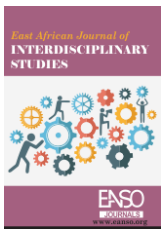

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Original Article

Historizing Gender in Household Production and Use of Cooking Fuels in Amuru District, Northern Uganda

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ABSTRACT

This study examined the gendered historical production and use of cooking fuels in Amuru District in Northern Uganda, focusing on household gender involvement, specialisation, and division of labour in cooking. The availability and accessibility of cooking fuels significantly affect household energy security, health, power relations, and gender dynamics (Bamwesigye et al., 2020). This study used a qualitative approach and historical research designs. The methods of data collection used were participatory rural approach (PRA), focus group discussions, participant observation (ethnography), document analysis, and one-on-one individual interviews. Respondents included the elderly, young women, young men, and children. The major findings revealed that the primary cooking fuels used in these rural communities included firewood, black charcoal, crop residues, and kerosene. Gender plays a crucial role in producing and using cooking fuels, with women predominantly responsible for collecting firewood and other biomass resources. This gendered division of labour has implications for women's time burden, health, and overall well-being. The study concluded by identifying challenges faced by rural communities in accessing clean and sustainable cooking fuels. The reliance on traditional biomass fuels contributes to deforestation, indoor air pollution, and adverse health effects. This study recommends the involvement of women in decision-making processes related to household production and the use of cooking fuels, including planning, implementation, and monitoring. This will ensure that their needs and perspectives are taken into account, provide training and capacity-building opportunities to women on sustainable charcoal production techniques, efficient stove use, and environmental conservation practices. This will empower women to participate more actively in the green charcoal value chain and address gender-based barriers by ensuring women have equal access to land, finances, technology, and other necessary resources for green charcoal production. This can be achieved through targeted policies and programs.

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INTRODUCTION

Globally, according to the International Renewable Energy Agency (IRENA, 2018), almost 3 billion people rely on biomass for cooking and heating, and about 1.5 billion have no access to electricity. In Sub-Saharan Africa, cooking fuels vary depending on the region and availability (New-Vision, 2023). The rural dependence on traditional fuels such as black charcoal, firewood, and agricultural wastes has greatly contributed to climate change due to deforestation and indoor air pollution, negatively affecting women and children at household levels (IRENA, 2022; Bamwesigye et al., 2020). This can further lead to respiratory diseases, eye infections, and other health problems. Nevertheless, Pelizan (2019) illustrates that access to clean cooking fuels remains a challenge for many households in Africa due to the high costs of clean fuels and limited awareness about the benefits of clean cooking fuels. This is aggravated by the restricted access to electricity for cooking.

In Uganda, cooking fuels are often produced through farming and other activities related to forestry, and obtained through gathering or purchasing from local sellers (Patel and Gross, 2019). Statistically, studies articulate that in Uganda, firewood usage stands at 74%, 21% use black charcoal, 1.4% rely on electricity for cooking, 0.6% depend on Kerosene, and biofuels are rated at 3.9% usage (Ogwok et al., 2022). The position of men and women remains significant in the production and use of household cooking fuels in Uganda and Northern Uganda (Elasu et al., 2023). For example, in many sub-regions of Uganda, women are responsible for cooking and household chores, which often involve collecting firewood and other biomass fuels for cooking (Bamwesigye et al., 2020). This task is time-consuming and physically demanding, limiting women's opportunities to engage in other productive activities, such as income-generating activities and education for school-going girls (Haley and Marsh, 2021).

Njenga et al. (2021) assert that women often spend significant amounts of time collecting firewood or other fuels and cooking over open fires using traditional stoves, which have negative health and environmental impacts. With the availability of cleaner and more efficient cooking technologies, women have access to safer and more sustainable energy sources, which can improve their health and well-being (Bloomfield, 2014). Phillip et al. (2023) addressing gender inequalities in cooking

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fuel production can improve the health and well-being of women and their families, by reducing their exposure to harmful indoor air pollution, reducing the risks, time, and effort required to collect fuel, and increasing access to clean, affordable, sustainable and environmentally efficient cooking fuels.

