

**ASSESSING THE LEVEL OF AWARENESS OF THE IMPACT OF CHARCOAL ON
FOREST DEGRADATION IN MPIGI DISTRICT**

BY

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**A RESEARCH REPORT SUBMITTED TO SCHOOL OF NATURAL AND APPLIED
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DECLARATION

I declare that this research has been prepared following rules and regulations of Kampala International University governing writing of report and that:

The information and documents within the report were taken within the appropriate academic perspective,

The images, figures and statistics within the research report where applicable, comply with scientific rules,

The works of other authors have been duly acknowledged,

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And this report has never been submitted to any department in this or any other university as an academic work leading to any award.

Signed:.....

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APPROVAL

This research report titled “Assessment of the level of awareness of the impact of charcoal on forest degradation in Mpigi district” has been compiled under my supervision and guidance and I confirm that it is ready for submission to the faculty higher degrees’ committee for further examination.

SIGNATURE:

DATE:

PROF. MARTINS ONUORAH

SUPERVISOR

DEDICATION

This book is dedicated to my dear parents mother and father whose contributions to my life was sufficient towards my success in life, may the almighty God bless you.

ACKNOWLEDGEMENT

A number of people have contributed both directly and indirectly at different stages of this study, It is impossible to mention them all. However special consideration goes to the following.

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ABSTRACT

The study conducted for Assessing the level of awareness of the impact of charcoal burning on forest degradation in Mpigi District. The objectives were to assess the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district secondly to examine the effect of charcoal burning on forests usage/ degradation and finally to establish mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district. The data was collected from 315 respondents using questionnaires and 8 Key informant interviews. The study found that people in Mpigi district had little or low awareness on the long-term effects of charcoal burning on the environment. The findings for the study show that 36.8% respondents were aware, 112(35.6%) respondents disagreed to awareness while 87(27.6%) respondents were not sure. The long-term effects of charcoal burning were on the environment, forests and agriculture in the long run; the occurrence of charcoal burning reduced the environmental features of forests and agriculture. Secondly the study found that charcoal burning reduces the forests coverage, the effect of the charcoal burning was reduction of the forest cover reducing significantly the forests both of natural and manmade, these effectively reduce the values of the forest covers presenting a negative influence for the forest coverage in Mpigi district. Thirdly the study reveals that mechanisms in place for government for sustainable charcoal burning in Mpigi district indicate that enhanced legal framework for managing forests, Community sensitization on deforestation, providing security in the forest and finally Instituted strict forest monitoring are the mechanisms put in place for the sustainable charcoal burning in the district. The study concludes that in the long run, the charcoal burning significantly affects the environment in Mpigi district. The effect of charcoal burning to the environment significantly remains high with the influences generally degrading the environment. secondly the study found that charcoal burning reduces the forests coverage, the effect of the charcoal burning was reduction of the forest cover reducing significantly the forests both of natural and manmade, these effectively reduce the values of the forest covers presenting a negative influence for the forests coverage in Mpigi district thirdly the study on the mechanisms in place for government for sustainable charcoal burning in Mpigi district indicate that enhanced legal framework for managing forests, Community sensitization on deforestation, providing security in the forest and finally Instituted strict forest monitoring are the mechanisms put in place for the sustainable charcoal burning in the district. The study recommends that first, the government of Uganda, through the relevant authorities, implements the existing forest and resource laws so as to ensure proper usage of the forest related products, Secondly, there is need for the forests usage to be improved, developed and enhanced through generating efficiency of the forest system. The power of charcoal production needs to be developed with efficiency and regulations be possibly developed for the managerial policy and development mechanisms. Thirdly the study recommends that there is need for Increased monitoring and enforcement of illegal timber extraction should be conducted by both local and government stakeholders. There is need for strengthening laws transferring increased decision-making and law enforcement authority to local communities could result the further decentralization of decision-making power.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter describes the background of the study, the research problems, purpose of the study, research objectives, research questions, research hypothesis, scope of the study, significance of the study and definitions of key terms.

1.1 Background of the study

Humankind's first source of energy is considered to be wood-fuel (Hosier, 1993). Fuel wood and charcoal are the most globally used for energy supply. Wood is an important type of biomass, with annual global utilization at 3.3 billion m³, of which more than half is used for energy (FAO, 2007). The use of natural wood charcoal is approximately dated back to 30,000 years ago commonly in cave drawings (van Beukering et al, 2007). Over 2 billion people globally rely on fuel wood as their main energy supply, especially rural households in developing countries (FAO, 2010). Wood charcoal production globally was in the year 2009, estimated at 47 million metric tons; 9% increase since 2004 (FAO 2009). Fuel wood and charcoal, provides more than 14% of the world's total primary energy and more significant in developing countries (ibid). This demonstrates the importance wood-fuel plays in meeting the energy requirements of developing countries.

Global modernization and revolution in the energy sector has been significant although majority of the population in developing countries still depend on wood-fuel for their day-to-day energy requirements (Smith et al, 2004). Unsustainable charcoal production can undermine production of ecosystem services, agricultural production, and human health (Zulu, 2012). This is as a result of high poverty prevalence that leads to deforestation through indiscriminate extraction of wood and other resources for charcoal production. Charcoal is used in cooking, heating, housing and crafts in order to earn a living. Environmental degradation thus deprives vulnerable groups from essential goods and accelerating both the downwards spiral of poverty and environmental degradation. Poverty plays a key role in the type of energy use, and therefore poverty reduction has increasingly been the focus of many development agenda world over (FAO 2012). Since the world's social summit of Copenhagen in 1994, the Millennium Development Goals (MDGs)

identified poverty reduction as a goal. The Kenya national government efforts began through the Sessional Paper No. 10 of 1965 in which the government identified poverty as one of the enemies of development. In its subsequent plans and blueprints, the government has realized that only through sustained economic growth can national wealth be created to provide the means to eliminate poverty (Kenya poverty eradication commission,2009)

Africa accounts for 63% of the global charcoal production(FAO,2011). About 94% of the African rural population and 73% of the urban population use wood-fuels as their primary energy source (Bailis et al, 2007) with the urban area heavily dependent on charcoal and rural areas dependent on firewood. The demand for biomass in tropical regions of sub-Saharan Africa, particularly fuel wood, is projected to grow exponentially in the future. Wood fuel, such as charcoal or firewood, is the most common form of biomass utilized in sub-Saharan African countries. Sassen (2015) further revealed the effect of biomass use on forest development by showing that forests would plunge into degradation because of cutting down trees for firewood or charcoal for household use. It is of the utmost importance to immediately obtain information on the dynamics between biomass production and deforestation to further elucidate the state of deforestation in Uganda and provide remedial solutions.

Eastern African countries have a large proportion of the people in the rural areas that can be categorized as poor or very poor (UNDP 2010) and in Kenyan, 44-46%of the total population, which is an improvement from 56% in 2000 are poor with 82% in rural areas (World Bank 2012). Therefore charcoal industry, which is prevalent in rural settings due to its affordability and accessibility to the poor, could contribute to poverty reduction through alternative income-generation opportunities (Zulu 2012).

Environmental degradation, lackof adequate forest cover, clean water and land suitable for farming; leads to more hunger, illness, poverty and reduced opportunities to make a living. This is brought about by in-appropriate technology adoption in charcoal production and insufficient access to education, information, making it difficult for poor people to manage available natural resources sustainably, thus creating loss of livelihood opportunities and of biological diversity (UNEP 2012).

Charcoal and firewood fuel biomass utilization is thought to be the main cause of deforestation in Uganda. Moreover, the practice of utilizing charcoal and wood fuel in Uganda is said to impact the health of many women and children in the region. Uganda is a nation well-endowed with natural/virgin forests of various species of the famous. African hardwood. While these forests mainly support biodiversity and the entire forest ecosystem, they also contribute to the national Gross Domestic Product through wood production and trade and eco-tourism (Sassen, Sheil, and Giller, 2015). Uganda, like most other sub-Saharan African countries, heavily relies on biomass as an energy source (Magala, 2015). Given the fact that the Ugandan population does not have nationwide access to modern energy sources, the resulting tendency is to over-rely on and consume wood biomass (. Due to the lack of modern alternatives, charcoal is a highly consumed form of biomass in Uganda. Both in the cities, urban centers, and the villages, charcoal and wood fuel seem to be not only an economic activity for the majority of women but also a source of livelihood for participating women and households in the charcoal business especially (Branch and Martiniello, 2018)

Sub-Sahara Africa (SSA), like other regions in Africa, heavily depends on biomass for energy, and so does Uganda. The country's energy environment is subjugated by biomass based energy sources contributing close to 95% of the total primary energy for domestic consumption. Electricity and petroleum products account for 4% and 1% respectively (Adeyemi and Asere, 2014). They argued that energy is fundamental to sustainable development and poverty reduction determinations. It touches all aspects of human advances such as social, economic, and environmental aspects including access to water, agricultural productivity, population levels, and gender-related issues. None of the Millennium Development Goals (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries. They equally noted that Uganda has lengthy ways to go in achieving a sustainable energy for everyone and achieving the Millennium Development Goals (MDGs) target by 2030, as was put forward by the Initiative of the United Nations (SE4ALL). Their study showed that the country ought to develop and harness renewable energy potential to meet the country's energy needs. The charcoal burning business remains one other lucrative trade in Uganda (Adeyemi and Asere,

2014). The process begins from cutting down the trees into logs, burning, transportation and distribution, as well as whole sale and retail trading. This makes a livelihood for vast of Ugandan households with majority being single mothers or women who must feed their children and also send them to school (Namaalwa, Hofstad and Sankhayan, 2009)

1.2 Statement of the Problem

Uganda is one of the nations blessed with vast natural forests that offer biodiversity and multiple economical and socio-cultural services (Bamwesigye and Hlavackova, 2017). Further studies advance alternatives of attaching value to such forest uses in terms of production and or damages caused in form of deforestation or deforested area (Khundi, Jagger, Shively and Sserunkuuma, 2018) as well as expounding on the socioeconomic and environmental issues related to forestry production. Despite the prevalence of forests in Uganda, the degree of degradation of the forests in the country still remain high as charcoal burning are the likely activities conducted especially in the vicinity of Uganda's capital city where charcoal burning in Mpigi district that is just close to Kampala targets to attain high survival through the sale of charcoal. Numerous studies argue that firewood and charcoal production are the reason for increased deforestation followed by other land use such as agriculture and settlement. It is evident in the rural areas of Uganda that all households use firewood and or charcoal for cooking their meals, and boiling water for family use. Charcoal is also used by rural, semi-urban and urban source of energy for cooking and other domestic or commercial importance (Shively, Jagger, Sserunkuuma, Arinaitwe and Chibwana, 2010). Charcoal burning could present a serious havoc to the forest exploitation and degradation if not addressed especially in Mpigi district which is just 30 Kilometers away from Kampala and has a viable market for the charcoal, Its based on this that an assessment of the level of awareness of the impact of charcoal on forest degradation in Mpigi district

1.3 General Objective of study

To Assessing the level of awareness of the impact of charcoal burning on forest degradation in Mpigi District.

1.4 Specific objectives

- 1) To assess the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district.
- 2) To examine the effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda
- 3) To establish mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district.

1.5 Research Questions

- 1) What is the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district?
- 2) What is the effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda?
- 3) What are the mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district?

1.6.0 Scope of the study

1.6.1 Geographical Scope

The study was conducted in Mpigi district. The focus of the study was based in Mpigi district. The area chosen is approximately 30 Kilometers from Kampala central district. The chosen area is because of occurrence of forest degradation constraints in the area and the fact that the area has attracted high levels of charcoal burning.

1.6.2 Subject Scope

The study conducted an assessing the level of awareness of the impact of charcoal burning on forest degradation in Mpigi District, first the study assessed the level of knowledge of the long-term effects of charcoal burning on the environment, secondly examined the effect of charcoal

burning on forests usage/ degradation and finally established mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district.

1.6.3 Time Scope

The study considered an analysis of the environmental situation of Mpigi for a period of 5 years from 2016 to 2021. The study has a time scope of 8 months which run from January to August 2021. The time chosen is sufficient to enable the researcher collect reliable information for the study.

1.7 Significance of the study

The study is justified by the existence of the level of awareness of the impact of charcoal on forest degradation in Mpigi district, the state of the forest degradation awareness is an icon and concern hence warranting an explanation on the state of affairs on forest degradation.

The study may contribute ideas to policy makers at the county government and national government in providing information and data about the adverse impacts of charcoal business which might be used for designing a more effective and sustainable charcoal business management.

The study may also contribute to the identification and formulation of strategies, plans and programs of action that could be applicable to global, regional, national and local conservation and sustainable exploitation of biological resources.

The entire study could serve as one of the reference materials for future researches and contribute to the body of knowledge for academic success and policy.

The study may also help in identifying opportunities in sustainable charcoal business management.

