



The Impact of Charcoal Business on the Environment in Nyabubare Sub-County Bushenyi District, Western Uganda

¹Akamumpa Nelson and ²Turyamureeba Silaji

¹Department of Science Education, Kampala International University, Uganda

²Department of Foundations Education, Kampala International University, Uganda

ABSTRACT

The purpose of the study was to investigate the impact of charcoal business on the environment in Nyabubare sub-county Bushenyi District. The study used descriptive survey research design utilizing both qualitative and quantitative research approaches. The researcher used questionnaires, interview guide and observation checklist and focus group discussions to collect data. Descriptive analysis was used to analyze the data collected from the field by relating them to the study objectives. Tables and graphs were used to present the field results. This research aimed at finding out the causes of charcoal burning, level of charcoal burning and identifying any measures that are being used in the area. Among the many causes of charcoal burning in Nyabubare Sub County, poverty (27%) and unemployment (23%) were pointed out as the major causes of charcoal burning respectively while low levels of education (8%) and population increase (12%) were the least causes of charcoal burning respectively. The level of charcoal burning was found out to be high (36%) with adverse effects like deforestation (29%) and death and migration of wild animals (19%). Change in micro climate (6%) and loss of herbal medicine (8%) were the least effects of charcoal burning on forests. The study further concluded that the effects of charcoal burning on forests were deforestation, death and migration of wild animals, change in micro climate and loss of herbal medicine. The recommendations were developed by the researcher to improve on the conservation of forests. The recommendations suggested include proper public awareness, strict laws and policies, afforestation, investment in other businesses among others.

Keywords: Charcoal Business, Environment, Deforestation, Sustainability, Nyabubare Sub-County

INTRODUCTION

Globally, Humankind's first source of energy is considered to be wood-fuel [1]. 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 [2]. In Central America charcoal pits persist for many decades suggesting that forest recovery in pit kilns is impaired for a long time after charcoal production. Because of this very slow forest regeneration, deforestation on kiln sites can be regarded as permanent. Unfortunately, published studies that have recorded the area covered by charcoal kilns are very rare. In China, the carbonization rate is increased from about 80% to more than 95%. It is easy to operate, safe and environmentally friendly, has high production efficiency, and can save a lot of energy. It is ideal equipment for long-rod biomass carbonization [3]. Combined mode of multiple units, carbonized combustible gas is used in series, which can save fuel in carbonization production and improve enterprise efficiency. Asia and Africa produce over 75% of wood fuel [4]. The global projection of consumption of wood fuel by 2010 ranged from 1.5 billion m³ to 4.25 billion m³ [5]. In Africa over 90% of the wood taken from forest is wood fuel. The majority is of wood is consumed as fuel wood; however, a varying but significant amount is transformed into charcoal, more than 80% of the fuel wood is consumed in urban areas making charcoal the most important source of household energy in many Africa cities [6, 7]. Unsustainable

charcoal production can undermine production of ecosystem services, agricultural production, and human health [8]. 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 like accessing clean water and accelerating both the downwards spiral of poverty and environmental degradation. In the study area, environmental degradation, lack of 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 [9, 10, 11, 12]. In Nyabubare Sub-County Bushenyi District charcoal enterprise is not an exception for the adverse environmental impacts associated with sustainable charcoal production activities. The charcoal burners have now turned to clearing the thicket and fruit trees. Trees use the sun's energy to take carbon dioxide from air and turn it into wood we then convert the wood into fuel as logs and charcoal. When this fuel is burnt the carbon dioxide originally absorbed by the tree is released again into the atmosphere therefore, the purpose of the study is to investigate the impact of charcoal business on the environment in Nyabubare sub county Bushenyi District.

RESEARCH METHODOLOGY

Research Design

The study used descriptive survey research design utilizing both qualitative and quantitative research approaches. Qualitative approach was used through asking questions and getting the feedback which was recorded and presented in a narrative form [13]. Quantitative approach was used to reveal the numerical form of data such as statistics and percentages. It was used to quantify the size, distribution and association of the variables.

Target Population

The target population was 163 residents of Nyabubare sub county Bushenyi District who may have knowledge of forest degradation in the area. These participants were selected depending on their availability and readiness to give relevant information.