For many households, scholars, and policymakers, gender and gender roles have historically been a source of interest in the production and use of energy sources for cooking (Elasu et al., 2023). However, the gap between gender and gender roles in cooking appears to be unclear and yet they have great implications for the production and use of cooking fuels and climate change. Nonetheless, rather than emphasising social roles, research on gender role differences in the production and use of household cooking fuels has framed gender as the biological architecture that separates men and women (Elasu et al., 2023).

Conceptual and Theoretical Considerations of the Study

In this work, gender is viewed as a socially constructed role of men's and women's sex (Oxfam-International, 2018). Cooking fuel refers to the energy used to prepare household food (Makonese et al., 2018). Production is perceived as making, collecting, transporting, and accessing cooking fuels. It involves the whole value-chain process from the source to the use of the cooking fuel (Schlag & Zuzarte, 2008). Use is conceptualised as the practice, norms, customs, routine, quantity and quality, experience, attitude, and mindset involved with cooking fuels during the cooking process.

This study uses structural functionalism theory to argue that, in subsistence economies, households consist of interdependent components with separate responsibilities that have vital roles in reliably providing for the basic social demands of household members (Potts et al., 2016). The structural functionalism theory helps to explain the social construction of gender and the resultant division of labour by society. Gender role values support overall social stability and household balance in developing economies (Bonnefoy et al., 2007). It is suggested that an important factor in explaining household fuel switch decision-making is value consensus at the household level. Contrary to the functionalist paradigm, a theory of cultural value orientations asserts that a household's culture, such as its values, beliefs, and customs, are fundamental to its well-being (Schwartz, 2009). It means that satisfying particular cultural needs is critical for a household's existence, welfare, and preservation for a given period.

In this study, this theory influences the gender, production, and use of cooking fuels in households. Historically, Puzzolo and Pope (2017) argue that cooking has been a woman's domain in the majority of third-world countries and in households that use biomass as their primary fuel source. Women and girls assume an unequal share of responsibility for collecting biomass fuel compared to men (Choudhuri and Desai, 2021). Women's choices and free time to engage in other activities that would facilitate the transfer of their households to modern energy fuels are severely limited by this seemingly insignificant obligation (Okello et al., 2018). Young girls spend time collecting firewood while their male classmates attend school (Boyd, 2007). This happens because the time that the girls could have spent studying and learning in class is now spent obtaining wood fuel.

In addition, urban employed women in Uganda prefer to use modern energy fuels such as electricity and gas, because fewer risks and time are involved compared to gathering and using wood fuels (Gebru & Elofsson, 2023). On the other hand, Nzabona et al. (2021) assert that rural women prefer using black charcoal and wood fuel depending on the season, convenience, availability, and affordability. However, their influence over the type of fuel used in the home is severely limited by their lack of education, formal employment status, and lack of ownership of household property (Khan, 2020). Jagoe et al. (2020) discuss that household fuel used in Kenya and Uganda took a biological approach, ignoring the belief that gender is about socially constructed

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roles, related lines, and duties. The objective of this study, therefore, is to examine the gendered historical patterns of production and use of cooking fuels in Amuru District, Northern Uganda, with a focus on household gender involvement, specialisation, and the division of labour in cooking.

METHODOLOGY

Study Area

The area of study is the Amuru District, found in Northern Uganda. Amuru District is bordered by Adjumani District to the North, Lamwo District to the Northeast, Gulu District to the East, Nwoya District to the South, and Nebbi and Arua Districts to the West. The district was chosen because it is one of the few districts in the region with rampant deforestation for the purposes of providing firewood and charcoal as cooking fuels for commercial motives, which have contributed to climate change in Northern Uganda.

