and other resources and access to markets. This implied that unless the other necessary infrastructural elements and the proper conditions for economic development are already present, rural electrification will not, by itself, cause an area to develop. When the necessary conditions for economic take-off are present, however, experience shows that the provision of a reliable electricity supply can act as a stimulus to economic development.

## **2.6 Economic Impacts on Households**

At the household level, electricity is mainly used for powering light bulbs, fans, television sets, computers and phones (Mvondo, 2010). For over 30 years, the World Bank and other organisations have studied the social benefits of electricity access and have noted that these benefits are usually derived from the longer days that powered light bulbs offer to the household, which directly or indirectly impacts on the economic empowerment of these households. When electricity is used for powering home appliances, household chores tend to become less tedious; when it is used for lighting, the



relative brightness of the light bulb as opposed to candle light allows children to read or study in the later hours of the day, bringing obvious education and leisure benefits (Barnes, 2007). Women and children benefit directly from these improvements, increasing the general welfare of all members of the household.

Lighting can also benefit other household economic activities, such as sewing by women (Khandker, Barnes & Samad, 2009). Khandker et al., (2009) indicates that household economic activities both in and outside of the house benefits a lot from electricity. For example, crop productivity can be increased by the application of electric irrigation pumps, businesses can be operated longer hours in the evening, electric tools and machinery can impact efficiency and productivity to industrial enterprises, and so on. Rural electrification projects are often justified because they are intended to promote household welfare by providing a better quality of life or more productivity. This view along with the significance of other sources of modern energy has resulted in modern energy being recognized as essential to fulfilling the Millennium Development Goals (United Nations, 2005).

According to Khandker et al. (2009), compared to the households in villages without electricity, those in villages with electricity have significantly better schooling outcomes which are key determining factor for economic empowerment. However, the differences in economic outcomes are not consistent. The village level electricity benefits may also include direct benefits to households and (indirect) spillover benefits, such as street lighting (Khandker et al., 2009). The direct benefits of electrification are those that go directly to the households with access to electricity. For households without electricity but located in villages with grid service, there is a possibility of indirect benefits such as

street lighting. Households with electricity have decidedly better levels of income, expenditures, and education than those without electricity.

According to the World Bank (2008), rural electrification does not drive industrial development, but it can provide an impetus to home businesses, even though few households use electricity for productive purposes. Overall, households with electricity are generally better off than those without electricity. World Bank (2008) analysis of household survey data does find evidence of a positive impact of rural electrification on home businesses. The finding is strongest for the 15-year panel data from 1988 to 2003. The number of home businesses grew significantly more in communities that became electrified than in either those communities that did not, or those that were already electrified in 1988. Similar evidence was not found in the other panel data set (Peru), but the year between surveys occurred at a time when rural areas were experiencing considerable unrest. In addition, the presence of electricity extends the work hours of home businesses, and this increases the net income from these activities.

## **2.7 Setting Up of Micro-Enterprises**

Electricity service is one of the factors, which may have both a direct and indirect impact on micro-enterprises' development (Maleko, 2005). The provision of electricity in rural areas is widely believed to be a stimulus to increased agricultural productivity and output through irrigation and mechanisation, to the growth of rural industries, and to raising the living standards of rural people (Cecelski & Glatt, 1982). Micro-enterprises like retail shops, salons, restaurants and bars, wood processing, welding, and the like depend on electricity services for lighting, refrigeration, entertaining customers (playing Radio, Music systems and Television), cooking, baking, shaft power, grain grinding and

oil processing (Sawe, 2003), which contribute immensely to the economic empowerment of people living rural areas.

Besides the social benefits, decision makers tend to give more importance to the economic impact of access to electricity as an income-generating process. Electricity use is expected to lead to more productive processes; the growth of businesses or farms using electricity will then increase demand for electricity, leading to a virtuous growth cycle profitable to both electricity providers and rural communities. Such economic growth is obviously an important achievement of any rural electrification programme. Some experts (Barnes, 2007), however, warn that the necessary conditions for such economic growth lie in the parallel or complementary development programmes for the newly electrified communities. While electricity is indeed an important input to rural businesses, farms or other small rural structures, adequate local conditions such as organized rural markets and sufficient credit are necessary for such businesses to grow. Lack of such complementary development programmes in these regions may hinder their economic growth.

World Bank (2008) supports Barnes (2007) ascertain by indicating that the number of enterprises grows as a result of electrification and that these enterprises operate for more hours. There is, therefore, a positive impact on household income. However, the broader literature has found these effects to be less than expected, except when there has been a specific program to promote productive uses of electricity. For example, crop productivity can be increased by the application of electric irrigation pumps, businesses can be operated longer hours in the evening, electric tools and machinery can impart efficiency and productivity on industrial enterprises, and so on. However, according to Cabraal and Barnes (2006), such economic gains can only be fully tapped when there are

organized markets for rural people to sell their products and services obtained through the application of electricity.

In Tanzania, the development of micro-enterprises in rural areas are linked to the increase in access and use of grid electricity services, leading to changes in micro-enterprises, and changes in livelihood characteristics of entrepreneurs, employees and community members in areas where these enterprises are located (Maleko, 2005). Also, Maleko stated that the growth rate of micro-enterprises were noticeably higher in areas with electricity services than in areas without electricity services, but the proportion was low compared to micro-enterprises growth rate and time of electricity introduction.

There is evidence that access to electricity services in rural areas in the developing world has led to technological change in existing micro-enterprises. For example, in rural areas of Indonesia, some shoes workshops changed from the use of manually operated machinery to electrical machines with an associated enhancement in productivity (Smyth, et al., 1994) cited in Rogerson, (1997). In Sumbawanga, a small factory, making nuts, screws and bolts had been established after electrification. In Kilimanjaro, six industrial projects had been started after electrification (Kjellstrom, et al., 1992).

Also, Rana-deuba (2001) cited by Meadows et al., (2003), example from Nepal shows that increased access to electricity has resulted in or contributed to the establishment of small enterprises like bakeries, photo studios, grocery stores, and saw mills, in addition to agricultural activities such as poultry farming and goat keeping which are economic boosters.

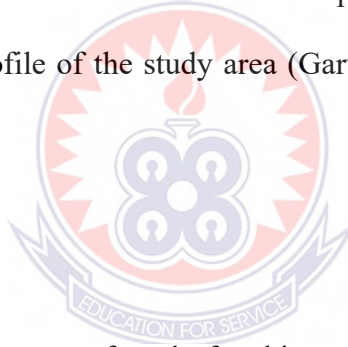
The main objective of this study was to assess the impacts of rural electrification on the economic development of rural folks. Specifically, the study seeks to: Examine how the lack of electricity affects the economic activities of rural people, identify the most significant changes brought to micro-enterprises by the taking up of electricity services, assess the general challenges rural folks encounter in the taking up of electricity, and make recommendations on the benefits associated with getting rural communities electrified.



## CHAPTER THREE

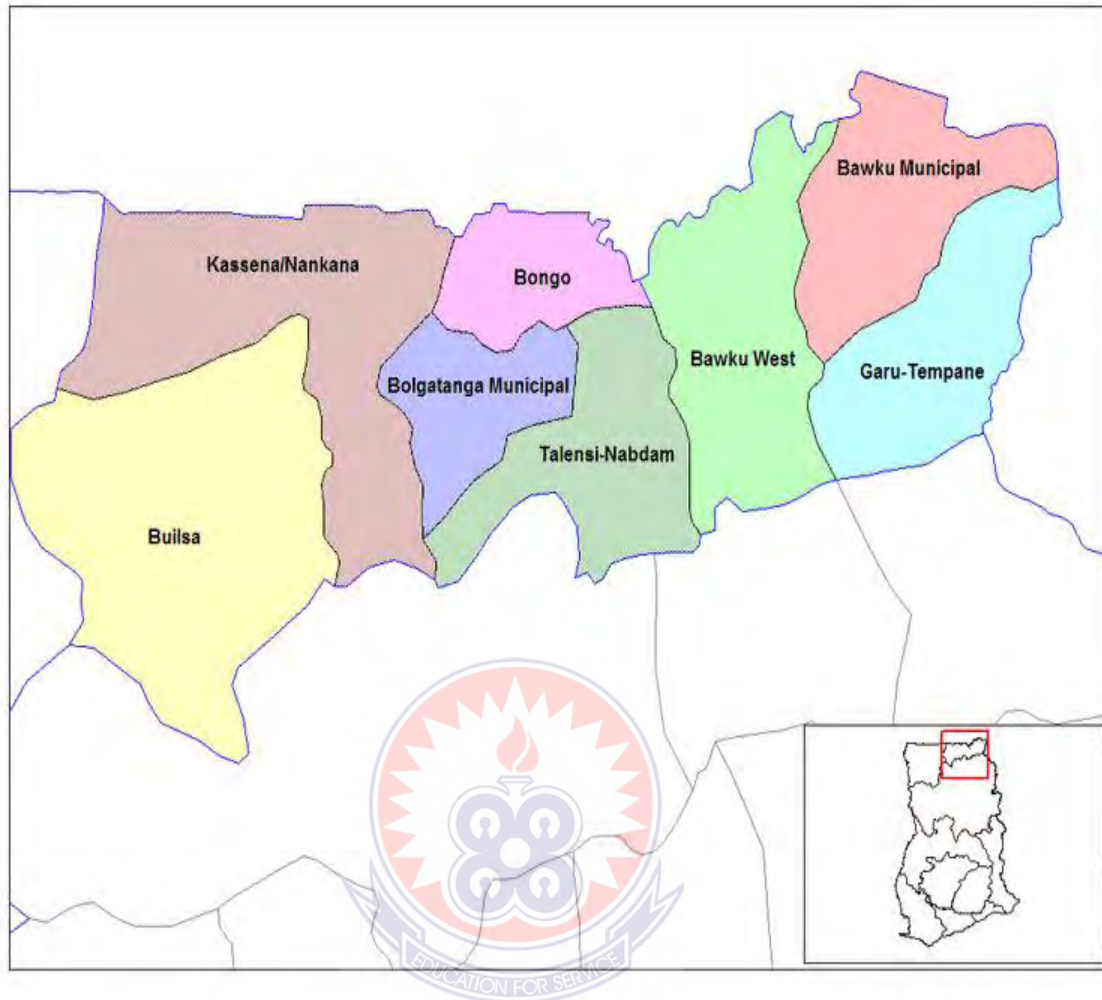
### METHODOLOGY

This chapter forms the methodological framework of the study. It is more of a practical section and it is informed by the field work. The chapter discusses the study design including the qualitative and quantitative research designs, the study population indicating the unit of analysis, sampling technique and procedure (methods of sampling the study population), research instruments (data collection instruments including structured questionnaire and focus group discussion). The final section of the chapter is the methods of data analysis (plan for analysing the data) obtained from the questionnaires and focus group discussion in relation to the research questions. It is also important to note that the socio-economic profile of the study area (Garu-Tempane district) is discussed in this chapter.



