EFFECTS OF RURAL ELECTRIFICATION ON RURAL LIVELIHOODS: A CASE STUDY OF RONGAI SUB-COUNTY, NAKURU COUNTY-KENYA

BY

Dancan Kipkemoi Ruto

A Dissertation Submitted to the Department of Developing Studies in the School of Social Sciences in Partial Fulfillment of the Requirements for the Award of a Master in Development Studies of St. Paul's University.

SEPTEMBER, 2017

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Supervisors:
Dr. David Gichuhi
Dr. Peter Koome

SEPTEMBER, 2017

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DECLARATION

This Dissertation is a product of my own work and is not the result of anything done in collaboration. It has not been previously presented to any other institution. I agree that this dissertation may be available for reference and photocopying, at the discretion of the college.

SIGNATURE OF STUDENT _____

DATE_____

Word Count: **21,676**

This dissertation has been submitted for the examination with our approval as the University Supervisors.

SIGNATURE OF SUPERVISOR 1_____

DATE_____

SIGNATURE OF SUPERVISOR 1_____

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DEDICATION

This Dissertation is dedicated to my father Alex Barno, My mother Grace Barno and my siblings for their support throughout the studies.

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ACKNOWLEDGEMENT

Special thanks go to the Almighty God for his sufficient grace and mercies, good health, confidence and commitment throughout this process.

I wish to express my sincere appreciation to my supervisors Dr. David Gichuhi and Dr. Peter Koome for their valuable guidance, patience and devotion from the start all through to the finalization of this thesis. Their competence, knowledge and expertise in scientific research have really enriched my work. Their readiness, availability, commitment and valuable contribution towards this work have always been amazing.

My sincere gratitude goes to my family for their moral support, encouragement, love, guidance and their constant prayer of which without, I could have not reached this far.

Lastly, I thank my classmates at St. Paul's University Nakuru campus and my friends for their support, encouragements, advice, contributions and a favourable atmosphere conducive for learning. I humbly and warmly say thank you. Your kind gesture enabled me to finish this work within a reasonable space of time.

May the Almighty God you bless abundantly.

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ABSTRACT

It is universally accepted that electrification enhances quality of life at the household level and stimulates economy at a broader level. The immediate benefit of electrification comes in the form of improved livelihoods through domestic and industrial use. In Kenya, the government through the Ministry of Energy formed the Rural Electrification Authority; a public fundedagency mandated to implement rural electrification. The government has shown commitment to rural electrification as evidenced by the recent presidential declaration on new connections to the Kenya Power grid. Rural electrification has been a major focus area of the national government in the recent years. This study was designed to examine the effect of rural electrification on the rural livelihoods. The study sought to determine the effect of accessibility, affordability and reliability of electricity on rural livelihoods in Rongai Sub-County. A cross sectional survey research design was used where31,840 households in Rongai sub-county were targeted. The cluster sampling method was used to determine the number of participants who were selected randomly from each ward. A total of 156 respondents were involved in the study. Questionnaire as well as interview schedules developed by the researcher, validated by experts in development studies, and pilot tested in Elburgon town in Molo sub-County were used to collect data. Descriptive statisticswas used to analyze data with the help of Statistical Packages for Social Sciences (SPSS version 20). Findings revealed that the rural electrification program has made electricity fairy accessible to rural dwellers with over 62.8% having electricity connections. Electricity was also fairly affordable with most households spending between Ksh. 300 and 499 per month on electricity bill. However, there is a major challenge with reliability with 74.2% reporting that they experience power outages about 3 times in a week. Accessibility and affordability were found to have a positive impact on livelihoods as they have supported business growth, crime reduction, and improvement in health services. Reliability issues, however, have a negative impact on businesses and households. The study recommends that, to enhance impact on rural livelihoods, stakeholders in the energy sector should work towards improving the reliability of electricity. There is also a need to make electricity accessible to all rural dwellers so as to ensure equitable distribution of benefits.

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ABBREVIATIONS AND ACRONYMS

DFID - Department for international Development

GDP - Gross Domestic Product

HDI - Human Development Index

HDR - Human Development Report

IEG - Independent Evaluation Group.

RE - Rural Electrification

REA - Rural Electrification Authority

REP - Rural Electrification Programme

REPLF- Rural Electrification Programme Levy Fund

RSME- Small and Medium Enterprises

SHS - Solar Home system

SL - Sustainable Livelihoods

SSA - Sub-Saharan Africa

UNDP - United Nations Development Programme

WHO - World Health Organization

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DEFINITION OF TERMS

Business growth: Theprocess of improving some measure of an enterprise's success such as sales, revenues, market share, or profits.

Household: A social group that reside in the same compound, shares the same meals, makes joint or coordinated decisions over resource allocation and income pooling, and has one household head.

Livelihoods: Comprise of people, their capabilities and their means of living including food, income and assets.

Living standards: Is the level of wealth, material goods, comfort, and necessities available to a group of people in specific geographical location.

Rural area: An area that is geographically located outside regions that are officially designated as townships, towns, municipalities, and cities often with low population density of less than 400 persons per square kilometer.

Rural electrification: The process of connecting rural households to the electrical power grid.

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CHAPTER ONE

INTRODUCTION

1.1: Background of the Study

Rural electrification is the process of supplying electricity and the necessary infrastructure to rural areas. Electricity has a number of benefits; it is used not only for heating, cooking and lighting but also mechanization of agricultural activities such as such as milking, pumping waters for irrigation and hoisting grain for storage. Energy plays a very important role in any country's development and in poverty reduction of a country. This means that a secure and affordable supply of electricity is a crucial vehicle for economic development due to the wave effects to other sectors (Abdullah &Jeanty, 2009).

At least a billion people globally have problem in accessing electric power. This population is equivalent to that on the entire world in early 19th century (IEA, 2011). As of the mid 2010s, an approximated population of about 200 to 300 Indians had no access to electricity (approximately between 15 to 30 percent of the entire population) and seven out of eight rural Sub-Saharan Africans had no access to electricity. Many people receive electric power that is intermittent and of low quality. The Alliance for Rural Electrification (2016) approximated that the number of people without access to electricity was rising not until late 1990's when rural electrification initiatives were started especially in East Asia that was grappling with the challenge of high population growth.

In 1970's it was estimated that about 2.01 billion people in developing countries had no access to the electricity. The IEA (2011) projected that, if the situation persists, the number of individuals without household electricity will rise to about 1.2 million people by the 2030. As a result of fertility rates in Africa resulting to high population growth in Sub-Saharan Africa, the number of people without electricity is projected to rise (Abdullaha&Markandyaa, 2011).

In 1981, 74.9% of Brazilian households had access to electricity (ARE 2016). In 2000, the Federal Government of Brazil, initiated a program known as the "Luz no Campo program" the aim of the program was to expand the supply and distribution of electricity in Brazilian populace, whose main targets were the rural households. In

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2003, the program was strengthened renamed “Luz paraTodos”. According to IEA, by 1996, 79.9%, 2002 90.8% and in 2009, 98.9 % of the households had access to electricity.

By 2015, the entire population of the Chinese households had access to electricity (IEA, 2011). Alliance for Rural Electrification reveals that in the early 1990s, the Chinese population living in rural and remote areas was engulfed in extreme poverty with 40 percent of this population having no access to electricity. Most of the rural dwellers depended on kerosene to light lamps. The Chinese government initiated the China Township Electrification Program in 2001 with the aim of providing electricity to about 1,000 townships across China. This project was succeeded by another major project, the China Village Electrification Program that sought to supply power to another 3.5 million Chinese households in 10,000 villages by 2010 and all rural households by 2015. In December 2015, the China Government encompassed the last 39,800 Chinese households onto the national electric grid by devoting approximately $324 million and hiring 5,000 labourers to wire 2 extremely remote villages in Quighai province located at altitudes of 13,100 ft.

Approximately 304 million Indians (24 percent of the entire population) still have no access according to Alliance for Rural Electrification (2016). Indians comprise on approximately 20% of the entire world’s population but approximately 40% of this population still has no access no access to renewable electric power. India is supplied with electricity non-uniformly with richer and able state being in a position to supply their villages with electricity whereas the poorer states strive to do the same to their villages. As a result the Rural Electrification Corporation Limited was established to purposely to address the issue of supplying electricity across all the villages in the country. Key issues affecting electrification in India that has left many villages without electricity include Poverty, inadequate resources, lack of poor planning, and vandalism, while on the other hand the urban areas have been enjoying growth in electricity consumption and capacity.

Despite the invention of light bulbs centuries ago, Africa still has a problem of access to electricity. It is because of this problem that economic activities in these African countries are affected. For instance, businesses can only operate using natural light hence slow growth rate. Quality of healthcare is also affected because

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there is no electricity to support equipment like refrigerators. Education is also affected as children cannot revise after sunset. Power outage is a problem being faced by over twenty five Sub-Saharan countries. However, Africa has a lot of fuel and other renewable resources that are on high demand by other continents though not equally distributed in all the African countries (World Bank, 2002).

Major impediments in Africa's energy sector include low access and insufficient capacity. Approximately 24% of sub-Saharan Africa populace is connected to electric power compared to approximately 40 percent in other low income countries. Exempting South Africa, the entire power generation capacity of sub-Saharan Africa stands at approximately 28 Gigawatts, which is equal to that of Argentina alone. Another major impediment is unreliability of available electric power. It is estimated that most of the manufacturing enterprises in Africa experience power outages on average 56 days a year resulting to firms losing 6% sales revenues in the informal sector. Thirdly, the energy sector is bedeviled by high costs of power tariffs. In many parts of the developed world, power tariffs range between US$0.04 and US$0.08 per kilowatt-hour whereas in Sub-Saharan Africa, the average tariff stands between US$0.13 per kilowatt-hour.

The lifestyle of citizens and the level of economic growth are mostly determined by availability of electricity in the country. Globally, it has been observed that electrification improves the quality of life at the household level and also steers the economy at a broader level. Cabraal and Barnes (2006) observed that the availability of electricity touches different aspects such as better lighting that enable students to study a little longer bringing about better academic performance. The researchers further submitted that other activities at home can be made easier when there is proper lighting, social gatherings after dark, and many others. According to Kulkarni and Barnes (2004), rural electrification brings about access to information and entertainment by use of radio and television among other electronic gadgets. Agarwal (2006) argues that household's income generating activities rely so much on electricity. Mechanization of such activities as irrigation not only makes work easier but also increases efficiency and productivity hence high revenues.

In Kenya, the then Kenya Power and Lighting company (KPLC) started a Rural Electrification Programme (REP) in 1970. These funds are obtained from a five

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percent levy that is imposed on the electricity users in the country commonly known as Rural Electrification Programme Levy Fund (REPLF). The Rural Electrification Authority (REA) is a Body Corporate established under Section 66 of the Energy Act, No 12 of 2006. The main objective for the establishment of this body was to ensure that rural electrification was achieved sooner. It is an Authority that took the responsibilities that were being handled initially by the Ministry of Energy. Speeding up of the electrification process was to ensure that there is a sustainable socio-economic development. It is specifically responsible for the management of REPLF, development of new and updated master plans for rural electrification, in addition to sensitizing the community on the benefits of using renewable energy. For example; small hydros, solar power, wind power, and hybrid systems. It is also responsible for educating the public on the other ways of utilizing power like for irrigation and other income generating activities. It plays a better role in management of the delineation, tendering and award of contracts for licenses and permits for rural electrification (REA, 2012).

Rural electrification has increased in Kenya courtesy of REA since 2006. There has been not only the expansion of the National grid, but also countywide distribution of transformers and electricity lines. As much as the power grid has been expanded, rural electrification stills falls between 18% and 26% among the households. Due the grid expansion, it is possible to expand the power access through grid connection. About 3.3 million Kenyan households are under the grid and their connection to the grid can be relatively lower.

In its effort to increase the number of households connected to electricity, the Kenyan government started the Last Mile Connectivity project, in 2015. This Project was started with the sole aim of ensuring that more and more Kenyan households are connected to the power grid. With this project, it is believed that by 2017 the connectivity will increase from forty percent to seventy percent and by 2020 have a 100% connection in the country. The project ensures that all households lying within 600 meters of the earmarked transformers are connected to electricity. According to MyGov (2016), the number of schools connected as at January 2015 to electricity were 20,575 from 8,203 in 2013 and there was also an indication that by the end of June 2015, all 22,175 schools would be connected. This was the first phase of the project named ‘the last mile’. The second and third phases would involve maximization of additional

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transformers, installing new transformers and extending the low-voltage network to connect more Kenyans. Under these phases, Kenya Power targeted to connect 500,000 households hence adding 2.5 million Kenyans to the national grid. It is evident that the Kenyan government has made tremendous progress in ensuring access to electricity for the rural communities.

The subject of rural electrification has received considerable attention in the existing body of literature, not only by academicians but also by governments wishing to optimally allocate resources. In both cases, the conclusion is the same; rural electrification generates substantial and favourable change in the welfare of rural households and it can be considered as a crucial prerequisite for development (Khandker 2012). According to Martins (2005) the benefits can be seen as either direct or indirect. The direct include improvements in lighting, television viewing, radio listening and use of refrigeration while the indirect include better education outcomes, improvement in income generation opportunities, lower fertility rates, and better healthcare. Therefore, the study on examining the effects of rural electrification on rural livelihoods is timely.

1.2: Problem Statement

The Kenyan government has directed a lot of resources towards financing rural electrification programmes. Rural electrification has been recognized as a key ingredient in poverty reduction and the enhancement of social and economic development. In fact, the UNDP (2005) established that the human development index (HDI) has a positive relationship with the per capital energy consumption in many countries. There is empirical evidence to show that access to modern energy and human development are closely linked. In the Financial Year 2016/17, the government of Kenya allocated Ksh. 26.02 billion towards rural electrification, which was Ksh. 9.11 billion more than what was allocated in the previous fiscal year.