Amuru District is characterised by a mix of Savannah and woodland vegetation. The district experiences a tropical climate with distinct wet and dry seasons. During the wet season, which typically occurs from April to October, the area receives significant rainfall, leading to lush greenery and the growth of vegetation. The dry season, from November to March, is marked by hot and dry conditions, with the landscape transitioning to a drier, more arid environment. The average annual rainfall amounts to about 1608 mm (63.3 inches) and receives 188 rainy days with 1 mm (0.04 inches) brink annually. However, according to the Uganda Bureau of Statistics (UBOS, 2017) report, Amuru district covers 3,721 square kilometres with a total population of 782,077 people – 2014 Census and most households rely on subsistence farming for livelihood. Environmental scholars such as Obua et al. (2010) concluded that approximately 1.9 million hectares of natural forests in Uganda are planned as a Forest Estate. This is intended to permanently conservation of biodiversity, the protection of environmental services, and the sustainable production of forestry products. While Uganda loses 1,8% of its forest cover annually.

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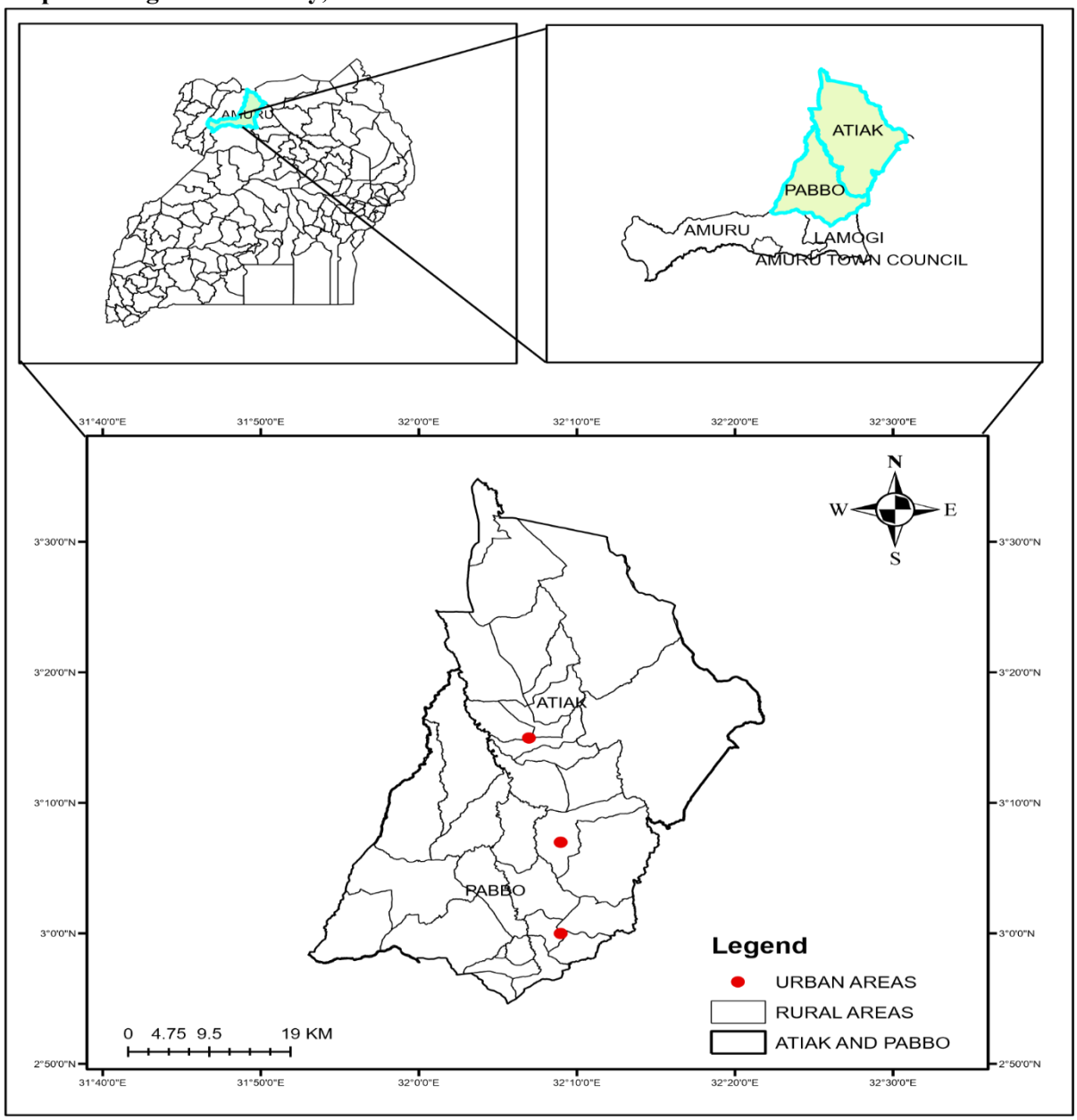
Map Showing Area of Study, Amuru District