Sample Size

According (Mugenda, 2003), a sample of 30% is sufficient to represent the target population in data collection for a research study. There are a total of approximately 163 local people, was used to calculate the sample size. The sample was calculated as follows:

$$\frac{30}{100} \times \text{Target population} = \frac{30}{100} \times 163 = 49 \text{ respondents}$$

For local people, the sample size is: = 49 respondents

Table 1: Sample size of respondents

Respondents	Sample size	Sampling method
Local people	45	Random sampling
Elders	01	Purposive sampling
Local leaders	02	Purposive sampling
Environmental officer	01	Purposive sampling
Total	49 respondents	

Research Instruments

The researcher used questionnaires, interview guide and observation checklist and focus group discussions to collect data.

Questionnaires

Questionnaires were issued to the selected respondents, made up of open and closed ended questions. The questionnaires were self-administered amongst the respondents especially those who know how to read and write. The questionnaires were used to save time since they covered large number of people to fill in.

Interview Guide

The researcher was able to conduct personal interviews with the key informants. The key informants were involved a local leader, an environment officer and the 2 elders of the area. (Participants that was sampled for the study). The study used interview guide because the number of respondents to use them were small and could be intervened face to face.

Observation Checklist

This method involved close use of the eye sense to observe the phenomena. Charcoal burning sites were viewed and the extent of deforestation was clearly observed. This was used because charcoal burning was observed by researcher with his naked eyes.

Focus Group Discussions

This instrument was used in data collection in that, the researcher put respondents in small groups of between 4 to 8 people (7 groups was formed) and ask them to give responses to the set questions in the interview guide. The responses were recorded and later analyzed to make them relevant to the study as was presented in chapter four. Focus group discussion was used to target those who could not give information individually.

Validity and Reliability

Validity

In order to ascertain the validity of instruments, expert opinion was sought from the supervisor to give guidance on the format of the questionnaire and interviews guide.

Reliability

An instrument is reliable when it measures consistently what it is supposed to measure. Even if other researchers administer it, it should produce the same results. In this study, the test or re-test method was done to establish reliability. The tools of data collection were piloted, tested twice on different occasions to the same population by different data collectors and they may produce the same results.

Data Analysis and Presentation

Descriptive analysis was used to analyze the data collected from the field by relating them to the study objectives. Tables and graphs were used to present the field results. Data analysis is done after collecting the raw data from the study area. This includes editing and checking for accuracy of information, consistency and uniformity. The edited data was analyzed both qualitatively and quantitatively. Quantitative data was grouped together with statistical description such as tables showing frequencies, percentages and graphs to be used for better interpretation. Qualitative data was analyzed in a way of identifying the responses from respondents to find their relevance to the research problem. Mainly, such data is analyzed by explaining the facts collected from the field under which the researcher is able to quote respondents' responses.

Limitation of the Study

Different limitations hindered the progress of this research, for instance; Some respondents were declined from participating in the study information. The researcher replaced them and continued with the study. Other respondents continuously postponed the interview and focus group discussions. The researcher patiently waited for the agreed schedule but some of them were replaced when they did not respond positively on the second chance.

Ethical Considerations

A letter of introduction from the dean, faculty of Education introduced the researcher to the respective administrative officers who introduced the researcher to the respondents. All the respondents were assured of confidentiality of the information relayed to the researcher. The researcher administered the questionnaires to respondents at an appropriate time for each category respondents to avoid collusion and ensure maximum recovery rate. Interviews were arranged and held between the researcher and key informants. The researcher treated the information collected from the field research with maximum confidentiality. Participants have the freedom to remain anonymous in answering the questionnaires and interviews [14].