Whereas it is clear that the government has continued to invest heavily in rural electrification, studies on the effect of such a program on rural livelihoods has seldom attracted scholarly attention. Most studies examining impacts of rural electrification have been conducted outside the Kenyan context; hence, may not reflect the Kenyan situation. The few studies that have been conducted in Kenya have yielded inconsistent results. For instance, Kemboi (2013) found that rural electrification had

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little impact on the socioeconomic condition of residents of Tala Division Machakos County. On the other hand, Ouma (2013) found that rural electrification provided the motivation for value addition services and expansion of SMEs in Mbita town.

From the above submissions, it is not clear how rural electrification programs have impacted the lives of rural dwellers in Kenya. This current study sought to bridge this gap in evidence by examining the effects of rural electrification on the livelihoods of rural households in Rongai Sub-County.

1.3: Purpose of the Study

The purpose of this study was to examine the effects of rural electrification on rural livelihoods in Rongai Sub-county. The government has made remarkable progress in the attainment of the goals outlined in the vision 2030. These goals include infrastructure development and access to cheap and affordable power as a key element in economic developments. Rural electrification has been a major focus area of the national government in the recent years.

1.4: Objectives of the Study

1.4.1: General Objective

The aim of the study was to examine the effect of rural electrification on rural livelihoods in Rongai Sub-County, Nakuru County.

1.4.2: Specific Objectives

The specific objectives of the study were to;

i. Explore the effect of accessibility to electricity on rural livelihoods in Rongai Sub-County.
ii. Investigate the effect of affordability of electricity on rural livelihoods in Rongai Sub-County
iii. Assess the effect of reliability of electricity on rural livelihoods in Rongai Sub-County**.**

1.5. Research Questions

i. What is the effect of accessibility of electricity on rural livelihoods in Rongai Sub- County?
ii. What is the effect of affordability of electricity on rural livelihoods in Rongai Sub-County?

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iii. What is the effect of reliability of electricity on of rural livelihoods in Rongai Sub-County?

1.6: Scope of the Study

This study sought to understand the effects of rural electrification on rural livelihoods in Rongai sub-county. It is one of the sub-counties in Nakuru County in Kenya. The sub-county is about 1,049.10 square kilometers in size with a population of approximately 31,840 households according to the 2009 population census. It is estimated that approximately seventy percent of the population comprises of the rural communities. They therefore make the best target population for such a study that seeks to understand the effects of rural electrification on rural livelihoods. The study focused on electrified and non-electrified households in Rongai Sub-County. The study on the effects of rural electrification on rural livelihoods was achored on three main variables which were; accessibility, affordability and reliability of electricity.

1.7: Justification of the Study

Electricity is a vital utility in the developmental process of any given nation. Kenya continues to prioritize energy production and distribution all areas including the rural ones as a development strategy. Vision 2030 contains a coherent energy policy, which is further strengthened by signatories in global declarations. The findings of this study will contribute to the understanding of the effects of accessibility, and reliability of electricity on improvement of rural livelihoods.

The findings of this study will be useful to both energy and policy makers in giving guidance to the Government on necessary course of action to enhance rural electrification. Further, the study will be instrumental in creating new knowledge that will guide the financing of rural electrification to go beyond lighting up homes and trading centers to small industries. Finally, the study may help the future academicians and researchers interested in undertaking similar studies on the effects of rural electrification in others parts of the country.

1.8: Limitations of the Study.

Due to the sensitivity of some questions in the questionnaire such as those involving income, some of the respondents were reluctant to give their responses on some questions. The above challenge was addressed through training of the research assistance and the research team who were also coming from the immediate

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environment. Some questions also were translated into their local native language for better understanding.

1.9: Assumptions of the Study

The major aim of this study was to examine the effects of rural electrification on rural livelihoods. This is with an understanding that apart from the effects enlisted in this study, rural electrification has many other effects. This study was based on the assumption that all other effects apart from growth of businesses, security and health and are held constant. That the sample size of this study will be representative of the population so as to allow generalization of the findings. The study also assumed that each respondent targeted will be available and cooperate during data collection. Lastly, that all respondents will give correct and valuable information that gave the researcher valid data.

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CHAPTER TWO
LITERATURE REVIEW

2.1: Introduction

This chapter outlines the theoretical framework upon which this study is based. It also reviews literature related to rural electrification results and its impact on rural livelihoods. The purpose is to examine what other researchers have already written on the independent variables as well as the dependent variable in books and other reports, in order to provide an in depth understanding of the concepts and opinions.

2.2: Theoretical Review

This study is based on the Sustainable Livelihoods model and the AmartyaSen's theory on human development. These are discussed in the following sections.

2.2.1: The Sustainable Livelihoods Model

The Sustainable Livelihoods Model (SLM) was formulated Robert Chambers in the 1980s, and later refined by Chambers, Conway and others in the 1990s (DFID, 2000). The model is a tool for development work. It highlights how to conceptualize, scrutinize and emphasizing the key issues that influence the livelihoods of the poor people in the society. DFID (2000) postulates that a livelihood consists of the capabilities, assets and activities required for a means of living. DFID (2000), states that livelihoods are sustainable when it can withstand with and overcome from stresses and shocks; enhance its capabilities and assets, while not undermining the natural resource base.

The SLM explains what development activities geared to reduce poverty should be able to focus on in order to create sustainability in the livelihoods of the poor people, how their way of live are diverse and how theses cultures their conceptualization and appreciation of livelihoods. The second principle states that the people themselves should the key stakeholders in pointing out important issues and aspects of their own livelihoods. The poor people understand what is important to them compared to the outsiders who tend to assume that their views and ideas are superior and good. This is also the principle that donors role is to aid the processes that help that help the poor people to be conscious of their priorities and scrutinize their environment for resources. It is also a principle that the role of the donors is to be process facilitators that help the poor to be aware of their priorities and analyze their own surroundings

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for resources. This means that collaboration and participation are to key vital factors in development work and by conclusively engaging in development efforts, the poor people will be empowered instead of relying on outsiders to assist them at all times (Norton & Foster, 2001).

The SLM also stresses on the principle that there should be a bridge between macro and micro politics because the two are related. The macro politics are responsible for the main structures and processes in an area whereas the poor people try to embrace them and try to improve their livelihoods through this. The last basic principle is that development has to have a long-term focus; this means that any activity geared towards development in an area should make it sustainable in future time (DFID, 2000).

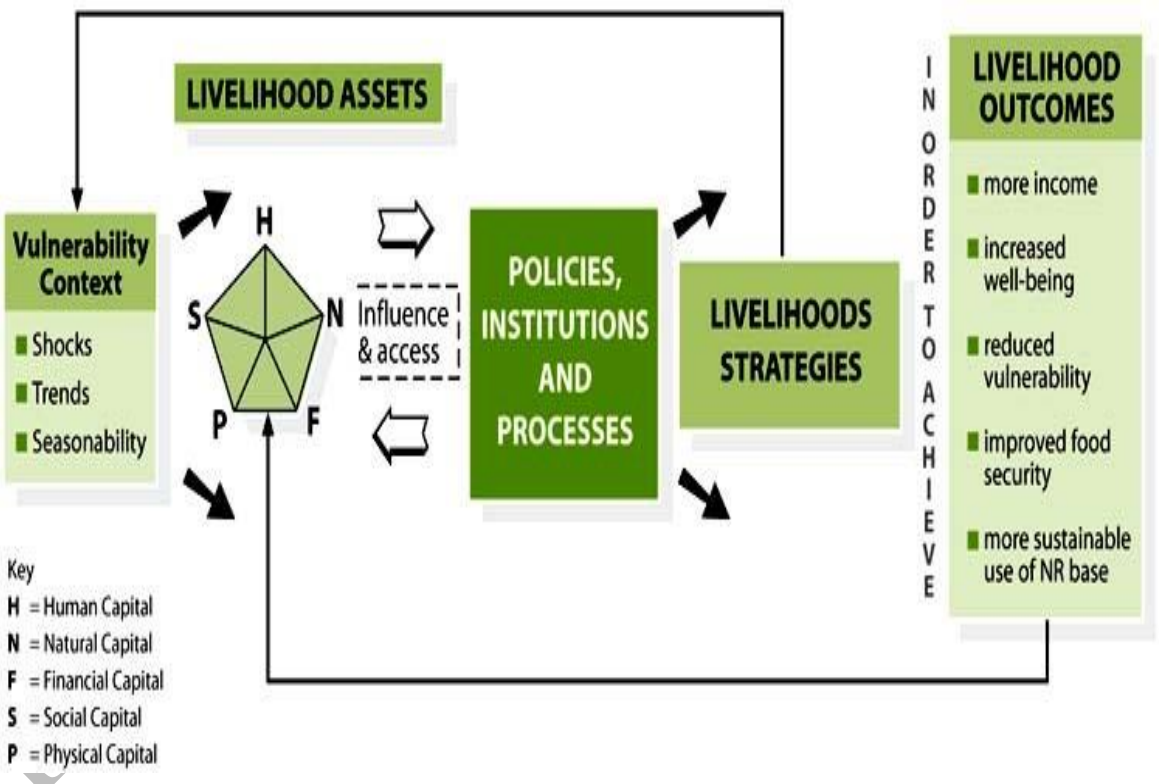


Figure 2.1: Sustainable Livelihood model.

Vulnerability context tries to describe the external surroundings that the poor live in. This external environment comprises of critical trends; for example technological trends or population trends, shocks like natural calamities or inflation in the economy and seasonality which defines the employment opportunities, prices of commodities and services and production may slightly be affected with seasons. The framework

also perceive that people needs assets to achieve as positive outcome. When all this different assets are combined they give to people the livelihoods they seek. These assess include; human capital, which refers to the knowledge ability to work, skill that enable the people to realize their livelihoods. Social capital includes formalized groups, mere trust between people, networking forms social resource. This forms avenues that people can get help from in order to better their livelihoods (Keeley, 2001).

Natural capital includes concrete factors like natural resources comprising of trees and land. Physical capital on the other hand describes the basic infrastructure and production of goods and services that are essential in supporting livelihoods. Financial resources are the savings, in whichever form, access to financial services, and regular inflows of money. The more access the households have to different assets the less vulnerable they will be to the negative effects of the trends and shocks and the more secured their livelihoods will be. (DFID,2000).

Transforming structure and process comprises of organization and policies that highlights the households with poor livelihoods found at all levels that is from the household to the international level. They determine the access the households have to different kinds of assets for example international agreements, ownership rights and laws to secure right of livelihoods. Livelihood strategies are activities that people do to achieve a descent livelihood. The access to these assets affects the different strategies people employ. Livelihood outcomes are achievements of the people's livelihoods strategies. The outcomes of livelihoods strategies are divided into between the effects of livelihood security and the effects on environmental sustainability. Improved access to various livelihoods assets and the outcome is greater likelihood security in terms of higher incomes, stables incomes and reduces risks are usually very vital objectives in rural livelihood strategies (Ellis, 2000).

2.2.2: AmartyaSen's Theory on Human Development

This study adopts AmartyaSen's theory on human development (Sen, 1999). This theory incorporates ideas from different economic spheres, including; sustainable development, ecological, welfare and feminist economics. It not only focuses on the well-being of the society, but also on the relationship between human health and economic depreciation. In this approach, the focus is on ensuring that the quality of

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life is improved and having a better lifestyle of citizens in relation to their opportunities and choices.

In his book, Sen (1999) defined human development as "the process of expanding the real freedoms that people enjoy" (P 19). Development has been redefined beyond apportionment of monetary value in the world as per the various Human Development Reports (UNDP 2016). From the reports' argument, people are said to be free if they have the ability to take part in the development process not only by their monetary inputs, but also their ideas. It is believed that having a people-centered approach to development is the best way to achieve meaningful progress. Greater focus should be on change how they live.

Sen further believes that it's only when people have the freedom to make real choices in regard to their ability to impact the quality of their lives that they will be said to be living well (Braber, 2013). The freedom to choose a life that one finds worth live forms the basis for defining the quality of human life. Much as they are cognizant of the fact that they are poor, the poor feel hopeless since they have never been given the freedom to change their lives to the one they would loveto live. Therefore as a way of bringing up human development building the capacity of the people to allow them broaden their scope can be the best tool to achieve this.

According to Sen, economic wealth should not be used as a tool to measure human development; instead, it should be determined by the level of freedom because wealth cannot be equated to the well-being of an individual (Alkire, 2010). Sen further argues that wealth is merely a means to an end but not the ultimate end that we need and wealth and income are only a means to achieving our goals. Gasper 2002 argues that economic growth should be seen as a means to achieving human development and not vice versa. This is to say that the achievements we make in life are as a result of economic growth. For instance having better housing is as a result of economic growth but it is not an end in itself.

Sen, differentiates functionings from capabilities by saying, functionings refers to what an individual does whereas capabilities refers to the ability to attain the desired goals (Strydom, 2014). According to Sen, functioning's is similar to a person's physical well-being, for example, whether one has enough food to eat; whether one is in a good mental state of being or is in a good social, for instance whether one has

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freedom doing certain things like taking part in social gathering (Braber, 2013). Therefore functioning refers to several things a individual may decide to achieve in life thereby treasuring it. Sen also postulates that functioning are more similar to the living conditions, since there are various components of it.

Capability entails to a person's ability to attain certain functionings. According to Sen, these capability comprise of an individual's freedom (Alkire, 2010). The concept of capability reflects an individual's freedom to live a one kind of life or the other. Capability, in this notion is similar to human freedom. The Human Development Report defines capacity as the power to live the life one treasures (UNDP, 2016). In other words, capability resolves around makes a person conceptualize what one can do (Braber, 2013).According to Sen, the concern should be on the level of freedom because the attainment of certain functioning largely depends on specific people capabilities or ability.