Sampling Procedure and Sample Size

This study employed a qualitative research approach, utilising a historical-ethnographic research design. This design was selected because it allows for an in-depth exploration of cultural practices, social dynamics, and historical contexts related to gender roles and the production and use of cooking fuels in Amuru District. The ethnographic component enables immersive understanding of community perspectives and behaviours, while the historical aspect provides insights into how these practices have evolved over time. Together, this design is well-suited to capturing the complex interplay between gender and fuel use within the cultural and historical framework of the region. The study participants were comprised of both elderly and young men and women to explore their experiences, knowledge, norms, and beliefs about available cooking fuels.

According to Chambers (2014), the study used the participatory rural approach (PRA), focus group discussions, participant observation (ethnography), document analysis, and one-on-one individual interviews to gather data on gender-related aspects regarding the production

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and use of cooking fuels from the target population.

Participatory Rural Approach

The participatory rural approach (PRA) (Sontakki & Venkatesan, 2019) and the Energy Cooking Fuel Matrix (Poblete-cazenave & Pachauri, 2018) were used to rank the cooking fuels from most to least used in Amuru District households. The seasonal calendar (Montesinos, 2010) helped to explain when each cooking fuel was utilised. This encouraged local engagement, as they ranked the usage, seasonality of the various fuels, and factors impacting gendered cooking fuel consumption. In this study, the PRA recognised the role of culture, norms, traditions, and indigenous knowledge in affecting cooking fuel production and use.

Focus Group Discussions (FGD)

A total of three (3) focus group discussions were organised to explore gender roles in cooking fuel production and use at the household and community levels. Each group was made up of eight (8) participants to enable them to have equal participation.

The first FGD was composed of women only, to create equal power relations and allow them the freedom to discuss without external interference from men. The second FGD was exclusively for men to enable them to express their opinions and views regarding cooking fuels. The third FGD was mixed, comprising four (4) men and four (4) women to triangulate the opinions collected from the two groups. The FGD sessions were on average 1-2 hours.

Ethnography

In the use of ethnography, the researcher lived in Amuru District for two (2) months, interacting with families, households, and restaurants. During this period, the cooking practices, perceptions, and mindsets of both men and women about cooking fuels were explored. The method enabled events and behaviours surrounding the production and use of cooking fuels to be explored. It further facilitated respondents to share their collective and individual experiences in the production and use of cooking fuels.

Interviews

A total of six (6) Key Informant Interviews (KII) were conducted, comprising Local Council 1 Chairpersons and the Town clerk. A total of 65 one-on-one interviews were held with various household members from four villages in Pabbo and four in Atiak sub-counties. In Pabbo sub-county, the villages included Gaya, Pabbo Kal, and Palwong, while in Atiak sub-county, they included Bibia, Kal, Okidi, and Pawel.