1.8 Operational definitions

Charcoal: refers to a solid residue derived from the carbonization, distillation, pyrolysis and torrefaction of wood (trunks and branches of trees) and wood by-products, using continuous or batch systems (pit, brick and metal kilns).

Charcoal burning involves felling down of trees and subsequent removal of vegetation cover that leads to loss of biodiversity (Timberlake, 1985). Trees removal results in alteration of plant community structures in terms of species diversity, distribution of different species and plant density.

Forest degradation is a direct, human-induced, long-term loss or reduction in forest carbon stocks and forest values not qualifying as deforestation (GOFC-GOLD 2009). The partial removal of forest carbon stock often occurs at subpixel scale and is not detected by high-resolution satellites. Higher resolution sensors (0.5 cm–3 m) offer enhanced spatial detail but their use is often limited by non-systematic acquisition dates.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, the researcher critically analyzes works of other people related to variables under study. The theoretical review constitutes the theory underlying the relationship between the two variables, related literature and related studies.

2.1 Theoretical Review

The study is based on Hardin's theory of 1968, Tragedy of the Commons is extremely important for understanding the degradation of our environment. The tragedy of the commons is a dilemma arising from the situation in which multiple individuals, acting independently and rationally consulting their own self-interest, will ultimately deplete a shared limited resource, even when it is clear that it is not in anyone's long-term interest for this to happen. This dilemma was first described in an influential article titled "The Tragedy of the Commons," written by ecologist Garrett Hardin in 1968.

Hardin's Commons Theory is frequently cited to support the notion of sustainable development, meshing economic growth and environmental protection, and has had an effect on numerous current issues, including the debate over global warming.

The basic idea espoused by the theorist is that if a resource is held in common for use by all, then ultimately that resource will be destroyed. "Freedom in a common brings ruin to all." To avoid the ultimate destruction, the human values and ideas of morality must be changed. This theory assumed that each human exploiter of the common (shared resources) was guided by self-interest. At the point when the carrying capacity of the commons was fully reached, an exploiter might ask himself, "Should I continue my actions?" Because the gain of so doing would come solely to him, but the loss from his actions would be "commonized" he will not give up his action. Because the privatized gain would exceed his share of the commonized loss, a self-seeking exploiter would not change his behaviour. Others reasoning in the same way, would follow suit. Ultimately, the common property would be ruined

Even when exploiters understand the long-run consequences of their actions, they generally are powerless to prevent such damage without some coercive means of controlling the actions of each individual. Idealists may appeal to individuals caught in such a system, asking them to let the long-term effects govern their actions. But each individual must first survive in the short run. If all decision makers were unselfish and idealistic calculators, a distribution governed by the rule “to each according to his needs” might work.

The spoilage process comes in two stages. First, the non-angel gains from his “competitive advantage” (pursuing his own interest at the expense of others) over the angels. Then, as the once noble angels realize that they are losing out, some of them renounce their angelic behavior. They try to get their share out of the commons before competitors do. In other words, every workable distribution system must meet the challenge of human self-interest. An unmanaged commons in a world of limited material wealth and unlimited desires inevitably ends in ruin. Inevitability justifies the epithet “tragedy,” which Hardin introduced in 1968.

This theory underpins the activity of charcoal producers. Fuel wood exploitation for charcoal burning results in forest destruction which charcoal producers are aware of but continue because of the selfish economic gains which however have general ramifications. The long-term impacts thus do not matter to them.

2.2 Level of knowledge of the long-term effects of charcoal burning on the environment

Moreover, Hood, Teoh, Devaiah and Requesens (2013) points out that fossil fuels are usually hydrocarbon deposits, which may include natural gas, coal, and petroleum, that derive from organic matter, especially from previous geologic periods. These are referred to as ‘fossilized biomass’, and they differ from present-day biomass. On the same note, Malinen et al (2018) explains that biomass absorbs carbon from the atmosphere as it grows and returns it to the atmosphere, especially after it has been consumed. In fact, this usually happens in a relatively short period of time. From this perspective, it is worth mentioning that biomass utilization usually creates a closed-loop carbon cycle.

Hatfield (2015) speculates that renewable resources are the key ingredient in a sustainable future for this planet. In fact, renewable resources such as biomass play a significant role, in terms of

scientific approaches, in the process of finding solutions to current energy problems. According to Renström (2016), biomass started to be a solution to energy challenges as early as the 1970s. In other words, it is not surprising that biomass has become one of the best renewable resources for both small and large-scale consumers.

According to Hood et al (2015) if biomass energy is appropriately managed, it has the potential to be sustainable in various countries. In addition, it usually creates jobs for local people, which, in turn, improves the health of the population. Moreover, a wide range of studies have shown that biomass has also been recognized in developed or industrialized countries, including the United States, Mexico, and Japan (Asbjornsen AND Ashton, 2012). For example, biomass utilization was first incorporated into Japan's Basic Act strategy in 2002, and it was later emphasized in 2009. In the Basic Act, the national government of Japan lists measures that are essential to realizing the utilization of biomass. Some of these measures include laying the necessary groundwork for biomass utilization through the creation of projects that supply biomass products.

In Turkey, Badamassi, A.; Xu, D and Leyla, B.H (2017) highlights that the country's vision for 2023 focuses on having an installed capacity of biomass power plant that is about 2000 MW. In fact, Turkey has recently spent millions of U.S. dollars in a bid to fulfill its biomass energy vision of 2023. In other words, the country is making massive investments in the setting up of biomass power plants, which will help it to reduce its trade deficit, especially in terms of importing energy sources. However, most countries including Turkey have limited biomass resources with which to fulfill their visions. It is not surprising that international trade in biomass has increased in recent years

In the United States, the government continues to work hard to support policies for and investment in biomass installations. In fact, Carleton (2018) highlights that the United States, like never before, is aiming to diversify its energy matrix in one way or another. The country has recently invested more than 22 million dollars in technology in a bid to become one of the leading nations in marine biomass . In this case, it is worth mentioning that this investment aims to achieve efficiency, especially in the transformation process

According to Wolfsmayr and Rauch (2014) forest biomass that is used in electricity, biofuel, and heat generation has become a core area for the United States. Some states, such as Minnesota, are using appropriate scales and technology to increase their production of energy from biomass. Moreover, Carleton (2018) mentions that the United States' Energy Information Administration (EIA) estimated that Minnesota's biomass consumption is 8.7%. This percentage is higher than that of nuclear power and more than half that of coal. Still, in 2007, the state of Minnesota enacted the Next Generation Energy Act, which requires an increase in the use of renewable energy to reduce carbon emissions. As a result, biomass has become the major alternative source of energy

Studies show that many countries have started to draft renewable energy laws with the aim of supporting strategies to increase energy supply. For example, Hood et al (2015) speculates that China is a leading country with a large amount of biomass energy resources, especially in rural areas. Moreover, China is currently producing a wide range of raw materials and, at the same time, discouraging the use of non-renewable energy to make its economy sustainable]. Advances in technology have helped China to increase its total annual production of biomass. In 2008, for example, China constructed more than 100 plants, which accounted for at least 7% of the total biomass production in the country.

Since 2008, the United Kingdom has placed much focus on renewable energy sources, such as biomass, to increase its energy production. According to Vlosky and Smithhart (2011) the United Kingdom has invested more than 600 million dollars to build a biomass plant with an installed capacity of 299 MW. In fact, research indicates that the United Kingdom has consistently supported renewable energy systems and fostered technological advancements to increase biomass production by 30% by 2030 (Vlosky and Smithhart, 2011). In this case, it is not surprising that setting up one of the largest biomass plants in the port of Teesside has the potential to help mitigate climate change while increasing renewable energy production.

The smoke released from burning firewood is of a unique composition. It consists of most air pollutants and factors to which consistent exposure can put human health at risk. In many firewood-reliant communities, women and children take responsibility for collecting and transporting firewood. The collected firewood biomass is transported in the most primitive ways; commonly, women and children carry it on their heads. Das et al (2015) states that biomass fuels are the predominant form of energy in firewood-dependent regions of sub-Saharan Africa, accounting for over 90% of household energy consumption. Similarly, it is the cultural responsibility of women and children to cook meals; therefore, they are predominantly exposed to the adverse impacts of firewood biomass use. Furthermore, over one-third of the day is spent shuttling between collecting and transporting firewood. This results in the occurrence of prolonged fatigue in these children and women

Moreover, domestic cooking with biomass fuels exposes women and children to pollutants that impair health. On the same note, the authors observed that women and children who cooked using firewood reported cases of household air pollution and continued occurrences of compromised lung health. In the study conducted by Oluwole et al (2013) on the use of low-emission stoves, the authors found significant reductions in the frequency of respiratory symptoms, such as a dry cough, suffocation, and runny noses, in mothers and children. In fact, these stoves were found to have efficiently enhanced the indoor and household air quality through reducing the exposure of women and children to dangerous pollutants. Similarly, the results of an investigation conducted by Schilman et al indicate that children belonging to households that used a Patsari stove had lower rates of respiratory infection compared with households that used open firewood.

Wood fuel such as charcoal or firewood is the most common form of biomass utilized in sub-Saharan African countries. Sub-Saharan African nations of Burundi, Burkina Faso, Central African Republic, Chad, Gambia, Liberia, Rwanda, Uganda, and Sierra Leone have over 90% of their population said to be reliant on woody biomass energy (Jones, Kansiime, Saunders, 2016). Charcoal is mostly utilized in urban areas of the region, whereas firewood is predominantly consumed in rural areas of the region Jones et al (2016) found that in sub-Saharan Africa, four

out of five people conventionally rely on solid biomass, primarily fuelwood for cooking, which makes it a source of food security

There is limited knowledge on effect of charcoal production on the environment, Studying the effect of biomass on the health of sub-Saharan African women provided interesting results. Cultural law mandates that women in most African countries are responsible for collecting wood biomass for domestic use. This has serious implications given that Das et al (2016) found that biomass fuels account for approximately 90% of household energy consumption. From this perspective, there is a correlation between women's health and biomass utilization in Sub-Saharan Africa. In most cases, women from rural areas in the sub-Saharan African region are burdened with heavy workloads as they are mandated to collect firewood from nearby or surrounding forests. Moreover, a common misconception in rural sub-Saharan Africa is that firewood is free and, as such, its collection is guaranteed. Das, I.; Jagger, P.; Yeatts (2016) also observed that the use of firewood and crop residue, when compared with the use of charcoal, was a factor in a higher incidence of difficulties with breathing, chest pain, night phlegm, loss of memory, dizziness, and dry irritated eyes.

2.3 Effect of charcoal burning on forests usage/ degradation

Charcoal is a key source of energy in African urban centers where nearly 80% percent of the population uses it as the main source of energy for cooking (Zulu and Richardson 2013). Population projections indicate an unprecedented increase in the urban population in African cities, increasing from 30% in 2000 to reach 60% by year 2050. The energy needs of the growing urban population will pose an increasing pressure on forest resources of rural areas. There is incomplete understanding of the drivers behind this degradation process and its connection to urban energy demands. There is also limited quantitative information about some of its key elements, such as extent of degraded areas, intensity of the degradation, spatial and temporal dynamics of the process, AGB removals and carbon emissions (Bolognesi, 2015).

Possible disruption of essential ecological processes is associated with accelerated and irreplaceable depletion of genes, populations, species and ecosystems. Biodiversity is the basis of ecosystem health and of the provision of ecosystem services (Delahunty, 2011). There exist

species inter-dependence in an ecosystem therefore decline or loss of a species population impacts on the life cycle of other species and the ecosystem at large

Selective cutting of trees for charcoal making results simplification of the habitat linked with observed thinning of woodlands (Bruckman, 2013). For instance a tree species can support many plant and animal species on an obligatory basis and one fruit tree can provide food for many birds and mammals. Charcoal industry if unsustainable may lead to deforestation and environmental degradation therefore disrupting the rich biodiversity ecosystem

Tree felling for charcoal production involves both clear and selective cutting at 0.2 - 0.3 m above ground with axes and occasionally with motorized chain saws. Ninety percent of the basal area is removed which represents about 95% of the above ground wood biomass. The majority (92%) of the residual trees in cut-over areas are small (<31 cm gbh). In 1990, about 20,000 ha of miombo woodland were cleared for charcoal production in central Zambia. Brush wood burning kills grasses and most of the root stocks of woody plants, including seedlings. Tree seedling density in old-growth miombo is estimated at 1.77 m² (Miombo Project results) so that about 700 tree seedlings ha⁻¹ may be killed by brush wood burning. The only survivors are probably fire tolerant species such as *Uapaca sp*, *Burkea africana*, *Parinari curatellifolia* (Lawton, 2015) with root coppicing ability. Several years may be required before herbaceous plants recolonize brush wood burnt spots.