RESULTS
Demographic Characteristics of Respondents

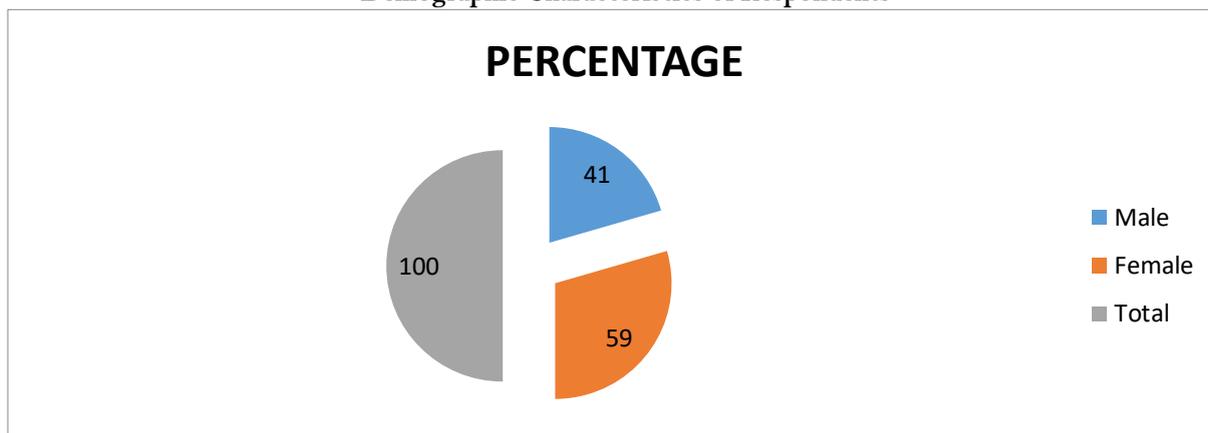


Figure 1: Sex of Respondents
Source; primary source

Among the respondents involved in this research, female (59%) was higher than males (41%), an indication that there is high reproduction which is one of the reasons why there is population increase mostly composed of the youth who are more involved in charcoal burning. When women are more in an area, chances of producing more children are also high because one man can produce with several women which leads to increased population.

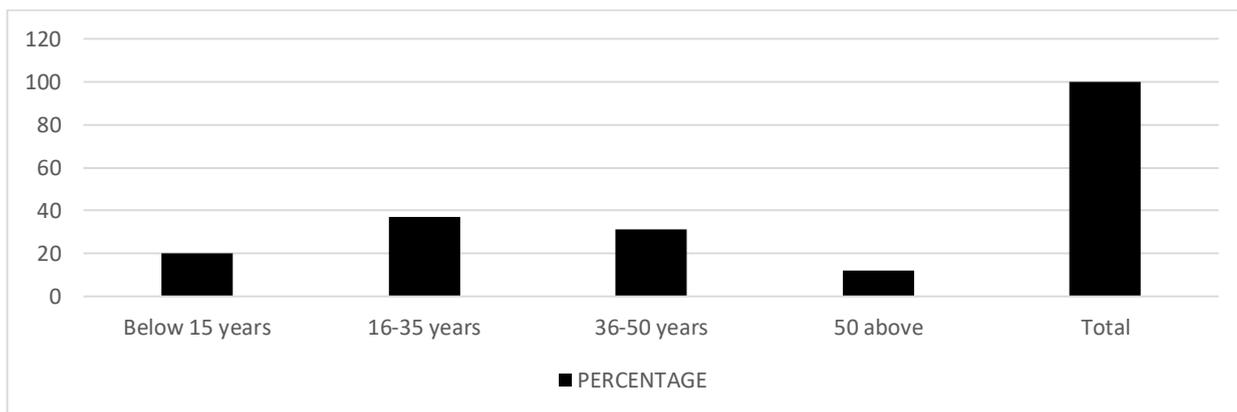


Figure 2: Age of the respondents

This research found out that 37% of the respondents were aged 16-35 years which is the highest, followed by 31% aged 36-50 years. The least percentage of the population is represented by those aged above 50 years (12%) and those below 15 years (20%). This elaborates that there is a higher population of individuals who are strong and able to utilize the forests through different ways like charcoal burning.