#### 3.1 Study Area

Garu-Tempane is the area of study for this research. The district was established by Local Government (Garu-Tempane District Assembly) (Establishment) Instrument, 2004 (L.I. 1769). The district which is located in the South Eastern corner of the Upper East Region has Garu as its capital. It shares boundaries with: Bawku Municipal to the North; Bunkpurugu-Yunysoo District to the South; Bawku West District to the West; and the Republic of Togo to the East. It covers an area of 1,230 km<sup>2</sup> and lies on approximately latitude 10° 38'N and 11°N, and longitude 0° 06'E and 0° 23'E. Figure 2 shows the location of the district.



**Figure 1: Location of Garu-Tempane on the map of the Upper East**

*Source: Ghana maps*

The location of the district puts it at a disadvantage. It is far from the regional and other district capitals. It costs money and time to transact business outside the district.

The 2010 population and housing census gave a district population of 130,003 at a growth rate of 1.1 percent (Regional). This is disaggregated into 62,025 males and 67,978 females. An exponential projection using the growth rate of 1.1 percent gives a figure of 139,908 by 2013. A substantial number of the district population is under 15 years of age. The dependency ratio is about 1:1.08 which implies a stress on the working population and that a huge requirement for educational infrastructure and other human resource development programmes so as to build a good future for the youth and prevent problems associated with youth unemployment (Ghana districts, 2012). The population density of Garu-Tempene district is 99 persons per sq. km. The population pyramid depicts a high population of the youth and with agric as the main economic activity in the district, there would be pressure on the land. There is the need to diversify, educate and provide alternative livelihood for the youth.

A significant feature of the population distribution in the district is the dominance of the rural population. The district capital is the only urban settlement in the district with population above 5000. Most of the communities have populations just above 1000. Six communities have population above 2000. The breakdown is as follows:

<b>Basyonde</b>	<b>2,279</b>
Woriyanga	2,979
Bugri	2,122
Denugu	3,710
Yabrago	2,252
Tamne	2,996



There is the need to provide basic socio-economic infrastructure geared towards bringing up other towns to prevent rural-urban drift to Garu. As these communities are fast growing, it is appropriate that measures are put in place to avoid haphazard development in future. Another significant feature of the settlement pattern is its dispersed nature. It is however important to extend gender beyond this to include decision making at the home and governance institutions such as the local government system.

The main economic activity in the district is subsistence farming, followed by small scale industrialisation, fishing and mining. A small proportion of the people are also engaged in the service industry. The outcome of all these is low output and income levels less than GH¢ 90.00 per annum (Ghana districts, 2012). A vigorous support for the Small and Medium Enterprises (SMEs) sector could be a step in the right direction.



***Energy***

Out of the 25 communities in the district, 11 have been connected to the national grid. Table 1 shows communities with and without electricity.

**Table 1: Communities with and without electricity**

<b>Without electricity</b>	<b>With electricity</b>
Basyonde	Garu
Bugri	Tempane
Kpatia	Gagbiri
Bantafarugu	Kpinkpanyoung
Kpikpira	Worikambo
Kugri	Farfar
Kongo	Woriyanga
Tubong	Pialogo
Duuri	Davonga
Senibaga	Gbantrago
Tamne	Nisbulga
Wiepiisi	
Akara-teshei	
Bugwia (Dabilla)	



*Source: Volta River Authority, 2012*

Fifty-six percent (56%) of the community is not connected to the national grid while forty-four percent (44%) of the communities have been connected to the national grid.

**3.2 Research Design**

Both the qualitative and quantitative designs were used for this study through structured questionnaires, and focus group discussion respectively. Specifically, by presenting respondents with a questionnaire that has a set of structured questions that required them to say only what they are asked for, limited their views and opinions.

However, complementing the quantitative data from the questionnaire with focus group discussion using the qualitative method as observed by Bluff (1997) further helped understand in detail how rural electrification affects the economic activities of households and micro-enterprises. In other words, integrating quantitative and qualitative research methods in this study reduced the risk of chance associations and of systematic biases due to a specific method. Also, this approach allowed a better assessment of the generality of the explanations obtained from the study.

### **3.3 Target Population and Sampling Technique**

In line with the objectives of the study, the study population involved communities with, and without electricity. Specifically, the unit of analysis involved different categories of households, and micro-enterprises. Households and micro-enterprises using rural electrification were treated as control and those not using electricity as experimental variable.

There are several compelling factors for sampling among which are cost of sending people out for data collection, greater accuracy of results, and greater speed of data collection. Since in reality, it would be difficult if not impossible to cover all members of the study population, both purposive and random sampling techniques were employed in selecting respondents for the study. In other words, the purposive sampling method was used in selecting communities both with and without electricity. To obtain vivid views, communities that have recently received electrification formed a greater part of the sample, while the district capital was automatically selected since there are a number of micro-enterprises in the District. The selection of the communities without electricity was done based on population size. That is communities above 2000 population

and without electricity were purposively selected. Table 2 shows the distribution of the selected communities across both electrified and non-electrified communities.

**Table 2: Communities sampled**

<b>With electricity</b>	<b>Without electricity</b>
Worinyanga	Basyonde
Worikambo	Tamne
Garu	Bugri

*Source: Researcher computation*

It is important to note that, Worinyanga was recently (one year) connected to the national grid hence the experiences and memories without light are still fresh to help enhance the efficiency of the results, while that of Worikambo is about three years now. Apart from the population size, most of the communities are homogenous hence six communities in all for the study was still adequate to enhance representativeness.

Regarding the sampling of households, since the houses are scattered in their settlements, simple random selection was done to ensure that, each house has an equal chance of being represented in the sample. However, to ensure representativeness, selection of households was based on the kind of household (modern and old) to guarantee that different income group households were represented in the sample. The selection of micro-enterprises also ensured representatives by including both the informal and formal sector.

Regarding the sample size, 317 respondents participated in the study. Table 3 shows the distribution of the sample size across the selected communities.

**Table 3: Sample size across selected communities**

<b>With electricity</b>	<b>No</b>	<b>Without electricity</b>	<b>No</b>
Worinyanga	40	Basyonde	55
Worikambo	50	Tamne	71
Garu	71	Bugri	30
Total	161		156

*Source: Researcher computation*

### **3.4 Instrumentation**

To obtain qualitative and quantitative data from the study, both structured questionnaires and focus group discussions manual were used as the tools to obtain these data. The questionnaire was administered to respondents in their homes and micro-enterprises in the form of a face-to-face interview. This form of administering the questionnaire was assumed to be the most appropriate since most of the community members were uneducated which could result in a higher probability of inadequately responding to the items on the questionnaire.

To ensure that the questionnaire contains relevant items that relate to the objectives of the study, two questionnaires were designed. One was for respondents at the household level, and the other for micro-enterprises level. Impact indicators for each community were identified on the basis of review of relevant literature and rigorous brainstorming. Specifically, each questionnaire was structured around the set of objectives for the study.

The first section of both questionnaires contained demographic characteristics of the household heads and the micro-enterprises such as age, educational background, gender, number of dependents, and the number of years of being in business. The second section of the questionnaires contained items in relation to energy use and economic activities with specific focus on the type of energy use, expenditure on electricity and other energy uses in a month, electricity increasing the income of households, among others.

In accessing the economic impacts of rural electrification on micro-enterprises, respondents were asked to rate their opinion about each item using a five point Likert-type rating scale, as conducted by Idowu et al., (2002). The rating used are strongly agree (SA) = 4, agree (A) = 3, strongly disagree (SD) = 1, disagree (DA) = 2 and neutral (N) = 0. Regarding the challenges encountered in the taking up of electricity, respondents were given five variables to rank in terms of the most expensive in taking up of electricity including connection fee, wiring, payment of bills, etc. Both questionnaires ended by eliciting suggestions from respondents on how to enhance the electrification of rural communities.

As indicated earlier, focus group discussion was further employed in obtaining qualitative data for the study. This was performed with women and men selected purposively from communities without electricity in assessing how the lack of electricity affects economic activities. It is important to indicate that each of the group was homogenous in demographic characteristics to enhance effective discussion, while each group was made up of between 6-10 members to give everyone the opportunity to express his/her opinion, while providing diversity of opinions.

In order to ensure high quality output in the data collection, a quality assurance system was instituted which took care of all systematic arrangements and activities directed towards safeguarding, maintenance and promotion of quality data throughout the study. In order to ensure accuracy and validity of such information, concerted efforts were made regarding the designing of instruments to facilitate information gathering. Thus the questionnaire and focus group discussion manual were pre-tested to ensure that they are appropriate for the study, and contain clear and unambiguous questions. The pre-test was conducted with five residents in Garu and Tubong.

### **3.5 Data Analysis**

Data management activities comprised coding of questionnaires, data processing and computerisation of data. The quantitative data from the questionnaire was analysed using the Statistical Package for the Social Science (SPSS) version 18. To adequately answer the research questions, descriptive statistics were applied in analysing the data, while the presentation of results was through tables and figures. Regarding the qualitative data from the questionnaires, focus group discussion, detailed transcription and analysis were done by putting the data into common themes.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

The results of the data analysed and the discussion of the findings are presented in this chapter. The discussion involves the possible implications of the findings. In discussing the findings, attempts were made to relate the findings of the study to the pertinent concepts and theories discussed in the review of related literature in Chapter Two.

The main objective of this study was to assess the impacts of rural electrification on the economic development of rural folks with specific focus on how the lack of electricity affects the economic activities of rural people. The most significant changes brought to micro-enterprises by the taking up of electricity services as well as the general challenges rural folks encounter in the taking up of electricity during the initial connectivity stage were assessed.