Lack of regulation and the use of conventional methods for production permeate the industry. Throughout SSA, the use of traditional earth-mound kilns is commonplace. The amount of time required to just prepare the oven for production can be up to two weeks; producers first dig a hole in the ground, saving the soil for later use. Extraction of wood from the surrounding forests is typically the most labor intensive phase in the entire production process. Producers have been known to travel greater than two miles (Brouwer and Falcao. (2014) minute walk, from personal communication with a producer) to cut, collect and haul wood to the production site. Once they have returned to the site, producers configure the wood in a specific way so as to ensure that the wood is evenly 'cooked'; this process has been refined over generations. Once the wood is configured in this way, it is topped with grasses and brush; soil is added last to allow the wood to undergo combustion in the absence of oxygen, or pyrolysis

Agricultural Organization (FAO) released a working document highlighting the dangers associated with industrial charcoal production in the developing world and the precautionary measures that should be taken by producers (Smith, 2012). The sheer volume of guidelines published almost thirty years ago suggests the severity and potential danger of these working conditions. However, lack of proper knowledge, institutional capacity and financial resources prevents these safety measures from being taken in most areas that produce charcoal for residential use, contributing to the prevalence of moderate to severe injury and illness.

Low process efficiencies, combined with unregulated actions of many producers, cause large volumes of wood to be harvested from nearby forests (Maes & Verbist, 2012). These areas are often sections of communally-owned land, but can also make up large portions of federally protected forests. As a result of weak, unenforced or disjointed forest policies, many countries in SSA are experiencing increased rates of deforestation from charcoal production in protected areas. Unlike the use of fuelwood for cooking and heating, which is often supplied from ground harvesting and has no major impact on environmental degradation (Zulu, 2017) current methods of charcoal production require vast amounts of resources for relatively little return

Lack of resources; educational, financial or otherwise, has been cited as the major reason for such trends. Land tenure in many parts of Sub Saharan Africa is also particularly volatile. Customary land tenure often conflicts with that of a statutory nature, preventing adequate land management practices and ultimately contributing to the widespread degradation that exists today (Benjaminsen and Lund, 2017). This can be especially devastating in post-conflict nations, where large in and out-fluxes of refugees and destruction or lack of ownership documentation further exacerbates already existing challenges. In some cases, whole communities live on land owned by a third party, ultimately leading to greater confusion among all stakeholders and creating an essential need for land tenure reform.

The link between environmental degradation and rural livelihood is quite clear in the utilization of forest resources. Lack of emphasis on rural livelihoods in national energy and resource policies lead to widespread slash and burn practices, erosion and increasing levels of

deforestation due to desperate attempts by rural communities to generate income through the exploitation of forest resources. These practices can have additional implications for soil composition, water resource availability, access and site productivity (Larson & Ribot, 2017). all of which are directly linked with rural livelihoods

Previous work has been conducted in this area at the national level, highlighting the very real threat that current methods of production have on society and the environment. Mwampamba (2017) modeled current and future deforestation rates based on survey data gathered on extraction and replenishing habits of rural charcoal producers in Tanzania, the largest charcoal producer in SSA, finding that by 2028, public forest resources will be depleted if policy interventions are not put in place (Ishengoma and Kappel, 2016). Similar methods from Namaalwa (2019) identified a collapse in the Ugandan charcoal supply chain by 2019. While these countries are some of the largest charcoal producers in the region, these findings hold grave implications for other nations whose population relies heavily on wood-based fuels. In addition, further research at local or sub-national levels can provide decision makers with information regarding geographical trends in energy dynamics. Attempts to criminalize this behavior by imposing fines, high taxes and restrictions on production levels are common and not only create additional livelihood pressure on rural communities, but leads to a national charcoal dichotomy. Production of charcoal is seen as highly problematic and in need of swift action, while its purchase and consumption is so economically, culturally and pragmatically engrained into the general lifestyle that realistic transitions away from this fuel are, indeed, quite unrealistic.

2.4 Mechanisms for sustainable charcoal burning to enhance forest conservation

Zambia has revised its charcoal regulations, and an association of producer groups has been organized in Choma as a result of exchange visits by senior government officials and producer organizations arranged. The first exchange visit to Kenya was in June 2015, back-to-back with the Africa Farm and Family Forest producers' conference. A further exchange in June 2016 focused on visiting charcoal and nursery producer associations in Kenya. This work has already resulted in a high level of enthusiasm from charcoal producers for recognition as producer

groups by government, and active participation of charcoal producers in ward development committees (Chidumayo & Gumbo, 2018).

There is also improved monitoring of charcoal production sites under the responsibility of Chief Singani, who now embraces charcoal groups, leading to peace between charcoal producers and traditional leaders in the village. Chief Singani previously banned charcoal production in his area, although illegality remained prevalent and caused conflicts among villagers and traditional leadership. Charcoal producer groups introduced through the program in production areas now work with the local headmen in identifying suitable sites for producing charcoal and later in getting consent from the chief and receiving the necessary licenses (Bervoets, 2016).

There are a number of activities that can be implemented to ensure that the achievements to date will continue into the future. As a priority, the program can support government efforts in scaling up the formation of charcoal producer groups across Zambia through the implementation of new charcoal regulations. Governments must also be supported in boosting awareness and implementation of these charcoal regulations. Inter-sectoral, multi-stakeholder dialogues across the entire charcoal value chain should be encouraged, to discuss coordinated options for reducing greenhouse gas emissions and mitigating climate change, including through such work as making the charcoal value chain a specific component (FAO, 2017).

Support can also be given to strengthen internal governance, legalization, operational efficiency and monitoring and evaluation of district charcoal associations so that they can proactively engage in policy-making and improved collaboration among producers, as well as with government and markets.

Help can be provided to facilitate government training in sustainable charcoal production by establishing demonstration sites with improved charcoal production technologies. As well, program assistance can help to facilitate the establishment of woodlots with fast-growing agroforestry and other natural trees by charcoal producers as future feed stock and production of certified charcoal for premium prices.

Improved business skills among producers and traders should also be supported as this will lead to greater control of pricing and setting standards for quality control among producers. Lessons learned from pilot projects should be shared and topical studies issued. A case study on the role

of women in the charcoal value chain must be developed. Work will be required to facilitate networking and capacity building among the different charcoal value-chain players for sustainable business, upward linkages and policy dialogue well into the future.

Kenya's current charcoal production is a threat to the environment as over 99 per cent of it still uses inefficient carbonization processes (Mutimba and Barasa, 2015). In addition to minimizing gas emissions, adoption of efficient charcoal production kilns would reduce consumption of wood. This could be achieved through building technical capacity of charcoal producers, who also need micro financing systems to adopt appropriate technologies supported by effective governing systems. Designing mobile, efficient charcoal kilns would minimize transport costs, while kilns for small-sized wood and branches would be necessary for farmers who are able to source wood from neighbors.

A large number of charcoal producers could easily be reached for training on efficient carbonization processes through working with community based groups producing charcoal. The existing ten energy centres through which farmers are trained by the Ministry of Energy are important platforms that could be empowered for community technical capacity building. The country has a wide range of media celebrities such as those in music and drama, public gatherings such as in churches, and community meetings (barazas), all of which could serve as important channels for reaching consumers with messages on efficient use of charcoal.

Many view the charcoal industry as a threat to natural resources and climate and their fear is real, as revealed by Mutimba and Barasa (2015), who found that over 75 per cent of charcoal in the country is produced unsustainably. Ironically, the charcoal industry could save the environment that it now threatens if communities and private practitioners grew trees for charcoal as well as harvested trees sustainably through proper management plans. There is potential to improve tree cover and produce charcoal, through adoption of short rotational agroforestry systems

The tree is suitable for charcoal production in arid and semi-arid lands as it occurs in almost mono-specific stands in high densities over vast areas, coppices readily when harvested or top-killed by fire, and its hard wood makes good quality charcoal. On the other hand as most charcoal is consumed in urban areas, there is a need for the establishment of private agroforestry

systems in peri-urban areas and opportunity cost studies on the use of peri-urban areas to be carried out. However, adoption of agroforestry systems for charcoal production will depend on availability of labour, land, and money, among other factors

Through government technical extension services, research and development organisations' work could help advise farmers on appropriate tree and shrub species, optimal tree management and rotation periods, as recommended by stakeholders during a charcoal seminar held at the World Agroforestry Centre (ICRAF). Farmers could be encouraged to form or join Community Forest Associations (CFAs) that will coordinate sourcing of seeds and seedlings, planting, management, awareness creation, and monitoring of charcoal production as a cash crop. The CFAs would also provide socio-economic benefits to communities such as encouraging equity, conflict resolution, poverty reduction, and sustainable utilisation of forest and tree products. There are 347 CFAs in Kenya which are mainly located in the important forest regions. Membership in these CFAs varies between 30 to 3,000 as they are made up of different self-help groups. Ranches and private companies could improve sustainability in charcoal production through formulating tree management plans and being provided with tax incentives by the government to plant trees for charcoal production.

Recovery of charcoal dust/fines for energy fuel briquette production Between 10–15 per cent of charcoal ends up as waste in the form of charcoal. This occurs during transportation and at wholesale and retail stalls. In Nairobi for example, about 70 tonnes of charcoal dust are produced daily at the charcoal wholesale and retail stalls. The term waste refers to something that is useless or worthless and one way of recovering charcoal dust is through production of energy fuel briquettes. Production of energy fuel briquette involves collection of combustible materials and compressing them into a solid fuel product of any convenient shape, and this is then burnt like wood or charcoal. Another option in briquette-making is harvesting of tree prunings

Formalisation of charcoal industry: Legalisation and enforcement of the charcoal regulations should be aimed at offering an enabling legal framework that promotes commercial charcoal production and licensing for revenue, enterprise-based approaches for poverty reduction, smallholder/private tree growing, wood fuel-energy conserving technologies, improved

agricultural productivity, and ecological sustainability. In Malawi for example stagnant policies based on charcoal bans and fuel-substitution were not effective and it was learnt that policies need to be transformed into proactive and realistic ones acknowledging woodfuel dominance and its socio-economic importance (Zulu 2016). To protect the country's biodiversity the charcoal regulations prohibit production of charcoal from endangered, threatened, and protected plant species, and require reforestation or conservation plans for the area where trees will be managed for charcoal production.

The regulation system will also address the lack of standards to regulate quality, weight, and size of the charcoal bags entering the market, which has caused buyers and sellers to pay the same amounts for different sized bags. Community based organizations have been entry points for many research and development interventions in the country but this has been absent in the charcoal industry due to its informal set up; the groups can now take advantage of the legal status of the industry.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

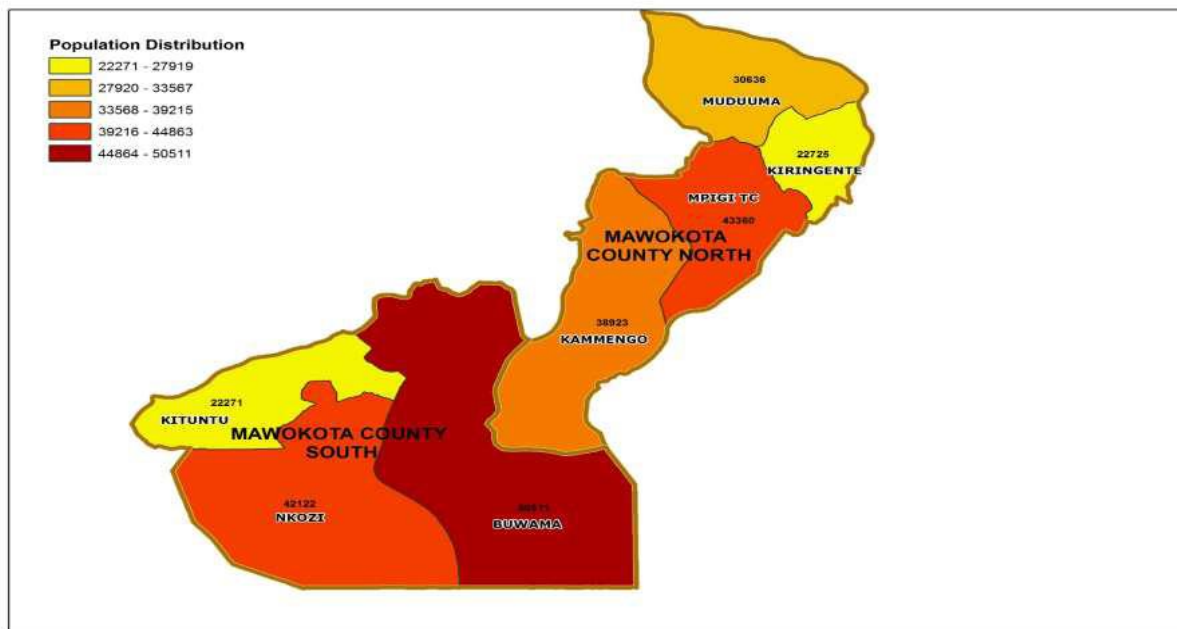
This chapter outlines the study area, study design to be used in the research, the area of study, the population to sample from, the sample size, sampling procedure, sources of data, data collection tools, validity and reliability of study, ethical issues and data analysis.

