



Fuel Wood Economy Study Report

2024

Overview

"The *'Fuel Wood Economy Study'* aims to provide a deeper understanding of the supply and demand for wood fuel, market dynamics, and factors influencing wood fuel access.



Fuel Wood Economy Study Report

A report developed by Engineers Without Borders East Africa



Plot 36, Ntinda Avenue Rd, Ministers' Village
Ntinda, Kampala Uganda, P.O. Box 2064
Email : info.uganda@ewb-ea.org
Tel: +256(0) 200 906 107
Web: www.ewb-ea.org

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Executive Summary

Over 1.7 million refugees and asylum seekers from neighboring countries currently reside in Uganda, with the West Nile region hosting refugee settlements like Rhino, Lobule, Imvepi, and Bidibidi. These settlements have populations of 166,331, 6,197, 69,453, and 202,102 people, respectively, as of September 30, 2024 (UGA Dashboard Annex II). The refugee influx has created a huge demand for wood fuel culminating to massive deforestation. This deforestation is intensifying the effects of climate change and difficulties in obtaining Livelihoods while creating tensions over resource scarcity. These Impacts are realized by both refugees and host communities. DanChurchAid (DCA) conducted a fuel wood economy study in the four West Nile refugee settlements. The study aimed at providing an understanding of the supply and demand for wood fuel, market dynamics, and the factors influencing wood fuel access.

A consolidated approach where both quantitative descriptive research and qualitative research design was adopted for the study as well as a desk review of the available literature, policies and national strategic plans. A total sample size of 418 respondents derived from Yamane's formula participated in the Quantitative approach of the study from the four settlements. Whereas a total of 53 people participated in Focus Group Discussions and 31 people in key informant interviews.

Findings reveal that both refugee and host households are highly dependent on biomass (forests/woodlands) as sources of energy in form of firewood and charcoal with the main drivers for fuel wood collection, purchase and use being high poverty levels, mindset and the scarcity/inaccessibility of the other cleaner energy options due to the fact that a number of them are still in pilot stages by the environment and energy partners. The key business players for the supply of fuel wood within the refugee settlement areas are the host communities due to the fact that they are the landlords and hence own the forests and woodlots with some few refugee community members acting as middlemen in the business and the majority of the refugee communities are the end users. The suppliers have preferred species of trees for wood as well as charcoal. The study reveals that the fuel wood preferred species are those that can regenerate easily in the shortest time possible while the ones preferred for charcoal are those that give high caloric value but certainly take between 3-5 years to regenerate. It is worth noting that the preferred species are native species which are not easily obtained due to the high pressure and hence the switch to planting exotic species with quick short regeneration time which ultimately affects the biodiversity and the ecosystem at large. It was realized that fuel wood economy is faced with some constraints ranging from collection, purchase and use which include long distances, loss of productive time, child abuse and school dropouts, safety concerns like rape, defilement, fights as well as loss of incentives like food staff from refugees in exchange with fuel wood to the host communities. Study findings reveal that seasonal variations affect the wood fuel economy with low quantities in wet seasons hence an increase in cost while in dry season low cost with good surplus as compared to the wet seasons.

Due to the growing scarcity; the environment and energy partners are trying to come up with different energy conservation as well as restoration interventions such as; energy-efficient cook

stoves, cooking baskets, solar energy systems, tree planting and growing activities. Additionally, the community is adopting to the prevailing situation by switching to lighter meals, putting off fire while not in use, using the available energy saving options as well as using other energy sources within their means like dry cassava stems, grass and to a small extent briquettes.

In general, access to wood fuel in the refugee hosting districts is becoming hard day by day. In the past 10 years fuel wood was easily obtained by community members both refugees and host communities. Lately, besides purchasing fuel wood from dealers; for an individual to obtain fuel wood has to cover an average distance of 2km which demands significant time and effort while it requires a substantial amount of money, an estimate of 50,000UGX per month, [approximately \$13.66] for an average household for those that purchase from the dealers which worsens their vulnerability.

In conclusion, the fuel wood economy in Imvepi, Bidibidi, Rhino, and Lobule plays a key role in the daily lives of refugees and host communities. While the reliance on fuel wood remains significant, the challenges associated with seasonal supply, land use, and the adoption of alternative energy sources require urgent attention. Addressing these challenges requires a multi-faceted approach that integrates policy initiatives, community engagement, and sustainable practices.

It is recommended that:

- i. The local government initiates shared land use models among the host and refugee communities to provide a chance to the community that currently has no access to land and also to effectively utilize the available land resources and reduce redundancy.
- ii. Community tree planting initiatives are established to encourage the community to plant and grow more woodlots and forests.
- iii. Awareness and education campaigns educating communities about the benefits of environment management in particular sustainable harvesting of forest products and the use of alternative fuels should be designed.
- iv. Fuel wood cooperatives are formulated to facilitate collective collection and distribution of fuel wood to mainly refugee settlements. This can enhance the bargaining power during fuelwood trade, reduce costs, and improve access to sustainable sources.

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It is our hope that the study's findings will have a meaningful impact on all who contributed to this initiative

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Abbreviations

CESCR - Centre for Economic Social Cultural Rights in Africa

DCA - DanChurchAid

DEAP - District Environment Action Plan

EWB EA - Engineers Without Borders East Africa

FGDs - Focus Group Discussions

HADs - Humanitarian Assistance and Development Services

HH - Household

INDC - Intended Nationally Determined Contributions

JLIRP - Jobs and Livelihoods Integrated Response Plan

KIIs - Key Informant Interviews

LC - Local Council

Ltd - Limited

NGOs - Non-Governmental Organizations

OPM - Office of Prime Minister

PAG - Pentecostal Assemblies of God

RBF - Results-Based Financing

RICE - Rural Initiative for Community Empowerment

RWC - Refugee Welfare Council

SCNL - Save the Children Nederland

SPSS - Statistical Package for Social Sciences

ToR - Terms of Reference

WESRRP - Ugandan Government's Water and Environment Sector Refugee Response Plan

Chapter 1: Introduction

1.1. Background

Uganda currently hosts over 1.707473 million refugees and Asylum seekers (OPM, Sep 2024) from South Sudan, the Democratic Republic of Congo, Rwanda, and Burundi among others. Refugees are settled in gazetted settlements, where they receive access to land, freedom of movement, and employment opportunities. However, this influx has caused significant environmental degradation, particularly due to the overharvesting of firewood and charcoal used for cooking and heating. As a result, fragile ecosystems such as forests, wetlands, and grasslands in and around refugee settlements are being negatively impacted, with evidence of vegetation cover rapidly declining. This deforestation is intensifying the effects of climate change, while also creating tensions over resource scarcity, particularly between refugees and host communities.

In response, DanChurchAid (DCA) contracted Engineers without Borders East Africa (EWB EA) Consult Limited to conduct a comprehensive study of the fuelwood economy in the West Nile refugee settlements. The study aimed to provide a deeper understanding of the supply and demand for wood fuel, market dynamics, and the factors influencing wood fuel access. The findings will be utilized to inform sustainable forest management and policy formulation, addressing gaps in previous studies by analyzing fuelwood supply, demand, and market dynamics as well as to guide future programs to restore forest cover and mitigate fuelwood shortages, reducing associated conflict and protection risks for women and girls. This report, therefore, consolidates the findings of the study and presents a detailed analysis of the results as well as key recommendations.

1.2. Objective

The main objective of the assignment is to comprehensively assess and analyze the supply and demand of wood fuel in the refugee settlement of West Nile, with the aim of informing sustainable forest management practices, policy formulation, intervention programming, and resource planning to enhance energy security, environmental conservation, and socio-economic development.

1.3. Purpose

The purpose of this assignment is to conduct a study, which adequately responds to the following research questions:

Table 1 List of research questions

No.	Question
1	How many households averagely utilize/prefer fuel wood for cooking versus other cooking technologies? If so, why do they prefer fuel wood?

No.	Question
2	What are the drivers for wood fuel collection, purchase/demand, and use by refugee and host community households?
3	Who are the key business players in the supply of fuel wood within the refugee settlements? / Who are the key players in the fuelwood market, supply route, etc.?
4	What is the distance/time covered by refugees to access wood fuel within the refugee settlement?
5	Which types of fuel wood are demanded for cooking in the refugee and host community settlements and why?
6	How frequently and in what quantities does each household collect/buy fuel wood for cooking using: a) Open fireplace b) Efficient cook stove
7	What is the value (monetary or food exchange) of fuel wood acquired by refugees and host communities?
8	Where are the fuel wood sale kiosks? / How many fuel wood sale kiosks are there in each area? Average people served by the fuel wood kiosks on a daily basis?
9	What are the constraints of wood fuel collection, purchase, and use by the refugees and host community?
10	Which species of wood fuel is most preferred by the community? And for what reasons? a) Of these species, which has the highest calorific values? b) What is the regrowth potential of the preferred species?
11	What are the energy conservation measures implemented in the refugee settlements? a) Profile the listed energy conservation measures. b) What are the effective behaviour change strategies at household levels on the uptake of more efficient cooking technologies, practices, and alternative fuels?
12	Seasonal variations in supply & demand of fuel wood (if any)?
13	What are potential or actual alternative cooking energy solutions that may be proposed?
14	Assessment of the economic/financial feasibility of fuel wood growing from a household and fuel wood supplier perspective matched against relevant energy efficiency solutions and behavioural insights from the study, as well as trade-offs e.g., with food production on households' land?

1.4. Project Scope

The study was conducted in Uganda's West Nile region, focusing on the refugee settlements of Rhino, Imvepi, Lobule, and Bidibidi. It focused on both refugees and host communities to ensure comprehensive research findings that will inform future programming and decision-making.

Chapter 2: Methodology

2.1. Introduction

This chapter outlines the research methodology applied in conducting the study and details the processes, tools, and approaches used to gather and analyze research data. The methodology also includes a comprehensive desk review of existing literature, policies, and reports relevant to the assignment.

