PROMOTING SOLAR POWERED ENERGY EFFICIENT STOVES IN KYANGWALI REFUGEE SETTLEMENT PROJECT (PROSPERS)

BASELINE STUDY REPORT

Developed and submitted by

HEDEN ENERGY SOLUTIONS LIMITED
Energy Management Centre
Plot 28-34, Coronation Avenue, UMA Show Grounds Lugogo, Kampala
P.O. Box 6457, Kampala – Uganda.

To

CARE International in Uganda
In partnership with
ACE and KRC Uganda

July 2021

Executive summary:

This report presents the results of the baseline survey on the project **"Promoting Solar Powered Energy Efficient Stoves in Kyangwali Refugee Settlement".** Kyangwali settlement is one of the eleven (11)[1] refugee settlements in Uganda with a population of over 12,780 refugees who mainly come from DRC (118,390 refugees); South Sudan (3,383 refugees); Rwanda (1,124 refugees); Burundi (107 refugees); Kenya (11 refugees); Somali (7 refugees) and Sudan (2 refugees) (UNHCR, 2020). It is located in Kikuube district in Western Uganda bordered by DRC in the West, Hoima district in the North and Kagadi in the South.

This innovative clean energy project is being implemented by CARE International in Uganda in partnership with African Clean Energy (ACE) and Kabarole Research and Resource Centre (KRC) and is supported by the Dutch Relief Alliance Innovation Fund. It aims at improving the accessibility of quality and affordable clean energy solutions to refugees (particularly women) in the Kyangwali refugee settlement. The project's innovative package includes two complementary programs namely; a) *The User Referral Bonus (URB) model* whereby the ACE package (ACE one stove + smart phone + solar powered lamp) will be made affordable to refugees in Kyangwali settlement and host communities, by allowing for payment in installments and also enabling URB participants to earn waivers on their monthly instalments through recommendation of peers; and b) *Briquetting program* whereby the first ten groups (farming cooperatives/VSLAs) which enroll at least half of their members into the URB will be supported with knowledge and equipment for clean, biomass briquette production, and also empowered to set up their own briquetting businesses.
The overall objective of this survey was to generate credible information that would support the PROSPERS' implementation team to track progress and measure outcomes and impact of the innovation. The specific objectives of the baseline were;

1. To determine baseline values for indicators at outcome level, as well as for selected outputs.
2. To test the feasibility of the proposed indicators and generate recommendations for refining them.
3. To propose target values for indicators at outcome and output levels.

The project set out to answer the following research questions:

1. What is the proportion of the population that has capacity or is willing to use the proposed clean energy solution being proposed?
2. What is the feasibility of achieving the proposed indicators?
3. What are the recommendations for refining the proposed indicators?
4. What targets can be achieved by the project and when?

The study used a cross-sectional design to collect both quantitative and qualitative data from both refugee and host communities under a 70%:30% ratio respectively. A total of 8 focus group discussions (FGDs) were conducted, categorized in the age groups of 18-30 and above 31 for both male and female respondents. Each focus group comprised of 8-10 members. A total of 5 key informant interviews were conducted out of the 7 targeted. Quantitative data was collected using Open Data Kit (ODK) from a total of 386 households. Data was saved instantly on a server run online and finally exported to Stata 13 for analysis. Qualitative data collected through recordings was then transcribed on paper then filtered using Atlas.ti to generate grounded themes from the data.

[1] https://en.wikipedia.org/wiki/Refugees_of_Uganda

The study established that wood fuel/firewood (58.8%) and charcoal (39.1%) dominate energy for cooking, in both refugee settlement and host communities of Kyangwali and Kamwenge. Respondents reportedly get firewood from Nguse forest[2] once a week under a community access arrangement with National Forestry Authority (NFA) for community use of non-timber forestry products (NTFP). Firewood collection is largely the role of mothers in both the refugee settlement (56.2%) and host community (58.1%).

There was no reported use of briquettes for cooking in both the settlement and host communities. Communities only used briquettes in the past and a few of them. A total of 19.9% and 4.6% of respondents mentioned that they had ever used briquettes in the refugee settlement and host community respectively. There were however notable opportunities for promoting briquettes use in the project area.