The semi-structured interviews were used to explore respondents' opinions, perceptions, and practices in cooking. Audio responses were recorded with the consent of the respondents. The semi-structured interviews ensured a comprehensive response to the questions asked, other than being restricted by a leading questionnaire. This created a conducive framework for the informants to provide information regarding their experiences and ideas on gender roles in the production and use of cooking fuels.

Document Analysis

This study reviewed historical records, books, newspapers (New Vision), and journal articles to investigate, from a historical to current-day perspective, the production and use of cooking fuels in Amuru District. The documents were used to triangulate and corroborate information from the focus group discussions and individual interviews.

FINDINGS AND DISCUSSIONS

The Role of Gender in the Production of Cooking Fuels in Amuru District, Northern Uganda

Women who participated in the focus group discussion (FGD1) discussed how they went about gathering firewood from an average distance of 3-4 kilometres. The respondents noted that some single mothers and widows who did not have husbands and sons to help them in the charcoal production process were physically

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involved in producing charcoal, beating the odds of culture and black charcoal production as a man's specialisation. Using indigenous knowledge of good charcoal-producing tree species, the women identified the trees, such as *Larwece, Owak, Opok, Oduku, and Olam*.

Table 1: Showing Tree Species Highlighted by Respondents for Their Quality Charcoal

Local Name (Acoli Version)	English Name	Botanical Name
Olam	Sycamore	Ficus sycamore
Oduku	Red pod terminalia or fresen tree	Terminalia brownii
Owaka	Indian siris, brown rain tree, woman tongues tree, or shak shak tree	Albizia lebecck
Opoko	Ivory Coast almond	Terminalia ivorensis
Larwece	Axle wood tree	Terminalia anogeissiana

These women, out of necessity and their conditions, looked for trees with average-sized trunks that were easy for them to fell and chop using rudimentary tools such as pangas and axes, which are not labour-intensive. Often, at times, they hire men with skills of felling huge trees and setting fire to the logs to burn, which at least a sizeable tree demands 5,000 to 15000 Ug. Shillings depending. This enabled them to manoeuvre the challenges of strength and energy. Women do not have to do heavy work. However, some of these women were personally involved in the process of black charcoal production from tree species identification, cutting, piling, setting fire and burning, packing in sacks, transportation, and selling.

The FGD2, which comprised males, reported that the men identified the tree to be cut down, they felled the trees using axes, powered saws and chopped them into logs, which are piled into earth kilns and fire-lit, then covered with fresh grass and leaves, and soil to allow the proper burning process. The young boys of 12 to 16 years old were part of this process. Similarly, some of these men were personally involved in the process of black charcoal production from tree species identification, cutting, piling, setting fire and burning, packing in sacks, transportation, and selling. Ironically, they do not disclose the money from the sales of the black charcoal to the women and girls, even when they have been part of the charcoal production process.

Men further demonstrated that, due to the financial nature of black charcoal production, the process primarily depends on the men, as women carry out their domestic duties and firewood collection. Gathering firewood has been a woman's responsibility, culturally making men's participation in firewood collection a taboo among the Acholi.

Men are primarily responsible for tree felling, charcoal production, and related activities, utilising tools like axes and saws (Ekpo et al., 2024). Young boys aged 12-16 are also involved in these processes, indicating intergenerational participation (Giraudeau & Bailly, 2019). Men handle the entire charcoal value chain, from cutting to selling, but they do not share the profits with women, despite their involvement (Ihalainen et al., 2020). Culturally, firewood gathering remains a woman's task, and men's participation in this activity is considered taboo among the Acholi (Okot, 2022). The dominance of men in charcoal production underscores gendered economic roles and traditional norms (Ekpo, 2024).