The attaining of things that people treasure give individuals much meaning to human life. However in evaluating the well-being of an individual, therefore his or her ability or capability or the extent of freedom the individual enjoys should take precedence simply because it is the freedom that an individual requires to be able to attain a certain state of being (Strydom, 2014). Allowing a person to be entitled to certain things in life like the basic needs gives him/her certain capabilities and functioning or the ability to do or be what he/she wants (Gasper & Gomez, 2012). The things that we desire in life contain certain characteristics and qualities that we want in them. Hence an individual's well-being is defined by certain things that this individual is entitled to and that will make his/her life worthwhile. For example having a good income is not an individual's final goal. Bringing about equality in terms of our capability and functioning are the best tools we can use to bring about a proper social arrangement. We can only achieve real freedom if the rights of an individual and what he/she is entitled to is used to enable him/her achieve his desires or well-being. According to Sen, a person's level of income limits his/her level of entitlement to certain living standards though he finds this not be adequate enough (Braber, 2013). But Sen has shown this to be inadequate. When an individual's entitlement allows him/her to have a broader option in life, then his/her well-being is said to be achieved.

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This paper identifies with this theory in realization that no matter what effort is exerted to harness opportunities presented by structures, if the said effort is not informative, free or in an environment that is secure, then that effort is wasted and cannot yield great results. This study therefore aims at establishing how growth of businesses, improved security, and improved health care as a result of rural electrification enables the residents of Rongai sub-county expand their valuable options in life.

2.3: Empirical Review

This section covers the independent variables such as growth of businesses, improved security, and improved health care as a result of rural electrification lead to an improvement in the rural livelihoods.

2.3.1: The Concept of Rural Livelihoods

There is increased emphasis on developing and applying strategies for reducing poverty levels in rural populations. It is approximated that about 75 percent of the poor people in the world live below $1.25 per day in which most of them reside in rural areas. Whereas poverty in rural areas seems to have reduces significantly globally in the recent years it is estimated that the likelihood of becoming poor in these areas in the developing countries is estimated to be more than 2.5 times larger than in cities. Although there has been increased interest in poverty reduction through the targets enshrined in the MDGs, the goals are the same old ones: poverty reduction has always been a main policy focal point in circles of development especially for the last three decades. Predictably, there is colossal literary work on poverty from as late as the 1960s, and the intent here is to draw out some of the main analytical viewpoint of the specific economic reforms whose aim is to have a pro-poor point of reference (Minogue, 2004). Although this literary work is debatable, there is broad concurrence that poverty in one way or another amount to deprivation; which has got both absolute and relative facets; and that it is composite and many-sided, with no evidence of a cause-effect linear relationship (Addison *et al*., 2008).

Over the years, poverty is often understood as one connected to low levels of income, depicted mostly in terms of insufficient food availability, inadequate fulfillment of basic necessities (Hulme& Shepherd, 2003). The lowest level requirements, which used to be considered exclusively in terms of food requirements, have now acquired

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the basic needs title, which are inclusive of both food and non-food necessities for the minimally acceptable fulfillment of human needs (Gomez & Gasper, 2012). Based on this idea of basic human necessities, poverty is regarded a deprivation of the minimum necessary level of necessities comprising of food, basic health, education and critical services that are key to preventing people from getting into poverty.

According to Alkire (2010), the notion of entitlement brings out the difference between availability and accessibility. He argues that this is due to the fact that simple availability of goods and services among the populace at large does not necessarily translate into everyone's access to them. Further, it is argued that people require having an established command over those goods and services for them to enjoy the benefits thereof. This implies that an entitlement to the minimum necessary goods and services essential to meet basic necessities is of paramount importance.

In addition, Cook (2014) observes that inequality is as critical as poverty. Cook observes that inequality's main focus is usually the distribution of income among the populace instead of the levels of deprivation in terms of basic needs experienced by individual members of the population. However, poverty and inequality are associated closely and eradication of poverty must take place inside a broader perspective of distributional dynamics. Research shows that there is a positive relationship between equality in income distributions and high levels of economic growth (World Bank, 2000). This case is true not only to diversities in countries but also to intra-regional examination, and this provides a justification for ensuring development in rural areas.

According to Chambers (2007), it is important to bring the poor on board when identifying the real issues as well as deciding the actual mechanisms of poverty reduction to be implemented in a certain locality. There are two major strategies that can be deduced from the literary work for policy interventions to reduce poverty. One of the strategies is livelihood promotion whose major aim is to increase productivity to get people out of poverty. The second strategy is livelihood protection which aims at preventing a reduction in welfare and makes use of direct transfers among other means to protect the susceptible among the society. In other words, livelihood protection focuses on making sure that the minimum level of entitlement is achieved. Well planned livelihood protection ensures livelihood promotion more feasible, since

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a household will have the courage to take on higher-risk, higher-return economic activities so as to raise income (Matin&Hulme, 2003).

Cook (2013) postulates that there is need to increase our conceptualization of the conditions at the ground because rural livelihoods is a very wide concept which cuts across a number of different dimensions and disciplines to capture various ways in which ecological and socio-economic system and governance influences the income generating activities and their distribution in rural areas. Obtaining credible and systematic data on rural livelihoods is very crucial for promoting valid decisions based on the facts. The inadequacy of organized information bridging various aspects of rural livelihoods becomes an impediment in supporting effective decisions aimed at reducing poverty among the rural population in rural areas and also food security. Food and Agriculture Organization (2004) to bridge this gap, it is important to provide the policy makers, stakeholders and decision makers with a special platform that carries all systematic and credible information and indicators and also developing a Rural Livelihoods Monitor (RLM). These will also aid the monitoring and evaluating the progress of FAO's Strategic Objective 3, which aims at curbing rural poverty.

The RLM indicators are laid down along six dimensions. These dimensions include, the Social Capital which refers to the degree of organization and empowerment of the people living in rural areas; Natural capital which refers access to natural resources such as land, water; Knowledge capital, which refers to access of producers living in rural areas and rural households embracing the technologies and knowledge on inputs and markets However, in this study the concept of rural livelihoods is operationalized as follows: the perceived change in the life of the residents(improved livelihoods) regarding their incomes, access to better healthcare and security as a result of rural electrification (Qiao*et al.*, 2015).

2.3.2: Rural Electrification and Improvement of Rural Livelihood: A Review of Linkages.

This study focuses on three aspects of rural electrification that are known to influence rural livelihoods. These aspects include access, affordability and reliability of electricity.

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With respect to access, Kenya like most of the Sub-Saharan Countries is not an exception in facing energy problems. According to International Energy Agency (IEA 2008), the SSA electricity access stands at approximately 28.5% with urban areas standing at 57.5% and rural areas standing at 11.95 electricity access. Kenya electricity access levels are wanting with access standing at 51.3% in urban areas and 5% for rural areas which are still below SSA average of 15%.

A study by the Ministry of Environment and Natural Resources (MENR 2005) revealed that over 70% of the total energy consumption was from wood based products. The study also revealed that 93% of the rural population relied heavily of this source this is because these communities are heavily dependent on the use of traditional fuel sources such as firewood and charcoal for their lighting, cooking and heating and as a result this poses adverse effects related to health complications and indoor pollution. The ministry of energy arrived at an agreement that a new approach was required to tackle issues of power supply to poor rural households. In 2006/7 the "*Umemepamoja*" which means "electricity together", was initiated by Kenya Power and Lighting Company. The aims of this initiative were to promote electricity access among the rural households and also to get the rural households connected collectively to the power grid thus reducing the cost.

As noted earlier, affordability is another factor that determines the extent to which an energy form impacts livelihoods especially for households living in rural areas. Due to this fact rural households have ended up relying on traditional sources of fuels such as kerosene, firewood and farming residues for uses such as lighting, cooking and heating. Key obstacles towards rural electrification are summarized as, inadequate finance to cover capital and operational cost for generation and transmission which are even higher than in urban areas. In additions of high power connection cost accompanied by low consumption of electricity and low incomes among rural households are further obstacles to rural electrification (World Bank 2010). In developed countries high costs of power tariffs fall in the range of US$0.04 to US$0.08 per kilowatt-hour whereas, in Sub-Saharan Africa, the average tariff is US$0.13 per (World Bank 2015)

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The lifestyle of citizens and the level of economic growth are mostly determined by availability of electricity in the country. Cabraal and Barnes (2006) observes that the availability and affordability of electricity has a great impact touching different aspects like; better lighting hence enabling students to study a little longer which will bring about better academic performance. The researchers further submitted that other activities at home can be made easier when there is proper lighting, social gatherings after dark, and many others.

Another vital determinant of the extent to which a given energy form impacts livelihood is its reliability. One of the basis of evaluating programme dedicated and aimed to improve the reliability of electricity systems is that these investments should be economically efficient. Over decades, Africa has had problems with regard to the quality of electricity supplies. These problems have been brought about by fluctuation in power supply which tends the businesses negatively these has resulted to most of African manufacturing enterprises experience power outages on average 56 days per year. As a result, firms lose 6 percent of sales revenues in the informal sector.

The Kenyan government has directed a lot of resources towards financing rural electrification programmes. Growth of the agricultural sector is attributed to the availability of electricity which is mostly used in mechanization of agricultural activities and irrigation and this in the end brings about economic development Rural electrification has been recognized as a key ingredient in poverty reduction and the enhancement of social and economic development. The United Nations has established that the human development index (HDI) has a positive relationship per capital energy consumption in many countries and there is empirical evidence to show that access to modern energy and human development are closely linked (UNDP, 2005).

The next sections present the nature of linkages between the three indicators of rural electrification (access, affordability and reliability) and their perceived benefits to the various dimensions of rural livelihoods. These dimensions are growth of business, security and healthcare.

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2.3.3: Effect of Access, Affordability and Reliability of Electricity on Growth of Businesses.

There is a large and growing body of literature on the role of micro, small and medium enterprises in the growth of per capita income for various national economies. The strategic importance of small and medium enterprises (SMEs) in national economic development is widely recognized in both the developing and developed countries (Moha *et al.,* 2000). Recent research has also suggested that small and medium enterprises play integral role in promoting economic growth in developing countries.

In all countries in the Asia-pacific region, SMEs occupies a prominent position in their development agenda and this can be evidenced by substantial resources and efforts from the public sector that have been directed at the promotion of SMEs potential and growth (Moha*et al.,* 2000). The growth of micro, small and medium enterprises is positively associated with the existence of basic infrastructure such as roads, modern energy and information and communication technology. In rural areas, lack of adequate infrastructure such as electricity, transport, communication and availability of other complementary services such as inputs, access to markets and credit support agencies is a major impediment to the development of enterprises (Singh, 2009). Due to the significant role that SMEs play in enhancing the national economic development in various developing countries, national infrastructural policies continue to be formulated and developed in order to expand their coverage and overall contribution.

Electricity as consumption and an intermediate good has been linked to income growth and therefore a causal relationship exists between income and infrastructure (Cook, 2013). Rural electrification promises a brighter future for many rural communities and in the long term, the benefits of providing electricity to poor households can be high. Research study outcomes have given evidence indicating the positive relationship between electricity consumption and gross domestic production and this correlation has been reflected by the relationship existing between the electrification rate in a country and the percent of households who are living above the poverty line of two dollars per day (Kirubi, 2006).

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Whereas demand for energy in urban areas is high due to large commercial enterprises, the energy demands of commercial sector, small industry and communities in the rural areas follow similar evolutions to those of households as economic activity increases (Fishbein, 2003). Electricity is an important condition for the development of rural businesses and that under the right circumstances it can result in significant economic growth. As evidenced by the existence of numerous research studies, the social and economic benefits of electrification have been researched over the last two decades. Barnes (2012) established in his review that in households with electricity, people have enhanced chances of undertaking activities that require higher levels of lighting as opposed to households with no electricity. Consequently a research study conducted by Singh (2009) found that businesses in rural areas of developing countries with access to electricity such as home businesses, small commercial shops, grain mills, saw mills, coffee and tea processing, brick kilns and other small scale enterprises can benefit from rural electrification programmes.

In his book "Rural Electrification and Rural Development" Cook (2013) points out that the effect of rural electrification on small businesses should be determined by the nature of the local community, the complimentary programs and the ability of rural entrepreneurs. He further emphasizes that although electricity is an important and essential input that can spur and help in the development of small industries, the other complementary conditions such as access to good rural markets and adequate credit should also be considered. The sentiments are further buttressed by Otieno and Awange (2006) who opines that since the above complimentary conditions are not uniformly distributed in all rural areas, the anticipated growth of enterprises in rural areas provided with electricity can be slow. Rural areas without electricity have worse record of business development when compared to rural areas provided with electricity.

A study conducted by World Bank in Philippines revealed that small home businesses were more active in areas with electricity (World Bank, 2008). Similarly, a survey conducted in all countries in the Asia-pacific region, SMEs occupies a prominent position in their development agenda and this can be evidenced by substantial resources and efforts from the public sector that have been directed at the promotion of SME potential and growth. The growth of micro, small and medium enterprises is positively associated with the existence of basic infrastructure such as roads, modern

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energy and information and communication technology (Moha*et al.*, 2000). In rural areas, lack of adequate infrastructure such as electricity, transport, communication and unavailability of other complementary services such as inputs, access to markets and credit support agencies are major impediments to the development of enterprises (Singh, 2009). Due to the significant role that SMEs play in enhancing national economic development in various developing countries, national infrastructural policies continue to be formulated and developed in order to expand their coverage and overall contribution. Various governments, especially from developing countries are increasingly carrying out programs that are focused on helping micro, small and medium enterprises that make up the bulk of business in rural areas and where most of the poor live, to develop more profitable and efficient enterprises (World Bank,2008).

A study focusing on the effects of rural electrification in Abuja state in Nigeria, conducted by Abegio and Okefe (2009) revealed the growth of micro, small and medium enterprises is positively associated with the existence of basic infrastructure such as roads, modern energy and information and communication technology. Infrastructure affects growth through a number of channels both direct and indirect. The most evident direct link is often through the productivity effect, where an increase in the quantity of infrastructure is anticipate to increase the output of other factors. Similarly dragging the speed of electrifying the rural areas in most developing nation is either through power grid extensions and stand-alone grid approaches have caused the slow growth rate of business enterprises.

On the other hand a study carried out by Singh (2009) revealed that businesses in rural areas of developing countries which are electrified such as home businesses, small commercial shops, grain mills, saw mills, coffee and tea processing, brick kilns and other small scale enterprises can benefit from rural electrification programmes. Rural areas without electricity have worse record of business development when compared to rural areas provided with electricity.