Although use of solar for lighting dominates both in refugee settlement and host communities, majority (55.6%) and 34% of the respondents do not have access to either grid electricity or solar energy for lighting in both refugee settlement and host communities respectively. Host communities dominate access to grid electricity (22%) and solar (26.6%). Only 2.2% access grid electricity in the settlement and 25.2% use solar. The host communities dominate use of grid electricity for lighting and phone charging (66%). 37% of respondents use it for lighting only in the refugee settlement and 22.6% in host communities. Visibly, there were wide variations on electricity use between the refugees and host communities in all aspects of lighting, cooking and charging. These variations will guide project interventions in both the settlement and host communities.

The study indicates that majority of mothers spend a big portion of their valuable time preparing food for their households. 27.7% of mothers (respondents) spend between 3 to 4 hours while 25.91% spend up to and above 8 hours preparing food for their families. Use of firewood-sometimes not well dried, is largely responsible for a long time taken while cooking or preparing meals for the family. Alternative energy sources are poised to reverse this trend and save some of this time that would be transferred to focus on other productive activities.

All respondents were engaged in some form of employment -either self-employed, casual or formal employment. Farming is the main source of income in both refugees and host communities. Trading contributes the least. Results show that the average income earned monthly from those respondents who were practicing farming was 323,990.2 Ugandan shillings or US$ 91 (exchange rate UGX 3560). Respondents in both refugee settlement and host communities spend most on cooking fuel and spend least on charging phones. This explains why limited fuel for cooking is one of the key challenges faced in the study area. Ownership of smartphone is limited to only 18.9% of the respondents

The study concludes that:

a) High dependency on wood fuel for cooking has negative impacts on the environment especially Nguse forest where the refugee community has been allowed weekly access for firewood. Similarly, the associated challenges involved in firewood collection such as rape are a danger to society and abuse fundamental human rights of the citizens.

[2] Communities gathering firewood are only limited to dry wood from fallen trees or branches, but not fresh trees. However, some community members go with intentions of cutting trees which is faced by tight monitoring by NFA forest guards.

b) The project area presents a lot of synergies between PROSPERS project and work previously done by other development partners which are good for easy adoption especially in relation to promotion of briquettes production and marketing.

c) There is some form of employment or income generating activity for most members in the project area which presents a good opportunity for the target beneficiaries to pay for energy technologies promoted by the project.

The study recommends the following:

a) CARE and PROSPERS implementing partners should prioritize leveraging on previous work by other development partners in the project area such as LWF, AAH, Nsamizi and CARITAS. This is key for easy penetration and uptake of the program.

b) In order to ensure effective stove distribution and collection of installment payments, ACE MOUs with leadership and individual members should boldly clarify on payment terms and penalties in case of non-compliance. Penalties should be agreed upon by the two parties. This is good for better follow-up of members and payment recoveries.

c) CARE International should design clear messages to create a massive campaign promoting clean cooking using solar ACE One stove and briquettes in the project area. The campaign should also preach against dependency on fuel wood for cooking and associated challenges. This will help in addressing the urgent energy needs within the settlement and host communities.

d) Considering that farming is the main source of income in the project area, promotion and marketing of energy technologies should be heightened during the harvesting season when the target beneficiaries have cash at hand after sale of their produce. Success will largely depend on a well thought out payment plan that favors the earning patterns of the target beneficiaries.

e) For quick market penetration, the project should target women and youth as key agents of change. Women and youth groups are known for successful VSLAs and SACCOs and therefore will propel project success.

f) There is need for dedicated and hands-on training on use of agricultural waste for briquettes making. This is very important for the beneficiaries to appreciate this type of waste since it is abundant and locally generated from the predominant farming activities. Use of agricultural waste will diversify inputs for briquettes production and reduce dependency on charcoal remains which are also scarce in the project area.

g) The study further recommends that a team of technicians should be selected from the community and trained to provide after sales and regular maintenance services whenever required. This will address most of the concerns raised by respondents concerning sustainability of the energy technologies citing examples in previous projects implemented in the area.