2.2. Desk Review

The team made a desk review of the existing related literature, plans, and policies relevant to the assignment. The following are the findings from the documents reviewed:

i). Yumbe District State of the Environment Report (2022)

This report offers a comprehensive assessment of the environmental health and status across the Yumbe District. It systematically presents data on environmental conditions, trends, and key influencing factors. It stipulates the major factors contributing to deforestation in the district include:

- a) Increasing population.
- b) Over-exploitation of forest products - wood fuel, timber.
- c) Opening up of new land for cultivation.
- d) Urbanization and institutional failures.
- e) Tobacco curing.
- f) Charcoal burning.
- g) Brick burning.

The report also stipulates responses to these factors at different levels i.e., national level, and subnational level (district, sub-county). Some of the responses established to curb unsustainable harvest and use of trees include; formulation of instruments (policy, guidelines, and tools) i.e. Ordinances passed by the District Council and Bylaws passed by sub-counties.

ii). Yumbe District Environment Action Plan (DEAP) (2023 – 2025)

The DEAP stipulates the district's natural resources status and degradation levels. The plan explains the dangers of over-dependence on nature for livelihood which puts immense pressure on the environmental resources of the district which is the case for the Yumbe district due to the overpopulation of both the host community and Refugees Settled in the Bidibidi settlement. The DEAP further proposes interventions to mitigate/restore the degraded areas such as:

- Designing and implementing projects for conserving & restoring the environment including massive tree planting and growing of trees especially indigenous trees in homes, institutions, and communities in the district.

- Training communities on tree nursery establishment and management.
- Raising tree seedlings and distributing them to farmers including refugees and institutions like schools, churches, health centers, and community groups, to mention a few.

iii). Terego District Environment Action Plan (2022-2025)

This provides information on the effect of refugee influx in the district. The ever-increasing need by refugees for firewood has exposed the Terego environment to more dangers. Vegetation has always been cleared in search of fuel as well as a source of livelihood for the charcoal and woodlot dealers. This has caused pressure up to wetland and river banks areas. The DEAP further stipulates that fuelwood demand is very high in both refugee settlements and host communities. This wood is mainly used for both domestic purposes and commercial purposes. The very common and rampant commercial use of wood is Tobacco curing and charcoal production. It is estimated that one lot of tobacco curing requires approx. 3m³ logs implying that an average farmer would use an equivalent of 20m³ in one season.

iv). Response to Increased Environmental Degradation and Promotion of Alternative Energy Sources in Refugee Hosting Districts - Stitching Save the Children Nederland (SCNL)

The plan addresses environmental degradation and related challenges in the refugee response in West Nile. It also identifies interventions which complement the implementation of the Ugandan Government's Water and Environment Sector Refugee Response Plan (WESRRP). This response plan advocates for the promotion of Alternative Energy Sources in Refugee Hosting Districts. Stakeholder engagements for this assignment were therefore done taking into consideration and exploring the aspects and possibilities of alternative energy sources.

v). Yumbe District Development Plan III, 2020 - 2025

This report describes the physical, biological, and socioeconomic environment and challenges to natural district resources within the district. The main challenges in the district include water and land degradation. Land degradation varies from one part of the district to another, and the reports/outlined drivers for land degradation are poor farming practices, deforestation, wild bush fires, and overgrazing. The planned interventions (goals) to halt degradation are limited by budget cuts and inadequate funding.

vi). Rapid Assessment of Natural Resource Degradation in Refugee Impacted Areas in Northern Uganda, Technical Report, June 2019

The assessment reveals that; i) the refugee influx has led to an increase in the rate of degradation and tree loss; both inside the West Nile refugee settlements and around their boundaries, with accelerated land cover changes in bushland and woodland. ii) Land cover change analysis shows an increase in tree cover loss and degradation both within and around the refugee settlements after the start of the refugee influx from South Sudan. iii) Refugee and host households are highly dependent on forests and other woodlands as sources of wood fuel for cooking and income generation iv) Households need additional wood to build and maintain living structures. In summary, this document shows the dependency on forests and other woodlands such as wood fuel sources for cooking and income generation by the high population in refugee settlement areas.

vii). Water and Environment Sector Refugee Response Plan, 2019

This plan gives insights into issues in several sectors affecting refugees and host communities. Sectors analyzed include; institutional analysis and strengthening, water, sanitation & hygiene and environment & natural resources protection. The identified issues affecting the environment and natural resources include but are not limited to increased demand for fuel wood, climate change, unplanned settlements, and poor solid waste management. The plan also outlines the lack of alternative fuel, environmental and natural resources degradation & increased greenhouse gases as some of the causes/drivers for these issues.

viii). Uganda's Intended Nationally Determined Contributions (INDC) 2015 – 2030

It highlights adaptive mechanisms in all sectors to reduce the vulnerability of sectors such as water, energy, health, disaster risk management and land management to increase resilience at the grassroots level. The energy measures highlighted include:

- Promotion and wider uptake of energy-efficient cooking stoves or induction cookers
- Promotion and wider solar uptake of solar energy systems
- Development and enforcement of building codes for energy-efficient construction and renovation.

The INDC also outlines priority adaptation Actions in each sector. The priority adaptation actions for the energy sector include:

- Increasing the efficiency in the use of biomass in the traditional energy sector.
- Promoting renewable energy and other energy sources.
- Increasing the efficiency in the modern energy sector, mainly of electricity.
- Ensuring the best use of hydropower by careful management of the water resources.
- Climate proofing investments in the electricity power sector.

The INDC also outlines priority adaptation Actions in the forestry as below:

- Promoting intensified and sustained forest restoration efforts (afforestation and reforestation programs, including in urban areas).
- Promoting biodiversity & watershed conservation (including re-establishment of wildlife corridors).
- Encouraging efficient biomass energy production and utilization technologies.
- Encouraging agro-forestry.

ix). National Forest Plan, 2011

Based on this plan forestry contributes a lot to the livelihood of the great majority of Ugandans, mostly in the informal economy. It stipulates that forestry has continued to form a large part of the informal sector through the sale of firewood, charcoal, furniture, craft materials, fruits, seedlings, honey, etc. The plan further outlines those various efforts have been undertaken to help the poor gain more access to forestry resources through agroforestry and community planting by NGOs, government, and donors **but access to resources still eludes many among the poor as**

seen from the increasing distances to collect firewood and growing scarcity of other products like timber. This study's findings similarly report increasing distances to collect firewood in the West Nile refugee hosting district.

The plan is in line with the study findings which show that biomass is the dominant energy resource for households and small businesses such as brickmaking, tobacco curing, and a number of agro-based small industries/businesses.

Moreover, the plan shows the dependency of households on forest resources as a source of livelihood. In the informal economy like the refugee and the host community areas, the sale of firewood, charcoal, furniture, craft materials, fruits, seedlings, honey, etc. are common livelihood activities that rely on forest resources.

x). National Biodiversity Strategy and Action Plan, 2002

The plan provides a framework to guide the setting of conservation priorities, the channeling of investments, and the building of the necessary capacity for the conservation and sustainable use of biodiversity in the country. It also highlights general threats to biodiversity in Uganda such as:

- **Biodiversity loss** due to depletion of tree resources (Habitat) in an effort to obtain forest products like charcoal, fuel wood, and timber
- **Introduction of Invasive Alien Species**, which also affects the native species. Exotic species out-compete native species and replace them in the system, thus reducing the species diversity.
- **Human population increase**, causing habitat conversion. Natural habitats like forests, wetlands, and grasslands are transformed into agricultural or urban areas, causing fragmentation and loss of ecosystems essential for maintaining species diversity.

xi) Jobs and livelihoods integrated response plan (JLIRP) refugees and host communities in Uganda, 2020/2021 – 2024/2025

JLIRP aims to ensure the social and economic ability of individuals, households, and communities in refugee hosting districts to meet essential needs through enhancing employability and livelihoods by providing strong social structures, increased levels of economic activity and elaborate social and economic linkages between refugees and host communities. The plan emphasizes environmental protection and sustainable use of natural resources to avoid conflict, and disasters, and promote greening. Strategic Objective 4 of the JLIRP is to have skilled refugees and host communities capable of harnessing employment opportunities in the country by 2025. This is expected to provide alternative livelihood options and hence a reduction in the dependency on natural resources as well as reducing tree cutting in an attempt to earn a living.

xii) The Forest Landscape Management Plan for the Bidibidi Refugee Settlement, Yumbe district, Uganda, 2023-2028

The plan gives background information on the forest cover status in the Yumbe district particularly the Bidibidi settlement and its surrounding environment. It stipulates that an average of 97 percent of households across the refugee and host communities use fuelwood for cooking. Refugee households are more likely to use charcoal than host communities. **Notably, the daily fuelwood consumption of refugee households in the Bidibidi settlement has declined**

significantly from 2017 to date approximated to 3.5 to 1.6 kg per person per day which is explained by the shift of diet from dry beans dominated diet to fresh food which cooks faster.

It also gives strategic interventions and approaches to restore degraded environment and to provide required cooking energy for both refugees and host communities in the area. The plan's main proposed management intervention is "Establishment and management of dedicated woodlots for biomass production". It outlines the recommended species for establishing and maintaining fuel wood plantations namely; *Eucalyptus spp.*, *Grevillea Robusta Gmelina arborea*, *Melia volkensii* and *Melia azedarach Pseudocedrela kotschyj*, *Azadirachta indica*, *Gliricidia sepium*, *Senna siamea*.