The results of the study are presented in five sections where each section focuses on one of the objectives of the study. The first section presents the findings and discussions on the demographic characteristics of the respondents. The second section specifically focused on the type of energy used in the home while the third section presents findings on how the lack of electricity affects the economic activities of rural people. The most significant changes brought to micro-enterprises by the taking up of electricity services was the focus of the fourth section while the final section explored the general challenges rural folks encounter in the taking up of electricity.



#### 4.1 Demographic Characteristics of the Respondents

This section presents the analysis and discussions of respondents' demographic characteristics. In all, there were 317 respondents who participated in the study. This was made up of 161 residents from rural communities with electricity and 156 residents from rural communities without electricity. In examining the demographic characteristics of the respondents, the following seven variables were analysed: gender, age, educational background, marital status, monthly income, number of dependents, and the occupation of the respondents. Table 4 presents the results

**Table 4: Gender of respondents**

Gender	Communities with electricity		Communities without electricity	
	f	%	f	%
Male	105	65.2	110	70.5
Female	56	34.8	46	29.5
Total	161	100.0	156	100.0

*Source: Field work, 2013*

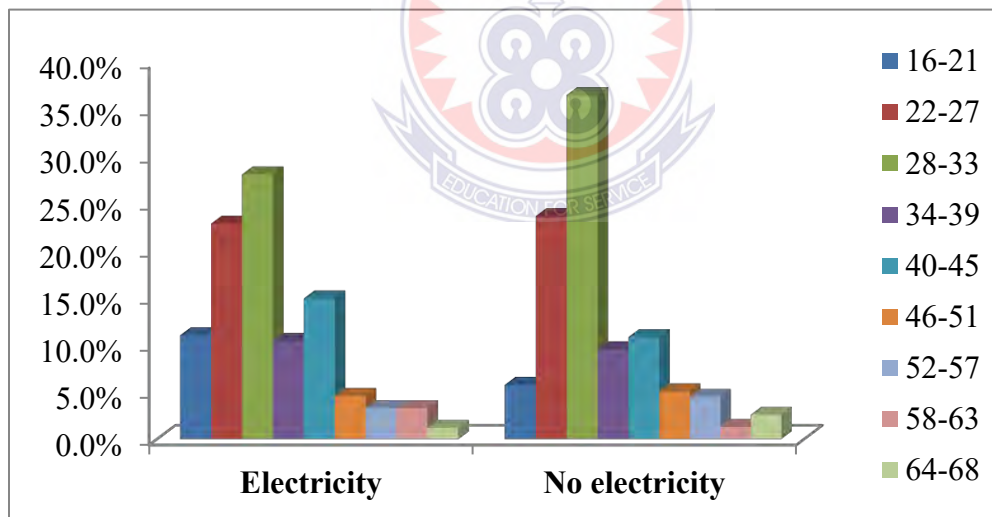
It is noted in Table 4 that, majority of the respondents from the communities with electricity (65.2%) and without electricity (70.5%) were respectively men. Although, the male respondents outnumbered the females in both communities, the male respondents from the communities without electricity were higher than those from the communities with electricity by 5.1 percent. Generally, the results imply that, both communities had a greater part of the population being males. The ages of the respondents were also analysed of which the results are shown in Table 5.

**Table 5: Descriptive statistics of the ages (years) of the respondents**

	Mean	Minimum	Maximum	Standard deviation
Communities with electricity	33.3	10.805	16	68
Communities without electricity	33.6	10.633	19	70

Source: Field work, 2013

The average ages of the respondents were 33.3 years and 33.6 years for communities with and without electricity respectively. Generally, it can be deduced that, the respondents in both communities with and without electricity had similar ages. Further analysis revealed that 72.6 percent of the respondents in the communities with electricity were below 40 years while 75.6 percent of those in the communities without electricity also aged below 40 years. Figure 3 presents a graphical representation of the results.

**Figure 2: Age of Respondents**

Source: Field Work, 2013

Generally, it can be deduced that the respondents who participated in the study from both communities were made up of younger people. The implications for this study therefore is that, the youthful nature of the respondents make them energetic and active,

thereby making them economically productive. Hence rural electrification could be a great source of employment as well as livelihood opportunities for the people in these communities. The marital status of the respondents was also analysed. The results are presented in Table 6.

**Table 6: Marital status of respondents**

Marital status	Communities with electricity		Communities without electricity	
	f	%	f	%
Never married	50	31.1	39	25.0
Married	102	63.4	111	71.2
Divorced	4	2.5	4	2.6
Widowed	5	3.1	2	1.3
Total	161	100.0	156	100.0

*Source: Field work, 2013*

The results revealed that, 63.4 percent of the respondents in the communities with electricity were married while 71.2 percent of those from the communities without electricity were also married. Although in both communities, majority of the respondents were married, the married respondents from the communities without electricity outnumbered those without electricity by 7.9 percent. These results are consistent with the ages of the respondents since it is common to find the married folks in these age groups.

As majority of the respondents from both communities were married, they have the responsibilities to provide for their dependents hence the need to be economically empowered through rural electrification.

Table 7 shows the results on the educational qualification of the respondents.

**Table 7: Educational background of the respondents**

Education	Communities with electricity		Communities without electricity	
	f	%	f	%
None	23	14.3	10	6.4
Primary	24	14.9	29	18.6
Secondary	56	34.8	51	32.7
Diploma/HND	33	20.5	59	37.8
First degree	24	14.9	7	4.5
Second degree	1	0.6	0	0.0
Total	161	100.0	156	100.0

Source: Field Work 2013

More than half (64.1%) of the respondents from the communities with electricity had tertiary educational backgrounds (at least HND/Diploma). However, less than half (41.9%) of the respondents from communities without electricity had no tertiary educational background. Thus generally, the respondents from communities with electricity had higher educational backgrounds than those from communities without electricity. This is in congruence with Khandker et al., (2009) assertion that compared to the households in villages without electricity; those in villages with electricity have significantly better schooling outcomes which are key determining factor for economic empowerment. Figure 4 shows the graphical view of the educational background of the respondents across communities.

The study further investigated the monthly income of the respondents. Descriptive analysis of their monthly income is presented in Table 8.

**Table 8: Descriptive statistics of monthly income (GH¢) of respondents**

	Mean	Minimum	Maximum	Standard deviation
Communities without electricity	294.48	50.00	986.68	190.83
Communities with electricity	470.43	50.00	1200.00	285.39

*Source: Field Work, 2013*

Table 8 shows that averagely, respondents from communities without electricity earned a monthly income of GH¢ 294.48 while those from communities with electricity earned GH¢ 470.43 monthly. Thus the average monthly earnings of respondents from the communities with electricity is higher than those from the communities without electricity by GH¢175.95. Further analysis shows that a significant proportion of the respondents from communities without electricity (78.6%) earned less than GH¢ 500.00 monthly. However, almost half (48.0%) of the respondents from the communities with electricity earned at least GH¢ 500.00 monthly. None of the respondents from the rural communities without electricity earned GH¢1000.00 and above in a month while those in communities with electricity earn as much as GH¢1,200.00.

The results on the monthly income distribution of the respondents give an indication that, those respondents from the communities with electricity earned higher income than those from the communities without electricity.

The number of dependents per respondent was also explored. Averagely, the respondents in communities with electricity had four dependents while those without electricity had five dependents. In a few cases, some respondents with electricity had maximum of 12 dependents against 15 dependents for respondents without electricity.

Further analysis shows that, half (50.0%) of the respondents in the rural communities without electricity had four to six dependents while less than half (47.4%) of the respondents from the communities with electricity also had dependents in the same category. Generally, it can be deduced that, respondents from the communities without electricity have more dependents, hence the need for them to be economically empowered through rural electrification to take care of their dependents. The employment sector of the respondents was also analysed, as presented in Table 9.

**Table 9: Employment sector of the respondents**

Sector	Community with electricity		Community without electricity	
	f	%	f	%
Informal	81	50.3	48	30.8
Formal	80	49.7	108	69.2
Total	161	100.0	156	100.0

*Source: Field Work, 2013*

A little over half (50.3%) of the respondents from communities with electricity were employed in the formal sector while majority of those from the communities without electricity were employed in the informal sector (69.2%). However, although half of the respondents in communities with electricity were employed in the formal sector, the proportion that was also employed in the informal sector was equally higher (49.7%). Generally, an assessment of the results in Table 9 suggests that, the respondents from both communities were generally engaged in the informal sector with trading and farming being the most dominated occupations.

Having the majority of the respondents being in the informal sector was expected since the trade and service industry is major driver of the informal industry as noted by the Ministry of Trade and Industry (2010). This as noted from the earlier findings could be attributed to the lower educational background of the respondents especially those from the communities without electricity.

#### **4.2 Energy Use in the Home**

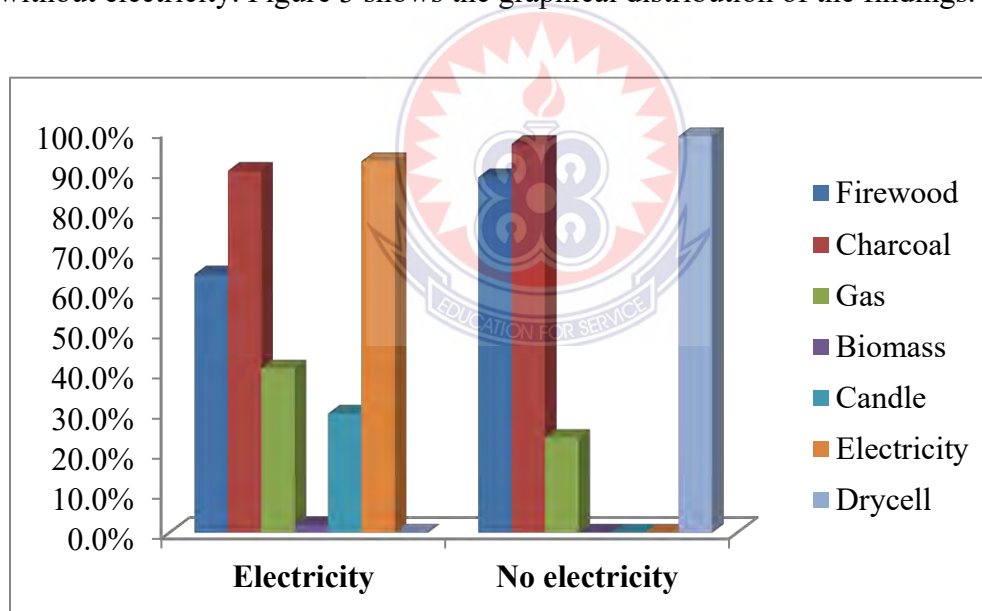
The main objective of this study is to assess the impacts of rural electrification on the economic development of rural folks. Specifically, the study seeks to:

- i. examine how the lack of electricity affects the economic activities of rural people;
- ii. identify the most significant changes brought to micro-enterprises by the taking up of electricity services;
- iii. assess the general challenges rural folks encounter in the taking up of electricity; and
- iv. make recommendations on the benefits associated with getting rural communities electrified.