3.1 Study area

3.1.1 Location

Mpigi district borders with the district of Wakiso in the North East and East, Mityana in the North, Butambala in West and North West, Kalangala and Lake Victoria in the South and Kalungu is to the south West. The District lies on the shores of Lake Victoria, the largest fresh water lake on the Continent of Africa. The Equator, a natural spectacular phenomena traverses the district at Nabusanke in Nkozi sub-county and River Katonga One of Uganda's longest rivers that Joins Lake Victoria to Lake George traverses the district in Nkozi Sub County.

3.1 Study area



Source: UBOS, 2018 Demographic Survey

Figure 3.1: Map of Mpigi district

3.1.2 Size

Mpigi District covers an area of 1,041.13 square kms which is about 0.07% of the country size. Mpigi District Headquarters are situated 2 kms on Mpigi – Butambala Road off Kampala - Masaka Highway and it is 35 kms from Kampala the Capital City of Uganda.

3.1.3 Climate

The District experiences a bi-modal rainfall pattern with first rains occurring between March and May and second rains coming between September and November with an average rainfall amount of 1320 mm though in many areas around the Lake zone it is between 1750mm and 2000mm. Mpigi District has an average annual maximum temperatures ranging between 22.5⁰C and 27⁰C. Average relative humidity ranges between 80% and 95% especially in forest areas. The average monthly days of rainfall are 11. The minimum temperature in the district is 11⁰ C while the maximum recorded is 33.3⁰C. The bi-modal type of rainfall is conducive for rain fed agricultural production throughout the year and crops mainly grown include bananas, tobacco, coffee, maize, beans and tea. Up-land rice and cocoa are increasingly gaining importance in the District.

3.1.4 Topography

The district lies in the central plateau of Uganda comprising of flat topped undulating hills with deeply incised valleys. Hills summits range between 1100m-1400 meters above sea level. These hills form part of the catchment for both seasonal and permanent wetlands that drain most low lying areas. The topography and geology provides abundant gravel and rocks resources used in construction. The underlying geology comprises mainly of rocks of Precambrian age that are highly weathered. The district has a variety of iron deposits, stone debris, Murrum and clay soils. The most dominant rocks being of the Buganda-Tooro system.

The district relief is generally made of plateau and small undulating hills characterizing the Buganda surface and lying between 1,182 and 1,341 meters above sea level. Much of the low lying areas are drained by seasonal streams. The district has a variety of iron deposits, stone debris, Murrum and clay soils.

3.1.5 Vegetation

The District is characterized by evergreen vegetation with many seasonal wetlands and few areas with savanna type of vegetation. The savannah vegetation is typical for human activities. The

thick forests especially those on private land are being used for timber harvesting although this poses a threat of environmental degradation since reforestation and afforestation are very limited.

3.1.6 Soils

The Land tenure system in Mpigi District is characterized by owner occupied contributing 77%, 20.7% staying on rented premises while only 2.3% of the Population live on subsidized type of tenure system.

3.1.7 Land

The Land tenure system in Mpanga Central forest reserve, Mpigi district is characterized by owner occupied contributing 77%, 20.7% staying on rented premises while only 2.3% of the Population live on subsidized type of tenure system

3.2 Research Design

The study adopted descriptive cross sectional design. This design is selected because the researcher intended to establish facts that already existed as opposed to creating new information that necessitate experimental research. Descriptive study is chosen as it deals with information that already exists. The findings established were used to confirm validity of theories and examine relationships between variables encompassed by the study. The study is cross-sectional because data was gathered from the respondents at one point. It was carried out using both qualitative and quantitative methods to generate information by use of questionnaires. The study therefore was based on the views of the respondents to draw conclusions and also make recommendations.

3.3.1 Study Population

The study was conducted based on the population of people in Mpigi district who according to Demographia 2019 was 42,000 adults. The study was conducted with community leaders, and selected community members. The population chosen is deemed fit for the provision of appropriate information to satisfy the study.

3.3.2 Sample Size

Out of the total population of the study, the researcher selected a sample of respondents who were identified from the total population of 42,000. The sample was arrived at by use of the Slovene's formula as illustrated below.

: Slovene's Formular

$$n = \frac{N}{1 + N(e)^2}$$
$$n = \frac{42,000}{1 + 42,000(0.05)^2}$$
$$n = \frac{42,000}{1 + 42,000(0.0025)}$$
$$n = \frac{42,000}{106}$$
$$= 396$$

396 Respondents

Table Showing sample size of respondents

Category	Sample	Sampling Technique	Research Tools
Community	286	Simple Random sampling	Questionnaire
Community Leaders	100	Convenience	Questionnaire
Environmental officers	10	Convenience	Interview Guide
Total	396		

3.4 Sampling Procedure

Two sampling procedures were used in this study. First, simple random sampling was applied to attain the community members to establish which of them would take part in the study. Community leaders and environmental officers were subjected to convenience sampling since their participation is expected.

3.5 Data Collection Methods

This study focused on the use of survey and interview.

Survey

The study used the questionnaire method to collect data so as to facilitate collection of large amounts of data from the respondents in a short period of time. The questionnaire were cheap and fast to distribute allowing respondents to fill out information in a short period of time

Interview Method

This method was used to collect data through one on one personal interview with all respondents. An interview guide was used to carry out in-depth interviews of respondents in order to obtain firsthand information. This method helps in collecting information that cannot be directly observed or got using questionnaires

3.6 Research Instruments

The study used two main research instruments namely the questionnaire and interview guide.

Questionnaire

Data collection was carried out using researcher-made questionnaires. The questionnaires were divided in four parts. The first part focused on the demographic characteristics of respondents, while the second, third, fourth provided questions on each objective guiding the study respectively. The questions in the questionnaires were both closed and open ended questions.

Key informant Guide

This instrument was used mainly to collect qualitative data from the qualitative respondents. The interviews were used on a few respondents who fall as part of environmental officers. The instruments contained open ended questions. Thus, the researchers were posed questions on the respondents who then answered the questions in details.

3.7 Validity and Reliability

3.7.1 Validity

Validity refers to the degree to which results obtained from analysis of the data actually represents the phenomenon under study. The researcher distributed the research instrument (questionnaire) to four experts to rate the relevance of the questions using a five (5) point scale anchored relevant, quite relevant, somewhat relevant and not relevant. The Content Validity

Index for the questionnaire should be above 0.7 for the questionnaire to be declared valid. This would mean that the questions therein are relevant to the variables under study. According to Saunders, Lewis and Thornhill, (2009) Validity of instrument is determined by the formula

Number of items declared valid by the judges

Total number of items

3.7.2 Reliability

To establish reliability of the research instruments, the researcher conducted a pilot study, using the test-retest method. The instruments were distributed to a section of the respondents and then wait for two weeks before being re-administered. The results were entered into the SPSS program and a reliability test carried out using the Cronbach's Alpha as the measure of reliability. If the Alpha is above 0.7, the instruments was declared as reliable (having internal consistency).

3.8 Data Gathering Procedures

An introduction letter was obtained from the Kampala International University studies for the researcher to solicit approval to conduct the study in Mpigi district. After approval, the researcher acquired a list of the eligible respondents from the authorities in charge and select respondents using simple random sampling from this list to arrive at the minimum sample size. The respondents were explained to about the study and were requested to sign the Informed Consent Form. The researcher produced more than enough questionnaires and interview guides for distribution. The researcher selected research assistants who assisted the researcher in the data collection; they were briefed and oriented in order for them to be consistent in administering the questionnaires and interview.

3.9 Ethical Considerations

The researcher respected anonymity of the respondents by ensuring confidentiality of the respondents and the data provided. This was done through assurance that the information they provided were purely for academic purposes and that their identity was not disclosed to anyone. This was highlighted in the introductory part of the questionnaire.

All the sources of literature have been acknowledged through citations and referencing. Lastly, objectivity will be considered during report writing to avoid personal bias

The researcher sought clearance from the University to be able to collect data in the targeted area. The researcher ensured and assured the respondents that all their responses were treated in strict confidentiality.

The researcher will obtain informed consent from authorities to interview their citizens and also interviewed the care takers. The researcher will explain to the people in the study area the objectives of the study, introduced him he explained why the particular respondents were chosen, the benefits, discomforts and harms of the study, and will request to also ask questions in relation to the study.

3.10 Data Analysis

Quantitative Analysis

The quantitative data involved information from the questionnaires only. Raw data from the field will be coded, entered into the computer and were checked and statistically analyzed using the Statistical Package for Social Scientists (SPSS) software package to generate descriptive and inferential analysis that were applied to the primary variable and associated indicator items related to the study objectives. Descriptive analysis was applied to describe the primary variable and associated indicator items related to the study objectives. The results for the study presented inform of tables then discussed in relation to existing literature. The presentations was done using frequency and percentages and then personal analysis according to the questionnaire presentations.

Qualitative analysis

The researcher used manual coding on the transcripts to identify the significant statements across individual interviews. Subsequent readings of the significant statements helped in identifying sub-themes emerging within the patterns. For presentation of thematic findings, both textural and structural descriptions were used in the results section. Textural descriptions are significant statements used to write what the participants experience. Structural descriptions are the interpretation of the context or setting that influenced participants' experiences. For textural

descriptions, the quotes of participants were given in italics with the respondent to whom that quote belongs marked with type. The structural descriptions as interpreted by the researcher was provided in plain text.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

The study set to conduct an Assessing the level of awareness of the impact of charcoal burning on forest degradation in Mpigi District. The objectives are to assess the level of knowledge of the long-term effects of charcoal burning on the environment, to examine the effect of charcoal burning on forests usage/ degradation and to establish mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district. This chapter provides the presentation, analysis and discussion of findings, the study provides the response rate, demographic characteristics of the respondents and finally the bio-data for the respondents then description of the frequency and Percentages and finally the correlation between the advertising, sales promotion and public relations on sales performance.

4.1 Response Rate

The study targeted to attain data from 386 respondents who were in the communities of Mpigi district but achieved a response rate of 315 representing 91.4% of the respondents. The findings mean that the study nevertheless attained a high response rate for the study.

Table 4.1: Response Rate

Questionnaires distributed	Questionnaires returned	Response rate
105	315	81.6%

Source: Primary data (2022)

The results in Table 4.1 show that data was collected from 315 respondents representing 81.6% of the study. The response rate is an indication that data was collected from reliably high number of the respondents with the response rate deemed as high. This implies that the response rate was high, the data collected is therefore reliable, even Saunders (2007) suggests that a response rate of 50% is adequate when quantitative data is manually collected

4.2 Demographic Characteristics of respondents

This was based on the gender of respondents, age, education and time of work in the organization. This is intended to provide an understanding of the influence of the bio-data on the

study. This measures the implication of the study affected by the demographic traits of the respondents. The different demographic characteristics are analyzed and presented as below.

4.2.1 Gender of Respondents

Here the researcher was interested in gathering information on the gender of respondents and information got was presented in the table below

Table 4.1: Gender of respondents

Gender	Frequency	Percent
Male	194	61.6
Female	121	38.4
Total	315	100.0

Source: Field Data (2022)

The findings from the field reveal that majority respondents were male who were 194(61.6%) of the respondents while the female respondents were 121(38.4%) of the study. The findings show that information was attained from both male and female though males were more, although the male dominated the study both genders provided the data, it further imply that data was collected from respondents across the gender, the findings can't be doubted on gender grounds.

4.2.2 Age of respondents

Here the researcher was interested in gathering information on the age of respondents and information got was presented in the table below.

Table 4.2: Age of respondent

Age	Frequency	Percent
20-29 Years	63	20.0
30-39 Years	102	32.4
40- 49 Years	92	29.2
50 Years above	58	18.4
Total	315	100.0

Source: Field Data (2022)

The results for the study show that the respondents who were majority were in the age of 30-39 years who were 102(32.4%) of the respondents, those of 40-49 years were 92(29.2%) of the study, those of 20-29 years were 63(20%) of the study and finally those of 50 years above were 58(18.4%) of the study. The study findings show that majority respondents were in the age of 30-39 years never the less majority respondents were youthful are hence involved in the promotional strategies of the company. The findings mean that information was attained from people with sufficient and understanding memory. Information attained can be relied upon for decision making.

4.2.3 Education of Respondents

Here the researcher was interested in gathering information on the education of respondents and information got was presented in the table below.