Recent research has also suggested that small and medium enterprises play an integral role in promoting economic growth in developing countries. A study carried out by Leegwater and Shaw (2008) found out that developing countries with larger share of small and medium enterprises have higher economic growth when compared to their

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counterparts. With lesser share SME's recognition of the integral role that SMEs play in national economic development is as a result of their perceived importance in enhancing forward and backward linkages in economically diverse sectors of the economy (Ng'ang'a&Onyango, 2009). According to Vandenberg (2009), SMEs can enhance economic development in developing countries by employing more workers per unit of capital when compared to large enterprises and can contribute towards the achievement of more equal income distribution in society.

In most developing countries it is very evident that availability to electricity brings about change in technology. In Indonesia for examples, there was a change from manual to electrical machines in the shoes production industries hence increasing the level of production (Tambunan, 2008). In Philippines, many ME's activities transformed their technical and economic efficiency by going over to modern technology powered by electricity. This leads to the question: "Do electricity services play an important role in stimulating micro enterprises development in rural areas?" It is very evident that electricity brings about economic development like for instance establishment of small enterprises like bakeries, green grocers and saw mills in Nepal (Meadows*et al.*, 2003).

Some authors cite findings from the literature and use only qualitative information to indicate the impact of electricity on Micro-enterprises. In Indonesia access to electricity brought about a revitalization of the Micro Enterprises like beauty parlors, bakeries and battery charging. According to Kerre&Nummela (2010), there is a similar growth in ME in rural Peru due to access to electricity because new commercial enterprises were created. The clothing and textile sector grew tremendously and expanded due to rural electrification in Brazil and Mexico bringing about increased production through subcontracting. Tambunan (2008) points out that there is a high impact of rural electrification on micro enterprises as was the case in South Africa's Northern Province of Elandskraal. This position was supported by Jimenez (2017) who argued that electricity brings about diversified growth in small and microenterprises.

In Namibia, a study carried out on the impact of rural electrification on social–economic development, revealed that electric power services clearly did not seem to have had a quantifiable impact on the growth of income generating

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endevours(Wamukonya & Davis, 2001). The outcomes of this study also revealed that number of households with home-based income generating activities were among the highest households without the access to electricity. Furthermore, the study also revealed that a few home-based enterprises had accessed electricity and it for income generating activities only for lighting purposes. From the study it clear that none of the home-based businesses using electric power started after rural electrification, therefore electric power could not have been a motivating factor behind the birth and growth of the new micro-enterprise (Wamukonya & Davis, 2001).

2.3.4: Effect of Accessibility, Affordability and Reliability of Electricity on Security

According to a research conducted by the Security Research and Information Centre (SRIC), it was found that theft was the main type of crime in the country accounting for 35.37% of all crimes. Other common types of crime were robbery (15.55%), burglary/break-ins (10.67%) and mugging (23.17%) with the three crime categories accounting for 84.76% of all crimes committed in Kenya. According to the National Crime Observatory Project Bi-Annual Report (2012), the highest number of crime incidents reported in Nakuru were 'theft' and 'armed robbery', with 423 and 342 cases being reported respectively. The report also noted that other prevalent crimes in Nakuru included murder, break-ins/burglary, domestic violence cases, rape and defilement, assault, kidnappings, and drug/firearm trafficking and possession.

In Kenya, stealing is defined under sections 268 of the penal code as where a person without the claim of right, fraudulently takes anything capable of being stolen. The punishment for stealing is defined under section 275 as being imprisonment for 3 years. According to Green and Stuart (2012), stealing is simply the act of taking the property that belongs to another person without the consent of that person and with the intent to deprive the rightful owner of its possession. Green and Stuart (2012) further says that the property theft is most of the times executed during nights than during the day and is more associated with the lack of light that may be availed through electricity. Urban lighting projects on the other hand were introduced to help reduce and prevent neighborhood crimes such as stealing which has been quite prevalent in Rongai sub-county. The influence of electrification on stealing in Nakuru Town has not yet been documented. This research hence seeks to document the influence of electrification on stealing in the study area.

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Assault and battery is another form of crime normally committed when there is excess darkness (absence of electricity) in the study area. Assault and battery is a combination of two violent crimes but the legal distinction exists only in jurisdiction where assault is associated with threatened violence while battery on the other hand has been associated with actual violence. According to Marcus *et al.*,(2002), battery involves an actual physical contact with the victim which leads to bodily injury or offensive contact while assault on the other hand does not really include physical contact with the victim but rather as intentional frightening of another person. The two offences can be aggravated thus become felonious in nature for example, aggravated battery is a felony hence should be punished as such and as per a country's statute. This is because most battery are committed with the intent to murder or rape. Similarly, assaults are usually committed with the same intent to kill and rape and therefore, should be punished as felonies and not misdemeanors Marcus *et al.*, (2002). They outline that what constitutes a deadly weapon automatically reflects an aggravated assault.

In Kenya, crime statistics survey conducted by National Crime Observatory Project Bi-Annual Report (2012), indicated high numbers of assaults and battery. For example, Nakuru County has constantly registered high number of domestic violence cases. Rural electrification can therefore prove very important in solving such social disorders in the community and neighborhoods so as to ensure safer environments to live in and especially, the crimes of assault and battery which have been more prevalent in the study area(Security Research and Information Centre, 2012).

Another common type of crime in the study area is burglary and housebreaking. Burglary involves an illegal or unlawful entry into a building for the purpose of committing an offence mostly stealing. In Kenya, burglary is distinguished from housebreaking in that burglary involves gaining an illegal entry into a building in the night which starts from 6pm to 6am while housebreaking on the other hand refers to an illegal entry into a building during day time starting from 6am to 6pm. These crimes are normally very prevalent in the study area. Many cases are usually reported according to National Crime Observatory Project Bi-Annual Report (2012). The two crimes have been prevalent in Nakuru where people have broken into buildings to steal property so as to make ends meet for them in hard economic times. Rural

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electrification initiative is envisaged that it would reduce the two offences (Security Research and Information Centre, 2012).

Murder is also common in the study area. Murder has been considered a capital offence or crime because of its lethality. In Kenya, murder is provided for in section 203 of the Penal Code CAP 63 Laws of Kenya. It's defined as where a person causes the death of another by an unlawful act or omission when the person in fact has malice aforethought. Under section 204, the retribution of murder is provided for as being sentencing to death. Section 202 on the other hand provides that any person who causes the death of another person by unlawful act or omission and without malice aforethought is guilty of a felony of manslaughter which is punishable by life incarceration. Murder has been experienced in several circumstances in our country for example, during terrorist attacks, inter-ethnic clashes, robbery and robbery with violence among others. Rural electrification is believed that it can be effective in reducing or preventing the menace of homicide that has led to loss of many innocent lives in the study area and Nakuru County at large.

In developing countries, the socio-economic development in the rural areas is believed to come as a result of access to electricity. In the rural areas, electricity is only seen to be important for lighting and entertainment as opposed to the cities where it is so much used to support income generating activities. The rural residents believe that lighting is a source of security and convenience and only few see electricity as an important tool in supporting economic development.

Their report indicated that since the 1980s, the murder rate had risen by 132%. While this figure does not differentiate between rural and urban rates, it does not bode well as a signal for the country as a whole. Some have downplayed the roles of organized crime and drug cartels, suggesting other socioeconomic factors are responsible (Insight Crime, 2013). This would seem, in the context of this particular research, to offer an opening for Rural Electrification and other development programs to have an impact. Carr (2014) observes that regrettable, the data are not available to test this hypothesis. He further submits that while crime rates on a national level and for most major cities in Brazil – especially tourist destinations along the coast – are readily available, rural statistics are harder to come by.

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Across India crimes against public order, the formal term for riots, has risen each year for a total 263.5% since 1953 (National Crime Records Bureau, 2013); similarly the overall rate of crime has risen irrespective of electrification, rural or urban. There are no data regarding whether crime rates are higher in urban versus rural areas. Incidents of terrorism sharply increased after 2006, particularly in the northeastern areas of the country (Global Terrorism Database, 2014). But again, just like Brazil, we are unable to separate the signal from the noise to determine correlation, much less causation. In sum, even as India inches towards its ultimate goal of electrifying every village, many questions remain as to the efficacy of these programs, how success is measured, and the ultimate cost and sustainability (Carr, 2014).

In addition, Carr (2014) observes that the impact these programs have on security and stability are still unclear. Attempts to classify the precise impacts of rural electrification efforts on security and stability run into the same difficulties as observed in Brazil and India: accurate data is difficult to come by, and that which is available is aggregated at too high of a level – country or state data that does not differentiate between rural and urban settings. Because Rural Electrification schemes do not have the same direct impact on stability and security as, for example, hiring more police officers might, it is difficult to pin down their effects on domestic stability and security (Puri, 2006).

Another study was conducted by Bensch*et al.,* (2012) on effects of Solar Home System (SHS). The study aimed to assess the potential security impacts of electrification with a major focus on robberies and pillages as well as animal attacks. Within the sample used for the study, it was observe that there were more cases among SHS using households. This can be justified that robbers only target richer households and in this case the richer households tend to be more electrified than the poor households hence being more affected by robbery cases. However, this is not always the case and it can't just be said that access to electrification brings about robbery. When a household connects electricity, they use outdoor electric lighting that is believed to prevent robbery at night. There is no data however, to justify the fact that outdoor lighting at night prevents robbery cases.

On attack by animals, the study revealed that a larger percentage of the respondents, improved lighting reduces attacks by snakes and scorpions. From the respondents,

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with lack of proper lighting people are not able to see these world animals and hence only get bitten and because these animals fear light, availability of better lighting keeps them away from the houses. However, according to Bensch*et al.,* (2012), it is not clear of the more attached be it the using and non-using households.

To have a grasp of more a subjective feeling of security, the researcher came up with a more structured questionnaire focusing on behavior at night and people's perception of darkness. Among the answers received, some said that much as they would love to go out at night, they don't because of the fear of darkness. From the analysis, it was found that more of the households with electricity had a tendency of being out of their houses after nightfall. This wasn't the case though for children below the age of 20 years since they were always in the house after nightfall (Bensch*et al.*, 2012).

The Second Islington Crime Survey is one of the many surveys which revealed the Public's faith towards proper stress lighting as a way of reducing crime. The survey entailed respondents in high-crime, inner-city area picking three leading items ina number of options for curbing and reducing sexual attacks and sexual harassment towards the women. The survey revealed that 'Better street lighting' was the second most preferred methods chosen by the males, who preferred the tradition methods such as 'harsher penalties'. For the female respondents, the survey revealed most of the women preferred self-defense courses than street lighting which was their third item picked (Welsh, 2008).

The quality of life is highly affected by street lighting in equal measure as it is affected by crime. The Second Islington Crime Survey included an item relating to a whole gamut of neighbourhood problems (Marchant, 2013). From the survey, among the answers received poor street lighting was mentioned either a big problem by half of those interviewed, i.e. 1600 respondents. However, there were a bigger number of problems that were mentioned by the respondents other than lighting, including; dirty streets, unemployment, poor housing, air pollution, inadequate facilities for the youths and poor health care services.

According to Blanc (2008), there are both positive and negative effects of lighting on crime. For instance, when there is adequate lighting in streets the criminals are able to see the objects that interest them. Electricity also leads to increased demand of certain objects that are more targeted by criminals hence increasing criminal activities.

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Availability on the other hand leads to improved security technology that can be used by both police and individual households like alarm systems, and surveillance cameras. According to Welsh (2008) it is also easy to identify any criminal activities when there is better lighting. From the empirical literature, it shows that crime is more deterred in most developed countries.

Kohlin*et al*., (2011) also found observational studies dealing with electrification of communities. These studied revealed that electrification had a positive impact through better schools where would prefer to be in schools spending much of their time planning for the lesson, better health outcome evidences by proper refrigeration facilities, improved security coupled with proper street lighting, greater social capital, increased employment opportunities and other economic opportunities such as better communication with markets and better storage facilities. Lastly, electrification as a renewable source of energy results to wider environmental benefits such as reduced cutting down of trees and also reduced pollution, relying on the methods used to generate electricity. The outcomes of these are better health and welfare.

2.3.5: Effect of Access, Affordability and Reliability of Electricity on Health Care

With good health, people will increase their productivity, children will perform well academically, they will live longer, and they will have more to save and invest since much won't be spent on medication. Kaseje (2006) observes that there are many macro benefits that can be derived from this improved health. For instance, increased saving and investment will lead to economic growth, and there will be equity and socio-political stability. Therefore, improved health is an instrumental aspect for human development. However, (Von-Schirnding, 2002) postulates that many policy analysts have ventilated their dissatisfaction with the current levels of progress in Sub- Saharan Africa. According to the analysts the Sub Saharan Africa will not be able to afford and be able to provide proper and adequate healthcare to its populace by the year 2020, and also may not be able to meet the United Nations millennium development goals as a result on increasing poverty levels. Kaseje (2006) asserts that health must be viewed as key and vital aspect of productivity rather than as an unproductive consumer of public budgets.

Kaseje (2006) observes that decentralization of public services undermined by the scarcity of resources in most SSA countries. The competition for the scarce resources

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makes the health sector to be ranked as being among the lowest during prioritization of national development. During the Abuja declaration in 2001, the African Union's heads of states pledged to allocate more funds to health care though this is yet to be achieved by many of these countries. In Africa, instead of at least US$27 required to support health care services, only US$10 is used. This shows that approximately five percent of the GDP of these countries is allocated to the health sector and half of the population does not have access to the health facilities. On the other hand, out of the total population in African countries, only 60% has access to safe drinking water and sanitation. Due to this low allocation of funds towards the health sector, most African counties are bedeviled by such challenges as; high levels of maternal, child, and infant mortality and low rates of immunization (WHO, 2003).