This section of the chapter focuses the type of energy used by the respondents across both communities (with and without electricity). The three most important sources of power among the respondents from communities with electricity were electricity (92.5%), charcoal (90.1%) and firewood (64.4%). On the other hand, the three most important sources of power for communities without electricity were charcoal (96.8%), dry cell (98.7%) and firewood (88.5%). Generally, it can be deduced that the sources of energy for lighting in communities connected to the national grid was electricity while that

for communities without electricity was dry cell. This finding is similar to Meier et al. (2010) assertion that an estimated 74 percent of all households use dry cells for small appliances such as radios and flashlights. This also explained why all the respondents used energy for lighting and cooking in their homes. For the respondents in communities with electricity, lighting was found as the major use of electricity (97.5%) followed by ironing (87.6%). However, the use of electricity for cooking was low among the respondents from communities with electricity (30.2%) and cooling (34.2%) respectively.

In relation to energy for cooking, it was noted that charcoal was the commonest among all the communities while firewood was the most common among the communities without electricity. Figure 3 shows the graphical distribution of the findings.



**Figure 3: Source of energy used in the home across the respondents**

*Source: Field Work, 2013*

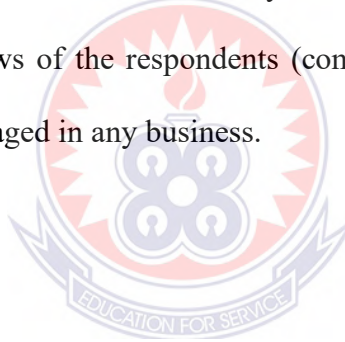
It is noted in Figure 3 that none of the respondents from communities without electricity used biomass and candle. It was also noted that none of the respondents from communities with electricity used dry cell for lighting. The recent introduction of

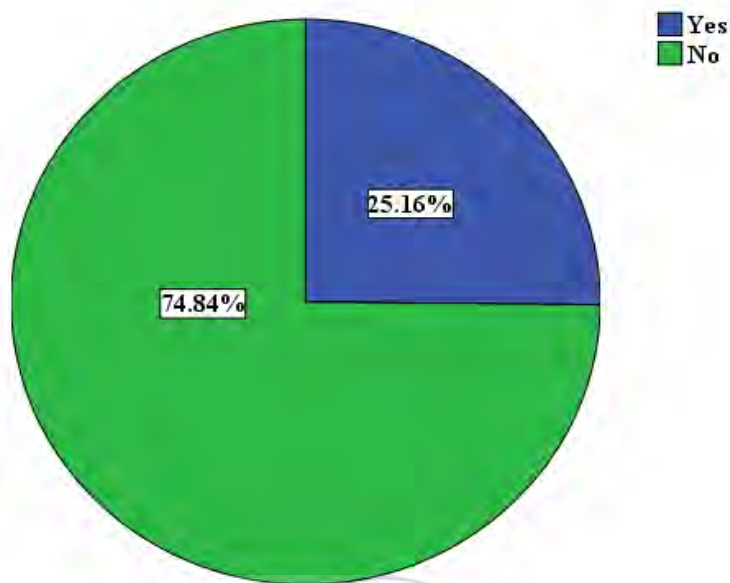


flashlights that are charged with electricity are used in place of dry cell. These flashlights replace the use of candles.

#### **4.3 Effect of Electricity on Economic Activity on Rural People**

According to Kjellstrom et al. (1992), there is evidence that access to electricity services in rural areas in the developing world has led to technological change in existing micro-enterprise. In this regard, this section examined how the lack of electricity affects the economic activities of rural people. As part of exploring how the lack of electricity affects the economic activities of rural people, the study first examined whether or not the respondents from communities without electricity are engaged in any economic activities. Figure 3 illustrates the views of the respondents (communities without electricity) as to whether or not they are engaged in any business.





**Figure 4: Engagement in business**

*Source: Field Work, 2013*

The results in Figure 4 shows that, majority (74.8%) of the respondents were not engaged in any business. The proportion of the respondents who were not engaged in any business were about 49.6 percent higher than those who were in business. The majority of the respondents not in any business could be explained by Bailey et al. (2007) assertion that more than half of the communities in the northern district of Ghana have not been connected to the national grid which significantly deprived them from tapping the economic gains associated with rural electrification. Thus the absence of electricity in the community has hindered the respondents from venturing into businesses especially those that require the use of electricity. This was supported from the focus group discussion where it was noted that the absence of electricity in the communities have limited the rural folks in the type of business to be engaged in.

In this regard, the study analysed the kind of businesses that respondents from the communities without electricity are involved in of which the following businesses were noted as major ones. These include trading and selling, farming including poultry and cattle rearing, dressing making, pito brewing, barbering and dressing making.

Generally, it is noted that, the respondents from the communities without electricity were engaged in businesses that require manual efforts although the presence of electricity could have made work easier. This is expected to affect the income earned in a month since not much work can be produced via the manual means of operation. Table 10 shows the amount earned by the respondents (communities without electricity) who are engaged in businesses.

**Table 10: Amount earned by respondents without electricity**

Amount (GH¢)	Frequency	Percentage
40.00-100.00	13	33.3
101.00-500.00	22	56.4
501.00-1000.00	3	7.7
Above 1000.00	1	2.6
Total	39	100.0

Source: Field work 2013

It is noted in Table 10 that, a significant proportion of the respondents (89.7%) earned less than GH¢500.00 a month while 10.3 percent earned above GH¢500.00 a month. Generally, it is noted that the respondents from the communities without electricity have not earn much from their businesses as a result of the absence of electricity. One of the women who was into dressmaking indicated: *“I am not able to sew much clothing in a month as compared to my colleagues who are using electrical sewing machines in*

*communities with electricity. This therefore affects largely how much income I made in a month from my business”.*

In order to assess how the lack of electricity affects the economic activities of the rural people, the study also examined among the respondents who were not into any business from the communities without electricity whether or not they would embark on any business if the community is electrified. The results are presented in Table 11.

**Table 11: Embarking on business if the community is electrified**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	77	65.9
No	18	15.4
Not sure	22	18.7
Total	117	100.0

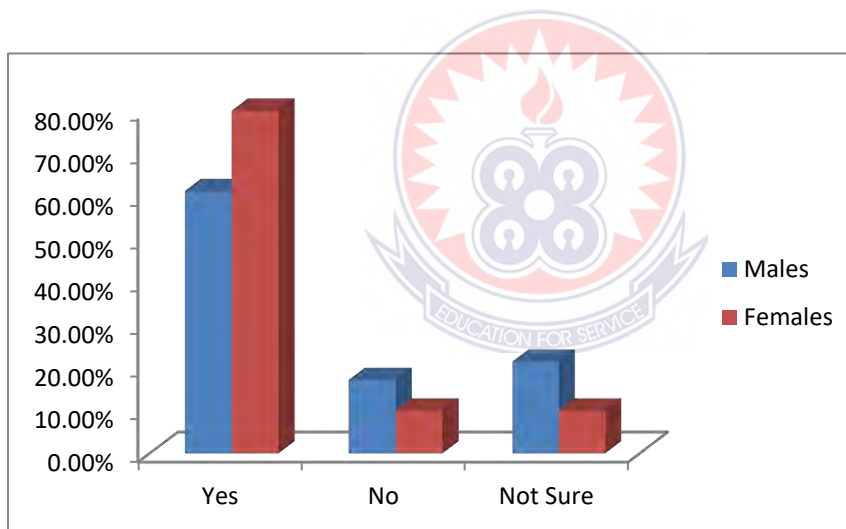
*Source: Field work, 2013*

The results in Table 11 revealed that, majority (65.9%) of the respondents from the communities without electricity who were not involved in any business would embark on a business if the community is electrified. This again suggests that the absence of electricity in the community has limited the rural people from engaging in income generating activities especially those that use electricity to become economically empowered. They study also identified the following businesses as the most likely ones to be engaged in by the respondents after the electrification, these include sale of electrical appliances, barbering, operating a cold store business, mobile phone repairs, grinding mill business, internet café and photocopying business.

It is noted that all the businesses the respondents intended to be engaged in after the electrification of the communities would make use of electricity. This gives an

indication that, the absence of electricity in the community has hindered some of the residents from venturing into many economic gainful employments.

The study also examined whether or not engaging in a business after the electrification of the areas would be dependent on the gender of the respondents. More than half (61.3%) of the males and the females (80.0%) respectively indicated that, they would engage in some form of business if the area is electrified. Additionally, about 20.5 percent of the males and 10.0 percent of the females were respectively not sure as to whether or not they would engage in any business when the area is electrified. Figure 7 illustrates the graphical view of the results.



**Figure 5: Interest in engaging in business after the electrification of the area**

*Source: Field Data, 2013*

It is noted in Figure 6 that, the proportion of the females who had interest in engaging in some form of business after the electrification of the area was about 18.7 percent higher than that of the males. However, further analysis shows that, the interest in engaging in some form of business after the electrification of the area was independent on the gender of the respondents and that both males and females respondents in the

communities without electricity had the intention of engaging in some form of business after the electrification.

Similar results were also noted across the educational backgrounds of the respondents were in the exception of the respondents with first degree (40.0%), more than half of the respondents with no formal education (75.0%), primary education (60.0%), secondary education (70.0%) and HND/Diploma (66.3%) all respectively had the intention of engaging in some form of business after the electrification of the area. Generally, it can be deduced that, the interest in engaging in some form of business after the electrification of the area was independent on the educational background of the respondents. In other words, both the highly and lowly educated respondents had the interest in engaging in some form of business activities after the electrification of the area.