Table of Contents

List of Tables:

List of Figures

List of Abbreviations

ACE:	African Clean Energy
AAH:	Action Africa Help
FGD:	Focus Group Discussion
KII:	Key Informant Interview
KRC:	Kabarole Research and Resource Center
LWF:	Lutheran World Federation
MEAL:	Monitoring, Evaluation, Accountability and Learning
NFA:	National Forest Authority
NGO:	Non-Governmental Organization
NTFP:	Natural Timber-Forest Products
ODK:	Open Data Kit
UBOS:	Uganda Bureau of Statistics
UNHCR:	United Nations High Commission for Refugees
URB:	User Referral Bonus
VSLA:	Village Savings and Lending Association

1.0 INTRODUCTION

Kyangwali settlement is one of the eleven (11)[3] refugee settlements in Uganda with a population of over 12,780 refugees who mainly come from DRC (118,390 refugees); South Sudan (3,383 refugees); Rwanda (1,124 refugees); Burundi (107 refugees); Kenya (11 refugees); Somali (7 refugees) and Sudan (2 refugees) (UNHCR, 2020). It is located in Kikuube district in Western Uganda bordered by DRC in the West, Hoima district in the North and Kagadi in the South. Kikuube has a population of 358,700 people and of these, 184,200 (51.4%) are males while 174,500 (48.6%) are females (UBOS, 2020). According to Uganda Bureau of Statistics (UBOS), 89.5% of Kikuube population lives in the rural setting while only 10.5% of the population lives in urban settings. The district is seated on an area of 2,097km^2 with a population density of 171.1/km^2. Kikuube hosts Kyangwali refugee settlement, the 5th largest refugee settlement (in terms of population) in Uganda (UNHCR, 2021).

1.1 Background and Project Overview

Over 87% of Uganda's population lives in rural areas and 13% lives in urban areas. Less than 10% of the population employs clean cooking practices. One-third of Ugandan households are headed by women. The cooking energy mix is dominated by unprocessed biomass, followed by charcoal. The share of cooking fuels among the population in Uganda includes: Unprocessed biomass (85%), Charcoal (13%), Kerosene (0.5%) and LPG (<0.5%) [World Bank, 2019[4]].

In order to address energy access challenges, CARE International in Uganda in partnership with African Clean Energy (ACE) and Kabarole Research and Resource Centre (KRC) is implementing an innovative clean energy project for the humanitarian context. The project code named **PROSPERS "*Promoting Solar Powered Energy Efficient Stoves in Kyangwali Refugee Settlement*"** in Kikuube district, South West of Uganda is supported by the Dutch Relief Alliance Innovation Fund. This project aims at improving the accessibility of quality and affordable clean energy solutions to refugees (particularly women) in the Kyangwali refugee settlement. The project's innovative package includes two complementary programs namely;

a) *The User Referral Bonus (URB) model* whereby the ACE package (ACE one stove + smart phone + solar powered lamp) will be made affordable to refugees in Kyangwali settlement and host communities, by allowing for payment in installments and also enabling URB participants to earn waivers on their monthly instalments through recommendation of peers; and

b) *Briquetting program* whereby the first ten groups (farming cooperatives/VSLAs) which enroll at least half of their members into the URB will be supported with knowledge and equipment for clean, biomass briquette production, and also empowered to set up their own briquetting businesses.

For both programs, the partners will ensure gender integration, advocacy (for increased uptake of the innovation beyond the project), action research, as well as the Monitoring, Evaluation, Accountability and Learning (MEAL) to inform continuous innovation and adaptation of the project to emerging realities.

[3] https://en.wikipedia.org/wiki/Refugees_of_Uganda
[4] https://openknowledge.worldbank.org/handle/10986/31283

1.2.1 Baseline objective.

The overall objective of this survey was to generate credible information that would support the PROSPERS' implementation team to track progress and measure outcomes and impact of the innovation. The specific objectives of the baseline were;

1. To determine baseline values for indicators at outcome level, as well as for selected outputs.

2. To test the feasibility of the proposed indicators and generate recommendations for refining them.

3. To propose target values for indicators at outcome and output levels.

1.2.2 Research questions

- What is the proportion of the population that has capacity or is willing to use the proposed clean energy solution being proposed?
- What is the feasibility of achieving the proposed indicators?
- What are the recommendations for refining the proposed indicators?
- What targets can be achieved by the project and when?

2.0 METHODOLOGY

2.1 Introduction

This section presents the methodology used to conduct the study; detailing data collection and analysis techniques; how samples were generated and the steps taken to arrive at the required data.

2.2 Study design

A cross-sectional design was used to undertake the baseline assessment whereby a combination of both quantitative and qualitative methods was deployed for complementarity in both refugee and host communities. This was disaggregated by sex, gender and equity. The key feature of the cross-sectional design is that the assessment is done at one point in time covering a representative sample of the study population as agreed upon by the funders of the baseline activity. During data analysis, we used relevant standard and analytical tools.