According to IEG report (2008), due to access to electricity, all the equipment at health facilities that require electricity will be functional in addition to the long hours that the health facilities will be open to the public. According to a survey conducted for Kenya and Bangladesh by IEG, it was found that clinics which had access to electricity were open for an extra hour. In addition, electricity facilitates preservation of vaccines to the required temperature through refrigeration IEG (2008). To maintain a store of vaccine in the rural areas, health clinics need refrigerators, which are most easily and cheaply operated by electricity. This implies that rural electrification can help to bring down the cost of providing immunization and be part of the routine services offered by a clinic.

According to Gibson and McKenzie (2007), there are immense benefits that are derived from electrification in the rural areas. For instance, electricity serves as a substitute for fuel where paraffin and candles are used hence reducing fires in addition to helping in reduction pollution that comes as a result of firewood used for cooking and heating. Due to electrification, clinics now offer better health care services and schools have improved their services including the introduction of evening classes for the adults in addition to other computer supported services like photocopying and printing hence bringing about efficiency. Borchers & Hofmeyr (2001), adds that crime was reduced due to street lighting.

A study carried out by Kageni (2012) in TharakaNithi County revealed that rural electrification has a direct influence on quality of services in health facilities including

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dispensaries, health centers as well as hospitals thus improving quality of health care among local communities. In addition, residents attributed electrification of health care facilities to extended time of service delivery which run overnight. In line with these findings, a study by ESMAP (2007) established that nurses in electrified clinics were able to attend to emergencies even at night as the facilities were open for longer hours. Furthermore, respondents' positive perception on improved healthcare delivery could be attributed to enhanced use of electric equipment essential for diagnosis and treatment of complex diseases and illnesses. For instance, medical supplies by health centers could be now refrigerated for preservation which could not previously be done without electricity. Refrigerators in the facilities have facilitated the service of instant immunization of children at health centers of the services and reliability that previously did not have fridges. With reliable source of power, hospitals operated more effectively, more so with the use of sterilizers and electrical detection equipment in rural clinics and more was guaranteed.

According to Hutton (2006) the health benefits of rural electrification operate through channels such as improvement of health facilities , better health from cleaner air as households reduce use of polluting fuels for cooking, lighting and heating. Improved health according to Hutton is also due to improved health knowledge through access to television and better nutrition through the media.

2.4: Conceptual Framework

This is a framework that has both independent variables which in this case is the access, affordability and reliability of electricity that leads to improvement of rural livelihoods which in this case is the Dependent variable. This is summarized in Figure 2.2

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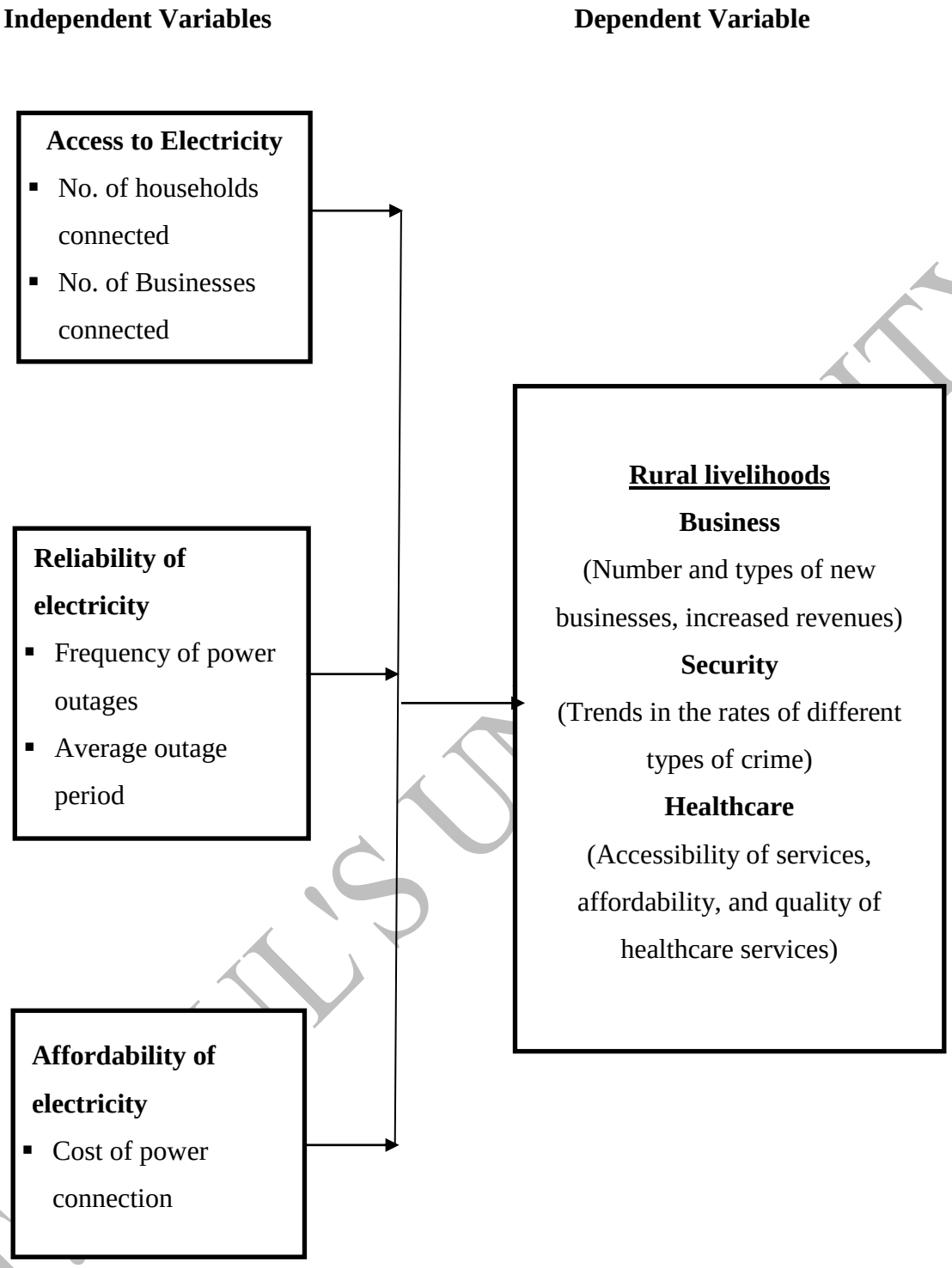


Figure 2.2: Effects of Rural Electrification of Rural Livelihoods

2.5: Research Gap

Various researches on the relationship between rural electrification and business growth have been done. However, majority of these studies have failed to link this growth to improved livelihoods. Researchers who have gone ahead have made efforts to link this growth of businesses to economic growth of various regions. Welsh (2008)

argues that, since economic growth is a means to human development, major focus should be on ensuring that freedom is the basis for this human development and not the other way round. A person's welfare is only achieved when he/she has the freedom to make choice about the kind of life he/she wants to live.

Much has been written about the benefits of Rural Electrification (RE) from a development perspective. Very little has been written as to the security benefits it may or may not provide. Numerous sources note the "public good" aspects of outdoor lighting, and electric pumps in a village square that eliminate long and potentially dangerous trips to streams and rivers, but few address the impact of RE on the stability and security of rural communities. In many cases it is not even estimated owing to incomplete data gathered. It is not clear whether the effect that rural electrification has on security is positive or negative.

Despite the acknowledgement of health care as very crucial to development, much less has been written on the effect that rural electrification has on delivery of health care services. In majority of the incidences, health care has just been included in the list of benefits that accrue to populace as a result of rural electrification.

2.6: Summary of Reviewed Literature

The current study aimed at assessing the effect of rural electrification on rural livelihoods. The major focus of the literature review in this study was the theoretical framework upon which the study is based. This study is based on AmartyaSen's theory on human development. It also includes a review of literature on the effect of rural electrification on growth of businesses where it is clear that rural electrification is positively correlated with growth of businesses as evidenced various studies for example, a study conducted by World Bank in Philippines revealed that small home businesses were more active in areas with electricity . Literature has also revealed that rural electrification has an effect on security. It is however not clear whether the effect is positive or negative. It is also clear that rural electrification has an effect on the delivery of health care services. Literature has also revealed that rural electrification has a positive effect on rural livelihood.

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CHAPTER THREE
RESEARCH METHODOLOGY

3.1Introduction

The design and methodology used are outlined in this chapter. It describes the research design, target population, and the sampling procedures that were used. It also describes how the data collection and analysis processes to be used.

3.2Research Design

The research designed used in this study was a cross sectional survey research design this is a present oriented methodology used to investigate populations by selecting samples to analyze and discover occurrences (Oso&Onen, 2008). This design allowed the researcher to collect data from a large sample and to use it in intensive analysis. The research design helps the researcher to get respondents' opinions and feelings on issues relevant to the study. Also, since it collects data at a point in time, cross sectional survey research design is cost effective as it saves time and money (Bhattacherjee, 2012).

3.3Target Population

This study targeted the households in Sub-County. Rongai Sub-County is one of the sub-counties in Nakuru County in Kenya. The sub-county is about 1049.1 square kilometers in size with a population of approximately 130,132 people with approximately 31,840 households (KNBS, 2013). Borg and Gall, (2009) defines the target population as the population from which the generalization of the study's results are derived by the researcher. Kothari (2008) describes the term universe as the total of items or units in any field of inquiry, whereas population refers to the total of items about which information is desired. Approximately, 70% of its population is estimated to be comprised of the rural communities. They therefore made the best target population this study that sought to examine the effect of rural electrification on rural livelihoods in Rongai Sub-County.

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Table 3.1: Population per Ward

Ward	Population(National Census 2009)	No. of Households	Area in Km^2
Menengai west	27,881	6900	118.7
Soin	24,969	7550	292.5
Visoi	31,368	5400	204.9
Mosop	27,047	4890	197.2
Solai	18,867	7100	235.8
Total	**130,132**	**31,840**	**1049.1**

(Source KNBS 2013)

3.4: Sampling Frame

The sample for this study was drawn from the households in Rongai sub-county. A sample frame is a list containing sampling units which are units or cluster forming the basis upon which the sampling process is founded. This sample frame has been defined as the actual set of units from which a sample has been drawn (Kothari, 2004).

3.5: Sample Size and Sampling Technique

The sampling frame was 31,840households in Rongai Sub-County (KNBS, 2009). Cluster sampling method was used obtain the sample from different wards (clusters) in the Sub-county. The sample size in each cluster (ward) wasdetermined by the percentage of cluster population (ward population) in the entire target population (McMillan, 2014). For instance, if a given ward constitutes 20% of the total population of the sub-County, 20% of the sample will be drawn from this ward.Random methods were then be used to select respondents (households) from each cluster. This method ensured that all the administrative wards are represented in the study. The following formula, suggested by Nassiuma (2000) was used to come up with an appropriate sample size for the study.

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

$$n = \frac{31840(0.25^2)}{(0.25)^2 + (31840 - 1)\,0.02^2}$$

$$n = \frac{1990}{12.8}$$

$$n = 155.5$$

Where: n = Sample size,

N = Population size

C = Coefficient of variation which is fixed between 0 – 30%

e = Margin of error which is fixed between 2-5%.

The sample size was be calculated at 25% coefficient of variation, 2% margin of error and a population of 31840 households.Twenty five percent (25%) coefficient of variation was used to ensure that the sample size is wide enough to justify the result being generalized for Rongai sub-county. Two percent (2%) margin of error was used because the study was a cross sectional survey, whereby the independent variables were not to be manipulated. Using the above formula, a sample of 156 households was obtained.Table 3.2 shows the population of 31,840 households and the percentage proportion for each ward (cluster) in Rongai sub-county. It also shows the calculated sample size for each ward and the total sample size for the study.

Table 3.2: Sample Size per Ward in Rongai Sub-County

Ward	Population	Households	Proportion (percent)	Sample size
Menengai west	27,881	6900	21.7%	34
Soin	24,969	7550	23.7%	37
Visoi	31,368	5400	17.0%	26
Mosop	27,047	4890	15.4%	24
Solai	18,867	7100	22.3%	35
Total	**130,132**	**31,840**	**100.0%**	**156**

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3.6: Data Collection Instruments and Methods

Both primary and secondary sources of data were used. Primary data was obtained in the field using observation, questionnaires and interview schedules. A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms. The Questionnaires comprised of both open and close ended questions designed to answer research questions in chapter one of the study. They were administered by the researcher and responses recorded as the interviews progressed. Secondary data was collected from secondary sources. These include data from the ministry of energy, books, journals and research papers from other researchers as well as private and public organizations.

3.7: Validity

The researcher provided the specialists in the department of development studies with the data collection tool to assess whether the items in the tools are representative of the area under study. Orodho (2005) defines validity as a non-statistical method used to validate the content employed in the instruments.

3.8: Reliability.

Reliability involved the researcher carrying out a pilot in Elburgon Town, Molo Sub-County, Nakuru County. Reliability is the ability to yield the same results when repeated measures are taken of the same subject under the same conditions (Lovell and Lawson, 2001). The researcher also employed a test re-test technique by subjecting the questionnaires to the same respondents after a period of two weeks. The pilot study assisted the researcher to evaluate the precision of the questionnaire items so that those items found to be insufficient or not species were either removed or modified to improve the quality of the questionnaire thus increasing its reliability.

3.9: Data Analysis and Presentation

This involves bringing the raw data that has been collected together in a summarized manner in order to give room for organization and categorization by the researcher (Bhattacherjee, 2012). This enabled the researcher to derive information from the tools used in data collection. The study used both qualitative and quantitative techniques. Qualitative data required respondents to indicate the opinions, statements and suggestions. This was the case for the open ended questions in the questionnaire. Qualitative analysis therefore consists of categorizing, tabulating and recombining

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evidence to address the research questions which were used as unit of analysis. Qualitative data was analyzed by organizing data in to themes, patterns and sub-topics.

Quantitative data was analyzed using descriptive statistics such as frequencies (numerical counts), percentages, measures of central tendencies (mean, mode and median) measures of variability such as standard deviation and variance.Descriptive statistics helped the researcher describe raw datain a manner that make sense (Kothari, 2004).It helped to reduce the volume of raw data into simple summaries that are relevant to the research issue. The Statistical Package for Social Sciences (SPSS) was used to facilitate this analysis. The results were presented using tables to make meaningful conclusions.