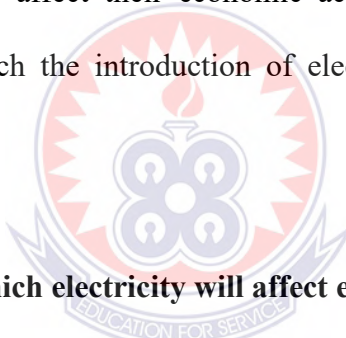
In this regard, the study examined whether or not the lack of electricity affects the economic activities of the respondents in communities without electricity. A significant proportion (94.2%) of the respondents admitted that, the lack of electricity in their communities affect their economic activities. This is explained by the fact that most of the respondents intended to use electricity for businesses such as cold store operation, sachet water manufacturing among others as noted earlier. Additionally, the study tried to identify the specific ways in which the absence of electricity hinders the economic activities of the rural people. The following major ways were noted

- a. Some respondents explained that their expenditure on fuel is very high that it dwindles the profit they make from their businesses.
- b. Since there is no electricity in the community, they rural folks are not able to extend their working hours into the night. One of the respondents stated: *“I cannot sell my groceries at night since there is no electricity.”*

Other respondent also indicated: *I am unable to sow in the night due to absence of electricity, hence much productivity hours of the evening are wasted without any economic gain*

- c. As noted earlier, most of the respondents wanted to engage in some form of businesses that use electricity for operation, however, as a result of the absence of electricity, they are limited in their choices of business. One of the respondents stated: *“I want to set up an electrical shop, but because there is no electricity, it would not be patronized.”*

As majority of the respondents from the communities without electricity admitted that, the lack of electricity affect their economic activities, the study went further to examine the extent to which the introduction of electricity will affect their economic empowerment.



**Table 12: The extent to which electricity will affect economic empowerment**

Response	Frequency	Percentage
Very large extent	61	39.1
Large extent	87	55.8
Low extent	5	3.2
Very low extent	3	1.9
Total	156	100.0

Source: Field work 2013

A significant proportion (94.9%) of the respondents were of the view that, they would be economically empowered with the introduction of electricity in their communities. The results give an indication that electricity is an essential component for economic development. According to the Asian Development Bank (2009), the demand

for reliable electricity services is significant and represents a key driver behind economic development and raising basic standards of living. In this regard, there is the need to enhance the electrification of these communities in order to drive their economy.

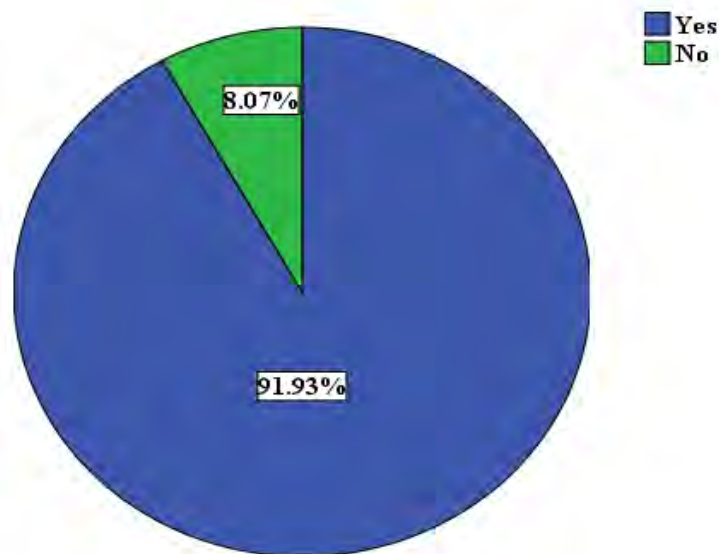
#### **4.4 Welfare Enhancement through Rural Electrification**

Micro-enterprises identified in the research are small businesses such as retail shops, salons, restaurants and bars, wood processing, welding, depend on electricity services for lighting, refrigeration, entertaining customers (playing radio, music systems and television), cooking, baking, shaft power, grain grinding and oil processing (Sawe, 2003). In this regard, this section of the chapter explored how rural electrification has impacted on the creation and growth of microenterprises.

As part of exploring the impact of rural electrification on micro-business, the study examined the economic activities in which the respondents were engaged in. The following major businesses dominated among the respondents engaged in any business. These are; barbering/saloon, beer bar operation, corn milling, tailoring, electrical repairs/welding, photocopying and printing, soap making, bicycle repairs and trading.

A comparative analysis of the businesses of both respondents in communities with and without electricity showed that trading/selling is a prevalent business in both communities. This gives an indication that small scale entrepreneurial activities such as selling or trading has become one of the main economic activities of the people in both communities. It is also noted that in exception of trading, the businesses of the respondents in communities with electricity used electricity as illustrated in Figure 7.





**Figure 6: Use of electricity for business**

*Source: Field Work, 2013*

It is seen in Figure 6 that, a significant proportion (91.93%) of the respondents from the communities that have electricity admitted that they use electricity for their daily business operations. This implies that dressmakers for instance, might have switched from the use of the manual sewing machine to the use of electric machine. Barbers might have also switched to the use of barbering machines instead of the use of scissors and blade with the introduction of electricity to the community. These significant changes are expected to empower the rural folks economically.

In this regard, the study carried out a descriptive analysis on the amount of money respondents from the communities with electricity make in a month before and after the introduction of electricity in their business. The results are presented in Table 13.

**Table 13: Amount respondents make before and after electrification**

	Mean	Minimum	Maximum	Standard deviation
Before electrification	GH¢145.02	GH¢10.00	GH¢1100.00	GH¢174.498
After electrification	GH¢252.06	GH¢10.00	GH¢1600.00	GH¢292.856

*Source: Field Work, 2013*

The results from the descriptive analysis revealed that the average amounts made before and after the introduction of electricity were GH¢145.02 and GH¢252.06 respectively. Thus the earnings of the respondents increased by GH¢ 107.04 after the electrification. This implies that there was an increment of 73.8 percent in the amount earned after the introduction of electricity into the communities. Table 14 shows the views of the respondents on the extent to which their household income has increased since the introduction of electricity.

**Table 14: Extent of income increase with the introduction of electricity**

Response	Frequency	Percentage
Very large extent	36	22.4
Large extent	84	52.2
Low extent	20	12.4
Very low extent	8	5.0
Not at all	13	8.0
Total	161	100.0

*Source: Field Work, 2013*

It is seen in Table 14 that, more than half (52.2%) of the respondents from the communities with electricity admitted that their income had increased to a large extent after the introduction of electricity. Further analysis revealed that, majority (74.6%) of the respondents' household's income has really increased since the introduction of electricity.

According to Parshall et al. (2009), electricity use is expected to lead to more productive processes, the growth of businesses or farms using electricity will then increase demand for electricity, leading to a virtuous growth cycle profitable to both electricity providers and rural communities. This expectation has been met as a greater part of the respondents from the communities with electricity admitted that their household's income has really increased since they had electricity. To this end one of the respondents stated: "*I am able to work more with the use of electricity and make as twice as I made when I did not have electricity.*"

This gives an indication that, their businesses are doing well with the use of electricity making them economically empowered. This cannot be said of those from the communities without electricity as the absence of electricity had hindered the growth of their businesses. The results give a clue that, rural electrification could boost economic activities.

The study also examined the significant changes that have been brought to micro-business as result of rural electrification. For the purpose of analysis, it is important to note that 99 of the respondents from communities with electricity were engaged in some form of business of which 91 uses electricity for their businesses. Specifically, Table 15 shows whether or not business had grown significantly as a result of the presence of electricity in the communities.

**Table 15: Business has grown significantly as a result of the presence of electricity**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly disagree	4	4.4
Disagree	4	4.4
Neutral	3	3.3
Agree	32	35.2
Strongly agree	48	52.7
Total	91	100.0

*Source: Field Work, 2013*

The results show that, a significant proportion (87.9%) of the respondents agreed that their businesses have grown significantly as a result of electricity in the community. Therefore, the result implies that, the presence of electricity in the communities contributed positively to the growth of the respondents' businesses. The results implies that the development of micro-enterprises in rural areas is linked to the increase in access and use of grid electricity services, leading to changes in micro-enterprises as also indicated by Maleko (2005). Additionally, the results in Table 15 supports World Bank's (2008) analysis of household survey data that found evidence of a positive impact of rural electrification on home businesses where the number of home businesses grew significantly more in communities that became electrified than in those communities that were not connected to the national grid.

Access to employment through business creation is a critical determinant to poverty alleviation. In this regard, the study further investigated whether or not the number of micro-enterprises has grown as a result of the electrification projects. Table 16 shows the results.

**Table 16: The number of micro-enterprises has grown as a result of the electrification projects**

Response	Frequency	Percent
Strongly disagree	6	6.6
Disagree	2	2.2
Neutral	2	2.2
Agree	33	36.3
Strongly agree	48	52.7
Total	91	100.0

*Source: Field Work, 2013*

It is noted that majority (89.0%) of the respondents indicated that the number of micro-enterprises has grown as a result of the electrification projects. This result was supported from the focus group discussion where one of the participants stated: *“Rural electrification has enhanced the creation of many microbusinesses in this community. Through the electrification of this area, many businesses have sprung up rapidly in the area and almost everybody has something to do to improve their livelihood.”*

The result suggests that the provision of electricity has contributed to the growth of businesses. It could be that respondents have expanded their businesses and new businesses have been set up as a result of the electrification projects. For example, majority of the respondents agreed that their businesses have grown significantly as a result of electricity in the community. The result supports World Bank’s (2008) assertion that the number of enterprises grows as a result of electrification and that these enterprises operate for more hours. Thus majority (78.0%) of the respondents agreed that the hours of work have increased and positively affected revenue from their businesses. Generally, the result implies that the presence of electricity has increased the hours of work for micro enterprises, and positively affected revenue from their businesses. This result is also

similar to Deichmann et al. (2010) assertion that small businesses, which rely heavily on family labour, can increase their production hours once electricity becomes available.

The use of equipment and tools by micro-businesses was also studied as part of identifying the specific changes which have been brought about by rural electrification and Table 17 shows the results.