2.3. Project Coordination and Stakeholder Engagement

To ensure timely completion of the assignment, the Consultant team worked closely with the client (DanChurchAid) to ensure prompt mobilization and approval of project deliverables. This collaboration was also complemented by a thorough stakeholder analysis, which enabled the team to identify and engage relevant stakeholders for valuable insights for the study. Below is the list of stakeholders who were consulted during the study.

i). Primary stakeholders:

Table 2 List of primary stakeholders

S/N	Stakeholder	Role/ Level of engagement
1	DanChurchAid staff	<ul style="list-style-type: none"> ▪ Mobilization of the stakeholders ▪ Contact identification for the various stakeholders ▪ Introducing EWB-EA to various stakeholders.
2	Refugee and host community(ies) of Rhino, Imvepi, Lobule, and Bidibidi	<ul style="list-style-type: none"> ▪ Relative response to the pre-set research questions / participate in the interviews.

ii). Secondary stakeholders:

Table 3 List of secondary stakeholders

S/N	Stakeholder category (ies)	Role/ Level of engagement
1	Local Councilors of the host district (LC1, LCIII and LC V), Mayors of the town divisions as well as secretaries for environment at the RWC Level.	<ul style="list-style-type: none"> ▪ Mobilization of the community ▪ Brief on socio-economic activity in the area as well as the fuel wood economy chain. ▪ Relative response to the pre-set research questions / participate in the interviews ▪ Brief information on similar programs done or to be done in the community
2	District Forest officer	<ul style="list-style-type: none"> ▪ Impact of the fuel wood use on the host district

S/N	Stakeholder category (ies)	Role/ Level of engagement
	Natural Resources Officer Environmental Officer Community Development Officer	<ul style="list-style-type: none"> Any development programs/intervention implemented or to be implemented to stop the fuel wood chain Environmental impacts faced due to fuel economy
3	Community leaders (clan leaders and elders) for the refugee and host community(i.e.) of Rhino, Imvepi, Lobule, and Bidibidi	<ul style="list-style-type: none"> Mobilization for the refugee and host communities to participate in the exercise Fuel wood economy chain (historical and current wood fuel economy trends) Relative response to the pre-set research questions / participate in the interviews
5	Environment and Energy Implementing Partners in West Nile, Kampala and Uganda	<ul style="list-style-type: none"> Ongoing or planned Energy interventions / programs Potential current and future challenges or opportunities in the fuel wood economy
6	Households/stakeholders/groups participating in firewood selling and buying	<ul style="list-style-type: none"> Potential current and future challenges or opportunities in the fuel wood chain

2.4. Study Design

This section consists of a breakdown of the research design and rationale used for each objective of the study.

2.4.1. Qualitative Approach

Through organized focus group discussions, and key informant interviews, a qualitative approach was used to address research questions (2, 3, 5, 8, 9, 10, 11, 12, 13, and 14). The selection of key informants and focus groups was based on their professional and personal experiences, attitudes, perceptions, and beliefs related to the fuelwood economy in the refugee settlements of Rhino, Lobule, Bidibidi, and Imvepi.

2.4.2. Quantitative Approach

This approach was used during household survey interviews conducted to achieve research objectives 4, 6, 7, 8, and 14. The data obtained from the representative sample in the refugee settlements of Rhino, Lobule, Bidibidi, and Imvepi, was collected using structured questionnaires and quantified.

2.4.2.1. Sample Determination

The survey covered a representative sample size of 418 households in the refugee settlements of Rhino, Imvepi, Lobule, and Bidibidi, targeting both refugees and the host community as shown below. The study was conducted through systematic random sampling in the refugee settlements

of Rhino, Imvepi, Lobule, and Bidibidi, focusing on both refugees and the host community. The sample size was derived from the formula below.

$$n = \frac{N}{(1 + N e^2)} \dots\dots\dots \text{Equation 1 (Yamane's formula C)}$$

Where n is the sample size, N is the population size, and e is the level of precision.

Using the above formula, considering the available resources (time), a 5% margin of error at a 95% confidence level was adopted to determine the sample size as indicated below.

2.4.2.2. Population Size and Sample Calculation

The sample population size (N) was calculated by summing the number of households in the four-refugee settlement

Table 4 Total number of households in each settlement

Refugee settlement	Number of Households, (Ns)
Imvepi	15,590
Bidibidi	36,560
Rhino	31,007
Lobule	976
Total number of Households (N)	84,133

Source: UGA Dashboard Annex II - Active Population by Settlement 30-Sep-2024

From equation (1):

$$n = \frac{84133}{(1 + 84133 (0.05^2))} = 398 \text{ households}$$

With a 5% error margin, the sample becomes:

$$e = 5\% \times 398 = 19.9$$

Hence consider an additional 20 households

Therefore, total n = 398+20 = 418 Households

2.4.2.3. Sample Distribution

The above-determined sample was arithmetically distributed across all the study areas using the formula below:

$$n_s = \left(\frac{N_s}{N}\right) \times n \dots\dots\dots \text{equation 2}$$

Where; n_s is the sample size for each of the refugee settlements, N_s is the population size in each of the refugee settlements, N is the total population size, and n is the sample size for the total population

Table 5 Sample size for each settlement

Name of the refugee settlement	Sample population (n_s)	Percentage to the overall sample size
Imvepi	77	18%
Bidibidi	182	44%
Rhino	154	37%
Lobule	5	1%
Total (n_s)	418	100%

Table 6 Sample distribution

S/N	Name of the refugee settlement	Adopted sample size	Women	Men	Sample from the host community (30%)	Sample from the refugee community. (70%)
			45%	55%		
1	Imvepi	77	35	42	23	54
2	Bidibidi	182	82	100	55	127
3	Rhino	154	69	85	46	108
4	Lobule	5	2	3	2	4
	Total	418	188	230	125	293

We aimed to have 50% of our correspondents being male, 45% being female correspondents and 5% allocated for any marginalized group found in the refugee and hosts communities.

Below is the number of key informant interviews and focus group discussions conducted during the study.

Table 7 Table showing the qualitative sample interviewed.

S/N	Name of the refugee settlement	Number of FGDs	Number of KII's	Total number
1	Imvepi	1	5	6
2	Bidibidi	1	5	6
3	Rhino	1	5	6

S/N	Name of the refugee settlement	Number of FGDs	Number of KII's	Total number
4	Lobule	1	5	6
	Total	4	20	24

2.5.Data Collection

The consultant team designed a structured questionnaire to gather information on socio-economic status, wood fuel collection and usage patterns, alternative fuel use, and household energy needs, preferences, and influencing factors. The data collected was disaggregated by location, age, and sex according to the specified sample.

The team held interviews with 418 households across all the refugee and host communities. Both the refugee and host community were interviewed by identified and well-trained enumerators. The structured questionnaire was formulated using the Kobo Collect Toolbox and administered via mobile phones. During data collection, strict adherence to data accuracy and ethical considerations was emphasized. The enumerators were warned against any form of sexual harassment or socio-economic wrongdoing during the exercise. To ensure the collection of accurate data, the platform's real-time monitoring features were utilized to track progress and address any issues promptly. The team regularly downloaded and backed up data from the digital platform. The downloaded dataset was cleaned to correct any errors or inconsistencies.

2.5.1.Participatory approaches

Key Informant Interviews, Focus Group Discussions and surveys are the participatory approaches used to understand and capture stakeholders' interests, needs, expectations, roles, responsibilities, capacities, and potential conflicts or synergies concerning fuel economy.

Table 8 Stakeholders and approaches used

S/N	Stakeholder category (ies)	Role/ Level of engagement
1	Local Councilors of the host district (LC1, LCIII and LC V)/ Mayors of the town divisions	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Questionnaires (structured interviews)
2	District Forest officer Natural Resources Officer Environmental Officer Community Development Officer	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Questionnaires (structured interviews) ▪ Focused Group Discussions (FGDs)
3	Community leaders (clan leaders and elders) for the refugee and host community(ies) of Rhino, Imvepi, Lobule, and Bidibidi	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Questionnaires (structured interviews)
4	United Nation High Commissioner for Refugees	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs)

5	Environment and Energy Implementing Partners in West Nile, Kampala and Uganda	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs)
6	Stakeholders/groups participating in firewood selling and buying	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Observation
7	DanChurchAid staff,	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Focused Group Discussions (FGDs)
8	Refugee and host community(ies) of Rhino, Imvepi, Lobule, and Bidibidi	<ul style="list-style-type: none"> ▪ Key Informant Interviews (KIIs) ▪ Observation

2.5.2. Gender equality and inclusiveness

During the assessment, gender inclusion was paramount to achieving SDG 5 and its targets. Gender inclusion and marginalized groups incorporation, integration, and participation during assessment and analysis of how the fuel economy works in the refugee settlement of West Nile, was strictly adhered. All gender-related unique perspectives, needs, experiences, and challenges were considered and noted. Across all key stakeholders, a gender-sensitive stakeholder engagement approach was employed by identifying stakeholders from diverse gender backgrounds, including women, men, and non-binary individuals, and ensuring inclusive engagement throughout the study. This was achieved by carefully selecting the focal group discussion (FGDs) invites in a way that covers all categories. Likewise, the surveys also considered the different groups and hence the interviewers were subjected to a diverse community considering all categories

2.5.3. Data collection tools development

The consultant team reviewed the Terms of Reference (ToR) and identified the objectives for data collection, as well as the key areas for assessing and analyzing how fuel economy functioned in the refugee settlement of West Nile. Based on this review, it was noted that the objectives included identifying indicators related to the research questions outlined in the ToR.

With the objectives of the study established, the team designed and developed the structure of the survey, which was organized into sections, including introduction and consent, as well as demographic information. The subsequent sections focused on key areas of the assessment and analysis of how the fuel economy functioned in the refugee settlement of West Nile, aiming to inform sustainable forest management practices, policy formulation, and resource planning to enhance energy security, environmental conservation, and socio-economic development.

2.5.4. Data Collection Tools and Techniques

This section details the tools and techniques, including survey software, statistical and qualitative analysis tools, and GPS devices, that were used to efficiently collect, analyze, and interpret data for the assignment.

2.5.4.1. Tools

The following are the data collection and analysis tools used for the study:

S/N	Tools	Who are the target respondents?	Function/use
1	Tools: Survey Software (e.g., Kobo Toolbox.	For collecting data from Households in the refugee settlements and host communities	To design and aid in conducting mainly household surveys (questionnaire administering)
2	Statistical Software: SPSS	For data analysis and visualization collected from the Households in the refugee settlements and host communities	For analysing and identifying patterns for the survey data
3	Qualitative Data Analysis device (phone recorder)	For collecting data during FGDs and KIIs	Collecting qualitative data during KIIs and FGDs For analysing interview and focus group discussion data.
4	Questionnaires:	For collecting data during household surveys (questionnaires) FGDs and KIIs (hard copies)	Used for gathering detailed information on fuel wood collection and usage patterns, quantities,
5	GPS Devices: (phone GPS)	To track the fuel wood routes and paths/distance	Track routes and distances covered for fuel wood collection.

2.5.4.2. Techniques

The following are the data collection and analysis techniques used during the study:

- **Household Surveys**

This technique involved administering structured questionnaires (using Kobo Toolbox or hard copies) to individual households in refugee settlements and host communities. The objective was to collect quantitative data on fuelwood usage, patterns, and socio-economic conditions.