3.10: Research Ethics

As part of research ethics adherence, the researcher gotpermission from the concerned authorities and also from the respondents who took part in this study. The researcher voiced the purpose and objectives of this study to the participants so that they can make informed choices on whether to take part or not to take part in the study. The researcher also assured the participants ofconcealment and confidentiality. The researcher also acknowledged all the literature that have beenquoted in the study to avoid cases of plagiarism

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CHAPTER FOUR
DATA ANALYSIS INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter presents the study findings. It begins by describing the demographic characteristics of the respondents. Thereafter, the results corresponding to the specific objectives of the study are presented. The chapter focuses on specific issues such as the effect of accessibility to electricity on rural livelihoods, the effect of affordability of electricity on rural livelihoods and the effect of reliability of electricity on rural livelihoods in Rongai Sub-County.

4.2 Questionnaire Return Rate

Respondents were given questionnaires which they filled and returned to the researcher. The questionnaire return rate is as presented on Table 4.1.

Table 4.1: Questionnaire Return Rate

Category of Respondents	Sample	Questionnaire Returned	% Return Rate
Households	156	148	94.9

Table 4.1 indicates that the response rate achieved for the household questionnaires was 94.9%. The return rate was considered adequate in providing valid and reliable presentation of the targeted population. The high response rate is was attributed to the fact that the researcher administered the questionnaires personally. According to Mugenda and Mugenda (2012), a response rate of about 50% is adequate, 60% is good and 70% and above is very good. The response rate was 94.9 was regarded as adequate and credible to allow analysis of data to be collected hence generalization of the findings to the target population.

4.3 Demographic Characteristics of the Respondents

This section presents the demographic characteristics of the respondents in terms of age, gender, marital status, education, employment status and income earning.

4.3.1 Age of Respondents

Age has been shown to influence how household heads behave and to some extent their uptake of various development projects. This may in the long run affect the

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development in an area. Respondents were therefore asked to indicate their ages. The responses were as summarized in Table 4.2

Table 4.2: Percentage distribution of the Respondents by Age

Age brackets	f	%
20-29	45	30.4
30-39	81	54.6
40-49	15	10.4
50- above	7	4.6
Totals	**148**	**100**

Mean = 44.78, Minimum = 25, Maximum = 75, Std. Deviation = 14.4

Table 4.2 indicates that the age bracket of 20-29 comprised of 30.4% of the household heads. It also shows majority of the household heads (54.6 %) were in the age bracket of 30-39 years. Few household heads (10.4% and 4.6%) were in the age bracket of 40-49 years and 50 years and above, respectively. This indicates that a higher percentage of the households in the study area are headed by middle aged persons.

4.3.2 Gender of Respondents

This study sought to determine how the respondents were distributed by gender. Table 4.3 indicates the percentage of respondents by gender.

Table 4.3: Percentage of the participants by Gender

Gender	f	%
Male	88	59.5
Female	60	40.5
Total	148	100.0

Source: Field Data (2017)

From the study results majority of the respondents (59.5%) were males while (40.5%) were females. It is clear that more male household heads participated in the study than their female counterparts. This could be probably attributed to the cultural factors existing in the area of the study. Due to cultural factors, most female are not allowed to head households in the study area. The finding is also consistent with Munene (2012) who found that only 34% of household in rural areas in Kenya are female-headed. This may explain the imbalance of the gender in the study.

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4.3.3 Marital Status of the Respondent

Majority (75.7%) of the respondents were married. This is shown in Table 4.4.

Table 4.4*:* Percentage of the respondents by marital status

Marital status	f	%
Widowed	9	5.9
Single	27	18.4
Married	112	75.7
Totals	148	100.0

Source: Field Data (2017)

Some of the respondents were single (18.4%) while a few were widowed (5.9%). Since majority of the respondents were married and with possibility of having children, electrification in the study area may be assumed to benefit a lot of people in the respective households.

4.2.4 Level of Education of the Respondents

Most of the respondents had less than tertiary level of education as shown in Table 4.5.

Table 4.5*:* Percentage of the respondents by Education level

Level of education	f	%
No formal education	20	13.5
Primary	30	20.3
Secondary	54	36.5
Tertiary (college)	24	16.2
Tertiary (university)	20	13.5
Total	148	100.0

Source: Field Data (2017)

Majority (36.5%) of the respondents had secondary level of education. This was followed by respondents with primary level of education as represented by 20.3%. About 16.2% of the respondents had tertiary (college) level of education. About 13.5% had no formal education while a similar proportion had tertiary (university) level of education. These results imply that majority of the household heads may lack adequate formal education which is necessary to better decision making at the

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household level. In addition to this, the level of education of the household head can influence the kind of decision that may be made on behalf of the entire household with regard to adoption of development issues such as electrification. More educated household heads are likely to make better decisions as well as quickly adopt new technologies as compared to their less educated counterparts.

4.3.5 Employment Status

Majority of the respondents were not in any formal employment as depicted in Table 4.6.

Table 4.6*:* Percentage employment status of the respondents

Employment status	f	%
Employed	42	28.4
Not employed	106	71.6
Totals	148	100.0

Source: Field Data (2017)

An overwhelming 71.6% had no formal employment and only 28.4% were employed (Table 4.6). This may imply that majority of the households may be having less income and could be disadvantaged in implementing projects such as electrification.

4.3.6 Household Income per Month

The study area had households whose income per month varied for example majority of the respondents had monthly income that ranged from Kshs. 5000 to 9,999 as represented by 64.6% of the total respondents. According to Oxford Poverty and Human Development Initiative (2017) the poverty line for households in sub-Saharan African was $1.90 a day in 2017. The 5,000 to 9,999 income range translates to $1.7 to $3.2 a day, which suggests that a majority of the households in the study are above the poverty line. This is closely followed by households with monthly incomes of less than Kshs. 5,000 (16.7%) and between Kshs. 10,000 and 29,999. Other categories of households' monthly incomes were between Kshs. 30,000 and 49,999 and Kshs. 50,000 and above with a representation of 4.7% and 1.3% respectively. The figures are summarizedin Table 4.7.

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Table 4.7: PercentageHousehold Income per Month

Income per month	f	%
Less than Kshs. 5,000	25	16.7
Kshs. 5,000 – 9,999	96	64.6
Kshs. 10,000 – 29,999	19	12.7
Kshs. 30,000 – 49,999	7	4.7
Kshs. 50,000 and above	2	1.3
Totals	**148**	**100.0**

Source: Field Data (2017)

4.4 livelihoods in the Study Area

This study was interested in the rural livelihoods of the residents of the study area by determining the extent of business growth, state of security and quality of health services. This study sought to determine the respondents' perception on the extent of business growth (variety, number of working hours, employment opportunity, variety of services/products offered, and quality of sales).

This study assessed the level of business growth in the study area on a scale of 1 to 5 by considering respondents opinion on variety of newly established businesses, extension of the businesses working hours, number of new employment opportunities created to the residents, variety of business services and products offered to the residents and increase in business sales in the area. Table 4.8 provides a distribution of respondents opinion on whether there has been business growth as a result of electricity connection in the area.

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Table 4.8: Proportion of Respondents who Agreed with Business Growth Statements

Statements	N	%
There has been increase in variety of newly established businesses	111	75.0
There has been extension of the businesses working hours	127	85.8
There has been increase in employment opportunities in businesses	108	73.0
There has been increase in variety of business services and products offered to the residents	99	66.9
There has been increase in business sales	103	69.6

Source: Field Data (2017)

Majority of the respondents indicated that there has been increase in variety of newly established businesses (75.0%), there has been extension of the businesses working hours (85.8%), there has been increase in employment opportunities in businesses (73.0%), there has been increase in variety of business services and products offered to the residents (66.9%) and that there has been increase in business sales (69.6%).

In terms of business varieties, this study established that the study area is characterized by a number of business types. The results shown in Table 4.9 indicate the various types of businesses that have come up in your area since connection of electricity.

Table 4.9: Types of Newly Established Businesses in Rongai Sub-County

Types of businesses	f	%
Retail shops	137	92.6
Posho mills	111	75.0
Salons	103	69.6
Welding	89	60.1
Cyber cafes	78	52.7
Hotels	44	29.7
Groceries	32	21.6
Others	21	14.2

Source: Field Data (2017)

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Majority of the business ventures that were established after the connection of electricity in the study area were retail shops as represented by 92.6% of the total responses. Other major types of businesses that were established included posho mills (75.0%), salons (69.6%), welding (60.1%) and cyber cafes (52.7%). A few respondents cited the establishment of hotels and groceries as represented by 29.7% and 21.6%, respectively. Other types of businesses that were also established related with electronic appliances, accommodation and computer training as represented by 14.2% of the total responses. Majority of the respondents perceived the business growth in the study area to be distributed as follows:

Table 4.10*:* Extent of Business Growth in the Study Area

Extent of business growth	**f**	**%**
Very high	39	26.4
High	81	54.7
Moderate	18	12.2
Low	7	4.7
Very low	3	2.0
Totals	148	100.0

Source: Field Data (2017)

Majority of the respondents indicated the extent of business growth as high as represented by 54.7% of the responses. About 26.4% cited the business growth as very high while 12.2% cited the growth as moderate. It was just 4.7% and 2.0% who perceived the growth as either low or very low, respectively. This finding is consistent with growth Moha*et al.,* 2000 who found that the existence of basic infrastructure such as modern energy, telecommunication network, and roads was positively correlated with growth of SMEs. It is congruent with Barnes (2012), who established households with electricity have enhanced chances of undertaking activities that require higher levels of energy as opposed to households with no electricity.In terms of security this study observed that there has been a major difference between the state of area security before electricity was installed in the area and now. This is summarized in Table 4.11:

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Table 4.11: Proportion of Respondents who agreed with Statements regarding Reduction in Crime

Statement	N	%
Cases of house breakage have declined after electrification	133	89.9
Cases of theft have gone down after electrification	111	75
Rape cases have also decreased after electrification	91	61.5
The number of robberies have also reduced	119	80.4
The rates of other crimes have also gone down	124	83.8

Source: Field Data (2017)

Table 4.11illustrates that, majority of respondents affirmed that the rate of crime had declined after electrification of their areas. About 89.9% of the participants confirmed that cases of house breakages had declined, 75% agreed that cases of theft have gone down, 61.5% said that rape cases have decreased, 80.4% reported that the number of robberies have gone down, and 83.8% reported that other crimes have declined. When interviewees were questioned on this issue, one of theme that came out was that electrification had led to improved lighting that has deterred crime. Another explanation was that electrification has created employment opportunities; hence, reducing motivation for engaging in criminal activities especially among youths and young adults.

These findings are consistent Marchant (2013) who found that poor street lighting was one of the reasons linked to a gamut of insecurity problem by over 1600 respondents. It is also congruent with Bransch et al. (2012) who found that the availability of electricityimproved access to security technology such as alarm systems and CCTV cameras that deter crime.The study also found that improved lighting reduced attacks by snakes and scorpions. However, the finding are not in line with the study by Blanc (2008), where it was found that adequate lighting in streets assists criminals to see the objects that interest them. The study also established that electricity availability increased ownership of objects that are more targeted by criminals such television sets, fridges, cookers, and other electronics.

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This study was interested in knowing whether there has been improvement in the state of health services in the study area as a result of electrification. The respondent's opinions are summarized in table 4.12.

Table 4.12: Proportion of Respondents who agreed with Statements regarding Improvement in the State of Health Services in the Study Area as a Result of Electrification

	N	%
There are now more facility operating for twenty four hours (24hours)	140	94.6
Scope of health services has expanded (maternity, laboratory, etc.)	125	84.5
There has been an improvement in facilities/equipment for diagnosis and treatment	113	76.4

Source: Field Data (2017)

Majority of the respondents indicated that as a result of rural electrification, there has been improvement in the nearest facility operating hours (24hours), scope of services (maternity, laboratory, etc) and facilities/equipments for diagnosis and treatment as represented by 94.6%, 84.5% and 76.4%, respectively.On a scale of 1 to 5, respondents' perception on the improvement on the health services in the study area has been summarized in Table 4.13.

Table 4.13:Respondents perception on the improvement on the Health Services in the Study Area

Extent of improvement on health services	f	%
Very high	41	27.7
High	68	45.9
Moderate	35	23.6
Low	3	2.0
Very low	1	0.7
Totals	148	100.0

Source: Field Data (2017)

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The results in Table 4.13 shows that majority of the respondents indicated that the improvement in the area health services has been high as represented by 45.9% of the total responses. About 27.7% argued that the improvement has been very high and was closely followed by 23.6% who argued that the improvement has been moderate. It was just 2.0% and 0.7% of the respondents who cited the improvement as low and very low, respectively.

These findings are consistent withGibson and McKenzie (2007) found that electricity serves as a substitute for fuel where paraffin and candles are used hence reducing fires. In addition, it helpsto reduce pollution that comes from firewood and fossil fuels resulting in better health. It is also congruent with Borchers and Hofmeyr (2001) who found that electrification has enabled clinics to offer better health care services as it supports technologies such as incubators. The findings are also in line with Kageni (2012) who found that rural electrification in TharakaNithi Countyhad a direct influence on quality of services in health facilities including dispensaries, health centers as well as hospitals thus improving quality of health care among local communities.

4.5 Effect of Accessibility to Electricity on Rural Livelihoods in Rongai Sub-County.

The first objective in this study was to determine the effect of accessibility to electricity on rural livelihoods in Rongai Sub-County. In order to determine the general accessibility of electricity in the study area, respondents were requested to indicate whether their houses were connected to electricity and if so, when the connection took place. The results are summarized in Table 4.14.

Table 4.14: Proportion of Respondents who were connected with Electricity

Electricity Connection status	f	%
Connected	93	62.8
Not connected	55	37.2
Totals	148	100.0

Source: Field Data (2017)

Table 4.14 shows that majority of the respondents were connected with electricity as represented by 62.8% of the responses. This level of access is a significant improvement from what International Energy Agency (2008) survey found in 2008.