**Table 17: Access to electricity increases use of equipment and tools in the business**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly disagree	5	5.5
Disagree	6	6.6
Neutral	3	3.3
Agree	39	42.9
Strongly agree	38	41.7
Total	91	100.0

*Source: Field Work, 2013*

Majority (84.6%) of the respondents indicated that access to electricity has increased the use of equipment and tools in their businesses. This implies that the access to electricity can support the income generating activities of the respondents by allowing them to utilize modern appliances, technologic and agricultural equipment while replacing inefficient and manual devices such as scissors by seamstresses as noted by support Davidson and Sokona (2002).

Additionally, the study also examined whether or not the introduction of electricity has significantly reduced the financial savings on energy expenditure in the business. Thus, the results are showed in Table 18.

**Table 18: The introduction of electricity has significantly reduced the financial savings on energy expenditure in the business**

Response	Frequency	Percentage
Strongly disagree	28	30.8
Disagree	13	14.3
Neutral	4	4.4
Agree	25	27.4
Strongly agree	21	23.1
Total	91	100.0

*Source: Field Work, 2013*

A little over half (50.5%) of the respondents agreed that the introduction of electricity has significantly reduced the financial savings on energy expenditure in the business. However, the proportion which disagreed in this regard was equally significant (45.1%). Even though, the results support NRECA (1993) assertion that in Bolivia, households can make significant financial savings on energy expenditure when they obtain means of electricity, it can be deduced that, the extent to which electricity has significantly reduced the financial savings on energy expenditure in the businesses of the respondents had not been very significant.

Respondents who disagreed that electricity has significantly reduced the financial savings on energy expenditure in their businesses also noted that rural electrification affects the micro-businesses in the following ways:

- i. Higher electricity bills making turnover from business low
- ii. Damages to business equipment when there is power surge
- iii. Loss of customers when there is power outages

The study also examined whether or not the expenditure on lightening has rather gone up after the electrification for microbusiness.

**Table 19: The expenditure on lightening has rather gone up after the electrification**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly disagree	32	35.2
Disagree	17	18.7
Neutral	4	4.4
Agree	24	26.4
Strongly agree	14	15.3
Total	91	100.0

*Source: Field Work, 2013*

More than half (53.9%) of the respondents disagreed that the expenditure on lightening has rather gone up after the electrification. Generally, the result does not largely support studies that indicated that the expenditure on lighting has been found to increase after electrification. For example, a study in rural Indonesia by Brodman (1982) notes that of all the households using electricity for lighting alone, 96 percent increase the proportion of their expenditures allocated to lighting.

Generally, it can be deduced from the findings that the most significant changes which rural electrification had brought for micro-enterprise is that the number of micro-business has grown as result of rural electrification, micro-business have grown significantly as a result of rural electrification. Additionally, access to electricity has increased the use of modern equipment and tools by micro-business. On the other hand, rural electrification has not significantly reduced the expenditure on lighting as well as the financial savings on energy expenditure of micro-business.

Furthermore, as part of exploring the impact of rural electrification on the economic empowerment of microbusinesses, the study also examines whether or not the introduction of electricity does not automatically stimulate economic growth for rural folks.



**Table 20: Introduction of electricity does not automatically stimulate economic growth for rural folks**

Response	Frequency	Percentage
Strongly agree	25	15.5
Agree	81	50.3
Disagree	33	20.5
Strongly disagree	10	6.2
Neutral	12	7.5
Total	161	100.0

*Source: Field Work 2013*

Generally, it is noted that, majority (65.8%) of the respondents were of the view that the fact that there is electricity in the community does not guarantee economic growth. This result is in agreement with Foley (1990) who put to bare that the introduction of electricity does not automatically stimulate economic growth. According to Foley, the effect of electrification is dependent upon a number of complementary factors, including the level of development in the area, the availability of capital and other resources and access to markets. This gives an indication that when there is electricity but no capital to start a business, economic growth is bleak even in the face of reliable, affordable and quality supply of electricity. It can therefore be deduced from the study that the introduction of electricity does not automatically stimulate economic growth although the introduction of electricity had increased the income of the respondents.

In this regard, the study examines if the lack of complementary development programmes such as markets and sufficient credits hinder the economic growth of the business even in the face of rural electrification.

**Table 21: Although electricity is vital, lack of complementary development programmes such as markets and sufficient credits hinder the economic growth of the business**

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Strongly disagree	2	2.2
Disagree	3	3.3
Neutral	2	2.2
Agree	46	50.5
Strongly agree	38	41.8
Total	91	100.0

*Source: Field Work, 2013*

An assessment of the results in Table 18 indicated that a significant proportion (92.3%) of the respondents agreed that the lack of complementary development programmes such as markets and sufficient credits hinder the economic growth of their businesses. This meant that apart from the provision of electricity in the community, markets and access to credit are vital to the growth of businesses. The result is in line with Barnes' (2007) view that, the necessary conditions for economic growth lie in the parallel or complementary development programmes for the newly electrified communities. Thus, while electricity is indeed an important input to rural businesses, farms or other small rural structures, adequate local conditions such as organized rural markets and sufficient credit are necessary for such businesses to grow. Lack of such complementary development programmes in these regions may hinder their economic growth.

#### 4.5 Challenges in Taking up Electricity

This section of the chapter explored the challenges that the respondents face in taking up electricity. In this regard, the respondents were asked to rank four challenges in terms of the most expensive in taking up electricity services for the rural folks. Table 19 shows the results.

**Table 22: Most expensive challenge in taking up electricity services for the rural Folks'**

Challenges	Frequency	Percentage
Initial connectivity charge	57	35.4
Cost of wiring	39	24.2
Distance to point of payment of electricity bills	37	23.0
Paying of electricity bills	28	17.4
Total	161	100.0

*Source: Field Work, 2013*

The most prevalent challenge faced by the respondents in taking up electricity was the initial connectivity charged (35.4%) followed by the cost of wiring and distance to point of payment of electricity bills. On the other hand, paying of electricity bills has not been a major challenge for the respondents in taking up of electricity services. This further supports the earlier findings where more than half of the respondents (53.9%) disagreed that the expenditure on lightening has rather gone up after the electrification. This suggests that the respondents have been economically empowered through rural electrification to pay for their electricity bills as they are now in a better position to earn more from their businesses as compared to when there was no electricity.

Generally, in relation to the challenges in taking up rural electrification, it can therefore be deduced that initial connectivity charge is the most expensive in taking up electricity services for the rural folks. This suggests that despite the fact that energy expenditures are typically less for electrified households, the connection fee acts as a barrier, preventing the poorest from switching to the lower-cost source as noted by World Bank (2008). The high cost of connection could however be explained by Kandawire (1992) assertion that utilities companies impose high costs for connection in order to recoup some, or all of their investment in the electrification project.



## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the findings from the study as well as the conclusions, recommendations, and directions for future research. Thus, the chapter focuses on the implications of the findings from the study for policy making and future research. The recommendations are made based on the key findings and major conclusions arising from the study.

#### 5.1 Summary

The study assessed the impact of rural electrification on the economic empowerment of rural folks. In all, there were 317 respondents of which 161 were residents from rural communities with electricity and 156 were residents from rural communities without electricity. Both questionnaires and focus group discussion manual were used in the collection of data. Quantitative data analysis was performed using the Statistical Products and Service Solutions (SPSS), version 18 and Microsoft Excel.

The first objective of the study examined how the lack of electricity affects the economic activities of rural people. The following major findings were noted:

- i. The absence of electricity has limited the rural people from engaging in income generating activities especially those that use electricity to become economically empowered
- ii. Generally, majority of the respondents were interested in engaging in some form of business after the introduction of electricity in their communities

- iii. The interest in engaging in economic activities after the electrification of the areas was independent on the demographics of the respondents
- iv. Specific ways in which the lack of electricity affects the economic activities of the people included high expenditure on fuel, restriction in the number of hours of work, as well as restriction on the kind of businesses to venture into.

The most significant changes brought to micro-enterprises by the taking up of electricity services were studied in the second objective with the following key findings:

- i. Generally, rural electrification had impacted on economic activities of micro-businesses in the study area
- ii. The most significant changes which rural electrification had brought for micro-enterprise is that the number of micro-business has grown as result of rural electrification, micro-business have grown significantly as a result of rural electrification and that access to electricity has increased the use of modern equipment and tools by micro-business.
- iii. However, rural electrification has not significantly reduced the expenditure on lighting as well as the financial savings on energy expenditure of micro-business.
- iv. Generally, the introduction of electricity does not automatically stimulate economic growth although the introduction of electricity had increased the income of the respondents.
- v. In the absence of good markets and access to credit, reliable, affordable and quality supply of electricity would not stimulate economic growth of micro-businesses

Findings on the challenges in taking up electricity services were studied in the final objective. The following key findings emerged:

- i. The most prevalent challenge faced by the respondents in taking up electricity services were the high cost of initial connectivity followed by the cost of wiring and the distance to point of payment of electricity bills.
- ii. Paying of electricity bills has not been a major challenge for the respondents in taking up electricity services

## **5.2 Conclusion**

Generally, the study concluded that the introduction of electricity has the tendency to increase the income of households. However, in the absence of good markets and access to credit, reliable, affordable and quality supply of electricity would not stimulate economic growth of micro-businesses and households. The study also concluded that the absence of electricity has limited the choices of business opportunities for rural folks, restricted the number of working hours and has as well as increased their expenditure on fuel for lighting.

The study concluded that rural electrification had impacted on economic activities of micro-businesses and that the most significant changes which rural electrification had brought for micro-enterprises include the increase in the number of micro-businesses, the significant growth ( high profit and sales) of microbusinesses and the increase in the use of modern equipment and tools by micro-business. The most significant challenge of access to electricity services is the charge on connectivity aside other challenges such as cost of wiring and the distance to point of payment of electricity bills. These challenges hinder rural people from accessing electricity services in spite of the economic

implications of rural electrification for the rural folks. The study further concluded that rural electrification projects enhanced entertainment and social interactions in the area. The electrification projects improved the technological knowledge of the rural folks. Moreover, the health of the populace also improved.

### **5.3 Recommendations**

Based on the major findings from the study, the following recommendations are made for policy making:

The Government of Ghana should extend the rural electrification projects to other remote areas to improve their economic, education, health and social livelihoods.