The study used both qualitative and quantitative methods of data collection in order to answer baseline questions. The qualitative methods generated data that provides explanations to the statistical data, ensure comparability of findings and allows design of indicators at both outcome and output levels. The qualitative sample size determination was guided by the principles of saturation and sufficiency.

On the other hand, quantitative methods helped to generate descriptive statistics on key study aspects such as current energy sources, accessibility and affordability of renewable energy and clean cooking technologies by type, available institutional support, gender dimensions, challenges faced and available opportunities, among others.

2.3 Scope of the study

The study was conducted in Kyangwali refugee settlement and the host community covering 70% and 30% sample size respectively.

2.4 Sampling and sample size determination

Quantitative sample size was determined following Kish and Lesley formula for cross sectional study designs, given by;

$$N = \frac{z^2 pq}{d^2} \quad \text{.....(1)}$$

Where;

Z, is 1.96 corresponding to a confidence interval of 95%

p, is estimated prevalence of clean energy use. We assumed a prevalence of 50% since we could not get prevalence rates from literature; therefore, p=0.5

q, is 1-p = 1-0.5=0-5

d, Precision/error and we used a 5% precision which translates to 0.05

$_N = (1.96^2 \times 0.5 \times 0.5)/0.05^2 = 0.9604/0.0025$

$_N = 384.16$

N=384 (correct to 3 significant figures)

The above formula yielded 384 households distributed among refugees (70%) and host communities (30%). The percentage ratio of 70:30 is the government requirement for program implementation

among the refugee settings in the country at the moment as per the Office of the Prime Minister (OPM) guidelines. The households were visited as guided by CARE International in Uganda and in accordance with zoning of the settlement camp and the village set up in the host communities.

2.5 Data Collection

A total of 8 focus group discussions (FGDs) were conducted, categorized in the age groups of 18-30 and above 31 for both male and female respondents. Each focus group comprised of 8-10 members. A total of 7 Key informant interviews were targeted for interaction with the study team but 5 key informant interviews were available while the remaining 2 did not create time for the study team to engage for their input; the available ones were from the Office of the Prime Minister(OPM), CARE field office, Lutheran World Federation(LWF), United Nations High Commission for Refugees (UNHCR) and Kabarole Research and Resource Centre (KRC) and the team engaged with these for input in the project plus learning lessons for the upcoming project

Quantitative data was collected using Open Data Kit (ODK) and a total of 386 households were visited by a team of trained research assistants who were recommended by the CARE Kyangwali field office. This helped to ensure that data was accurate and came from the right respondents. Data was saved instantly on a server run online and finally exported to Stata13 for analysis.

2.6 Data Analysis

Quantitative data was exported to Stata13 and tables generated from the data showing descriptive characteristics of the respondents through tables, frequencies, means and standard deviations.

Qualitative data collected through recordings was then transcribed on paper then filtered using Atlas.ti to generate grounded themes from the data.

2.7 Limitations of the study

The study was conducted during the Covid 19 pandemic where the research assistants and study population had to strictly observe the Ministry of Health (MOH) Standard Operating Procedures (SOPs). This limited FGD numbers and related interactions with other study participants. The team however ensured they strictly observe the SOPs to ably collect the required data.

3.0 RESULTS AND DISCUSSIONS

3.1 Introduction

This section presents key findings from both qualitative and quantitative data and their implications for effective PROPERS project implementation.

3.2 Demographic Characteristics of Respondents

Respondents' characteristics considered for this study were age, sex, marital status, citizenship, education and employment status. These demographics are important to understand the key attributes of the study population which is crucial for project delivery.

The study involved 386 household respondents-277 refugees in the refugee settlement representing 71.8% of respondents and 109 nationals living in the host community representing 28.2% of respondents. Table 1 shows detailed respondent characteristics.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Variable (N=386)	Frequency n (%)
Age of respondents	
Teenagers (13-19)	23 (6.0%)
Young adults (20-30)	144 (37.3%)
Middle aged (31-40)	98 (25.4%)
Adults (41-50)	64 (16.5%)
Elderly (51 and above)	57 (14.8%)
Sex	
Male	205 (53.1%)
Female	181 (46.9%)
Status of respondent in household	
Household head	287 (74.4%)
Not household head	99 (25.6%)
Marital Status	
Married	249 (64.4%)
Single	61 (15.8%)
Widowed	45 (11.7%)
Separated	28 (7.3%)
Declined	3 (0.8%)
Education status of respondents	
Never gone to school	126 (32.2%)
Primary	155 (40.2%)
Secondary	76 (20.0%)
Tertiary	18 (4.7%)
University	11(2.9%)
Citizenship status of respondent	