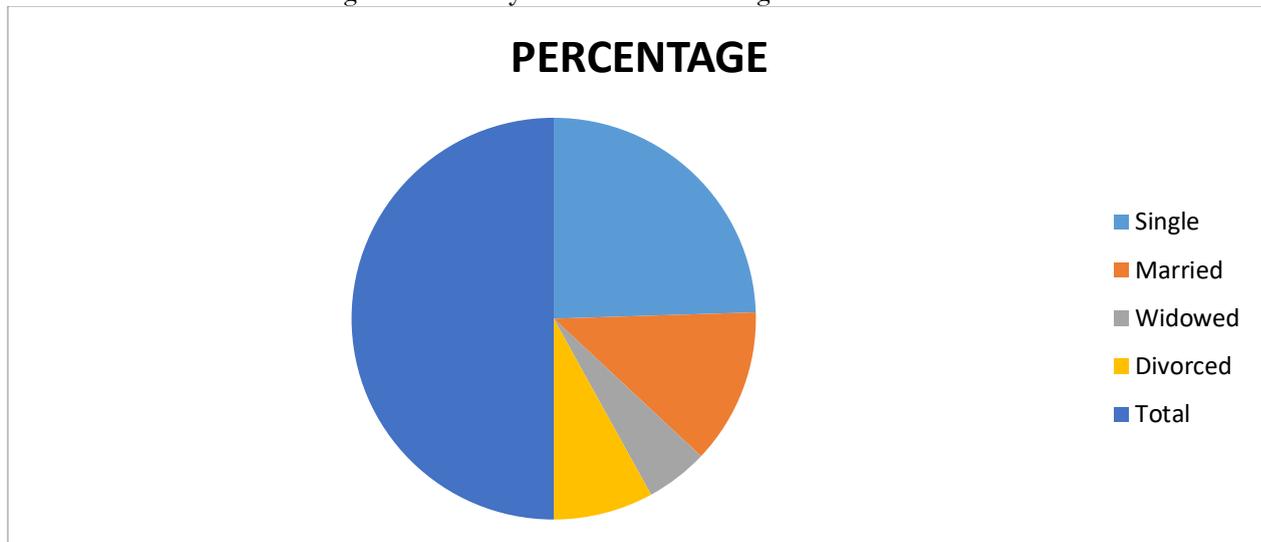


Figure 3: Marital Status of Respondents
Source; primary source

Figure 3 Illustrates that most of the respondents who represented the population staying in Nyabubare Sub-County are single (49%), an indication that the youth who still have enough energy and many things to achieve are the highest. This puts forests at a more continuous risk of deterioration for more years to come because these people will have married and have dependents now whom they must work tirelessly for.

Table 2: Occupation of respondents

OCCUPATION	FREQUENCY	PERCENTAGE
Business	22	45
Student	13	27
Farmer	8	16
Official	2	4
Professional	4	8
Total	49	100

Source; primary source

Most of the people living in Nyabubare are business men and women (45%) of which the business they do is related with charcoal burning. The least number of respondents were officers (4%) and professional workers like teachers and nurses (8%) indicating that most people are less educated or not educated at all making them opt for charcoal burning as the easiest source of income. These people have an easy interaction with the environment they live in since they are available all the time and the work they do is determined by where they live; which is one of the contributions towards forest destruction.

Table 3: Population per house hold

No. OF PEOPLE	FREQUENCY	PERCENTAGE
< 6	15	31
6-10	27	55
>10	7	14
Total	49	100

Source; primary source

According to the study, the most households are comprised of 6-10 (55%) members that clearly show that there is less or no use of family planning in this area that has resulted to increase in population of people.

The Sustainability of the Charcoal Business in Nyabubare Sub-County.

In response to the sustainability of the charcoal business in Nyabubare Sub-County, the researcher asked respondents to answer according to their observation in the area. The respondents answered in one of the following ways; very high, high, moderate, low or very low. The responses are presented in figure 4.