Figure 1 Photo of enumerator conducting household interview

- **Focus Group Discussions (FGDs)**

FGDs were conducted with groups from the refugee settlements and host communities to gather qualitative insights. The focused group discussions mainly composed RWC (I, II and III), community elders, persons of special needs, women representatives, youths and LC (I, II and III). Numerically, a minimum of 10 participants were considered during the FGD with the refugee community contributing 70% while the host community contributed 30%

During mobilization, gender sensitivity was taken into consideration. A FGD was held with a minimum at least a 30% female gender representation. Poor time management, roads and harsh weather conditions (rain) and communication barrier were some of the challenges the consultant faced during mobilization and execution of the FGDs.

Some of the participants could not freely express their submissions in English but rather were well conversant with the use of their local language. To solve the communication barrier, a translator was deployed by the consultant. However, the FGD method encouraged discussion on common practices, challenges, and strategies regarding fuel wood collection



Figure 2 Photo of focus group discussion with members from Bidibidi Settlement

- **Key Informant Interviews (KIIs)**

KIIs involved one-on-one interviews with key stakeholders which included; District Forest Officers, District Environment Officers, Office of the Prime Minister (OPM) in the settlements, and Environment & Energy partners. The aim was to capture in-depth knowledge and qualitative data on fuel wood practices and community dynamics.

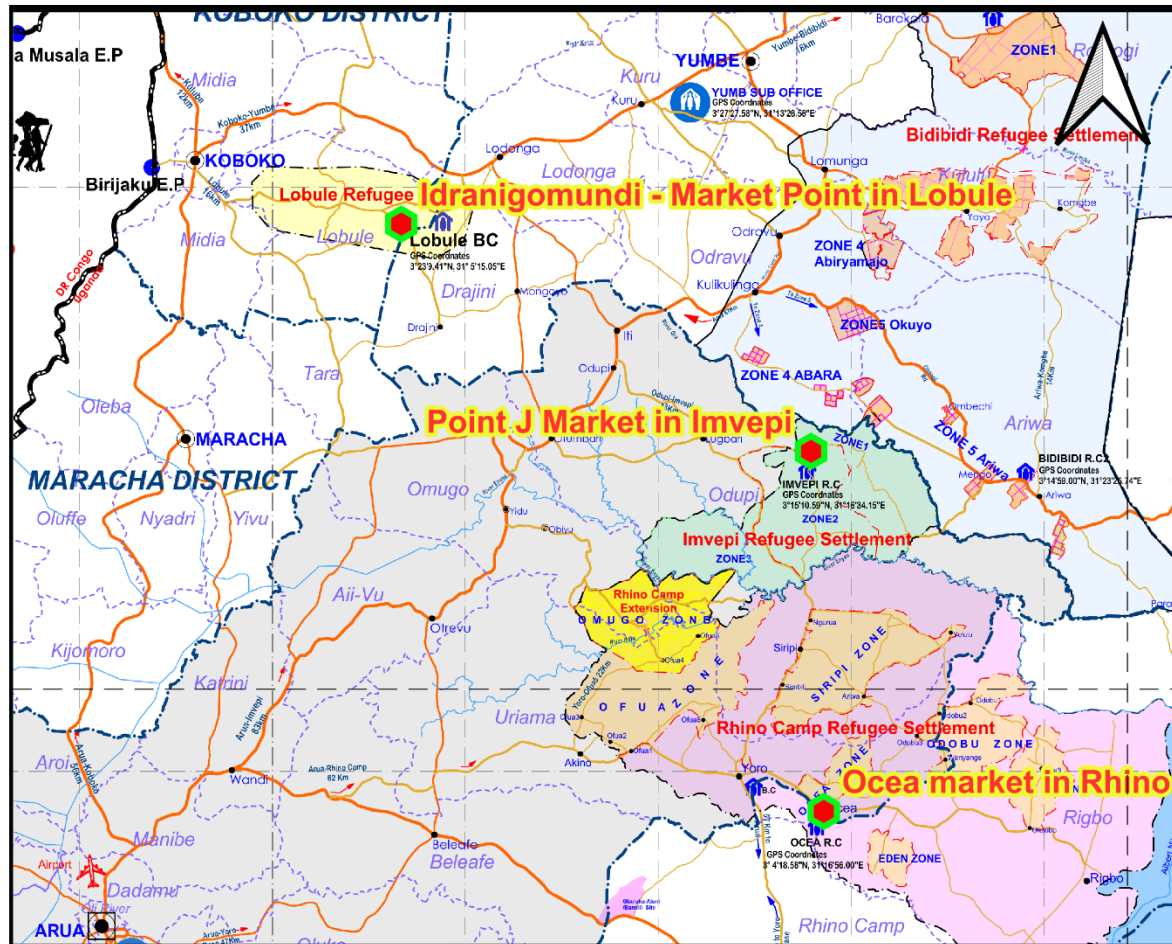


Figure 3 Photo of key informant interview in Rhino Camp

- **GPS Tracking**

GPS tracking was employed to map the locations for fuel wood market points where the majority of the people in the settlement collect their fuel wood. This map helped to provide spatial visualization and understanding of the distribution of these fuel wood market points within the settlements as shown in the figure below.

MAP OF FUEL WOOD MARKET POINTS



LEGEND

 Market Points

MARKET	LATITUDE	LONGITUDE
Idranigomundi	3.38168	31.06618
Point J	3.26486	31.2777
Ocea	3.07969	31.28426

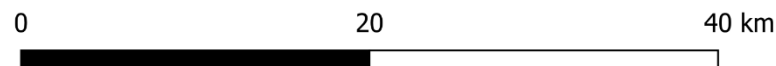


Figure 4 Map of fuel wood market points

2.6. Data analysis

2.6.1. Quantitative data entry into the analysis software

Data from the questionnaire was manually entered into the Statistical Package for Social Sciences (SPSS). A single transfer coding method was used for all the questionnaires. Each variable in the data was represented in each column in the data view window. Labeling and definition of each kind of data entered in each column was also done. A piece row in the data view window epitomized a record. Cleaning of the data was done manually.

2.6.2. Frequency distributions and graphical displays of the data.

In order to analyze the data, frequency distributions were done. This denoted the number of times the given variable had happened, and this information was represented on the graph or in a table. Robinson (2002) advocates for a frequency distribution display that makes data to be quickly and easily understood by a large audience.

2.6.3. Summary statistics

This research employed a number of ways to represent important aspects of the obtained data set by a single numerical value. This was done by describing the distribution level of the data by means of measures of central tendency. In this research, measures of central tendency were the median, mean, and mode. The median is the mid value obtained when all the scores are set in order of their ascending size. The mean is an average value obtained after summing all the scores and dividing by the number of scores. The mode is the highest frequent score. Descriptive statistics were done, the analysis was run, and the output was continuously checked, while customized output options, such as tables, charts, graphs, or reports were developed. Descriptive analysis was done to determine the percentage of households with access to fuel wood. The output was carefully examined, while any errors, warnings, or messages indicating any problem with the data or analysis were identified. The confounding factors describing the socio-economic characteristics of the sampled population were collected during the cross-sectional survey.

Chapter 3: Study Findings and Discussion

3.1. Quantitative Findings

This section presents results and discussions from quantitative data analysis in regard to households' characteristics, fuel wood collection and accessibility, fuel wood economy in the refugee settlement and the host community, challenges and recommendations to improve the energy and environmental interventions. The chapter also provides the possible feasible interventions and energy conservation measures. The results are presented without any reference to values as found in each section (in this case, each refugee settlement namely; Rhino, Imvepi, Bidibidi and Lobule). For some indicators, 95 percent confidence interval was used.

3.1.1. Household Characteristics

a) *Surveyed households by Refugee settlement.*

442 households were surveyed as compared to 418. Rhino refugee settlement was 103% represented [158/154], Lobule refugee settlement was 600% represented [30/5], Imvepi refugee settlement was 103% represented [79/77], and Bidibidi refugee settlement was under represented by 96% [175/182]. Bidibidi refugee settlement was under represented due to incomplete submissions made by the enumerators during household data collection. On average, 48.7% males [219/442] responded our survey while 50.3% females [223/442] responded to the survey. This is contrary to the 55% male and 45% participation. This is because most females are always at home during day time doing house chores, which is the data collection time. Accordingly, on average, each household has approximately 4 females [mean =3.81~4] and 3 males in each household [mean =3.43~3]. Most households have more females than males meaning that household sizes mostly depend on the number of females.

b) *Nationality of the households.*

According to the statistics, Rhino refugee settlement is mostly dominated by refugees from South Sudan. Other nationalities present include; Uganda (33%), Sudan (11%) and Kenya (1%), while Imvepi refugee settlement, is observed to be mostly dominated by refugees from South Sudan (77%), and Ugandans (23%). Lobule refugee settlement is observed to be mostly dominated by refugees from Congo (77%), and Ugandans (23%), while Bidibidi refugee settlement is mostly dominated by refugees from South Sudan (55%). Other nationalities present include Uganda (32%), and Sudan (13%).

c) *Education level and income source*

Farmer-related activity was the primary occupation and major source of income for 64% of the surveyed households in the four refugee settlements. This corresponds to primary education (48%, [212/442]) being the most dominant attained education level by the respondents of the interviewed households. This is responsible for the highest level of farming activities in the area. Secondary (31%, [135/442]) and tertiary (4%, [18/442]) education levels, were second and fourth education levels attained by respondents of the households in the four settlements. This is related to the skilled labour occupational activities in the area as the second source of income in the area. (17%, [77/442]) of respondents of the interviewed households in the four settlements were uneducated.

3.1.2. Findings for Fuel wood collection and accessibility.

Fuel wood is a vital resource used for cooking and heating. The firewood is collected from within the settlements and host communities, while charcoal is accessed from the host communities although some small quantities are also acquired from within the settlements. Depending on the type of wood fuel utilized, the type of technology used to cook, as well as household size, the quantities harvested vary significantly. The high craving by host communities for income through charcoal burning and

the sale of firewood escalates this condition further. The following are the quantitative findings presented for each research question:

1. How many households averagely utilize/prefer fuel wood for cooking versus other cooking technologies? If so, why do they prefer fuel wood?