Apart from the presence of electricity in rural communities, provision of other complementary development programmes such as markets and access to credit will be critical to the economic growth of businesses in the communities. Thus, government through the Ministry of Trade and Industry and the District Assembly should provide markets for communities that lack them and improve upon existing market infrastructures in the communities, which will help facilitate business activities. Additionally, improvement in the road infrastructure in these communities is very important. Roads will help people in nearby communities and localities outside the District capital to get access to the markets as well as facilitate the transportation of goods, especially farm products, to other parts of the country.

In terms of access to credit, the role of government is very critical to the provision of credit facilities to microenterprises. Therefore, government agencies such as MASLOC should continue to assist microenterprises financially. In addition, agencies such as banks and microcredit institutions should help provide adequate financial support for the



businesses in the communities. Thus, microenterprises can be given loans at lower interest rates.

The high cost of connection can be eased by allowing households to spread payments by adjusting the tariff to an installment basis. Thus, agencies in charge of rural electrification projects in the country such as NEDCo and Electricity Company of Ghana should institute policies that will help residents of rural communities without electricity to pay for the connection charge in installments and put measures in place to ensure that the connection fees are fully paid. Therefore, to assess the sustainability of such a programme, it can be implemented on a pilot basis for some selected rural communities. Customers should be made to pay an affordable sum of money upfront before being connected. Based on the installment option, customers' monthly bills may have two components namely: the cost of their energy consumption and the remaining installment of their connection. In this regard, there should be public education on the payment policy or installment options.

The government through the Ministry of Energy should create the needed incentives to attract investors for rural electrification. This can be achieved by creating a system of tariffs and subsidies that ensures sustainable cost recovery while minimizing price distortions.

Sufficient funds should be made available by government through the Ministry of Energy to help extend electricity to other parts of the District that have not yet been connected to the national grid. This can be achieved by the government and all other major stakeholders in the energy sector creating appropriate incentives for investors. The District Assembly can also raise funds for the extension of electricity through its internally generated funds (IGF).

The business objectives of electrical utility companies generally do not encourage them to invest in rural schemes with low levels of demand. In any case, they are rarely well placed to work effectively with rural communities in a supportive manner. In this regard, this study suggested that there is a need for institutional support of the electricity companies such as NEDCO, ECG at the national and local level, but most particularly at an intermediary level in extending electricity to the rural folks

There can be considerable scope for reducing costs and improving the financial performance of electrification schemes. The initial cost of household connections can be reduced by a number of means, such as simple wiring looms with connection boards. The cost of meter reading and billing can be reduced by means of simplified fixed (maximum demand) monthly tariffs. Tariffs should be such as to provide a reasonable return on investment

#### **5.4 Suggestion for Further Studies**

Based on the major findings arising from this study and the key limitations of the study, it is recommended that a replicate of this study be conducted but this time with more communities to obtain a representative view of the issues of rural electrification and the economic empowerment of the rural folks.

The study also recommended that future studies should include officials from the energy utilities companies such as NEDCo and ECG to obtain views in relation to the challenges they encounter in their efforts to extend electricity to communities which have not yet been electrified.

## REFERENCES

- Aryeetey, E. (2005). *Guide to electric power in Ghana*. (1<sup>st</sup> ed.). Accra: Institute of Statistical Social and Economic Research.
- Asian Development Bank, (2009). Why is access to basic services not inclusive? A synthesis with a special focus on developing Asia. ADB Sustainable Development Working Paper 6. Manila.
- Azumah, A. (2010). *Government secures \$100m from US partners*. Accra: Ghanaian Chronicle.
- Bailey, P., Chotimongkol, O. & Isono, S. (2007). *Demand analysis and optimization of renewable energy: Sustainable rural electrification of Mbanayili, Ghana* Ann Arbor: University of Michigan.
- Barnes, D. (1988). *Electric power for rural growth: How electricity affects rural life in developing countries*. Boulder: Westview Press.
- Barnes, D. F. (2007). *The challenge of rural electrification: Strategies for developing countries*. Washington, D.C: Resources for the Future Press
- Bensch, G., Kluve, J. & Peters, J. (2010). *Rural electrification in Rwanda: An impact assessment using matching technique*.
- Brodman, J. (1982). *Rural electrification and the commercial sector in Indonesia*. Washington, D.C.: Resources for the Future Press
- Burke, R. J. & Onwuegbuzie, A. J. (2004). *Mixed methods research: A research paradigm whose time has come*. 33(7), 14-26.
- Cabraal, A. & Barnes, D. (2006). Productive uses of energy for rural development. *Annual Review of Environment and Resources*, 30, 117-144.

- Cecelski, E. & Glatt, S. (1982). *The role of rural electrification in development*. A discussion paper from the Center for Energy Policy Research. Washington, D.C.
- Davidson, O. & Sokona, Y. (2002). *A new sustainable energy path for African Development: Think bigger, act faster*. Cape Town: Energy and Development Research Centre, University of Cape Town.
- Deichmann, U., Meisner, C., Murray, S. & Wheeler, D. (2010). *The economics of renewable energy expansion in rural Sub-Saharan Africa*. Policy research working paper Washington, D.C: The World Bank Development Research Group Environment and Energy Team.
- Dinkelman, T. (2008). *The effect of rural electrification on employment*. New evidence from South Africa. Princeton University.
- Foley, G. (1990). *Electricity for rural people*. London: Panos publications.
- Ghana Energy Foundation (2006). *Energy in Ghana*. Accra.
- Glemarec, Y. (2012): Financing off-grid sustainable energy access for the poor. *Energy Policy* 47, S. 87-93.
- Guyol, N. B. (1969). *The world electric power industry: Rural electrification in India, Economic and institutional aspects of renewables*. Yale University. CA: Berkeley University of California Press.
- Hiremath, R. B., Kumar, B., Balachandra, P., Ravindranath, N. H. & Raghunandan, B. N. (2009). Decentralised renewable energy: Scope, relevance and applications in the Indian context. *Energy for Sustainable Development*, 13, 4–10.
- Idowu, P. A., Alu, A.O. & Adagunodo, E. R. (2002). The effect of information technology on the growth of the banking industry in Nigeria. *The Electronic Journal on Information System in developing countries*, 10(2), 1-8.

- Igbinovia, S .O. & Orukpe, P. E. (2007). Rural electrification: The propelling force for rural development of Edo State, Nigeria. *Journal of Energy in Southern Africa*,3, 18-26.
- International Energy Agency (IEA) (2010). Comparative study on rural electrification policies in emerging economies. *Rural electrification: Main challenges and issues*.
- Kandawire, J.A.K. (1992). *The Malawi beneficiary assessment study*. Sociology Department, Chancellor College. Zomba: University of Malawi.
- Kankam, S., Boon, S. E. K. (2009): Energy delivery and utilization for rural development: Lessons from Northern Ghana. *Energy for Sustainable Development* 13, S. 212–218.
- Khandker, S. R., Barnes, D.F. & Samad, H. A. F. (2009). *Welfare impacts of rural electrification: A panel data analysis from Vietnam*. Economic development and cultural change.
- Kjellstrom, B. (1992). *Rural electrification in Tanzania*. Past experience-new approaches, report prepared within the research co-operation between the Tanzania Electric Supply Company and the Stockholm Environmental Institute.
- Maillard, K. (1985). Rural electrification in the developing countries: *European commission*. Brussels.
- Maleko, G. C. (2005). *Impact of electricity services on microenterprise in rural areas in Tanzania*. Netherlands: University of Twente, Enschede.
- Malzbender, D. (2005). *Domestic electricity provision in the democratic South Africa*. Pretoria: University of Pretoria.
- Mason, M. (1990). *Rural electrification: a review of World Bank and USAID financed Projects*. Back ground paper, Washington, D.C.

- Meadows, K., Riley, C., Rao, G. & Harris, P. (2003). *Modern energy: Impacts on micro enterprises*. Report of Literature Review for DFID KaR-R8145.
- Meier, P., Tuntivate, V., Barnes, D. F., Bogach, S. V. & Farchy, D. (2010). *Peru: National survey of rural household energy use*. Washington, D.C.
- Meisen, P. (2008). *The case for meeting the millennium development goals through access to clean electricity*. San Diego: Global Energy Network Institute (GENI).
- Munasinghe, M. (1990). Rural electrification in the third world. *Power Engineering Journal*, 4(4), 189-202.
- Mvondo, J. M. (2010). *Impact of access to free basic electricity on households' poverty in buffalo city municipality in the Eastern Cape*. Thesis submitted to the University of Fort Hare.
- NRECA, (1993). *Beneficiary assessment of the Misque-Aiquile subproject, April*. (Draft).
- Parshall, L., Pillai, D., Mohan, S., Sanoh, A. & Modi, V. (2009). National electricity planning in settings with low pre-existing grid coverage: Development of a spatial model and case study of Kenya. *Energy Policy*, 37, 2395–2410.
- Rana-Deuba, A. (2001). *Generating opportunities: Case studies on energy and women*. New York: United Nation Development Programme, Sustainable Energy.
- Reddy, A. K. N., Annecke, W. & Blok, K. (2000). Energy and social issues. In *world energy assessment: Energy and the challenge of sustainability*. New York.
- Rogerson, C. M. (1997). *Rural electrification and the SMME economy in South Africa*. Cape Town: Energy & Development Research Centre, University of Cape Town.
- Saghir, J. (2005). *Energy and Poverty: Myths, links and poverty issues, technical report, the World Bank 2005*. Energy working notes.

- Sawe, E.N. (2004). *Brief on energy sector in Tanzania: Renewable energy and environmental news* (TaTEDO).
- Strout, A. M. (1977). *The future of nuclear power in the developing countries*. MIT-EL 77-06 WP. Cambridge, MIT.
- Togobo-Ahiataku W. (2012): Access to sustainable energy in Ghana-Role of renewable energy as a prerequisite for the MDGs. Ministry of Energy, AREA conference, Rockefeller Bellagio Centre, S. 1-33.
- Uddin, M. S. (1989). *Socio-economic impacts of rural electrification in Bangladesh: Case studies in some villages*. Ph.D. Thesis.
- UNDP & WHO, (2009). *The energy access situation in developing countries: a review focusing on the least developed countries and Sub-Saharan Africa*. New York: United Nations Development Programme and World Health Organisation.
- UNDP, (2005). *Energy services for the millennium development goals*. New York.
- Valencia, A. F. & Seppanen, M. (1987). *Electrification and rural development: The installation and immediate impacts in rural Casco*. Peru: Institute of Geography.
- Vanderpuye, H. (2010). *SHEP-Ghana's self-help electrification*. Limbe.
- Vogel, G.H. (1993). Rural electrification in Swaziland. Fachtagung Ländliche Elektrifizierung, Abt.415, GTZ, Eschborn.
- Wamukonya, N. & Davis, M. (2001). *Socio-economic impacts of rural electrification in Namibia: Comparisons between grid, solar and unelectrified households*. Energy for sustainable development.