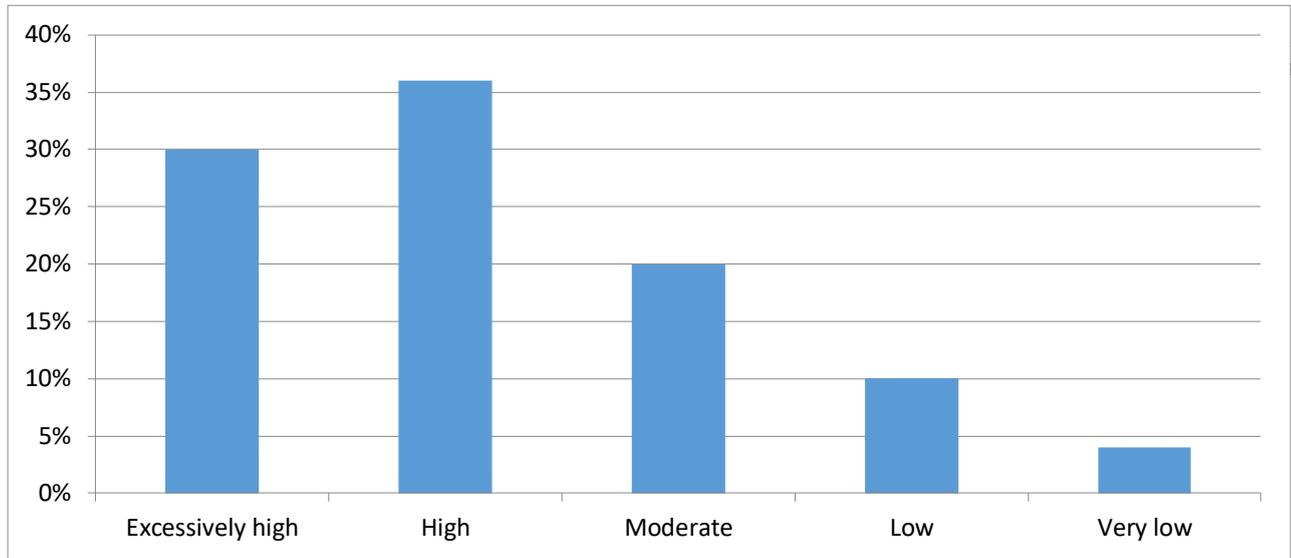


Figure 4: The sustainability of the charcoal business in Nyabubare Sub-County

From the respondents' views as presented in figure 1 above, the researcher found out that the level of charcoal burning was high (36%) and excessively high (30%). Many respondents also reported that charcoal burning is moderate (20%) while fewer respondents reported that is low (10%) and very low (4%).

The Factors Affecting Environment in Nyabubare Sub-County Bushenyi District

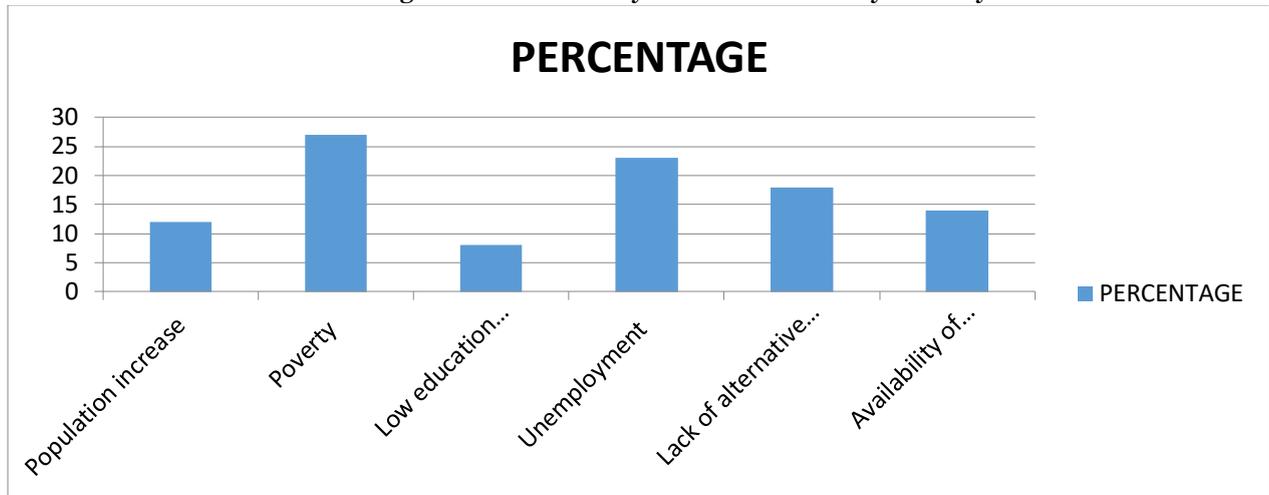


Figure 5: The Factors Affecting Environment in Nyabubare Sub-County Bushenyi District.

Source; primary source

According to table 6, poverty (27%) is the most cause of charcoal burning followed by unemployment (23%). The respondents pointed out poverty as the most cause of charcoal burning because most of the parents lack enough funds to support their families. They also pointed out that poverty is partly caused by unemployment which has hit most of the youth for the last 20 years. Poverty as the most cause of charcoal burning relates with [15] who wrote that in Jamaica, charcoal burning is majorly caused by poverty. Jamaica gets its name from the island's indigenous inhabitants who called it Xaymaca, meaning "land of wood and water" - but nowadays that title does not seem so apt because of charcoal burning. People still argued that lack of alternative sources of fuel (18%) like electricity which would be used in cooking partly influences charcoal burning. They also reported that most people

especially in towns use charcoal for cooking which provides ready market (14%) for the product. Ready market for charcoal influences most people especially the unemployed youth to look at charcoal burning and selling as a potential source of income which in return affect the environment. Related to [16] who wrote that In China, the excessive consumption of charcoal goes with the population growth and is the main source of deforestation, population increase (12%) and low levels of education (14%) were the least causes of charcoal burning respectively in Nyabubare Sub-County. However, according to the LC 1 of Rutanga cell argued that, population increase and low levels of education would not cause charcoal burning if poverty was eradicated. It was also reported that people lack entrepreneurial knowledge to start other business enterprises instead of charcoal burning. “Actually, population increase is very good in terms of business because it provides more labour and market for the goods.