From the study, the most preferred cooking method in the four settlements is by use of the firewood (99%, [436/442]), followed by the use of charcoal (38%, [169/442]). This represents the reliance of the population on fuel wood as the energy source for cooking in the surveyed households.

2. What are the drivers for wood fuel collection, purchase/demand and use by refugee and host community households?

The study shows that the drivers for fuel wood collection, purchase/demand and use by refugee and host community households are diverse and more than one in each of the surveyed households. The main reason why individuals from the surveyed sample prefer fuel wood charcoal is because it's cheap and easy to use as the secondary reason. However, there are other reasons like easy operation and maintenance, efficiency, flexibility, cultural purposes, and cleanliness especially with the charcoal option. Out of 442 households surveyed, Affordability (71%, [316/442]) and readily available (61%, [269/442]) are the leading reasons the preference of fuel wood usage for cooking. Reliability (41%, [183/442]), and efficiency in terms of burning easily (25%, [110/442]) are also among the reasons for the preference of fuel wood usage for cooking. Culture (12%) was the least reason for the preference of fuel wood usage for cooking among the four settlements. In comparison with other energy sources such as LPG, in all FGDs conducted findings *"The food cooked using fuel wood is tastier and sweet as compared to the food cooked using other methods such as LPG"*. Generally, the direct investment cost of solar powered cook stoves is higher as compared to the fuel wood options since a basin of charcoal ranges from \$1.37 to \$2.73 depending on the season, a bundle of firewood ranges from \$0.27 to \$1.37 depending on the size and season, with a sack of charcoal ranges from \$ 6.83 to \$16.39 depending on the size and season. This is far less than the approximately \$191.26 to \$273.22 required investment cost for the solar-powered cook stove costs

3. Who are the key business players for the supply of fuel wood within the refugee settlements? / Who are the key players in the fuel wood market, supply route etc.?

The consultant first determined the source of the fuel wood to the surveyed households in the refugee settlements and the corresponding host communities. The key players were then determined. From the analysis, households have no specific sources of fuel wood but rather utilize mix sources of buying and collecting by themselves. 90% of the households (both host and refugee communities) collect fuel wood by themselves while also, if not, 55% of the households at times purchase from retailers (from refugee and host community) using nearby weekly/daily markets or kiosks. The main challenge is affordability and availability more so on the side of the refugees as compared to the host community that has land to grow fuel wood. In other words, most of the households just collect fuel wood by themselves.

This makes the Local community to be the major player in the fuel wood economy in Bidibidi (65%, [114/175]) and Imvepi (34%, [27/79]), while outside communities are the main players in the fuel wood economy in Rhino (78%, [123/158]), and Lobule refugee settlements. For Lobule, most of the fuel wood is supplied by the outside communities from the nearby Yumbe district while in Rhino, most of the zones have no fuel wood and hence are supplied by Ofua 6 zone. Due to the longevity of Bidibidi refugee settlement, most of the fuel wood is supplied by the host community and also traded within the refugee communities in the settlement, while for Imvepi it is attributed to the largest refugee weekly market (Point J) found across the four settlements.

In general, most of the households do not obtain fuel wood from a single source but rather do mixed sources (individual collection and purchasing from others). This explains why across the four settlements, (74%, [329/442]) individual fuel wood collectors, and (41%, [182/442]) local traders are the primary fuel wood suppliers in the four settlements. This explains why most of the households in the four settlements collect firewood for cooking by themselves (90%, [380/442]), if not, they buy it from the nearest market (55%, [230/442]).

4. What is the distance/time covered by refugees to access wood fuel within the refugee settlement?

(50.0%, [219/442]) households use above 60 minutes to collect fuel wood each time while (32.0%, [147/442]), and (18.0%, [81/442]) use between 30-60 minutes and less than 30 minutes to collect fuel wood each time. The time used by the households corresponds to the distance covered while searching for fuel wood. In other words, (43.0%, [188/442]) households cover a distance of 1-2kms to fetch firewood while (36.0%, [160/442]), and (21.0%, [94/442]), respectively cover a distance of above 2km, and less than 1km to collect enough fuel wood. This attributes why (50.0%, [219/442]) households use above 60minutes to collect fuel wood each time while (33.0%, [147/442]), and (18.0%, [81/442]) use between 30-60minutes and less than 30 minutes covering approximately 1-2 km to collect fuel wood each time. This explains the scarcity of fuel wood among the four settlements.

5. Which types of fuel wood are demanded for cooking in the refugee and host community settlements and why?

Due to the diversity of the tree species and lack of knowledge by the correspondents on the botanical name of the tree species, other preferred tree species were determined during KIIs and FGDs. According to the quantitative research, among the most preferred tree species identified include Cebania, Caliandra, and Bamboo as confirmed in the FGDs. However, the FGD information is more exhaustive about other preferred tree species, especially native species. Both qualitative and quantitative findings confirm these preferred tree species grow in a period of 3-5 years as indicated in the research question 10. This is due to the preferred species being readily available, being cheap and growing faster making them easily got/accessible.

6. How frequently and in what quantities does each household collect/buy fuel wood for cooking using:

a) Open fireplace

For open fireplaces, (64%, [283/442]) of the households collect fuel wood on weekly a basis, (23%, [102/442]) collect fuel wood on a daily basis, (13%, [13/442]) households collect fuel wood on a monthly basis, and no household collects fuel wood on annual basis. In terms of quantity, (57.7%, [255/442]) households collect 0-5 kg of fuel wood each day (31.4%, [139/442]) households collect between 5-10 kg every day for use. Most of the households in both the refugee and host communities are small as confirmed by the household sizes data, which explains the small quantities of firewood used.

b) Efficient cook stove

Using efficient cook stoves for cooking, (49%, [217/442]) households collect fuel wood on a weekly basis while (46%, [203/442]) households collect fuel wood on daily basis. (5%, [22/442]) households collect fuel wood on a monthly basis while no household collects fuel wood on an annual basis. This is due to the efficiency of the energy-conservative cook stoves in using fuel wood. On the amount used while using efficient energy cook stoves, (67.2%, and [273/442]) households collect 0-5Kgs of fuel wood each day for cooking. (22.4%, [91/442]) households collect above 5-10.0 kg every day for use. This is because of the small number of people in each household surveyed.

7. What is the value (monetary or food exchange) of fuel wood acquired by refugees and host community?

According to the information from the FGDs, KIIs and household data collected, money is the only medium of trade in all four settlements.

Using a structured questionnaire, the consultant formulated questions that aimed at determining how much each household spent monthly to acquire the fuel wood. The consultant formulated questions that determined the source of fuel wood to understand the ways in which the household's access fuel wood, and the transport mode used for transporting the collected firewood.

Based on the data collected, there are two main ways of obtaining fuel wood i.e. collecting by themselves or buying from the weekly/daily markets and kiosks. (90%, [380/442]) of the households in the four settlements collect firewood for cooking by themselves, and (55%, [230/442]) buy it from the nearest market as shown by the statistical representations. Households use both of these means to obtain fuel wood [they sometimes buy or collect fuel wood]. Due to logistical issues faced, most of the surveyed households across the four settlements on a monthly basis spend between 10,000-50,000 UGX [approximately \$2.73-\$13.66] purchasing fuel wood. Also, a considerable number of 127 households across the four settlements on a monthly spend less than 10,000UGX [approximately \$2.73] on fuel wood.

8. Where are the fuel wood sale kiosks? /How many fuel wood sale kiosks are there in each area?

Average people served by the fuel wood kiosks on daily basis?

In this section of the survey, the consultant determined the availability, number of kiosks and weekly within the refugee settlements and host communities, the distance apart from the surveyed households with the time needed to reach the fuel wood selling points. In general, across the four settlements, 179 households purchase firewood from the weekly markets while 153 of the surveyed households purchase firewood directly from the suppliers. This explains why respectively (46%, [202/442]), and (64%, [283/442]) households using efficient cook stoves for cooking, and an open fireplace for cooking collect fuel wood every week. This is because fuel wood can be stored and preserved for future use, and the efficiency of the energy-conservative cook stoves in using fuel wood. Since the weekly markets are the main selling points of fuel wood in the refugee settlement, (24.4%, [108/442]) households move a distance of 1-5Km to reach the nearest weekly market to collect fuel wood while (22.4%, [99/442]) households move a distance of less than 1Km to reach to the weekly market to collect fuel wood. (3.4%, [15/442]) households cover a distance of 5-10Km to reach to the weekly market to collect fuel wood while (0.9%, [4/442]) households move a distance of more than 10Km to reach to the weekly market to collect fuel wood. This explains why (50.0%, [219/442]) households use above 60minutes to collect fuel wood each time while (33.0%, [147/442]), and (18.0%, [81/442]) use between 30-60minutes and less than 30 minutes to collect fuel wood each time.

On the number of kiosks present in the host and refugee community, most of the zones have 0-5 fuel wood kiosks. Ocea and Rhino extension Omugo have the highest number of the fuel wood kiosks with 36 and 16 respectively. The number served by either weekly markets or the kiosk was estimated during the KIIs and FGDs. On the distance to the nearest kiosk, (20.1%, [89/442]) households move a distance of 1-5Km to reach the nearest fuel wood kiosk to collect fuel wood while (21.3%, [94/442]) households move a distance of less than 1Km to reach to the nearest fuel wood kiosk to collect fuel wood. (2.5%, [11/442]) households cover a distance of 5-10Km to reach to the nearest fuel wood kiosk to collect fuel wood while (0.5%, [2/442]) households move a distance of more than 10Km to reach to the nearest fuel wood kiosk to collect fuel wood. This explains why (50.0%, [219/442]) households use above 60minutes to collect fuel wood each time while (33.0%, [147/442]), and (18.0%, [81/442]) use between 30-60minutes and less than 30 minutes to collect fuel wood each time.