World Bank, (2001). *The World Bank energy program: Poverty reduction, sustainability, and selectivity*. Energy and mining sector board paper. Washington, D.C.: World Bank.

World Bank, (2008). *The welfare impact of rural electrification: A reassessment of the costs and benefits*. An IEG Impact Evaluation. Washington, D.C: World Bank.

Yaron, G., Irving, T. F. & Jansson, S. (1994). *Solar energy for rural communities: Case of Namibia*. London.





## APPENDICES

### APPENDIX A

#### AN APPROACH TO ENHANCE WELFARE IN UPER EAST REGION OF GHANA THROUGH RURAL ELECTRIFICATION

#### QUESTIONNAIRE FOR COMMUNITIES WITH ELECTRICITY

**Dear Respondent,**

This study seeks to assess the Welfare impacts on rural folks with specific focus on the impact of rural electrification on the economic activities of households, the most significant changes brought to micro-enterprises by taking up of electricity services, identify whether rural electrification automatically stimulate economic growth, and make recommendations on the benefits associated with getting rural communities connected to the national grid.

You have been identified as one of the most trusted residents of the community to respond to the study to the best of your ability. I will be most grateful if you could spare a few minutes of your busy schedule to participate in the study. Your response is anonymous, will be treated with strict confidentiality, and use for only academic purpose.

#### **Section A: Socio-demography data**

1. What is your Age?.....
2. What is your Gender?
  - a. Male           [    ]
  - b. Female         [    ]

- 3. Monthly income.....
- 4. Marital status
  - a. Never married [ ]
  - b. Married [ ]
  - c. Divorced [ ]
  - d. Widowed [ ]
- 5. How many dependents do you have in your household.....

6. What is your Highest Educational Qualification?

- a. None [ ]
- b. Primary [ ]
- c. Secondary [ ]
- d. Diploma/HND [ ]
- e. First Degree [ ]
- f. Second Degree [ ]



7. What is your occupation?.....

**Section B: Electricity use and economic empowerment**

8. What source(s) of energy do you use in the home? You may tick more than ones

- a. Firewood [ ]
- b. Charcoal [ ]
- d. Gas [ ]
- e. Biomass [ ]
- e. Candle [ ]
- f. Electricity [ ]

g. Others.....

9. How much do you spend in a month on fuel?
- a. Before the electrification of the community Ghc.....
  - b. After the electrification of the community Ghc.....
10. What do you use electricity for in the home, you may tick more than once
- a. Lighting [ ]
  - b. Cooking [ ]
  - c. Heating [ ]
  - d. Cooling [ ]
  - e. Ironing [ ]
  - f. Others.....
11. To what extent has your household's income increase since the introduction of electricity in the community...a Very large extent [ ] b. Large Extent [ ]  
c. Low extent [ ] d. Very low extent [ ] e. Not at all [ ]
12. Please provide reasons for your choice of answer in question 11
- .....
- .....
13. The introduction of electricity does not automatically stimulate economic growth for rural folks a. Strongly Agree [ ] b. Agree [ ] c. Disagree [ ]  
d. Strongly disagree [ ] f. Neutral [ ]
14. The expenditure on lightening in the home has rather gone up after the electrification. a. Yes [ ] b. No [ ] c. Not sure [ ]

**Section C: Micro-enterprises and rural electrification**

**Microenterprises only**

15. What kind of business are you into.....
16. For how long have you been in the business.....
17. Does your enterprise use electricity for its daily operations. a. Yes [ ] b. No [ ]
18. If Yes, what specifically are you using electricity for in your business  
 .....
19. How much do you make from your business every month?
- a. Before the introduction of electricity.....Ghc.....
- b. After the introduction of electricity.....Ghc.....
20. Kindly indicate in your view the impact of electricity on the activities of micro-enterprises with the rating of strongly agree (SA) = 4, agree = 3 (A), strongly disagree (SD) = 2, disagree (DA) = 1 and neutral (N) = 0.

<b>Impact</b>	<b>SA</b> <b>4</b>	<b>A</b> <b>3</b>	<b>D</b> <b>2</b>	<b>SD</b> <b>1</b>	<b>N</b> <b>0</b>
1. My business has grown significantly as a result of the presence of electricity in this community					
2. Although electricity is vital, lack of complementary development programmes such as markets and sufficient credits hinder the economic growth of our business					
3. The number of micro-enterprises has grown as a result of the electrification projects					
4. The hours of work has increased and have positively affected revenue from business					

5. Access to electricity increases use of equipment and tools in my business					
6. The introduction of electricity has significantly reduced the financial savings on energy expenditure in the business					
7. The expenditure on lightening has rather gone up after the electrification					

**Section D: Challenges in taking up electricity**

21. Kindly rank the following four variables in terms of the most expensive in taking up electricity services for the rural folks, where 1 = “Less Expensive, and 5 = “Most Expensive”

Variables	Rank			
	1	2	3	4
Initial connectivity charge				
Paying of electricity bills				
Cost of wiring				
Distance to point of payment of electricity bills				

22. Kindly indicate other any challenge(s) that are encounter in obtaining electricity into the home or business

.....

**Section E: Suggestions and recommendations**

23. Kindly indicate policies that can be instituted to ensure that the economic gains associated with rural electrifications are adequately tapped

.....

24. Kindly indicate policies that can be instituted to ensure that the challenges encounter in the taking up of electricity are reduced to the barest minimum

.....

**THANKS FOR YOUR TIME AND COOPERATION**



## APPENDIX B

### AN APPROACH TO ENHANCE WELFARE IN UPER EAST REGION OF GHANA THROUGH RURAL ELECTRIFICATION

#### QUESTIONNAIRE FOR COMMUNITIES WITHOUT ELECTRICITY

**Dear Respondent,**

This study seeks to assess the Welfare impacts on rural folks with specific focus on the impact of rural electrification on the economic activities of households, the most significant changes brought to micro-enterprises by taking up of electricity services, identify whether rural electrification automatically stimulate economic growth, and make recommendations on the benefits associated with getting rural communities connected to the national grid.

You have been identified as one of the most trusted residents of the community to respond to the study to the best of your ability. I will be most grateful if you could spare a few minutes of your busy schedule to participate in the study. Your response is anonymous, treat with strict confidentiality, and use for only academic purpose.

#### **Section A: Socio-demography data**

1. What is your Age?.....
2. What is your Gender?
  - a. Male            [   ]
  - b. Female         [   ]

3. Monthly income.....
4. Marital status
  - a. Never married [ ]
  - b. Married [ ]
  - c. Divorced [ ]
  - d. Widowed [ ]
5. How many dependents do you have in your household.....
6. What is your Highest Educational Qualification?
  - i. None [ ]
  - ii. Primary [ ]
  - iii. Secondary [ ]
  - iv. Diploma/HND [ ]
  - v. First Degree [ ]
  - vi. Second Degree [ ]
  - vii. What is your occupation?.....



**Section B: Energy use in the home**

7. What source(s) of energy do you use in the home? You may tick more than once
  - a. Firewood [ ]
  - b. Charcoal [ ]
  - d. Gas [ ]
  - e. Biomass [ ]
  - f. Dry cell [ ]
  - e. Specify if others.....



8. How much do you spend in a month on fuel? Ghc.....
9. What do you use fuel for in the home?
- a. Lighting
  - b. Cooking
  - c. Heating
  - d. Others.....
10. If the community is electrified, what will you use electricity for?
- .....
- .....

**Section C: Rural electrification and micro-enterprises**

11. Are you engaged in any business? a. Yes [ ] b. No [ ]
12. If YES, what kind of business.....
13. How much do you make from your business on a monthly basis?.....
14. What tools and equipments are used in your business.....
15. If you are currently not into any business, would you embark on any business if the community is electrified? a. Yes [ ] b. No [ ] c. Not Sure [ ]
16. If Yes from 15, which business are you most likely to be engaged in?
- .....
- .....

**Section D: Rural electrification and economic empowerment**

17. Does the lack of electricity affect your economic activities?
- a. Yes [ ] b. No [ ] c. Not sure [ ]

18. If Yes from 17, kindly indicate in what way

.....  
.....

19. To what extent will the introduction of electricity affects your economic empowerment? a. Very large extent [ ] b. Large Extent [ ]  
c. Low extent [ ] d. Very low extent [ ] e. Don't know [ ]

20. The introduction of electricity will significantly reduced the financial savings on energy expenditure in the home and business.  
a. Strongly agree [ ] b. Agree [ ] c. Disagree d. Strongly disagree [ ]  
e. Natural [ ]

**Section E: Suggestions and recommendations**

21. Kindly indicate policies that can be instituted to ensure that rural communities without electricity are connected to the national grid

.....  
.....

**THANKS FOR YOUR TIME AND COOPERATION**

## **APPENDIX C**

### **AN APPROACH TO ENHANCE WELFARE IN UPPER EAST REGION OF GHANA THROUGH RURAL ELECTRIFICATION**

#### **FOCUS GROUP DISCUSSION FOR MEN AND WOMEN IN COMMUNITIES WITHOUT ELECTRICITY**

##### **Introduction**

Thank you for agreeing to participate in this focus group discussion. I am very interested to hear your valuable opinion on the impact the lack of electricity in the community is having on the economic developments of homes and business. It is hoped that the discussion will produce information which will enable stakeholders such as VRA and ECG to understand the economic gains associated with rural electrification to enhance its promotion.

The information you give is completely confidential, while your name will not be associated with anything you say during the discussion. You may refuse to answer any question or withdraw from the study at anytime, while participants are to respect each other's confidentiality.

##### **Questions**

1. What is your general view on rural electrification?
2. It is important to connect rural communities to the national grid?

3. How has the lack of electricity affects the economic activities of the
  - i. Home
  - ii. Business; and
  - iii. Community
4. What efforts can be made to ensure that rural communities without electricity get access