National	277 (71.8%)
Refugee	109 (28.2%)
Employment status of respondent	
Employed	170 (44.0%)
Not employed	**216 (56.0%)**

Error! Reference source not found. shows that respondents were dominated by young adults (37.3%) aged 20 to 30 years, followed by middle aged adults (25.5%) aged 31 to 40, adults (16.6%) aged 41 to 50 years, elderly (14.8%) aged 51 years and above, and 6.0% aged between 13 and 19 years. The study respondents were well disaggregated by sex where males were 53.1% and females 46.9%. A total of 74.4% were household heads. Household heads are key decision makers on household expenditures. A sizeable number of household heads involved in the study implies that they are in position of positively influencing adoption of the proposed technology.

Majority of respondents (64.4%) were married, while 15.8% were single, 11.7% widowed, 7.3% separated. 0.8% declined to describe their marital status. A total of 56% of respondents were not employed formerly and 44% of respondents mentioned to be having some paid employment.

3.3 Baseline Results

3.3.1 Energy sources for cooking and lighting

In order to establish critical baseline information related to energy for cooking and lighting, the study focused on energy types/sources, availability and responsible members in a given household in both the refugee settlement and host community (Table 2).

TABLE 2: ENERGY SOURCES BY TYPE FOR COOKING AND LIGHTING IN KYANGWALI REFUGEE SETTLEMENT

Main source of fuel for cooking	Nationality Status of respondent (N=368)		
	Refugees	National	Total
Wood fuel	174 (62.8%)	53 (48.6%)	227 (58.8)
Charcoal	101 (36.5%)	50 (45.9%)	151 (39.1%)
Liquid Petroleum Gas	0 (0.0%)	3 (2.8%)	3 (0.8%)
Kerosene	2 (0.7%)	0 (0.0%)	2 (0.5%)
Briquettes	0 (0.0%)	3 (2.8%)	3 (0.8%)
Biogas, Electricity and Solar	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	277 (100%)	109 (100%)	386 (100%)

Table 2 details energy uses by source and type in the both the refugee settlement and host community. In terms of energy for cooking, wood fuel/firewood (58.8%) and charcoal (39.1%) dominate in both refugee settlement and host communities. Respondents reportedly get firewood from Nguse forest[5] once a week under a community access arrangement with National Forestry Authority (NFA) for community use of Non-timber forestry products (NTFP). This is confirmed by responses from Key Informant Interviews (KII), thus:

> *" The government through the OPM decided to allow people go into the forest for firewood for one day per week. And that is always on Wednesday. So, every Wednesday, the community goes to the forest to collect firewood and the people are escorted by security people. They go fetch the firewood and come back as they are being escorted by security people. And that is the only way it is done."* KII_Natural Resources Focal Person, CARE Uganda, Kyangwali Settlement

Table 2 further shows that LPG and Keresone are least used for cooking in the project area. There was no reported use of biogas, electricity and solar for cooking in the study area. No respondent mentioned using electricity, biogas or solar for cooking.

Based on the household respondent patterns and results from FGDs, firewood is used most mainly in the villages while people in or close to trading centers are relatively rich and tend to use charcoal. Some households were using briquettes though at a very small scale with only 19.9% and 4.6% of respondents in refugee and host community respectively mentioning to have ever used briquettes. Focus group discussions highlighted concerns about use of firewood which has depleted trees within and around the settlement and that it is also threatening towards depleting the natural forest of Nguse due to weekly firewood collection. There is also an associated risk of accessing firewood from the forest due to long distance and risks of human-wildlife conflicts, in addition to rude forest guards from NFA who regularly monitor the activity. Besides, major parts of the forest where they used to collect firewood from have been cut down and converted into gardens for crop production. There are also incidences of rape within the forests as they collect firewood, as reported in one FGD of Kyeya (for males):

> "*At this moment firewood is scarce, where we used to fetch firewood from was cleared and turned into gardens so it is our responsibility as men to go to someone and buy a tree for firewood. Whoever is available collects firewood, for instance I can go with my wife and children. Firewood collection is a collective effort between a husband, wife and children." FGD_Male Kyeya.*

While these remain fears and risks at the household and community level, there are limited options of alternative energy sources, and to some poor households, no options at all, according FGD discussion participants. This presents an opportunity for project interventions to address the energy uncertainities of the settlers and also environmental, social and health concerns posed by dependency on forewood as the main source for cooking in the settlement and host communities.