Table 4.4: Education of Respondents

Education	Frequency	Percent
Secondary	85	27.0
certificate	104	33.0
Diploma	62	19.7
Degree	42	13.3
Post Graduate	22	7.0
Total	315	100.0

Source: Field Data (2022)

The study results show that the majority respondents are certificate holder's education representing 104(33%) of the study while secondary leavers were 85(27%) of the study, diploma holders were 62(19.7%) of the study, degree holders were just 42(13.3%) of the study and finally 22(7%) respondents were post graduate holders. The study findings show that the majority respondents for the study were educated indicating that majority of the respondents were educated, they have information sufficient for the study. These findings reveal that respondents were able to read and write and understand the questions in the questionnaire and provided appropriate answers to the study.

4.2.4 Marital Status of the respondents

The researcher here sought to determine the marital status of the respondents. The information attained from the study based on the information needed is provided in Table 4.5

Table 4.5: Marital Status of Respondents

Marital Status	Frequency	Percent
Single	78	24.8
Married	207	65.7
Separated	30	9.5
Total	315	100.0

Source: Field Data (2022)

The findings on the marital status of the respondents indicate that married respondents were 207(65.7%) of the study, 78(24.8%) of the study were single and finally 30(9.5%) of the respondents were separated. The findings show that the majority respondents for the study were married, information attained from the study can be relied upon for effective decision making, marriage is a sign of responsibility, and information is attained from highly responsible respondents of the study.

4.2.5 Time of stay in Mpigi district

Here the researcher sought for the responses on the time of stay of the respondents in Mpigi district, the information attained from the field concerning the study is presented in the results provided as below.

Table 4.6: Time of stay in Mpigi district

Time	Frequency	Percent
Less than 1 year	20	6.3
1- 5 Years	21	6.7
6-10 years	51	16.2
10 Years above	223	70.8
Total	315	100.0

Source: Field Data (2022)

The results for the study show that the majority respondents for the study had been in Mpigi district for 10 years above, these were 223(70.8%) of the study, 51(16.2%) of the respondents had been there for 6-10 years, those of 1-5 years were 21(6.7%) of the study and finally 20(6.3%) respondents had been there for less than 1 year. The study results show that the many respondents for the study had been living in Mpigi district for long, information attained is relied upon for decision making.

4.3 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

The first objective was to assess the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district. The study results based on the information attained from the field is presented in the Tabulations provided in the Table 4.7.

4.3.1 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

Table 4.7: Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

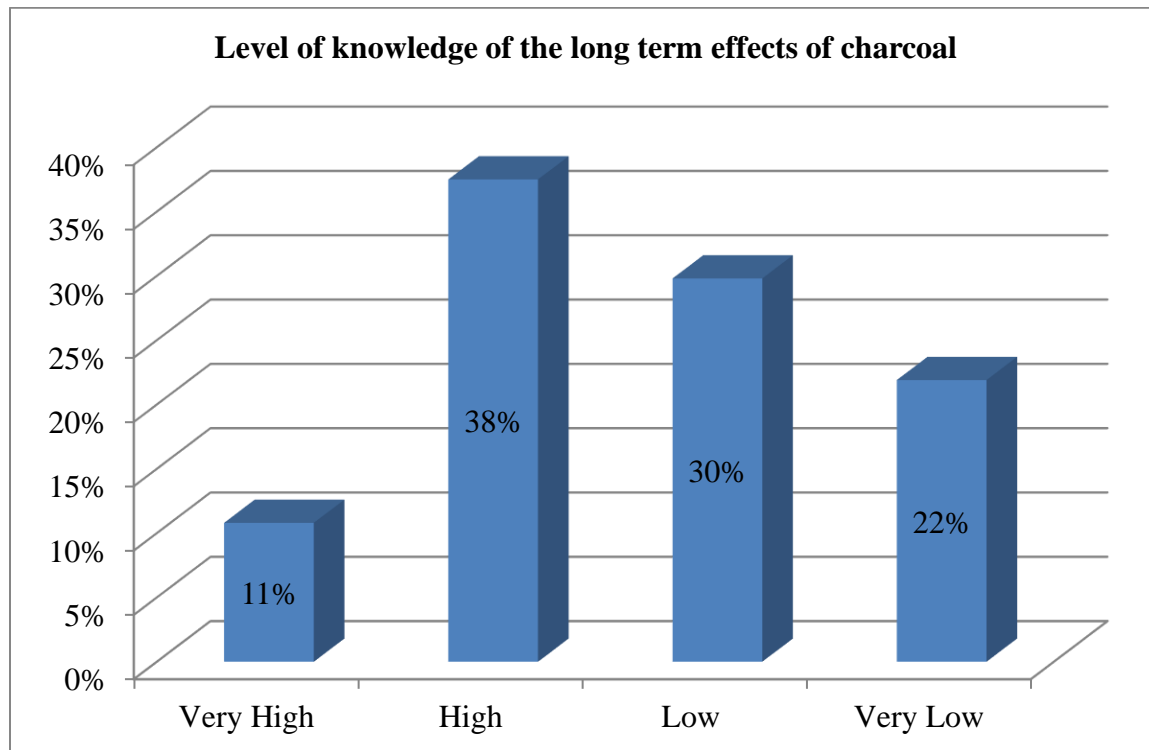
Response	Frequency	Percent
Yes	116	36.8
No	112	35.6
Not Sure	87	27.6
Total	315	100.0

Source: Field Data (2022)

The results in Table 4.7 on whether there is some Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district. The findings for the study show that 36.8% respondents were aware, 112(35.6%) respondents disagreed to awareness while 87(27.6%) respondents were not sure. The findings indicate that there is little knowledge of the people on the long-term effects of charcoal burning on the environment.

4.3.2 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

Figure 4.1: Showing responses on Level of knowledge of the long-term effects of charcoal burning on the environment Mpigi district



Source: Field Data (2022)

Figure 4.1 showing responses on the Level of knowledge of the long-term effects of charcoal burning on the environment, the results show that 118(38%) respondents argued that it was high, 94(30%) were for low, while 69 (22%) were for very low and finally 34(11%) respondents provided for very high. In the responses provided, it's prudent to argue that the level of knowledge amongst the respondents was generally an indication that there is moderate knowledge of the people on the long-term effects of charcoal burning on the environment. The research show that there is prevalence of knowledge though this is low as people don't know the effects of charcoal burning on the environment.

4.3.3 Short-term effects of effect of charcoal burning on the environment in Mpigi district

Table 4.8: Short-term effects of effect of charcoal burning on the environment in Mpigi district.

Short-term effects	Frequency	Percent
Pollution of the environment	65	20.6
Loss of trees	78	24.8
Burning of the biological organisms	54	17.1
Pollution of animals and plants	118	37.5
Total	315	100.0

Source: Field Data (2022)

The results in Table 4.8 on whether there are short-term effects of effect of charcoal burning on the environment in Mpigi district revealed that Pollution of animals and plants had 118(37.5%) respondents, 54(17.1%) respondents contend that burning of the biological organisms, 78(24.8%) respondents provided for loss of trees and finally pollution of the environment had 65(20.6%) of the study. The results show that many respondents agree that the charcoal burning is generally harsh on the environment in Mpigi district in the short term. The findings provide indicate that many respondents agree that charcoal burning significantly affect the environment.

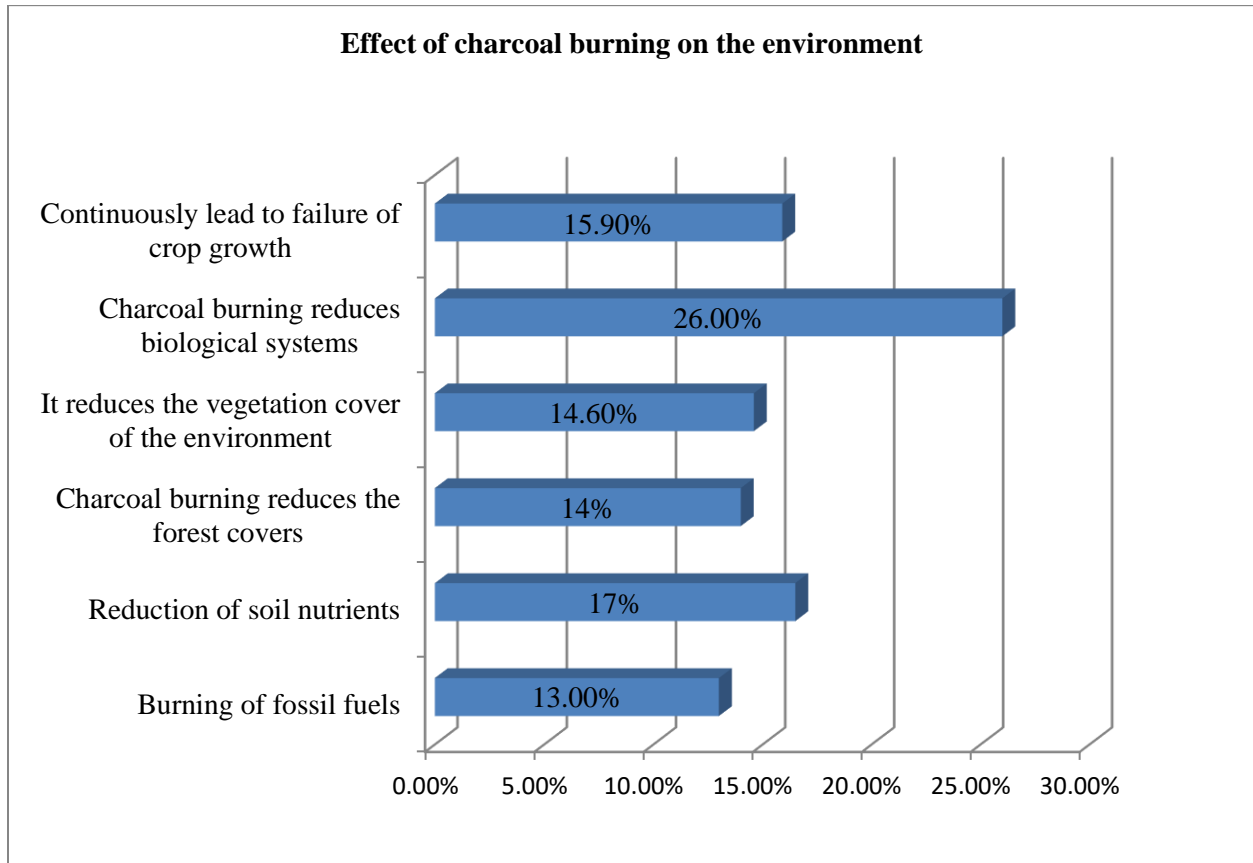
The results from the interview are in the same notion explaining the state of the effect of short-term charcoal burning on the environment. Charcoal from most earth-based kilns is produced in an oxygen-poor environment that results in the formation of products of incomplete combustion, such as methane. Charcoal production therefore affects global warming through the production and emission of greenhouse gases, such as carbon dioxide (CO₂) and methane (CH₄). Although carbon monoxide is one of the products of incomplete combustion during

charcoal making, it is not listed as a greenhouse gas is considered to be short-lived in the atmosphere

KII with Environmental officer Mpigi district, 2022

4.3.4 Effect of charcoal burning on the environment in Mpigi district

Figure 4.2: Effect of charcoal burning on the environment in Mpigi district



Source: Field Data (2022)

Figure 4.2 show results on the effect of charcoal burning on the environment in Mpigi district, the study show that Burning of fossil fuels had 41(13%) of the respondents, Reduction of soil nutrients had 52(17%) of the respondents, Charcoal burning reduces the forest covers had 44(14%) respondents, It reduces the vegetation cover of the environment 46(14.6%) of the study and Charcoal burning reduces biological systems 82(26%) and finally Continuously lead to failure of crop growth had 50(15.9%) respondents. The study results show that the charcoal burning significantly affect the environment in Mpigi district. The findings show that the

charcoal burning presents a negative long-term effects on the environment in and around Mpigi district.

The results further attained through charcoal burning on the environment, which provided that through the regulation of water flow, forests contribute to the maintenance of wetland ecosystems, such as swamps and floodplains, and fish resources that wetlands harbor. Although the impacts on human well being of some ecosystem services provided by forests are indirect, they are nonetheless important for sustaining livelihoods and environmental health and security in the basin. Forests regulate stream flows by intercepting rainfall, and absorbing the water into the underlying soil, and gradually releasing it into the streams and rivers of its watershed.

KII with environmental officer, Mpigi district, 2020

4.3.5: Effects of charcoal burning on agriculture in Mpigi district

Table 4.9: Effects of charcoal burning on agriculture in Mpigi district

Effects	Frequency	Percent
Charcoal burning reduces the agricultural land fertility	75	23.8
Charcoal burning reduces the organisms for soil aeration	57	18.1
Charcoal burning has direct burning to food crops	133	42.2
Reduce agricultural land space	50	15.9
Total	315	100.0

Source: Field Data (2022)

Results in Table 4.9 on the effects of charcoal burning on agriculture in Mpigi district revealed that Charcoal burning has direct burning to food crops with 133(42.2%) respondents for the study, Charcoal burning reduces the agricultural land fertility had 75(23.8%) respondents, Charcoal burning reduces the organisms for soil aeration had 57(18.1%) of the study and Reduce agricultural land space had 50(15.9%) respondents for the study. the findings show that the charcoal burning generally reduce the performance of the agricultural sector in Mpigi district. It's sufficient to argue that charcoal burning generally present a hard arching effect on the agricultural systems of people in communities in Mpigi district.