The Environmental Implications of Charcoal Production in Nyabubare Sub-County

The researcher continued and asked the respondents on the environmental implications of charcoal production in Nyabubare Sub-County. The responses are presented in table 8 below.

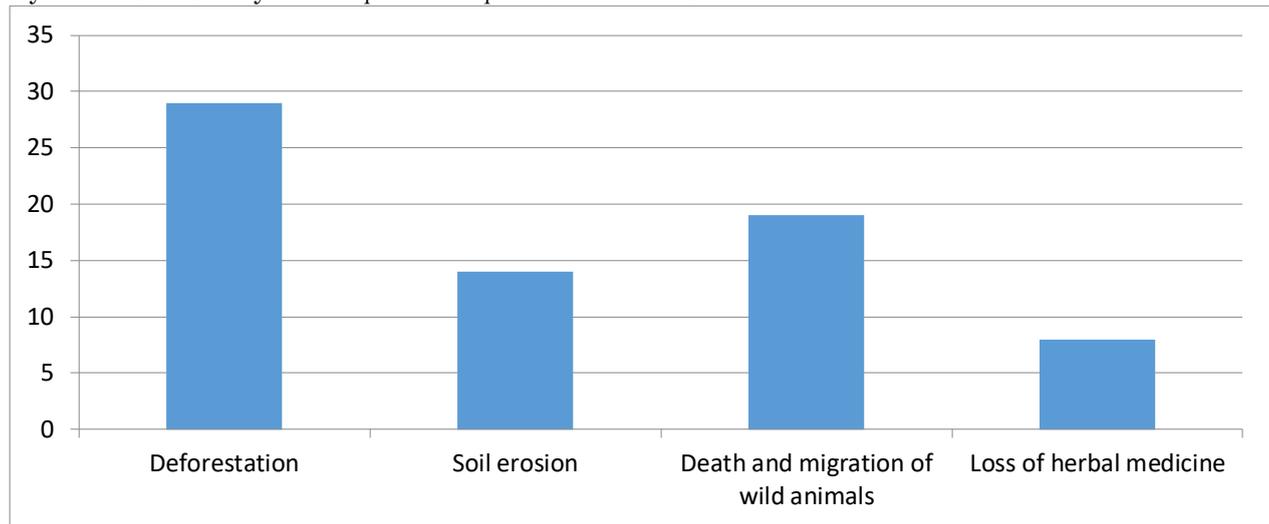


Figure 6: The environmental implications of charcoal production in Nyabubare Sub County
Source; primary source

Related to [17] who wrote that in Uganda, the high request for charcoal has an incessant pressure on the forest, which leads to a deforestation rate of 600 km² per year and [18] who said that 75% of the destroyed forests are attributable to the consumption of ligneous energy (charcoal and firewood) in Tanzania, the respondents in Nyabubare Sub County also confidently alerted that deforestation (29%) was the most effect of charcoal burning. According to, a single mother and a charcoal dealer who started the business in 2010, she sells more than 50 bags of charcoal a week; of which she earns money to support her family. She however reported that this claims a lot of trees in the area and has also resulted into many other challenges like death and migration of wild animals (19%). One among the respondent reported that there were very many species of animals around 2001 and 2005 which he no longer sees currently. One among the respondents said that these animals were hunted down and killed by charcoal burners while others died because of lack of food and yet their habitat was also getting smaller and smaller every day. Some of the respondents reported that some of the animals used to invade them and kill their domestic animals which still happen currently. Forest fires (14%) among the effects of charcoal burning were pointed out among the as the most pressing ones. However, they said that it happens accidentally because they would not love to spoil their charcoal business by burning the forests. Respondents explained that forest fires as a result of charcoal burning happen accidentally when people unknowingly leave some burning charcoal and fire ends up spreading to the rest of the forest of bush. In an interview with some respondents they said that soil erosion (14%) in Nyabubare has started to be evident especially in those areas where deforestation for charcoal burning took place. They said that the soil structure is even destroyed (10%) by the heat from the wood during charcoal burning making the soil so loose for the agents of erosion especially running water and wind. In an interaction with some respondents, they confidently knew and remembered that when they were growing up before, charcoal burning and deforestation were so excessive, wind erosion was not evident in the area because the forests would act as wind breakers while erosion by running water was ever stopped by the dense vegetation cover of grasses and shrubs. The least pointed out effects of charcoal burning of forests were change in micro climate (6%) and loss of shrubs for herbal medicine (8%) respectively. The respondents who looked ignorant about the effect of charcoal burning on the micro climate of the area said that they do not see any influence of the activity on the changing climate. However, one of the