9. What are the constraints of wood fuel collection, purchase and use by the refugees and host community?

From the survey, (85.5%, [378/442]) of the surveyed households across the four refugee settlements face long distances as the main challenge faced while collecting or purchasing fuel wood in the refugee settlements. This explains why (49.5%, [219/442]) of the surveyed households across the four refugee settlements asserted that the activity of fuel wood collection or purchasing is time-

consuming. It is also more evident that poor accessibility (no direct routes) is the third most challenge faced while collecting or purchasing fuel wood in the refugee settlements as recorded by (46.2%, [204/442]) of the surveyed households across the four refugee settlements. Also, harsh weather in the form of high rainfall even and high sun insolation intensity (39.4%, [174/442]), high cost of transporting the fuel wood (35.1%, [155/442]), and safety concerns (33.5%, [148/442]) were recorded among the challenges the surveyed households face during the process of collecting or purchasing fuel wood in the refugee settlements. There are cases of gender-based violence (7.9%, [35/442]), and sexual exploitation (attempted rape and defilement) (4.5%, [20/442]), recorded among the challenges the surveyed households face during the process of collecting or purchasing fuel wood in the refugee settlements.

10. Which species of wood fuel is most preferred by the community? And for what reasons?

a) Of these species, which has the highest calorific values?

b) What is the regrowth potential of the preferred species?

Due to the existence of different species in each refugee settlement, the exact tree species with the highest calorific value was determined in each settlement during FGDs and KIIs. For the regrowth potential of the preferred exotic species, below is the summary of the findings of the survey. From the survey, (51.1%, [226/442]) of the surveyed households across the four refugee settlements acknowledged that the preferred species grow faster (0-3 years) to reach the period of harvesting. (47.1%, [208/442]) of the surveyed households across the four refugee settlements acknowledged that the preferred species grow moderately (3-5 years) to reach the period of harvesting. This indicates that the preferred tree species can be potentially adopted in any restoration projects involving tree planting in the settlement. Most of these preferred species are native, produce quality wood and resistance to harsh weather conditions though they negatively impact biodiversity. The government highly recommends growing of teak and bamboo trees due to their environmentally friendly nature and production of quality wood.

11. What are the energy conservation measures implemented in the refugee settlements?

a) Profile the listed energy conservation measures.

b) What are the effective behaviour change strategies at household levels on the uptake of more efficient cooking technologies, practices and alternative fuels?

In context to adopting and using alternative energy conservative methods, (43.9%, [198/442]) of the surveyed households across the four settlements have and use efficient cook stoves (Lorena), while (22.4%, [99/442]) use other fuel saving techniques. 98 of the surveyed households across the four settlements engage in the different restoration programs in the area in the form of planting and maintaining Woodlots, forest covers, controlled tree cutting and grazing. (18.3%, [81/442]) use briquettes while 12 use other green energy technologies such as solar powered systems. Also, (58.2%, [257/442]) of the surveyed households across the four settlements have participated in energy conservation programs/ projects, while (41.8%, [185/442]) of the surveyed households across

the four settlements have never participated in energy conservation programs/ projects. This explains the presence and use of the energy conservation cook stoves and use of briquettes in the area.

12. Seasonal variations in supply & demand of fuel wood (if any?)

Generally, (80%, [353/442]) households have experienced any seasonal variation in the supply and demand of the fuel wood while only (20%, [89/442]) households have never experienced any seasonal variation in the supply and demand of the fuel wood. Since (80%, [353/442]) households have experienced any seasonal variation in the supply and demand of the fuel wood, the consultant determined how these households adapt to the seasonal variation in the supply and demand of the fuel wood. On adaptation mechanisms, (56.8%, [251/442]) of the surveyed households across the four refugee settlements prepare for fuel wood seasonality by stocking enough fuel wood in advance during seasons of high supply. (47.3%, [209/442]) of the surveyed households across the four refugee settlements resort to using other alternative fuel sources such as briquettes, use of dry food crop stems (cassava), leaves and grass

13. What are potential or actual alternative cooking energy solutions that may be proposed?

Due to difference in the socio-economic status, preference and technical capacity among the different households across the four settlements, the consultant used KIIs and FGDs to determine the most preferred alternative energy cooking solution for each settlement. However, although most of the households use or are willing to adopt alternative energy sources, there are few challenges that have hindered the adoption rate of these technologies. In general, (73.8%, [326/442]) of the surveyed households across the four settlements reported that these sources are expensive to buy, while (43.4%, [192/442]) reported that these sources are not readily available. (34.8%, [154/442]) of the surveyed households across the four settlements reported that most of the desired alternative energy sources are highly technical with (19.7%, [87/442]) households report high operation and maintenance cost as a hindrance to the use and adoption of the alternative energy sources.

14. Assessment of the economic/financial feasibility of fuel wood growing from a household and fuel wood supplier perspective matched against relevant energy efficiency solutions and Behavioral insights from the study as well as trade-offs e.g., with food production on households' land?

Due to differences in the socio-economic status, preference and technical capacity among the different households across the four settlements, the consultant determined how much land each household has allocated for tree growing. Below is a summary of the findings.

- **Proportion of land used for growing fuel wood**

Although most of the households are participating in tree growing, the following illustrates land proportions allocated by the surveyed households that participate in tree planting.

Table 9 Proportion of land use for growing fuel wood

Proportion of land in acres	Frequency	Percentage
0 -5	283	76.3
5 -10	71	19.1
10 - 50	16	4.3
50 - 100	1	0.3
Above 100	0	0.0
Total	383	100%

In general, (84% [383/442]) of the surveyed households across the four settlements have land allocated for tree growing. (76.3% [283/383]) of these households have allocated 0-5 acres of land for fuel wood growing, (19.1% [71/383]) have 5-10 acres for tree growing. (4.3% [16/383]) and (0.3% [1/383]) have respectively allocated 10-50 acres and 5-100 acres of land for fuel wood growing. Of the 383 households having land for fuel wood growing, no household had an allocation of more than 100 acres for tree growing. 124 households grow trees in order to increase the accessibility to fuel wood a little. 16 related the tree growing practice to environmental conservation. Providing shade (83), income source (36) and food source for fruit tree (30) also were considerable benefits the households participating in tree growing have witnessed. The benefits are as illustrated below.

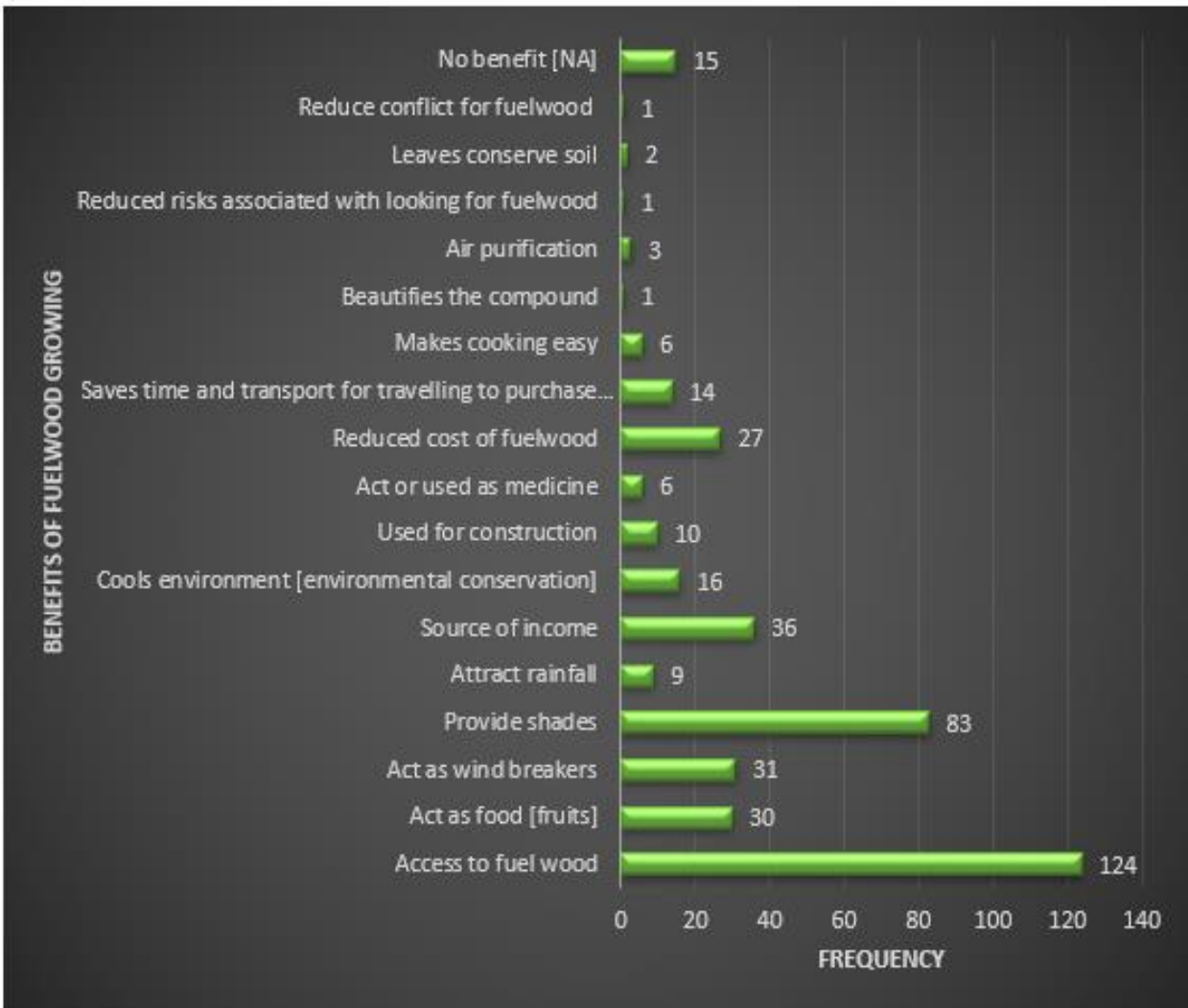


Figure 5 Benefits of Fuel Wood Growing

However, limited land (land conflicts issues) to enough tree growing (82), and difficulty in getting seeds/ seedlings (81) are leading hindrances in community participation in tree growing. The challenges faced are summarized below.