The results on the impact of charcoal production on agriculture are through its impact on the soil at two different levels of intensity. Intense impact occurs at the kiln site as a result of the extreme heat generated during the carbonization process and the digging to make a pit and/or soil to cover the wood pile. Low impact occurs in the area surrounding the kiln where the wood is harvested. Soil impacts in the harvested area are probably similar to those of any low impact forest clearing that does not result in land use change.

KII with Environmental Officer Mpigi district.

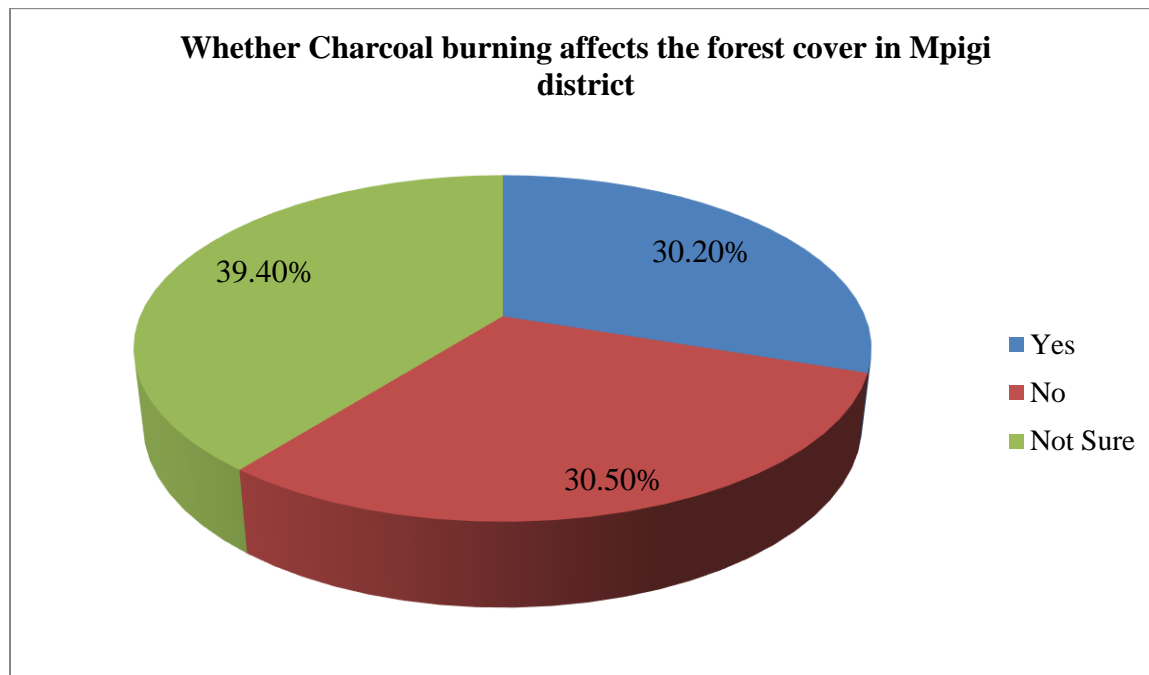
The results show that both the interview and questionnaire responses contend that the charcoal production presents a danger to the environmental situation that is attained through creation of the environment limiting the expansion of the communities and limiting the capacity of the soils hence reducing the performance of the economies.

4.4 Effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda

The second research objectives for the study were to determine the effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda. The results attained in this regard are provided in the tabulations and graphical presentations provided in the following.

4.4.1 Whether charcoal burning affects the forest cover in Mpigi district Uganda

Table 4.3: Whether charcoal burning affects the forest cover in Mpigi district Uganda

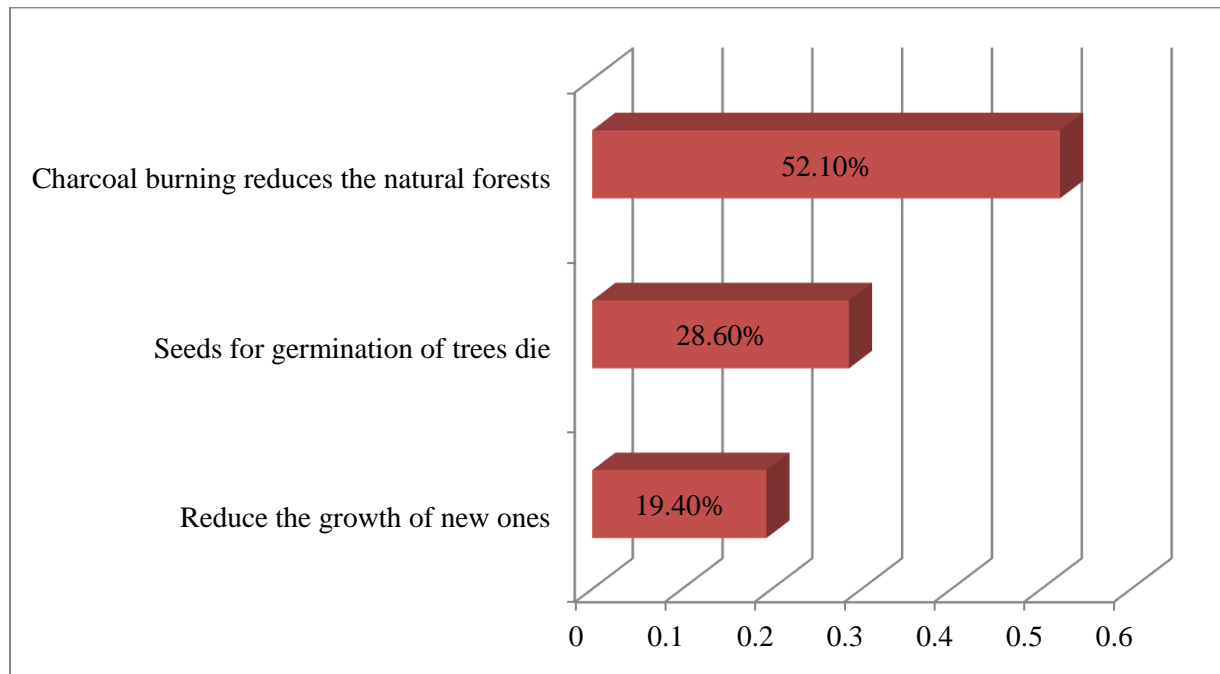


Source: Field Data (2022)

Results in Table 4.10 on whether charcoal burning affects the forest cover in Mpigi district Uganda revealed that 30.2% respondents agree that charcoal burning affects the forest cover in Mpigi district Uganda, it was revealed further that 30.5% respondents disagreed and finally were not sure 39.4% of the respondents were not sure. The results indicate that the charcoal burning has a negative effect on the forest cover in the district. The charcoal burning is significant affect the forest cover.

4.4.2 Effect of charcoal burning on forests Growth in Mpigi district

Figure 4.4: Effect of charcoal burning on forests Growth in Mpigi district



Source: Field Data (2022)

Results in Figure 4.4 on the effect of charcoal burning on forests Growth in Mpigi district revealed that charcoal burning reduces the natural forests according to 164(52.1%) respondents, Seeds for germination of trees die had 28.6% respondents and finally reduce the growth of new ones had 19.4% respondents provided for the study. The results indicate that charcoal burning present a negative effect on the forests Growth in Mpigi district. The results further show that the state of increased charcoal burning is significant in inducing the forest cover in the district.

4.4.3 Effect of Charcoal Burning on Existing Forests in Mpigi District

Table 4.10: Effect of charcoal burning on existing forests in Mpigi district

Effects	Frequency	Percent
Charcoal burning lead to direct cutting of trees	80	25.4
Charcoal burning reduce the forests cover	121	38.4
Burning charcoal in forests reduce the quality of existing forests	114	36.2
Total	315	100.0

Source: Field Data (2022)

Results in Table 4.10 on the effect of charcoal burning on existing forests in Mpigi district reveal that Burning charcoal in forests reduces the quality of existing forests with 114(36.2%) respondents while Charcoal burning reduce the forests cover had 121(38.4%) respondents for the study and finally charcoal burning lead to direct cutting of trees according to 80(25.4%) respondents. The study findings show that charcoal burning is significant in inducing the burning of charcoal, it's significant in reduction of the forest state and reduction of the forest losses.

The results are in consonance with those of Key informant Interviews who provided in the same direction as

The charcoal burning significantly leads to the pollution of environment, reduce the performance functionality of the forests systems, and reduce the values and efficiency of the communities. The demand for food and other land-demanding commodities, thus requiring more land to produce them. As population growth is often viewed as the main cause of deforestation, it is important to nuance this with the observation that most deforestation is from the conversion of forest to

agricultural land and much of this is from industrialized rather than smallholder agriculture.

KII with Environmental officer, 2022.

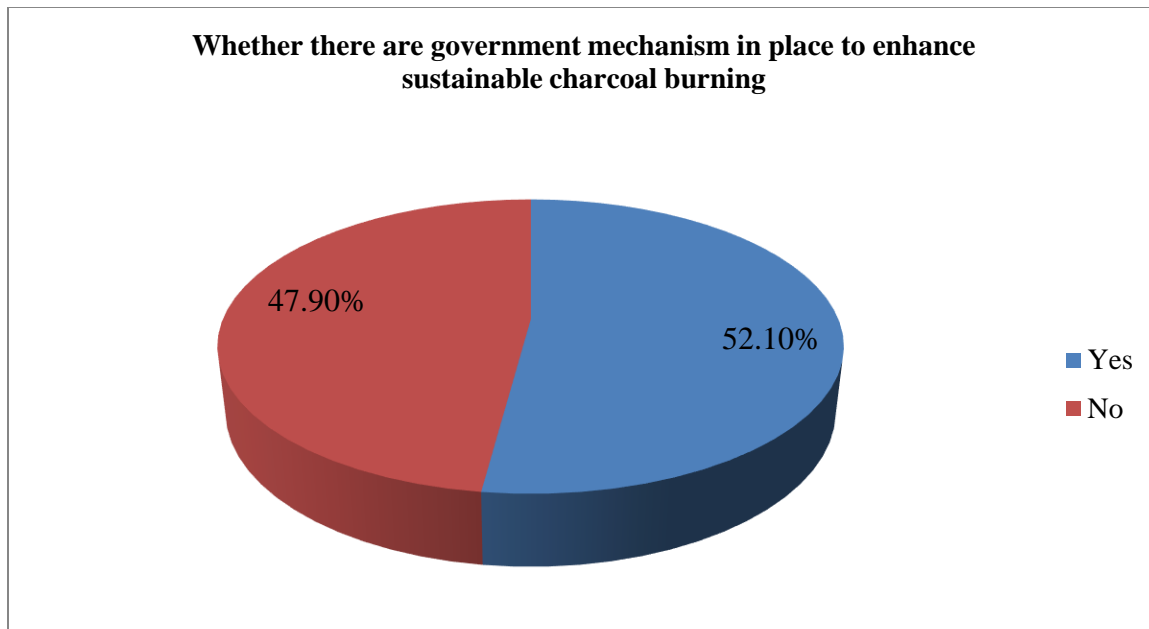
The study further reveal that the occurrence of charcoal burning has significantly reduced the existing forests in the communities. The charcoal burning posses danger and threats to the environmental management in the communities for the people.

4.5 Mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district.

The second objective of the study was to establish mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district. The researcher sought for information from the respondents based on the need for the study as provided in the responses provided here under.

4.5.1 Whether there are government mechanisms are in place to enhance sustainable charcoal burning.

Figure 4.5: Whether there are government mechanism are in place to enhance sustainable charcoal burning



Source: Field Data (2022)

Results in Figure 4.5 on whether there is government mechanism are in place to enhance sustainable charcoal burning revealed that 164(52.1%) respondents agreed, 151(47.9%) respondents disagree. The study findings show that the government mechanisms are less in place to enabling the sustainable charcoal burning in the communities. The study implies that enhancing the state of charcoal burning policy would significantly generate the reduction in the resources and environmental health systems.