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According to the 2008 survey, only 5% of households in the rural areas were connected to the electric power grid. However, findings of the current study show that there is a still a significant proportion of the population in the study area that does not have access to electricity (37.2%). Participants were also asked to rate the extent to which access to electricity has affected their standard of living. Their responses are summarized in Table 4.15:

Table 4.15: Respondents Perception of Extent to which Access to Electricity has Improved Standards of Living

Extent of Improvement	F	%
Great extent	43	29.1
Moderate Extent	81	54.7
Somewhat	14	9.5
Little Extent	8	5.4
Not at all	2	1.4
Totals	148	100.0

Results in Table 4.15 indicate that the majority of the participants (54.7%) felt that access to electricity had improved their standards of living to a moderate extent. Another 29.1% reported that access to electricity had improved their standards of living to a great extent. In general, most of the respondents feel that being able to access electricity has had a positive impact on their lives. The finding reinforces Cabraal and Barnes (2006) position that the availability of electricity impacts different aspects of life including education, health, security, and employment positively. It also strengthens the study by Tambunan (2008) where it was found that increased access to electricity by rural dwellers in Indonesia transformed shoes production industries from manual to electrical machines resulting in increased level of production.

The link between access and livelihood is further expounded by the qualitative data where some respondent narrated that access to electricity had led to establishment of variety of business ventures such as barber shops and hair dressing resulting in the growth of the area.Another respondent recited that electricity access has increased the value of land in their area resulting in the growth of the net worth and wealth of each household. Another theme that was brought in the qualitative data was that access to

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electricity had improved level of education in the area as children are able to study longer into the night. Electricity has also improved health by reducing reliance on lanterns for lighting, which emit smoke that have a detrimental impact on health.

4.6: Effect of Affordability of Electricity on Rural Livelihoods in Rongai Sub-County

The rural electrification program is not just aimed at availing electricity to rural dwellers but also seek to ensure that this resource is available at affordable rates. The second objective in this study sought to evaluate the effect of affordability of electricity on rural livelihoods in Rongai Sub-County. Respondents were requested to indicate how much they paid for electricity connection and the results recorded in table 4.16.

Table 4.16: Amount paid for connection

Amount paid for connection	f	%
Less than Kshs. 2000	12	12.9
Kshs. 2000 – 19,999.00	74	79.6
Kshs. 20,000.00 – 35,000.00	4	4.3
More than Kshs. 35,000.00	3	3.2
Total	**93**	**100.0**

Source: Field Data (2017)

Majority of those who were connected to electricity indicated to have paid between Kshs. 2,000 and 19,999.00 as represented by 79.6% of the total responses. About 12.9% of the respondents were connected after paying a fee of less than Kshs. 2,000 while 4.3% and 3.2% paid Kshs. 20,000.00 – 35,000.00 and more thanKshs. 35,000.00, respectively.Respondents were also asked how the paid for electricity installation. Most of the respondents who were connected to electricity further indicated that they paid the connection in cash while others paid in bills as indicated in table 4.17.

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Table 4.17: How the connection fee was paid

Method of payment	f	%
Cash	53	57.0
Bills	40	43.0
Total	**93**	**100.0**

Source: Field Data (2017)

The results in Table 4.17 shows that majority of the respondents (57.0%) paid their connection fee in cash while 43.0% paid in bills. Respondents were requested to comment on the affordability of connectivity to electricity at the time of your connection and theresults summarized in Table 4.18.

Table 4.18*:* Affordability of Electricity Connection

Affordability of electricity	f	%
Very unaffordable	0	0.0
Unaffordable	5	3.4
Moderately affordable	60	40.5
Affordable	53	35.8
Very affordable	30	20.3
Totals	148	100.0

Source: Field Data (2017)

Most of the respondents (40.5%) cited that electricity connectivity was moderately affordable at the time they were getting connected. About 35.8% indicated that their electricity connection was affordable while 20.3% argued that it was very affordable. It was just 3.4% of the respondents who indicated that the connection was unaffordable. None of the respondents indicated that the connectivity was very unaffordable. This finding differ from the World Bank (2015) position that electricity is sub-Saharan Africa is unaffordable. According the World Bank (2015),high costs of power tariffs in developed countries fall between US$0.04 and US$0.08 per kilowatt-hour whereas, in Sub-Saharan Africa, the average tariff is US$0.13 per.

Another indicator that was used to measure affordability was the proportion of respondents who have had their electricity disconnected at least once in the past six

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months due to delayed payment of bills. The findings regarding electricity disconnection in the area isshown in Table 4.19.

Table 4.19: Proportion of Respondents disconnected in the past Six Months

Response	f	%
Yes	43	46.6
No	50	53.4
Total	**93**	**100**

Source: Field Data (2017)

Majority of the respondents (53.4%) reported that they had never been disconnected. However, 46.6% had been disconnected due to inability in paying the electricity bill. Although the majority of respondent do not perceive electricity to be unaffordable, findings on number of disconnections suggest that a significant portion of rural dwellers struggle to pay their electricity bill. To further elaborate this issue, respondents were requested to indicate the number of times they experienced disconnections and the results summarized in table 4.20.

Table 4.20: Numberof Disconnections experienced by the Respondent

Number of disconnections	f	%
A single time	15	34.9
Two times	19	44.2
Three times	6	14.0
More than 3 times	3	7.0
Total	**43**	**100.0**

Source: Field Data (2017)

Most of the respondents (44.2%) indicated that they experienced disconnections for about 2 times while 34.9% experienced disconnections for only a single time. About 14.0% experienced about three disconnections. A few respondents had been disconnected for more than three times as represented by 7.0% of the total responses. The cause of these power disconnections was echoed by a majority of the participants to be late payment of bills and tokens due to forgetfulness rather that unavailability of funds.

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Table 4.21: Monthly Bill Paid by Respondents

Monthly bill	f	%
Less than Kshs. 300	25	26.9
Kshs. 300 – 499	44	47.3
Kshs. 500 – 999	16	17.2
Kshs. 1000 – 1999	5	5.4
Kshs. 2000 and above	3	3.2
Totals	**93**	**100.0**

Source: Field Data (2017)

Majority of the respondents indicated that their monthly bills were between Kshs. 300 – 499 as represented by 47.3%. About 26.9% of the respondents were paying less than Kshs. 300 as monthly bills. About 17.2% were paying monthly bills of between Kshs. 500 – 999. A few respondents had monthly bills of Kshs. 1000 – 1999 (5.4%) and Kshs. 2000 and above (3.2%). Respondents were also asked to rate the extent to which the affordability of electricity has improved their livelihoods. Responses are summarized in Table 4.22:

Table 4.22: Respondents Perception on the Extent to which Electricity Affordability has improved their Livelihoods

Extent of Improvement	F	%
Great extent	39	26.4
Moderate Extent	74	50.0
Somewhat	21	14.2
Little Extent	11	7.4
Not at all	3	2.0
Totals	148	100.0

Source: Field Data (2017)

Results in Table 4.22 indicate that the majority of the participants (50%) felt that affordability of electricity had impacted their way of life to a moderate extent. About 26.4% were of the view that affordability had improved their livelihood to a great extent. Only 2% of the respondent felt that the affordability of electricity had not led to any improvement. This finding is consistent with Everhard and Shkaratan (2012), who found that access to affordable electricity tend to spur economic growth by

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making economic activities more competitive. Hutton (2006) also found that there is a strong connection between affordability and accessibility of electricity. The study showed that high electricity connections fee and tariffs make electricity inaccessible to poor households even when electricity grid is available in their areas.

The effect of affordability on livelihood is further expounded in the qualitative data where some of respondents explained that the affordability of electricity has enabled them to save money that they would have otherwise spent on other sources of energy such as kerosene. These savings, in turn, help them to pay for other basic goods and services such as food, education, and healthcare. Another participant reported that the affordability of electricity had led to an increase in profits in his Posho mill business as it reduced reliance on the expensive fuels. Consequently, his life has changed significantly as he is now able to provide quality life to his family. He further explained that electricity has also enabled him to reduce the prices of services he offers to consumers, which has also significantly improved their quality of life given that maize floor is basic commodity in most households within the area.

4.7: Effect of Reliability of Electricity on Rural Livelihoods in Rongai Sub-County.

The third objective in this study sought to determine the effect of reliability of electricity on rural livelihoods (with respect to business growth, security and health services) in Rongai Sub-County.

This study first assessed the reliability of electricity by seeking respondents' opinion on whether they experienced power outages and on what frequency. The results are summarized in Table 4.23.

Table 4.23: Proportion of Respondents who experience Power Outages

Experience of power outages	f	%
Experience	148	100.0
Do not experience	0	0.0
Total	**148**	**100.0**

Source: Field Data (2017)

The results in Table 4.24 show that all (100.0%) the respondents in the study area experienced power outages. There was none of the respondent who reported that they

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had never experienced power outages. Most of the respondents echoed that this power outages were caused by lightening, vandalism of the transformers and also maintenance undertaken by the Kenya Power and lighting company.

Majority (74.2%) of the respondents indicated that they experienced power outages about 3 times per week. About 19.4% of the total respondents indicated to be experiencing power outages more than 4 times per week while 6.5% indicated to be experiencing power outages less than 2 times per week as shown in Table 4.24.

Table 4.24: Number of times Respondents experienced Power Outages

Number of power outages	f	%
More than 4 times per week	18	19.4
3 times per week	69	74.2
Less than 2 times per week	6	6.5
Total	93	100.0

Source: Field Data (2017)

These results show that the reliability of electricity in the study area is low and is often characterised by constant power outages. An average power outage in the study area takes about 1 - 2 hours to be resolved by the Kenya Power and Lighting Company Ltd as shown in table 4.25. This finding support Eberhard and Shkaratan (2012) positions that most electricity programs in sub-Saharan African emphasize accessibility and affordability at the expense of reliability. Consequently, the programs end up setting tariffs that make it difficult for the utility firm to raise sufficient funds for maintaining its grid. Wangare (2015) also pointed out that most sub-Saharan African countries have unreliable sources of electricity. A majority of the country rely on hydropower that susceptible to changes in weather pattern.

According to the Kenya Ministry of Energy and Petroleum (2017), Kenya had an installed capacity of 2,234 megawatts in 2017 against a peak demand of 1,763 megawatts. Given the disaggregate nature of electricity production in Kenya; a fault in one of the production sites pushes the available capacity below the peak demand creating an imminent shortage. In addition, Rose et al (2016) found that electricity consumption was rising at the rate of 6% per annum, which is above the rate of investment in new generation capacity. Consequently, there is the possibility that demand for electricity might surpass the current installed capacity causing more

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reliability issues. To further interrogate the electricity reliability issue in the study area, participants were asked to detail the amount of time it takes for the utility firm to rectify outages. Findings are summarized in Table 4.25:

Table 4.25: Duration of Power Outages in the Study Area

Duration	f	%
Less than 1 hour	22	23.0
1-2 hours	42	45.4
2-3 hours	16	17.1
3-4 hours	4	4.6
More than 4 hours	9	9.9
Total	93	100

Note. Range = 0.5 – 6.0 hours, Mean = 2.49, Std. Deviation = 1.37, n = 93

Source: Field Data (2017)

The mean duration that KPLC took to resolve the respondents power outages was 2.49 hours with a standard deviation of 1.37 hours. A cumulative percentage of 85.5% of the respondents cited that the power outages lasted upto 3 hours. Majority (45.4%) of the respondents indicated that the power outages lasted an average of 1-2 hours. About 23.0% of the total respondents had power outages that lasted less than 1 hour while 17.1% reported power outages lasting for 2-3 hours. There were very few respondents who reported power outages lasting for 3 – 4 hours (4.6%) and more than 4 hours (9.9%) as shown in Table 4.26.

Most respondents felt that the frequent outages had a negative effect on businesses. Some respondents explained that some of the businesses in the area such as posho mills and barber shops require electricity to operate. Consequently, disruption in power supply results in loss of productive hour, and consequently, loss of potential revenues. A significant group of respondents also lamented that the power outages are a major cause of inconveniences since most of the appliances in their homes utilize electricity for their functioning. Majority of the respondents said that they use electricity for lighting, watching television, listening to radio, charging phones, security lighting and charging torches among others. A lot of inconveniences arise when power goes off for hours.

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CHAPTER FIVE

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECCOMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings, the conclusions and recommendations drawn from the study. In addition, suggestions for further research are given. The study sought to establish the influence of rural electrification on rural livelihoods in Rongai Sub- County, Nakuru County, Kenya. Rural electrification was assessed with respect to its accessibility, reliability and affordability. Rural livelihood was analyzed with respect to extent of business growth, state of security and quality of health services.

5.2 Summary

Primary data was collected using a questionnaire for the respondents and interview schedule for the key informants. A sample of 148 respondents and 4 key informants formed the respondents of the study. Quantitative data was analyzed using descriptive statistics such as percentages, frequencies, mean, and standard deviation. The results were summarized based on the study objectives.

5.2.1 Effect of Accessibility to Electricity on Rural Livelihoods.

The first objective of the study was to examine the effect of accessibility to electricity on rural livelihoods. Descriptive analysis revealed that the majority of the respondents (62.8%) were connected with electricity as represented by 62.8% of the responses. A majority of the participants also reported that access to electricity had improved their standard of living to a great extent (54.7%) or moderate extent (29.1%). Qualitative data revealed that accessibility to electricity had improved the livelihoods of residents by facilitating the creation and growth of businesses such as posho mills, hair dressing, barber shops, computer training colleges, cyber cafes, movie shows, and welding. It was also reported that accessibility to electric power had led to increase in the price of land resulting in the growth of the net worth of households. With respect to improvement of health services, majority of the respondents indicated that as a result of rural electrification, there has been improvement in the nearest facility operating hours

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5.2.3 Effect of Affordability of Electricity on Rural Livelihoods

The second objective of the study was to examine the effect of affordability of electricity on rural households. Affordability was measured in terms of household expenditure on power including the initial installment cost and monthly expenses. Majority of the respondents (79.6%) indicated to have paid between Kshs. 2,000 and 19,999.00 to have electricity installed. In terms of recurrent cost, the majority of the respondents (47.3%) indicated that their monthly bills were between Kshs. 300 – 499. Majority of the respondents (53.4%) reported that they had never been disconnected for nonpayment of bill further suggesting that the cost of electricity is within the reach of the majority of area residents. A majority of the respondent reported that affordability of electricity had improved their livelihood to a moderate extent (50%) and great extent (26.4%). Qualitative data revealed that access to affordable power had led to savings that have enabled households to invest in other basic goods and services such as food and healthcare. Business operators such as posho mill owners have also reported increases in profits as result of using affordable power as an alternative to diesel.