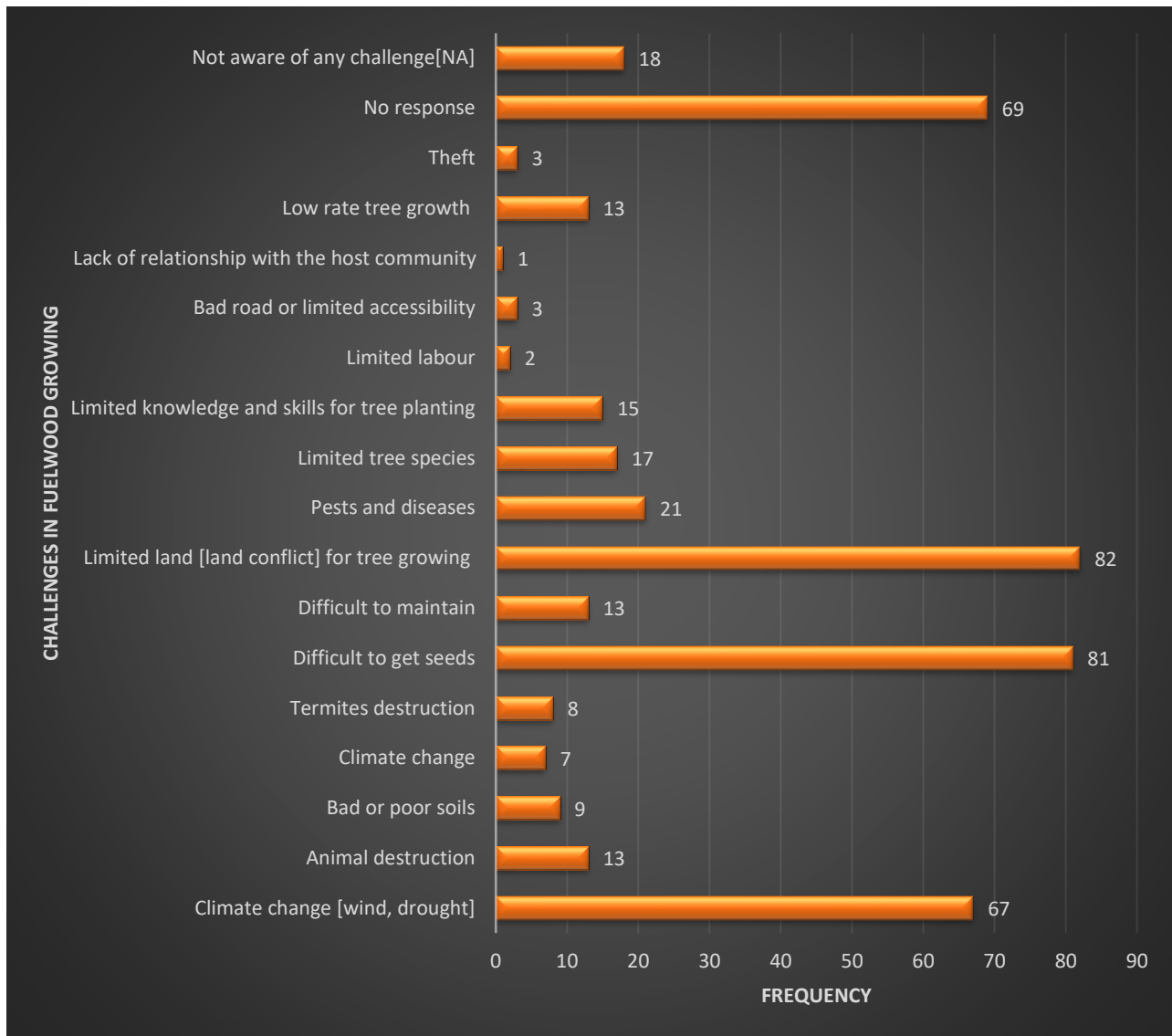


Figure 6 Challenges in Fuel Wood Growing

3.2. Qualitative Findings

The qualitative findings were obtained from the review of the notes made during the different focus group discussions and key informant interviews. These findings provide a good insight into the perceptions, challenges, and experiences of both refugee and host communities regarding the fuelwood economy.

i) Drivers for wood fuel collection, purchase/demand, and use by refugee and host community households

Refugee and host households are highly dependent on biomass (forests/woodlands) as sources of energy in the form of firewood, charcoal, and to some extent briquettes. Based on the quantitative

study it is realized that 99% of the surveyed households use firewood, 38% use charcoal between 18% use briquettes. It is worth noting that some surveyed households use both wood fuel and charcoal. The survey revealed that the main drivers for fuel wood collection, purchase, and use in the refugees and host communities of Imvepi, Rhino, Lobule, and Bidibidi are; i) lack of enough money to explore cleaner energy options; many of the other energy options require significant upfront investment which can be prohibitive for refugees and host community. Based on findings; the cost for solar-powered cook stoves is approx. \$191 - \$273 while the Lorena stoves and cooking baskets range between \$5 - \$10. ii) Mindset as most of them believe that food cooked using biomass is delicious. iii) biomass is readily available and hence one main source of livelihood where both the refugees and host communities earn a living through selling firewood directly or production of charcoal from the woodlots. iv) The available cleaner energy options (cooking basket & Lorena stoves) are still in pilot stages by the environment and energy partners and hence have access limitations i.e. quantities issued/ quantities available on the market, knowledge of the operation, and other conditions instituted for the beneficiary household like owning kitchen.

ii) Key business players for the supply of fuel wood within the refugee settlements

The host community is the key player in the supply of fuel wood within the refugee community since they are the landlords and hence own the woodlots. It is important to note that most refugees have very small pieces of land on which they build their homes. The Office of the Prime Minister (OPM) currently assigns a 30m x 30m plot of land to each refugee household regardless of household size which is insufficient to meet their needs for both shelter and cultivation (*Norwegian Refugee Council, Housing Land and Property Challenges and Best Practices in West Nile Settlements, 2024*). In contrast, many members of the host community own larger plots of land that they use for farming and woodlot plantations. Some of these landowners either manage the land themselves or hire a few refugee communities to help exploit the resources available, such as through charcoal burning. The host community tends to sell off standing trees for charcoal production. It was noted that 90% of the surveyed households search for the wood fuel themselves whereas 10% buy from the middlemen or the available kiosks in the settlement. The refugees mostly purchase wood fuel and charcoal from the host communities. The survey found out that the dealers on the market are mainly women with few men selling in bulk while the women do the retailing.

iii) Types of fuel wood demanded for cooking in refugee and host Community Settlement

Findings revealed that both the host and refugees use relatively more firewood and charcoal for cooking with some few using alternative options like Lorena stoves and briquettes (as elaborated in Section 3.2 (i)). However, limited access to the sources of firewood and wood lots for charcoal production by the refugee community and hence purchase firewood or woodlots for charcoal production from the host communities as a source of livelihood as well as home use. For briquettes, a small portion (18.3%, [81/442]) of the community was trained by the environment and energy partners and the majority had inadequate knowledge in the formulation and utilization of briquettes thus low demand.

iv) Constraints of fuel wood collection, purchase and use by refugees and host community

Fuelwood related constraints range from collection, purchase and use. It was noted that lately, it is quite difficult to access fuelwood unlike 5-10 years ago due to exploitation of the forest resource that originally supplied the community. Currently, the community has to cover a long distance in order to obtain fuelwood. In addition to covering long distances, some individuals opt to carry wet fuel wood/logs to avoid missing the collected woodlots as other interested parties would utilize them during that time lag in an attempt to dry them.

Due to the fact that the host communities are mainly the landlords; refugee accessibility to the sources of fuelwood during the search for fuelwood is almost close to impossible. As a result, cases of women and girls being exposed to risks such as rape, defilement, fights etc. are common. Other challenges include snake bites, increased school dropout, and loss of refugee supplies (e, g food which is occasionally exchanged for fuel wood).

Whereas individuals who opt to purchase fuel wood are faced with high charges and hence limiting accessibility. The other challenges for fuel wood use by both refugees and host community are smoke production which results in air pollution, limited access to energy saving stoves and hence the consumption of the available limited resources is very high.

v) Preferred species of wood fuel and for what reasons

Tree species for fuel wood are *Nifaliba*, *Kireri*, *Rera*, *Gwogwe*, *Karatusi*, *Lira Kkonyuke*, *Teak*, *Bamboo*, *Calandra*, *Cebania gomaninina*, *Sabiya*. The species are preferred because they dry faster. The preferred species for fuel wood are exotic species and are specifically selected due to their potential to withstand climatic conditions of the region as well as their short regrowth period of between 1-3 years. The same species are recommended by the Bidi Bidi Forest Landscape Management Plan 2023-2028.

Whereas *Jingili Ioso*, *Tireyi*, *Gogoyi*, *Papa*, *Larukini kire koligi*, *Reriya Mavuli*, *Duruba*, *Pepe*, *Dobe*, *Lekebe*, *Kuji*, are preferred for charcoal production due to the high calorific values and hence making high-quality charcoal with a regrowth potential of between 3-10 years.

Based on the FGDs and KII interviews, charcoal production is done using traditional Kilns giving 8-12% efficiency and hence big chunk of the harvested resource is put to waste.

vi) Energy conservation measures implemented in the refugee settlements

A number of interventions have been put in place by environment and energy partners. Such interventions include the use of energy-efficient cook stoves which require less wood while providing better heat efficiency, the installation of biogas digesters, cooking baskets, putting off fire while not in use, and Solar energy systems however, these options are still covering very few households. It was realized that households in some camps like Lobule are more familiar and have experienced the use of energy-saving technologies as compared to the other settlements.

vii) Effective behaviour change strategies at household levels on the uptake of more efficient cooking technologies, practices, and alternative fuels

Due to the difficulties in accessing fuelwood, the community tries to strategize in order to adapt to the prevailing conditions of fuelwood scarcity. This was observed right way from homesteads. Such strategies include engaging in restoration programs, embracing the alternatives for energy like efficient/energy cookstoves if given opportunities, learning to make briquettes out of materials like cassava peelings, tree leaves and charcoal dust, fuel saving techniques, and cooking light meals. It is worth noting that some of these materials could also be used for compost manure in agricultural fields however based on energy source demand they are used to formulate briquettes.

viii) Seasonal Variations in supply and demand of fuel wood

Field findings reveal that the quantity of firewood and charcoal is high during the dry season leading to relatively low prices of firewood and charcoal. Whereas in the wet season, the quantity of production of fuel wood is low since all the trees are fresh with a lot of moisture content and hence not many of the tree branches are drying.