4.5.2 Mechanisms in place for government for sustainable charcoal burning in Mpigi district

Table 4.11: Mechanisms in place for government for sustainable charcoal burning in Mpigi district

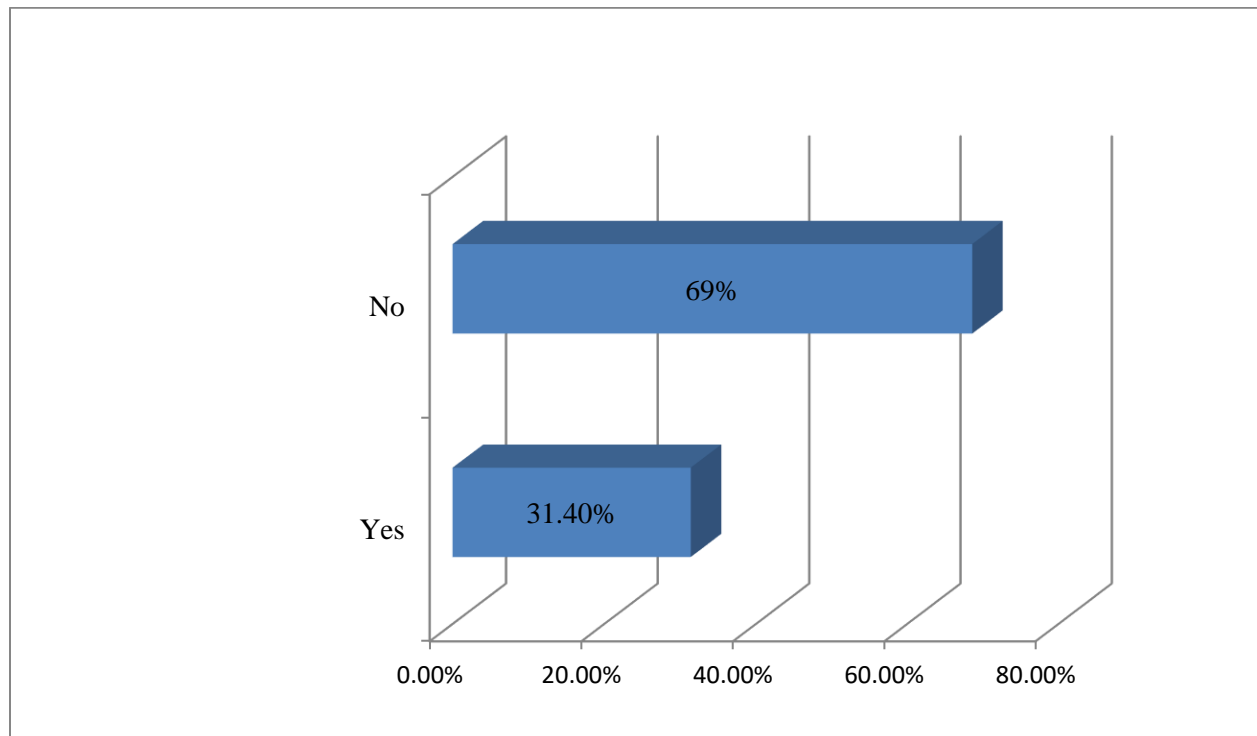
Mechanisms	Frequency	Percent
Instituted strict forest monitoring	46	14.6
Providing security in the forest	91	28.9
Community sensitization on deforestation	89	28.3
Enhanced legal framework for managing forests	89	28.3
Total	315	100.0

Source: Field Data (2022)

Results in Table 4.11 on the mechanisms in place for government for sustainable charcoal burning in Mpigi district indicate that enhanced legal framework for managing forests had 89(28.3%) respondents, Community sensitization on deforestation also had 28.3%, Providing security in the forest had 91(28.9%) and finally Instituted strict forest monitoring had 46(14.6%) respondents for the study. the results indicate that there are mechanisms in place for the sustainable charcoal burning in the district, the mechanisms are however not very sufficient in enabling the improvements in the charcoal burning amongst the people in the communities.

4.5.3 Are there community induced mechanisms for addressing sustainable charcoal burning in Mpigi district

Figure 4.6: Are there community induced mechanisms for addressing sustainable charcoal burning in Mpigi district



Source: Field Data, 2022

Figure 4.6 on whether there is community induced mechanisms for addressing sustainable charcoal burning in Mpigi district, the findings show that 69% respondents disagreed that there are community mechanisms for sustainable charcoal burning while 31.4% respondents agree. The study findings indicate that there are less community mechanisms for addressing the sustainable charcoal burning, the study indicate that charcoal burning mechanisms are not provided in sustainable burning for the charcoal.

4.5.4 Avenues has the community developed in addressing sustainable charcoal burning in Mpigi district

Table 4.12: Avenues community developed in addressing sustainable charcoal burning in Mpigi district

Avenues	Frequency	Percent
Planting of tress	59	18.7
Reducing deforestation	96	30.5
Reporting those cutting trees	91	28.9
Sensitizing the fellow members	69	21.9
Total	315	100.0

Source: Field Data (2022)

The study results in Table 4.12 on the avenues developed by the community in addressing sustainable charcoal burning in Mpigi district, the study revealed that 59(18.7%) respondents were in agreement that planting of trees, 96(30.5%) respondents were for community involvement in reduction of deforestation, reporting the people cutting trees had 28.9% and finally sensitizing the fellow members had 21.9% of the respondents. The study results finally revealed and implied that there are avenues designed in addressing sustainable charcoal burning in Mpigi district. The results imply that the state of the charcoal burning exist with some few community avenues designed to reduce the prevalence.

Results from the Key informant interviews

The study reveals that NEMA has undertaken a direction for demarcation and preservation of the forests (Mpanga forest reserve) under the management of the district environmental officer, there has been issues that restrict and limit the people in occurrence and effective working. The work of NEMA and National forest authority (NFA) has undertaken to demarcate and manage the forests.

KII with Environmental officer, Mpigi district.

The study results based on the interviews are presented in the assessment below.

Through working with the traditions and activities of forest communities, a sharper interest towards forest resource management could be developed. It is important to emphasize that tackling deforestation requires a pragmatic integration of the activities of forest-dependent communities into national policy. In this regard, the communities will more readily appreciate the need to protect forest resources, as mitigating deforestation also implies safeguarding their own livelihood.

KII with Environmental officer, Mpigi district

Government should employ people under the traditional council to look into forest conservation or preservation. Fines should be imposed for deforesting. Laws should be developed to mitigate deforestation in rural communities. People should pay wood collection fee before collecting.

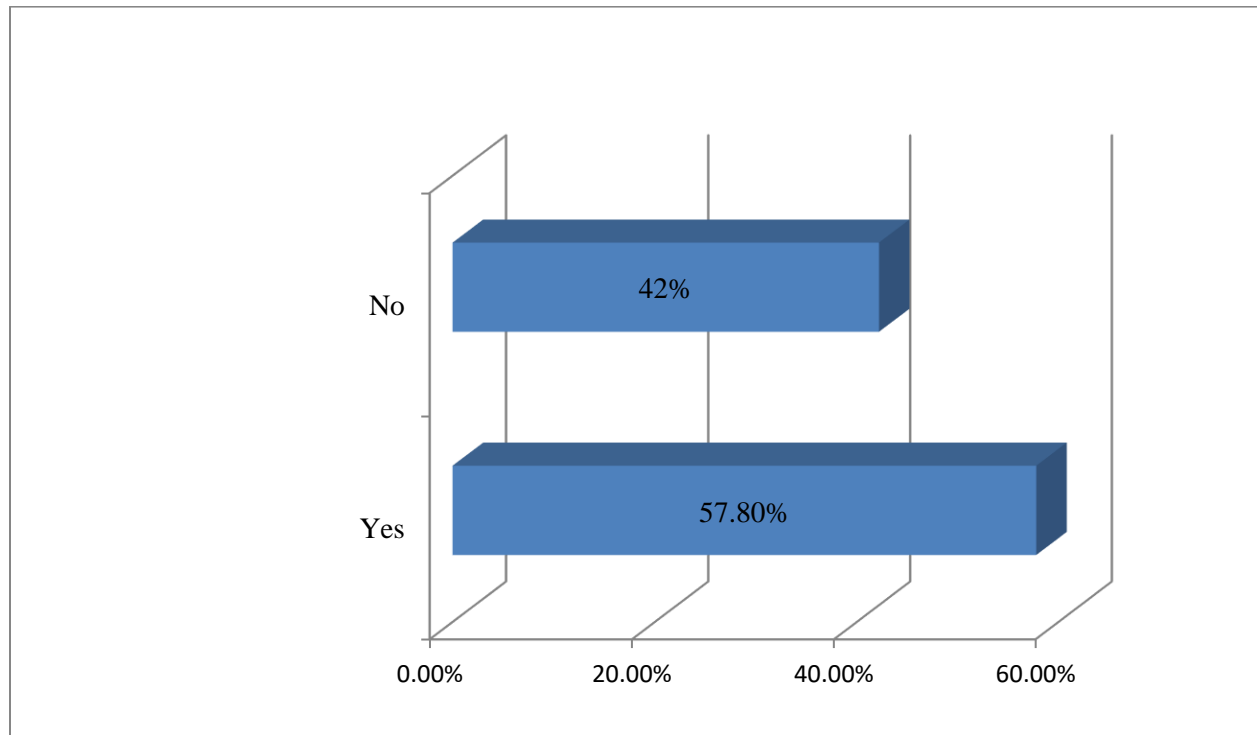
KII with Environmental officer, Mpigi district.

There is need for media in raising awareness about the impacts of deforestation. Traditional leaders should call community members in traditional gatherings to raise awareness about the impacts of deforestation. Government should integrate social and environmental policies by using community education model to mobilize, impart knowledge, change attitudes and practices to deal with the impacts of deforestation.

KII with Environmental officer, Mpigi district.

4.5.5 Whether Mpigi district local government provide guidance to local on charcoal burning

Figure 4.7: Whether Mpigi district local government provide guidance to local on charcoal burning



Source: Field Data, 2022

Results in Figure 4.7 on whether Mpigi district local government provide guidance to the locals on charcoal burning; it was found that 57.8% respondents agree, 42% respondents disagreed in the regard. The findings for the research show that majority respondents are in agreement with the presence of guidance provided by the district local government in ensuring the reduction of charcoal burning, the study results show that charcoal burning activities are highly discouraged by the Mpigi district local government.

4.5.6 What Mpigi district local government has done in guidance to local on the charcoal burning

Table 4.13: What Mpigi district local government has done in guidance to local on the charcoal burning

Has done	Frequency	Percent
Establishment of bi-laws on forest preservation	84	26.7
Community awareness campaigns on forest value	78	24.8
Enhanced the development of skills for proper forest usage	111	35.2
Training on the forest usage	42	13.3
Total	315	100.0

Source: Field Data (2022)

Table 4.13 show results on what Mpigi district local government has done in guidance to local on the charcoal burning, the findings revealed that majority respondents contend that Mpigi district local government has Enhanced the development of skills for proper forest usage according to 35.2% respondents, establishment of bi-laws on forest preservation had 26.7%, Community awareness campaigns on forest value had 24.8%, those who provided for training on the forest usage were 13.3% of the study. The research findings show that Mpigi local government has undertaken some efforts in enhancing and reducing the charcoal burning in and around Mpigi district local government; these however seem insignificant given the continued existence of the charcoal burning.

To provide more remedies in enhancing sustainable forest usage and reduce the environmental danger on the community, the study proposes avenues needed in developing the state of affairs in developing the forest environment and avoids charcoal burning; these range from the following mechanisms as enumerated.

A large number of charcoal producers could easily be reached for training on efficient carbonization processes through working with community based groups producing charcoal. The existing ten energy centers through which farmers are trained by the Ministry of Energy are important platforms that could be empowered for community technical capacity building. The country has a wide range of media celebrities such as those in music and drama, public gatherings such as in churches, and community meetings, all of which could serve as important channels for reaching consumers with messages on efficient use of charcoal.

KII with environmental officer, Mpigi district

The interview further revealed that through government technical extension services, research and development organization work could help advise farmers on appropriate tree and shrub species, optimal tree management and rotation periods, as recommended by stakeholders during a charcoal seminar held at the World Agroforestry Centre. Farmers could be encouraged to form or join Community Forest Associations that will coordinate sourcing of seeds and seedlings, planting, management, awareness creation and monitoring of charcoal production as a cash crop

It was found that the charcoal production can be sustained by

Supporting of the ongoing harvesting of the invasive Prosopis juliflora species as a strategy to restore pastureland in the affected areas. Global concern about deforestation caused by fuel wood shortages prompted the introduction

KII with environmental officer, Mpigi district

Legalization and enforcement of the charcoal regulations should be aimed at offering an enabling legal framework that promotes commercial charcoal production and licensing for revenue, enterprise-based approaches for poverty reduction, smallholder/private tree growing, wood fuel-energy conserving technologies, improved agricultural productivity and ecological sustainability.