The production and use of briquettes (green charcoal) is a new development resulting from government and NGO efforts to achieve SDG7, which calls for affordable, reliable, sustainable, and modern energy for all by 2030, and SDG13, which advocates for agent action to combat climate change and its impacts. Both men and women are involved in the production process of green charcoal, given the SDG principle of 'leaving no one behind' and gendered development. According to findings from FGD3, comprising both men and women in Pabbo,

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women's role in the production of green charcoal is limited to drying and mixing the materials, carbonating the materials, and drying the briquettes. Men operate the machines and perform the heavy-duty tasks. Given that the briquette-making machines are gender insensitive as they are labour-intensive, disadvantaging women.

The study further established that women in one household used indigenous knowledge to blend charcoal dust, cow dung, clay soil, water, and cassava flour to mould briquettes. The respondent reported that, having observed the process of making green charcoal out of the local material, she replicated the process and hand-moulded the briquettes. Her dilemma was whether her home-made product qualified to be considered as green charcoal. Nevertheless, both men and women were involved in experimenting production of briquettes with support from NGOs like WACFO. This highlights the vital role of indigenous knowledge in promoting sustainable practices like briquette-making, showcasing community-driven innovation. The involvement of both men and women, supported by NGOs, underscores the importance of collaborative efforts and external facilitation in scaling eco-friendly solutions. It also raises questions about standardisation and recognition of homemade products within sustainability frameworks. Overall, it emphasises empowering local communities to develop practical, environmentally friendly alternatives that can enhance livelihoods.

The review of articles and newspapers makes it abundantly evident that women perform the majority of cooking duties in many households, including the process of producing charcoal and collecting firewood, as reported by the New Vision on Wednesday 27, September, 2023. This is a result of the fact that women dominate in the household cooking. An elderly head of the family revealed that a man's main responsibility was to provide wood fuel for the household by pruning trees and branches. The women gathered the wood and carried it home for cooking. Men carried bigger firewood logs for setting the family fireplace, traditionally called *Wang-oo* in the Acholi dialect spoken in the area, where indigenous knowledge and clan history are passed to the youth by word of mouth (Oral tradition). Today, women and girls are more involved in collecting firewood for cooking, while men are more involved in black charcoal production and business. The above findings agree with the literature given by Elasu et al. (2023) and Bamwesigye et al. (2020).

Traditional gender roles where men were responsible for providing firewood, especially larger logs for the family fireplace, while women gathered and carried smaller firewood (Njenja et al., 2021). Indigenous knowledge and clan history are transmitted orally during these activities, emphasising cultural importance (Bihari, 2023). Currently, women and girls are more involved in collecting firewood for cooking, whereas men focus on black charcoal production and trade, reflecting a shift in roles (Elasu et al., 2023; Bamwesigye et al., 2020). This change indicates evolving gender dynamics influenced by socio-economic factors (Awuni et al., 2022).

The Role of Gender in the Use of Cooking Fuels in Amuru District, Northern Uganda

The study established that women dominate in cooking activities by almost 90%, while men's participation in cooking is estimated at 10%. This is attributed to the cultural and societal norms and perceptions that it was women's responsibility to cook and prepare meals for their families. Culturally, the cooking fuel considered ideal was firewood, and with urbanisation, black charcoal has gained popularity. A male respondent noted that "*Throughout history,* in Acholi culture, *cooking was predominantly a woman's activity in a family."* In a key informant interview, a local council leader noticed a remarkable wind of change across society as a result of women's emancipation advocated for by the Government, NGOs, and educated women. Today, men assist women in splitting firewood, collecting wood fuel, and buying black charcoal and firewood to support them in cooking food faster and on time. Women dominate cooking activities at nearly 90%, due to cultural norms that assign this role to them (Jabeen et al., 2020). Traditionally, firewood

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was the preferred fuel, but urbanisation has increased the use of black charcoal (Derebe et al., 2025). Recent societal changes, driven by government and NGO efforts, have seen men increasingly assist with fuel collection and preparation, reflecting shifting gender roles (Elasu et al., 2023).