5.2.4 Effect of Reliability of Electricity on Rural Livelihoods

The final objective of the study was to investigate the effect of reliability of electricity on rural livelihoods. All (100.0%) the respondents in the study area experienced power outages with a majority (74.2%) indicating that they experienced power outages about 3 times per week.The mean duration that KPLC took to resolve the respondents power outages was 2.49 hourswith a standard deviation of 1.37 hours. Respondents reported that the fruquent power outages have a negative effect on their livelihoods as they disrupt business that depend on electricity such as barber shops and posho mills. Respondents also reported that the outages were a major cause of inconviniences as they disrupt the functioning of most of their home appliances. However, the respondent did not think that these reliability issues had a major implication on crime.

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5.3 Conclusions

In light with this study results/findings, the following conclusions has been made:

Rural electrification project has improved accessibility to electric power by rural dwellers. Accessibility of electricity positively influences business growth, security and health services in the study area. The positive outcomes associated with enhanced access to electricity include mushrooming of new businesses, greater security and better health services, hence improved livelihood.

Rural electrification has also improved the affordability of power. Affordability of electricity has positively influenced the livelihoods of households in the study area as it has led to savings at the household level, increased profits for businesses, and decline in prices of basic commodities such as maize floor.

Recent years in the study area have been marked by increased accessibility and affordability of electricity. However, this has not been without some challenges. The unreliability electricity remains a major drawback to the effectiveness of the rural electrification project in changing livelihoods in the study area. Frequent power outages in the areas adversely impact on the operations of some businesses and causes massive inconveniences to households.

5.4 Recommendations

This study has presented and discussed the results of a research carried out in Rongai sub-county, Nakuru County with the objective of examining the effect of rural electrification on the improvement of rural livelihoods. Therefore the following was recommended:

The government should increase its budget on rural electrification with a view to increasing access to electricity energy power in the rural areas. Many renewable technologies best suited to providing energy services to remote areas use non-monetized fuel, but have a prohibitive initial capital cost. Subsidies are a conventional means to overcoming the financial obstacles involved in initial establishment costs such as electricity connectivity. Private investments are crucial in ensuring the energy supply to rural people thus greater access. A greater effort by the government and development partners is key in promoting access to rural electricity. The issue of energy access in rural areas is closely linked to rural development and to the achievement of the Millennium Development Goals and; hence, it should be the

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responsibility of the government. Policy instruments for improving electricity access in rural areas including intermediation, subsidies, and pricing should be highly explored.

The government should support Kengen Company that is charged with the responsibility of generating electricity energy for the country as well as KPLC that controls most of electricity transmission and distribution system in the country, in order to operate at reasonable economies and be able to offer rural energy at affordable costs. In order to reduce the cost of electricity, private sector participation should be adopted as an important option for cutting the costs of electricity as well as ensuring greater access to rural people. Business models and private sector participation for increasing affordability to energy in rural areas should be explored. These options include market-based models, control and command models, private company participation and subsidies.

Rural development with respect to reliability of electricity need to be given much higher priority by policy makers and regulatory agencies. For increased reliability in the rural energy (electricity), decentralized is crucial in order to put rural people themselves at the heart of planning and implementation. Rural energy development must be integrated with other aspects of rural development. Rural development in general and rural energy development specifically needs to be given much higher priority by policy-makers so that the electricity reliability is improved. The grid operator should also be provided with adequate resources that will improve maintenance operation and hasten the speed of repairs when outages are reported.

5.5 Areas for Further Research

This study was conducted in Rongai Sub-county and focused the effects of rural electrification on the improvement of rural livelihoods. From the findings the study makes the following recommendations for further research.

In order to generalize these findings to a wider scope, a similar study needs to be carried out involving different counties and possibly with a larger sample.

There is need to investigate whether there are other energy related factors a part from affordability, reliability and access that may affect rural livelihoods in the study area.

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There is need to investigate how local leadership especially the member of county assembly and Member of Parliament affect the realization the affordability, reliability and access of rural energy in the study area

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APPENDICES

APPENDIX 1: LETTER OF INTRODUCTION

I am undertaking a Master's degree course in Development Studies of St. Paul's University. I am currently undertaking a research study on; **EFFECTS OF RURAL ELECTRIFICATION ON RURAL LIVELIHOODS IN RONGAI SUB-COUNTY:** The purpose of this letter is to request you to provide the necessary information that is required to enable me achieve the objectives of this study. Kindly note that all your responses will be treated with utmost **CONFIDENTIALITY.** It is important that you give honest views. Please read the items **CAREFULLY** and **UNDERSTAND** and answer **ALL** the questions in both sections.

Thank you for your anticipated responses.

Yours faithfully

Ruto Dancan

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APPENDIX 2: QUESTIONNAIRE

Questionnaire Number_____

Dear Sir / Madam

I am a Master's student from St. Paul University carrying out a study on the **EFFECTS OF RURAL ELECTRIFICATION ON RURAL LIVELIHOODS**. Your responses to the questions will be confidential and will only be used for the purpose of this study. Please answer all the questions provided as honestly as possible, to the best of your knowledge. Your cooperation will be highly appreciated.

Sub-County _____ Ward:_____

Location _____ Sub-location_____

Section A: Background Information (Tick (√) the appropriate option (bracket)

1. How old are you? ……
2. What is your Gender?
   a) Male [ ] b) Female [ ]
3. Marital status:
   a) Single [ ] b) Married [ ]
   c) Widow [ ] d) Widower [ ]
   e) Others (specify) ……
4. What is your highest academic qualification?
   No formal Education [ ] Primary [ ]
   Secondary [ ] Tertiary (College) [ ]
   Tertiary (University) [ ]
   Others (specify) ……...
5. Are you employed? Yes [ ] No [ ]
6. Averagely how much do you earn per month? ……..

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SECTION B

Access to electricity

7. (a) Is your house connected to electricity? Yes [ ] No [ ]

   (b) If yes when did this take place? …….

8. (a) Do you have electrical appliances in your house? Yes [ ] No [ ]

   (b) If yes which of the following electrical appliances use electricity in your home?

Television	[ ]	Radio	[ ]
Iron box	[ ]	Electric kettle	[ ]
Phone	[ ]	Torch	[ ]
Refrigerator	[ ]	Lights	[ ]

   Others specify ……..

   (c) To what extent has access to electricity improved your living standards?

Great extent	[ ]	Moderate extent	[ ]
Somewhat	[ ]	Very Little extent	[ ]
Not at all	[ ]		

Affordability of electricity

9. (a) How much did you pay for electricity connection?

……

   (b) How did you pay for the connection fee?

   Cash [ ] Bills [ ]

   Others (specify) _____

   (c) How affordable do you think the connectivity to electricity was at the time of your connection?

Very affordable	[ ]	Affordable	[ ]
Moderately affordable	[ ]	Unaffordable	[ ]
Very unaffordable	[ ]		

10. (a) Averagely what is your monthly electricity Bill? …….

    (b) In the past six months have you been disconnected due to unpaid bills?

    Yes [ ] No [ ]

    (c) If yes, how many times? ……..

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(d) What could be the cause to this disconnection in 10 (a) above?

……

……

……...

Reliability of electricity

11. (a) Do you experience power outages? Yes [ ] No [ ]

(b) Averagely how often do you experience these outages in a month?

……

(c) What do you think are the causes to these power outages?

……

……

……

……**.....**

(d) Averagely long does it take Kenya Power and Lighting Company to respond to the outages?

……

12. (a) Do you think electricity meet your needs as a consumer? Yes [ ] No [ ]

(b) How does it meet your needs as a consumer?

……

……

……

Section C

Effects of access, affordability and reliability on Business growth

13. (a) Do you own a business? Yes [ ] No [ ]

(b) If Yes, What kind of a businesses do you own? …….

(c) If no, proceed to question 14.

14. Since connection what are some of the businesses that have come up in your area?

Posho mills	[ ]	Retail shops	[ ]
Salons	[ ]	Cyber cafes	[ ]
Hotels	[ ]	Welding's	[ ]
Groceries	[ ]		

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Others (specify)…….

15. Is/are these businesses mentioned above connected to electricity?

Yes [ ] No [ ]

16. What are the major differences that you have noticed on businesses around your area after the electricity connection?

a) A variety of businesses have come up in the area [ ]
b) Business close late at night as a result of proper lighting [ ]
c) The businesses have created employment opportunities to the residents [ ]
d) Businesses in the area offer a variety of services to the residence [ ]
e) Businesses in the area are making good sales [ ]

17. To what extent do you think electrification has contributed to business growth in your area?

Very great [ ] Great [ ] Moderate [ ]
Little [ ] Very little [ ]

Effects of access, affordability and reliability on Security.

18. (a) Does your area have security lights (Flood light/Mulikamwizi)?

Yes [ ] No [ ]

(b) Do homes/business premise have security lights? Yes [ ] No [ ]

19. (a) What are the major differences that you have noticed on security around your area after the electricity connection?

Cases of house breakage have declined after electrification [ ]
Cases of theft have gone after electrification [ ]
Rape cases have also decreased after electrification [ ]
The number of robberies has also reduced [ ]
The rates of other crimes have also gone down [ ]

(b) After electrification, how has been the decline in crime?

Very high [ ] High [ ]
Moderate [ ] Low [ ]
Very low [ ]

(c) Do you feel safer at night now than before electrification?

Yes [ ] No [ ]

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20. To what extent do you think electrification has contributed to improvement in security in your area?

Very great	[ ]	Great	[ ]	Moderate	[ ]
Little	[ ]	Very little	[ ]		

Effects of access, affordability and reliability on Health

21. Which is the nearest health facility to you?

Hospital	[ ]	Health center	[ ]
Dispensary	[ ]	Mobile clinic	[ ]

22. Has there been a new health facility in your area since electricity was installed?

Yes [ ] No [ ]

23. What are the major differences that you have noticed on your nearby health facilities after the electricity connection?

a) The facility now operates 24hours [ ]
b) Emergency cases are now handled even at night [ ]
c) The facility admit child delivery cases at night [ ]
d) The facility have electric equipment essential for diagnosis and treatment [ ]

24. Rate how electrification has improved the service delivery of the health facilities in your area.

Very high	[ ]	High	[ ]
Moderate	[ ]	Low	[ ]
Very low	[ ]		

Thank you for your cooperation.

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APPENDIX 3: INTERVIEW SCHEDULE

Section A: Background information

1. Name of the ward/ Village
2. What is your gender?
3. What position do you hold in this ward?
4. How old are you?
5. How long have you been a community leader in this ward?
6. (a) Is your area connected to electricity?
   (b) When did this take place?

Section B: Effect of access, affordability, and reliability of electricity on growth of Businesses.

(c) What kind of businesses are there in your ward
(d) Are these businesses connected to electricity?
(e) Have you noted any changes in these businesses since connection?
(f) What are some of the changes you've noted?

Section C: Effect of access, affordability, and reliability of electricity on security

10. Does your area have street lights?
11. (a) Since connection, have there been cases of insecurity?
    (b) What are some of these case (s) in 11 (a) above?
12. (a) Do you think street lighting has improved security levels in your area?
    (b) If yes how?

Section C: Effect of access, affordability, and reliability of electricity on healthcare.

13. (a) Which health facilities are there in your area?
    (b) Is the health facility mentioned in (a) above connected to electricity?
14. (a) As a result of the facility being connected to electricity, have you noted any changes?
    (b) If yes, what are some of the changes you've noted?

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Section E: Effect of access, affordability, and reliability of electricity on the living standards

15. (a) Do you think rural electrification have affected positively on the quality of life on your residents?
    (b) If yes, how?
    (c) How would you rate this effect?

Thank you for your cooperation.

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APPENDIX 4: RESEARCH PERMIT

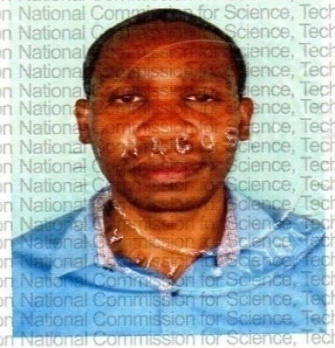
THIS IS TO CERTIFY THAT:
MR. DANCAN KIPKEMOI RUTO
of ST. PAULS UNIVERSITY, 52-20102
ELBURGON,has been permitted to
conduct research in *Nakuru County*

on the topic: *THE EFFECT OF RURAL ELECTRIFICATION ON RURAL LIVELIHOODS:THE CASE STUDY OF NAFAKA VILLAGE, RONGAI SUB-COUNTY, NAKURU COUNTY-KENYA.*

for the period ending:
27th March,2018

.....
Applicant's Signature

Permit No : NACOSTI/P/17/74407/16462
Date Of Issue : 27th March,2017
Fee Recieved :Ksh 1000



.....
Director General
National Commission for Science, Technology & Innovation

ST. PAUL'S UNIVERSITY

APPENDIX 5: RESEARCH AUTHORIZATION LETTER

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/17/74407/16462**

Date: **27th March, 2017**

Dancan Kipkemoi Ruto
St. Pauls University
P.O. Private Bag - 00217
LIMURU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"The effect of rural electrification on rural livelihoods: The case study of Nafaka Village, Rongai Sub-County, Nakuru County-Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **27th March, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Nakuru County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

STUDY