respondents tried to explain to them but they insisted that if it is that case the situation would be calm because there are some trees that have been planted for the last five years. Some other respondents said that herbal medicine is a problem but others said it is not because most herbs are planted and cared for in their gardens and compound.

DISCUSSION

The Factors Affecting Environment in Nyabubare Sub-County Bushenyi District.

Related to [15] who wrote that in Jamaica, charcoal burning is majorly caused by poverty, (27%) of the respondents in Nyabubare noted that poverty is the most cause of charcoal burning followed by unemployment (23%). Due to poverty, most people lack funds to support their families with the essential basic needs like education, health care, food, clothing and they end up carrying out charcoal burning as their main economic activity. Poverty is mainly caused by unemployment which has hit most of the youth for the last 20 years. Related to [16] who wrote that in China, the excessive consumption of charcoal goes with the population growth and is the main source of deforestation, population increase (12%) and low levels of education (14%) in Nyabubare Sub-County.

The Sustainability of the Charcoal Business in Nyabubare Sub-County.

From the respondents' views as presented in figure 1 above, the researcher found out that the level of charcoal burning was high (36%) and very high (30%) and has led to deforestation. This Relates to [17] who wrote that in Uganda, the high request for charcoal has an incessant pressure on the forest, which leads to a deforestation rate of 600 km² per year and [18] who said that 75% of the destroyed forests are attributable to the consumption of ligneous energy (charcoal and firewood) in Tanzania. The respondents in Nyabubare Sub County confidently alerted that deforestation (29%) was the most effect of charcoal burning.

The Environmental Implications of Charcoal Production in Nyabubare Sub-County.

Related to [17] who wrote that in Uganda, the high request for charcoal has an incessant pressure on the forest, which leads to a deforestation rate of 600 km² per year and [18] who said that 75% of the destroyed forests are attributable to the consumption of ligneous energy (charcoal and firewood) in Tanzania, the respondents in Nyabubare Sub-County also confidently alerted that deforestation (29%) was the most effect of charcoal burning. According to one of respondents, a single mother and a charcoal dealer who started the business in 2010, she sells more than 50 bags of charcoal a week; of which she earns money to support her family. She however reported that this claims a lot of trees in the area and has also resulted into many other challenges like death and migration of wild animals (19%). Some of the residents of the area also reported that there were very many species of animals around 2001 and 2005 which he no longer sees currently. They said that these animals were hunted down and killed by charcoal burners while others died because of lack of food and yet their habitat was also getting smaller and smaller every day. It was also reported that some of the animals used to invade them and kill their domestic animals which still happen currently.

CONCLUSION

Among the many causes of charcoal burning in Nyabubare Sub-County, poverty (27%) and unemployment (23%) were pointed out as the major causes of charcoal burning respectively. On the same note, low levels of education (8%) and population increase (12%) were the least causes of charcoal burning respectively. Most respondents reported that the level of charcoal burning was high (36%) and excessively high (30%). Many respondents also pointed out that the effects of charcoal burning on forests were deforestation (29%) and death and migration of wild animals (19%) while change in micro climate (6%) and loss of herbal medicine (8%) are the least effects of charcoal burning on forests. Various measures were reported as being implemented to control the effects of charcoal burning on forests and public awareness (29%) and afforestation and re-afforestation (27%) were said as the highest and most effective in controlling the challenge. In addition to those, laws and policies (18%) was the third measure pointed out. Giving loans for other businesses (12%) and management committees (14%) were the least measures practiced against effects of charcoal burning.