The FGD indicated that rural women and low-income urban women living in the slums were the main users of hand-moulded briquettes (green charcoal) because of their inability to purchase other cooking fuels, such as black charcoal in bulk, green charcoal, gas, and electricity. They observed that green charcoal briquette production was the best alternative for low-income earners. With increased community awareness, more women in Amuru would adopt the use of green charcoal to save them from the inconveniences of using firewood and black charcoal, and the dangers associated with the collection of firewood. Women in rural and slum areas use green charcoal briquettes because they are affordable and accessible, offering an alternative to traditional fuels (Njenga et al., 2024). Increasing awareness could promote broader adoption, reducing dependence on firewood and related health and environmental hazards (Chweya, 2020).

Shared Experiences on the Effectiveness of Using Cooking Fuels.

Firewood

The respondents acknowledged that from time immemorial, firewood has been the main fuel used for cooking, given that Acholi land is rich in vegetation. The Acholi people collected firewood from the natural forests, which are now getting depleted. Firewood is used to cook meals in the nuclear family and at large social gatherings (marriage ceremonies and burial ceremonies). Tree species such as *"Larwece, Owak, Opok, Oduku, and Olam"* are known for their quality of slow-burning and emitting high heat during cooking. Firewood was preferred for cooking because it lit and cooked faster, and was more available compared to black and green charcoal, which lit slowly and burned for a long time. It is believed to be affordable to people with diverse socioeconomic backgrounds. From the Energy Cooking Fuel Matrix (ECFM) undertaken during the PRA in the field, firewood was ranked highly because it produced tasty local and traditional Acholi food, with a nice smoky scent. An elderly man, comparing the use of charcoal, electricity, and gas, emphasised that smoked meat, white peas, and traditional sauce *Dek Ngor,* which is prepared from pigeon peas, taste better when cooked in a pot, using firewood. This agrees with statistical conclusions illustrated by Ogwok et al. (2022), who indicated that 74% of the 94 households in Uganda depend on firewood as a fuel.

Firewood has historically been the primary fuel for cooking by the Acholi, owing to the region's abundant vegetation, and is used for both everyday meals and large social events (Kaibei, 2023). Specific tree species like Larwece and Opok are valued for their slow-burning properties and high heat output, making firewood preferred over black or green charcoal, which burns more slowly (Hoare, 2020). Firewood is also considered affordable and culturally important, especially for preparing traditional Acholi dishes with a desirable smoky aroma, which enhances flavour (ASADA, 2019). An elderly respondent highlighted that traditional foods taste better when cooked with firewood compared to modern fuels like electricity or gas (ASADA, 2019). The Energy Cooking Fuel Matrix (ECFM) rated firewood highly for its cultural and culinary significance, aligning with Ogwok et al. (2022), who reported that 74% of households in Uganda rely on firewood (Ogwok et al., 2022).

Charcoal

The FGD participants noted that black charcoal came into existence with urbanisation in Northern Uganda, which became prominent at independence in 1962, as more people moved from the rural to the urban in search of jobs and better social services. Following the end of the Lord's Resistance Army war in 2006, and the return of the internally displaced persons from the camps, the production and use of black charcoal

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gained momentum, given that it became a lucrative business and source of livelihood. This made the locals engage in black charcoal production to sustain the families who had settled in the towns for security reasons. Charcoal was considered a clean energy source for cooking, compared to firewood, as it is more advantageous than firewood because it has no smoke and cooks relatively faster and better. Charcoal was reported to be more convenient because the user did not need to closely monitor the cooking process. Charcoal was preferred for its convenience in use in a multi-functional room, which was used as a bedroom, sitting room, and kitchen. After all, it was associated with the high socioeconomic status of rural and urban families with a small number of household members. The popularity of charcoal use in Northern Uganda is attributed to its perceived cleanliness, efficiency, and convenience compared to firewood, making it suitable for multi-functional living spaces (Richmond 2024). Additionally, the use of charcoal is associated with higher socioeconomic status, reflecting its role in social and economic mobility within both rural and urban contexts (Smith et al., 2019).