To protect the country's biodiversity the charcoal regulations prohibit production of charcoal from endangered, threatened, and protected plant species, and require reforestation or conservation plans for the area where trees will be managed for charcoal production. The regulation system will also address the lack of standards to regulate quality, weight, and size of the charcoal bags entering the market, which has caused buyers and sellers to pay the same amounts for different sized bags. Community based organizations have been entry points for many research and development interventions in the country but this has been absent in the charcoal industry due to its informal set up; the groups can now take advantage of the legal status of the industry.

KII with environmental officer, Mpigi district

The study suggests the mechanisms that local government has done in guidance to local on the charcoal burning. The study results show that the modes of local government in guidance for enhancement and reduction of charcoal burning can be reduced in generation of the sustainable environment.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the results attained from the field alongside with the previous authors in literature review, it further provide the conclusions and recommendations based on the implied results for the conclusions in the study.

5.1 Discussion of findings

5.1.1 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

The study found that people in Mpigi district had little or low awareness on the long-term effects of charcoal burning on the environment. The findings for the study show that 36.8% respondents were aware, 112(35.6%) respondents disagreed to awareness while 87(27.6%) respondents were not sure. The long-term effects of charcoal burning were on the environment, forests and agriculture in the long run; the occurrence of charcoal burning reduced the environmental features of forests and agriculture. The results are in agreement with those of Wolfsmayr and Rauch (2014) who argue that forest biomass that is used in electricity, biofuel, and heat generation has become a core area for the United States. Some states, such as Minnesota, are using appropriate scales and technology to increase their production of energy from biomass. Even by Oluwole et al (2013) on the use of low-emission stoves, the authors found significant reductions in the frequency of respiratory symptoms, such as a dry cough, suffocation, and runny noses, in mothers and children. In fact, these stoves were found to have efficiently enhanced the indoor and household air quality through reducing the exposure of women and children to dangerous pollutants. Even Das et al (2016) found that biomass fuels account for approximately 90% of household energy consumption. From this perspective, there is a correlation between women's health and biomass utilization in Sub-Saharan Africa. In most cases, women from rural areas in the sub-Saharan African region are burdened with heavy workloads as they are mandated to collect firewood from nearby or surrounding forests.

5.1.2 Effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda

The study found that charcoal burning reduces the forests coverage, the effect of the charcoal burning was reduction of the forest cover reducing significantly the forests both of natural and

manmade, these effectively reduce the values of the forest covers presenting a negative influence for the forests coverage in Mpigi district. The results are in agreement with the previous studies such as of Bolognesi (2015) who argued that there is incomplete understanding of the drivers behind this degradation process and its connection to urban energy demands. There is also limited quantitative information about some of its key elements, such as extent of degraded areas, intensity of the degradation, spatial and temporal dynamics of the process, AGB removals and carbon emissions. Even Mwampamba (2007) modeled current and future deforestation rates based on survey data gathered on extraction and replenishing habits of rural charcoal producers in Tanzania, the largest charcoal producer in SSA, finding that by 2028, public forest resources will be depleted if policy interventions are not put in place and finally Namaalwa (2009) identified a collapse in the Ugandan charcoal supply chain by 2019. While these countries are some of the largest charcoal producers in the region, these findings hold grave implications for other nations whose population relies heavily on wood-based fuels. In addition, further research at local or sub-national levels can provide decision makers with information regarding geographical trends in energy dynamics.

5.1.3 Mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district

The study on the mechanisms in place for government for sustainable charcoal burning in Mpigi district indicate that enhanced legal framework for managing forests, Community sensitization on deforestation, providing security in the forest and finally Instituted strict forest monitoring are the mechanisms put in place for the sustainable charcoal burning in the district. The study reveals that the mechanisms for the forest conservation through sustainable charcoal burning continue to low. The state of the sustainability enhances the forest conservations in Mpigi district. The results for the study are in agreement with those of FAO (2017) contend that governments must also be supported in boosting awareness and implementation of these charcoal regulations. Inter-sectoral, multi-stakeholder dialogues across the entire charcoal value chain should be encouraged, to discuss coordinated options for reducing greenhouse gas emissions and mitigating climate change, including through such work as making the charcoal value chain a specific component. Also Mutimba and Barasa (2005) found that over 75 per cent of charcoal in the country is produced unsustainably. Ironically, the charcoal industry could save the environment that it now threatens if communities and private practitioners grew trees for charcoal as well as

harvested trees sustainably through proper management plans. There is potential to improve tree cover and produce charcoal, through adoption of short rotational agro forestry systems.

5.2 Conclusions

5.1.1 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district

The study found that people in Mpigi district had little or low awareness on the long-term effects of charcoal burning on the environment. The long-term effects of charcoal burning were on the environment, forests and agriculture in the long run; the occurrence of charcoal burning reduced the environmental features of forests and agriculture.

The study concludes that in the long run, the charcoal burning significantly affects the environment in Mpigi district. The effect of charcoal burning to the environment significantly remains high with the influences generally degrading the environment. The study conclude that in the long-term the charcoal burning is an affect though the knowledge on the environment is generally on the community.

5.1.2 Effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda

The study found that charcoal burning reduces the forests coverage, the effect of the charcoal burning was reduction of the forest cover reducing significantly the forests both of natural and manmade, these effectively reduce the values of the forest covers presenting a negative influence for the forests coverage in Mpigi district. The study provides that charcoal burning is sufficiently deriving the forest degradation; unregulated charcoal burning significantly reduces the growth of the forest cover and plants.

The study conclude that charcoal burning if continued presents harmful effects on the forests cover in terms of usage of the forests in the environment for the community in Mpigi district.

5.1.3 Mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district

The study on the mechanisms in place for government for sustainable charcoal burning in Mpigi district indicate that enhanced legal framework for managing forests, Community sensitization on deforestation, providing security in the forest and finally instituted strict forest monitoring are the mechanisms put in place for the sustainable charcoal burning in the district.

The study concludes that sustainable charcoal burning is supportive in developing the forest conservations in Mpigi district. The study provided are in the alerting of the assertion that charcoal burning can be sustainably done to reduce the danger of the practices on the environment.

5.3 Recommendations

5.3.1 Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district.

The study found that people in Mpigi district had little or low awareness on the long-term effects of charcoal burning on the environment. Based on this, the researcher recommends the following action to be undertaken.

Charcoal research need to be quantified to reduce the damage value but also the monetary value of fire wood at domestic level which is non-documented but yet the major problem. The Government of Uganda, through the relevant authorities, implements the existing forest and resource laws so as to ensure proper usage of the forest related products. Furthermore, there is need for policy legislation on modern and or improved technological use of forestry products, especially for firewood and charcoal.

5.3.2 Effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda

The study found that charcoal burning reduces the forests coverage, the effect of the charcoal burning was reduction of the forest cover reducing significantly the forests both of natural and manmade. The researcher makes the following recommendations to be undertaken in order to reduce the danger of bush morning on the forest cover:-

Compulsory use of Improved Eco-stoves should be implemented to ensure efficiency and effectiveness for sustainable forest development in regional development. There is need for the forests usage to be improved, developed and enhanced through generating efficiency of the forest system. The power of charcoal production need to be developed with efficiency and regulations be possibly developed for the managerial policy and development mechanisms.

5.1.3 Mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district

The study found that the mechanisms for the forest conservation through sustainable charcoal burning continue to be low. The state of the sustainability enhances the forest conservations in Mpigi district: The researcher recommends the following mechanisms

The study recommend that there is need for Increased monitoring and enforcement of illegal timber extraction should be conducted by both local and government stakeholders. Payment systems for the monitoring of forest extractions activities should be continued and expanded in the study area. There is need for strengthening laws transferring increased decision-making and law enforcement authority to local communities could result the further decentralization of decision making power and monitoring responsibility to local communities by granting them the authority to decide who can access forests surrounding local communities, what forest products are allowed to be harvested, when it is allowed and by whom and how local communities are compensated for their efforts in ensuring sustainable forest extraction practices.

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Appendix I: Research Questionnaire

Dear respondent, I am a graduate student at Kampala International University; I am conducting a research on Assessing the level of awareness of the impact of charcoal burning on forest degradation in Mpigi District. The questionnaire is intended to generate information for the study; you are kindly invited to participate in this survey, by sharing your knowledge and experiences. The information you provide will be used for academic purpose and all information from you will be treated confidentially.

SECTION: PROFILE OF THE RESPONDENTS

1. GENDER

1. Male

2. Female

2. AGE

1. 20-29

2. 30-39

3. 40-49

4. 50 above

3. Time of Stay

1. Less than a year

2. 1 – 5 years

3. 6 – 10 years

4. 5 and above

4. Marital Status

1. Single

2. Married

5. Level of Education

1. Secondary

2. Diploma

3. Bachelor

4. Master

Section B: Level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district.

6. I am aware of the long-term effects of charcoal burning on the environment in Mpigi district?

Yes

No

Not Sure

7. What is the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district?

Very high

High

Low

Very Low

8. What are the short-term effects of effect of charcoal burning on the environment in Mpigi district?

Pollution of the environment

Loss of trees

Burning of the biological organisms

Pollution of animals and plants

9. What is the long-term effect of charcoal burning on the environment in Mpigi district?

Burning of fossil fuels

Reduction of soil nutrients

Charcoal burning reduces the forest covers

It reduces the vegetation cover of the environment

Charcoal burning reduces biological systems

Continuously lead to failure of crop growth

Any other

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10. What are the effects of charcoal burning on agriculture in Mpigi district?

Charcoal burning reduces the agricultural land fertility

Charcoal burning reduces the organisms for soil aeration

Charcoal burning has direct burning to food crops

Any other

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11. What else can be the long/ short-term effect of charcoal burning on the environment in Mpigi district?

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Section C: Effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda

12. Does charcoal burning affect the forest cover in Mpigi district Uganda?

Yes

No

Not Sure

13. What is the effect of charcoal burning on forests Growth in Mpigi district Uganda?

Reduce the growth of new ones

Seeds for germination of trees die

Charcoal burning reduces the natural forests

Any other

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14. What is the effect of charcoal burning on existing forests in Mpigi district Uganda?

Charcoal burning lead to direct cutting of trees

Charcoal burning reduce the forests cover

Burning charcoal in forests reduce the quality of existing forests

Charcoal burning reduces the existence of forest numbers

Any other

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Section D: Mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district

15. Are there mechanisms in place for sustainable charcoal burning to enhance forest conservation in Mpigi district?

Yes

No

16. What government mechanism are in place to enhance sustainable charcoal burning to enhance forest conservation in Mpigi district

Instituted strict forest monitoring

Providing security in the forest

Community sensitization on deforestation

Enhanced legal framework for managing forests

17. Are there community induced mechanisms for addressing sustainable charcoal burning to enhance forest conservation in Mpigi district?

Yes

No

18. What avenues has the community developed in addressing sustainable charcoal burning to enhance forest conservation in Mpigi district?

Planting of tress

Reducing deforestation

Reporting those cutting trees

Any other Mention

19. Does Mpigi district local government provide guidance to local on charcoal burning ?

Yes

No

20. If Yes, What has the Mpigi district local government done in guidance to local on the charcoal burning Mpanga forest reserve?

Establishment of bi-laws on forest preservation

Community awareness campaigns on forest value

Enhanced the development of skills for proper forest usage

Any other, please mention

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21. What policy mechanisms can be developed in enhancing the sustainable forests cover

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Appendix II: Interview Guide

- 1) What is the level of knowledge of the long-term effects of charcoal burning on the environment in Mpigi district?
- 2) What are the effects of the charcoal burning on the natural environment in Mpigi district?
- 3) What is the effect of charcoal burning on the physical environment in Mpigi district?
- 4) What is the effect of charcoal burning on forests usage/ degradation in Mpigi district Uganda?
- 5) What are the mechanisms for sustainable charcoal burning to enhance forest conservation in Mpigi district?
- 6) What avenues can be developed to ensure forestation in Mpigi district?

Appendix III: Introduction Letter



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Directorate of Higher Degrees and Research Office of the Director

Our Ref: 2018-08-03857

Monday 6th June, 2022

Dear Sir/Madam,

RE: INTRODUCTION LETTER FOR SADIYA FATAH JAMA REG. NO. 2018-08-03857

The above mentioned student is a student of Kampala International University pursuing a Master's Degree in Environmental Management.

The student is currently conducting a research study titled, **"ASSESSING THE LEVEL OF AWARENESS OF THE IMPACT OF CHARCOAL ON FOREST DEGRADATION IN MPIGI DISTRICT"**.

Your organization has been identified as a valuable source of information pertaining to the research subject of interest. The purpose of this letter therefore is to request you to kindly cooperate and avail the student with the pertinent information needed. It is our ardent belief that the findings from this research will benefit KIU and your organization.

Any information shared with the researcher will be used for academic purposes only and shall be kept with utmost confidentiality.

I appreciate any assistance rendered to the researcher.

Yours Sincerely,


Ibrahim Abdullahi, PhD
Director

C.c. DVC Academic Affairs
Dean SONAS



"Exploring the Heights"