REFERENCES

1. Hosier, R. H. "Charcoal Production and Environmental Degradation: Environmental History, Selective Harvesting, and Post-Harvest Management." *Energy Policy*(1993) 21(5): 491-509.
2. FAO Wood energy. www.fao.org/forestry/energy/en/. (2012). Accessed on 20/03/2014.
3. Colón J, Cadena E, Pognani M, Barrera R, Sánchez A, Font X, Artola A. Determination of the energy and environmental burdens associated with the biological treatment of source-separated municipal solid wastes. *Energy & Environmental Science*. 2012;5(2):5731-41.
4. Floess E, Grieshop A, Puzzolo E, Pope D, Leach N, Smith CJ, Gill-Wiehl A, Landesman K, Bailis R. Scaling up gas and electric cooking in low-and middle-income countries: climate threat or mitigation strategy with co-benefits?. *Environmental Research Letters*. 2023 Feb 14;18(3):034010.
5. BROOKS DJ. The outlook for demand and supply of wood: implications for policy and sustainable management. *The Commonwealth Forestry Review*. 1997 Jan 1:31-6.

6. Seidel A. (2008). *Charcoal in Africa, Importance, Problems and Possible Strategies*. GTZ. Smith K.R., Samet J.M., Romieu I., Bruce N. *Indoor Air Pollution in Developing Countries and Acute Lower Respiratory Infections in Children*. Thorax. 2000;55:518–532.
7. Bailis R, Ezzati M, Kammen DM. Mortality and greenhouse gas impacts of biomass and petroleum energy futures in Africa. *Science*. 2005 Apr 1;308(5718):98-103.
8. Zulu LC, Richardson RB. Charcoal, livelihoods, and poverty reduction: Evidence from sub-Saharan Africa. *Energy for Sustainable Development*. 2013 Apr 1;17(2):127-37.
9. UNEP U. *Towards a green economy: Pathways to sustainable development and poverty eradication*. Nairobi, Kenya: UNEP. 2011 Feb 22.
10. Bailis R, Berrueta V, Chengappa C, Dutta K, Masera O, Patara S, Still D, Smith K. Performance testing as a tool to monitor improved stove interventions: Experiences of the Shell Foundation's Household Energy and Health Project. *Energy for Sustainable Development X*. 2007;1:57-70.
11. Mutimba S, Murefu B. National Charcoal Survey: Exploring the Potential for Sustainable Charcoal Sector in Kenya. ESDA.
12. Ezzati M, Mbinda BM, Kammen DM. Comparison of emissions and residential exposure from traditional and improved cookstoves in Kenya. *Environmental Science & Technology*. 2000 Feb 15;34(4):578-83.
13. Ugwu CN, Eze VH. Qualitative research. *IDOSR Journal of Computer and Applied Sciences*. 2023;8(1):20-35.
14. Nneoma UC, Udoka EV, Nnenna UJ, Chukwudi OF, Paul-Chima UO. Ethical publication issues in the collection and analysis of research data. *Newport International Journal of Scientific and Experimental Sciences (NIJSES)*. 2023;3(2):132-40.
15. Ouédraogo NS. *Bioenergy for Africa: An Illusion or a Sustainable Option to Reduce the Vulnerability to Energy and Poverty*. Université Paris-Dauphine: Centre Géopolitique de l'Energie Et des Matières Premières. 2009 May.
16. Chen Y, Sheng G, Bi X, Feng Y, Mai B, Fu J. Emission factors for carbonaceous particles and polycyclic aromatic hydrocarbons from residential coal combustion in China. *Environmental Science & Technology*. 2005 Mar 15;39(6):1861-7.
17. Fontodji JK, Atsri H, Adjonou K, Radji AR, Kokutse AD, Nuto Y, Kokou K. Impact of charcoal production on biodiversity in Togo (West Africa). *The Importance of Biological Interactions in the Study of Biodiversity*. 2011 Sep 22:953-78.
18. Makundi WR. Potential and cost of carbon sequestration in the Tanzanian forest sector. *Mitigation and Adaptation Strategies for Global Change*. 2001 Sep;6:335-53.

CITE AS: Akamumpa Nelson and Turyamureeba Silaji (2025). The Impact of Charcoal Business on the Environment in Nyabubare Sub-County Bushenyi District, Western Uganda. RESEARCH INVENTION JOURNAL OF RESEARCH IN EDUCATION 5(2):84-92.
<https://doi.org/10.59298/RIJRE/2025/528492>