Briquettes

The study also found the existence of hand-moulded briquettes used by the local people at the household level. This knowledge was first introduced by NGOs and community-based organisations. For instance, WACFO trained 22 women and 10 men in briquette making. According to FGD3, the briquettes were made by mixing charcoal dust with agricultural wastes such as rice husks, maize cobs, sesame stems, ant hill soil, and cassava flour. This was done by both men and women to generate income. In terms of cooking, briquettes were perceived to produce more heat compared to black charcoal and firewood. Participants believed that it cooks faster with no smoke and is used for warming houses during rainy and cold seasons. Both men and women appreciated the advantage of briquettes as a better option for cooking fuel, compared to wood fuel and black charcoal. However, they demonstrated limited skills and difficulty in lighting briquettes. They reported that the limited and seasonal production of green charcoal affects accessibility. This finding underscores the perceived advantages of briquettes as an improved cooking fuel among community members. Participants believe that briquettes generate more heat than traditional fuels such as black charcoal and firewood, which enhances cooking efficiency. The perception that briquettes cook food faster and produce no smoke highlights their potential to improve household health by reducing indoor air pollution (Karekezi & Kithyoma, 2002). Additionally, their use for warming houses during rainy and cold seasons indicates their role in enhancing thermal comfort and extending energy use beyond cooking needs. These perceptions suggest that briquettes are viewed as a more efficient, cleaner, and versatile energy source, which could encourage their broader adoption despite existing challenges.

CONCLUSIONS

The role of gender in the production of cooking fuels in Amuru District is significant and complex. Traditionally, women have been primarily responsible for collecting firewood and other biomass fuels for cooking purposes. More women are getting involved in cooking and energy production. This gendered division of labour has implications for women's time, health, and overall well-being. Women often spend long hours searching for firewood, which can be physically demanding and time-consuming, limiting their opportunities for education, income generation, and other activities. Moreover, the reliance on biomass fuels contributes to deforestation and environmental degradation, further exacerbating the challenges faced by women in accessing sustainable energy sources. Efforts to address this issue should involve promoting gender equality, providing alternative cooking technologies and clean energy solutions, and empowering women to participate in planning, budgeting, decision-making, and implementation processes related to energy production and consumption. By recognising and addressing the gendered dynamics in the production and use of cooking fuels, we can work

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towards more environmentally sustainable energy, benefiting both women and the community in Amuru District by 2030.

Abbreviations

GUREC - Gulu University Research Ethics Committee

UPCHAIN – Unlocking the Potential of Green Charcoal Innovations to Mitigate Climate Change in Northern Uganda

DANIDA – Danish International Development Assistance (or Danish International Development Agency)

NGO – Non-Governmental Organisation

WACFO – Women's Advocacy for Clean Fuel and Off-Grid Technologies

FGD – Focus Group Discussions

ECFM – Energy Cooking Fuel Matrix

SDG – Sustainable Development Goal

PRA – Participatory Rural Approach

UBOS – Uganda Bureau of Statistics

KII – Kei Informant Interviews

Ethical Approval and Consent to Participate

Ethical approval to conduct this study was obtained from the Gulu University Research Ethics Committee (GUREC-Reference Number 2023-641). The study was conducted in accordance with the principles outlined in the *Declaration of Helsinki* (World Medical Association [WMA], 2013). Prior to data collection, informed verbal consent was obtained from all participants. Only consenting participants were included in the study.

Conflict of interest: The authors declare no conflict of interest.

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Availability of data: The datasets/transcripts used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Author's Contributions:

Mbazalire Ezekiel and Agatha Alidri participated in designing the study; Mbazalire Ezekiel, Agatha Alidri, and Okello Simon participated in collecting field data; Mbazalire Ezekiel, Agatha Alidri, and Okello Simon participated in analysing and presenting data; and wrote the initial draft of the manuscript that was reviewed by Atube Francis. All the authors participated in writing and approved the final version of the manuscript.

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