Moreover, fuelwood dealers who cut the entire tree in order to dry and make fuelwood still don't achieve much since the weather in the wet seasons doesn't allow quick drying of the wood. In addition, most of the fuelwood dealers switch to cultivation in the wet seasons which confirms that such dealers participating in this business is an economic activity. In such seasons, the community tries to switch to alternative energy sources within their means like cassava dry stems and grass

ix) Proposed potential or actual alternative cooking energy solutions

The community have in mind the options that would be explored to manage the crisis of fuelwood. Such options are the use of energy cooking stoves like the Lorena stoves, cooking baskets, electricity, Biogas, Solar stoves, and Briquettes made of materials like grass and cassava dry stems.

3.3. Discussion

The quantitative data analysis focused on household characteristics, fuelwood collection and accessibility, economic aspects of fuelwood, and challenges within four refugee settlements: Rhino, Imvepi, Bidibidi, and Lobule. The chapter provides insights into household preferences and limitations regarding energy usage, with an emphasis on feasible conservation measures and interventions.

3.3.1. Interpretation of Findings

Based on the findings, the compositions of households tend to be mainly female members. South Sudanese refugees dominate Rhino and Imvepi, while Lobule hosts a high proportion of Congolese refugees. Most households rely on agriculture as their primary income, correlated with low education levels, where primary education is most prevalent.

Fuelwood is critical for cooking, with 99% of households relying primarily on firewood and 38% also using charcoal. Fuelwood preference is driven by affordability, availability, and ease of access.

However, collection demands significant time and effort, with 50% of households spending over an hour collecting fuelwood and covering distances up to 2 km. Key suppliers of fuelwood are individual collectors and local traders, mostly from the surrounding host communities. Lobule and Rhino receive significant fuelwood supplies from outside communities, while Bidibidi and Imvepi have a mix of local and host community supply networks. Frequent use of open fireplaces for cooking leads to weekly or daily fuelwood collection by most households. The majority of households collect fuelwood independently, although some rely on markets, with typical expenditures ranging from 10,000 - 50,000UGX [\$2.73 - \$13.66] monthly. Seasonal variations impact fuelwood availability, with 80% of households experiencing supply fluctuations. Many households adapt by stocking fuelwood in advance or using alternative biomass sources, such as crop stems or leaves.

Households face challenges like long travel distances, poor accessibility, weather-related issues, and security risks, including gender-based violence. Preferred wood types include deadwood and fast-growing shrubs due to their availability and quick regrowth potential, which is essential for sustainable use. Some households have adopted efficient cookstoves, participate in forest restoration efforts, or use briquettes, which helps reduce fuelwood demand. However, less than half of households have engaged in formal energy conservation programs, indicating room for broader awareness and adoption efforts. Potential interventions include scaling up access to alternative cooking methods, such as briquettes and energy-efficient stoves. Expanding awareness and infrastructure for renewable options, such as solar power and further forest conservation initiatives, could alleviate reliance on fuelwood and support sustainability efforts across these communities.

In general, access to wood fuel in the refugee hosting districts is becoming hard day by day. In the past 10 years fuel wood was easily obtained by community members both refugees and host communities. Lately; besides purchasing fuelwood from dealers an individual to obtain fuelwood has to cover a distance that is not less than 5km. On several occasions, even wet logs are being obtained and kept near homesteads for drying due to the high demand and hence one would risk losing the log as chances are high that the log would be carried by other community members interested.

3.3.2. Fuel Wood Economy Trends

10 years ago, at the early stages /inception of refugees, it was easy to obtain fuel wood. Almost every homestead was surrounded by scattered dry tree branches that would serve as fuelwood. However, as time went on the refugees started to move small distances of 50 meters trees in search of the same distances increasing from time to time. To date, it is reported that refugees move several kilometers to obtain some wood fuel. It was reported that in Lobule settlement in Koboko district, the main source of fuel wood serving this community is Yumbe and that dealers transport both charcoal and woodlots from Yumbe district.

The effect has also extended to the host communities who were the suppliers of fuelwood to the refugees. Currently, the fuelwood crisis has extended to host communities and as such they cover longer distances in search of fuelwood.

In 2016 during the inception of the refugees, key tree species i.e. Indigenous species like *afrizeria Africana*, *mahogany*, and *shear nut* originally existing in the refugees hosting districts have been cleared with few scattered ones remaining. This puts such species at risk of going extinct.

3.3.3.Impacts on Refugee and Host Communities

The findings indicate that the heavy reliance on fuel wood has considerable implications for both refugee and host communities. The time spent on fuel wood collection is substantial, with many households reporting collection times exceeding one hour. This not only affects household productivity but also heightens safety risks, particularly for women and children, who are often tasked with collection. According to the UNHCR and NHS data (UBOS), 53.3% of the refugee households and 31.2% of the host community households earn less than 500,000UGX [\$136.61] annually. 46.2% [204/442] of the surveyed households use fuel wood of approximately 10,000-50,000UGX [\$2.73-\$13.66] monthly, which is 120,000 - 600,000UGX [\$32.79-\$163.93] annually.

The economic impact is significant, as many households spend substantial portions of their income on fuel wood up to 50,000 UGX [\$13.66] monthly which worsens their vulnerability. Additionally, the depletion of local forest resources due to overharvesting threatens long-term sustainability and biodiversity in the region, necessitating immediate intervention to ensure both environmental and social stability.

The prevailing status for fuel wood accessibility in the refugee settlement areas generally has a high impact on the entire community from children and adults. Such impacts include; school dropouts due to time loss during fuel collection, gender-based violence like rape, Loss of working hours due to delayed meals, and impact on public health due to the air-polluting aspects of the wood fuel.

For refugee communities, restricted access to fuel wood also increases economic pressures, forcing them to buy fuel from the host community at higher prices. This dependence creates tension between refugees and host communities, as the latter often control the supply of fuel wood, leading to unequal access and worsening socio-economic disparities.

3.3.4.Stakeholder Insights and Perspectives

Insights gathered from key stakeholders including local government representatives, NGOs, and community leaders indicate a consensus on the urgent need for sustainable fuelwood solutions. Stakeholders recognize the potential benefits of alternative energy sources but also acknowledge the barriers to adoption, particularly around affordability and technical complexity. There is a shared perspective that community education on sustainable fuelwood practices, coupled with financial support for energy-efficient technologies, can significantly improve the situation. Moreover, stakeholders emphasize the importance of collaborative efforts between local authorities and communities to enhance fuelwood sustainability, thereby improving livelihoods and environmental health.

Stakeholders, including local governments, NGOs, and community organizations, have differing experiences with regard to the fuelwood economy. Some organizations are pushing for alternative energy solutions like biogas and solar cookers but face challenges in gaining community acceptance.

Many individuals prefer traditional cooking methods due to cultural beliefs and familiarity, often viewing new technologies as time-consuming or unreliable.

In conversations with stakeholders, a common sentiment was the necessity for enhanced community sensitization and education on the environmental and health benefits of adopting alternative energy solutions. It is important to highlight that using cleaner technologies can lead to mitigating the environmental impacts arising due to massive deforestation as well as the associated health impacts related to the use of wood fuel and its derivatives.

Chapter 4: Conclusion and Recommendations

4.1. Conclusion

The fuel wood economy in Imvepi, Bidibidi, Rhino, and Lobule plays a key role in the daily lives of refugees and host communities. While the reliance on fuel wood remains significant, the challenges associated with seasonal supply, land use, and the adoption of alternative energy sources require urgent attention. Addressing these challenges requires a multi-faceted approach that integrates policy initiatives, community engagement, and sustainable practices.

4.2. Recommendations

- v. It is recommended that the local government initiates shared land use models among the host and refugee communities to provide a chance to the community that currently has no access to land, and also to effectively utilize the available land resource and hence reducing redundancy.
- vi. Establishment of community tree planting initiatives to encourage the community to establish woodlots and forests.
- vii. Awareness and education campaigns; Campaigns to educate communities about the benefits of environment management in particular sustainable harvesting of forest products and the use of alternative fuels should be designed.
- viii. Establishment of fuel wood cooperatives; it is recommended that Cooperatives are formulated to facilitate collective collection and distribution of fuel wood for the communities. This can enhance the bargaining power during fuel wood trade, reduce costs, and improve access to sustainable sources.
- ix. Create partnerships between development organizations, financial institutions and local governments to enable easy access to funds to aid in the installation of cleaner energy options.
- x. Creation of green financing initiatives for private sector players investing in environmentally friendly projects in the fuelwood sector, especially those aimed at reducing emissions, improving energy efficiency, and supporting reforestation as well as private businesses exploring opportunities in converting agricultural waste, sawdust, or other organic materials into fuelwood alternatives, thus reducing the pressure on natural forests.

4.3. Policy Recommendations

Building upon our findings, we propose the following targeted policy recommendations aimed at promoting sustainable energy practices and environmental conservation for the fuel wood economy in the settlements:

- **Subsidization of alternative energy solutions**
The government and development partners should consider subsidizing the costs cleaner energy options. In addition, it should be set in a way that each homestead should have in place a cleaner energy option of their choice to ensure that there is a minimum requirement for wood fuel in each homestead. Innovative business models, such as Results-Based Financing (RBF), which have proven successful in the region, should be further adopted to encourage more private sector participation in meeting the settlement's energy demand through cleaner solutions.
- **Strengthening land use policies:**
Develop policies that promote sustainable land use practices, ensuring that fuel wood production does not compromise the environment as well as food security. This includes incentivizing agroforestry practices that integrate food and fuel wood production.

4.4. Future Research Directions

To deepen understanding and inform sustainable energy policy, we recommend the following research directions. These studies will provide more valuable data on fuelwood use, intervention outcomes, and alternative energy options, enhancing evidence-based decision-making:

- **Long-term studies on Fuel wood dynamics**
Long-term studies on the fuel wood economy can also be helpful in establishing the trends in the economy and tracking changes in fuel wood supply and demand over time, particularly in relation to climatic changes and population dynamics.
- **Impact assessment of interventions**
Studies on the impact of already implemented energy interventions at household level, institutional level as well as the environment at large can provide insights for future programming.

DanChurchAid
Uganda Country Office, Mindra House
P.O. Box 146332, Kampala
Plot 07, Binayomba Road, Off Luthuli Avenue,
Bugolobi