The role of fetching firewood is largely a reserve of the mother in the household in both the refugee settlement and the host community compared to fathers and the rest of the members (Table 3).

[5] Communities gathering firewood are only limited to dry wood from fallen trees or branches, but not fresh trees. However, some community members go with intentions of cutting trees which is faced by tight monitoring by NFA forest guards.

TABLE 3: FIREWOOD ACCESS BY GENDER IN REFUGEE SETTLEMENT AND HOST COMMUNITY

Variable	Refugee	Host community
Do you collect firewood?	N=277	N=109
Yes	210 (75.8%)	62 (56.9%)
No	67 (24.2%	47 (43.1%)
How often do you collect firewood?	210	62
Less (1-2 times)	159 (75.7%)	17 (27.4%)
Moderate (3-4)	50 (23.8%)	38 (61.3%)
Many (5 and above)	1 (0.5%)	7 (11.3%)
Who collects firewood?		
Mother	118 (56.2%)	36 (58.1%)
Father	20 (9.5%)	10 (16.1%)
Daughter	28 (13.3%)	0 (0.0%)
Son	23 (11.0%)	3 (4.4%)
Others	21 (10.0%)	13 (21.0%)

Table 3 shows that there is no statistical difference between the refugee settlement (56.2%) and host communities (58.1%) regarding the role of mothers in firewood collection. Table 3 further shows that while a sizeable number of daughters in the refugee settlement fetch firewook (13.3%), there was reportedly no mention of daughters in the host communities who fetch. Similarly, a very small number of sons in the host communities collect firewood (4.4%). The category of 'others' included workers and or those buying from those that collected firewood for selling in refugee settlement 10%) and 21% in host communities. A participant in one FGD explained thus;

> *"For my case, men are always busy. So, in my home it's my woman who usually collects firewood and she does most of the household work but I sometimes come in to help collect firewood." FGD_Male Youth.*

> *"For cooking, it is the women that are charged with the responsibility like fetching firewood for cooking. So, it is the women who mostly feel the pain of fetching firewood. Men are just there seated, drinking and waiting for food on the table. I don't know whether men are also playing a part in fetching firewood. For lighting, I am not sure about the gender roles there." KII_Energy and Environment officer UNHCR.*

These results largely explain the gender roles within the housedholds in the settlement and host community.

3.3.2 Use of briquettes in the settlement and host communities

The study undertook to further understand the availability and use of briquettes in both the settlement and host communities in order to inform project interventions. The study established that briquettes are not among the energy options currently available for cooking in both the settlement and host communities. Results show that settlers and host communities only used briquettes in the past-and a few of them used it. A total of 19.9% and 4.6% of respondents mentioned that they had ever used briquettes in the refugee settlement and host community respectively (Table 4). Out of these that have used briquettes from both communities before, majority (83.6%) are in refugee settlement and all (100%) were using briquettes made of charcoal residues. Agricultural waste is least used.

TABLE 4: USE OF BRIQUETTES IN KYANGWALI BY REFUGEES AND HOST

Variable	Refugee community	Host community
Ever used briquettes	N=277	N=109
Yes	55 (19.9%)	5 (4.6%)
No	222 (80.1%)	104 (95.4%)
Type of briquettes used	N=55	N=5
Charcoal dust	46 (83.6%)	5 (100%)
Agricultural waste	9 (16.4%)	0

Production and use of briquettes in the area has been promoted in the past by development partners such as Lutheran World Federation (LWF) and Action Africa Help (AAH) through training and provision of production equipment. Selected women groups mainly benefited from this as highlighted by 2% of the respondents. Production and sharing was arranged in a way that women groups would averagely produce 50kgs of briquettes per day and every member would be entitled to 40kgs of briquettes per month for use in their homes to address their cooking needs. There was limited or no market to sell the remaining briquettes and resorted largely to producing for home use. Participants also reported limited availability of raw materials for making briquettes. These partly demotivated them. Diversification of inputs for briquettes making and marketing should therefore be key ingredients in the promotion of briquettes in the project area.

> *"Here in Kyangwali, we have AAH which introduced briquettes and then we have LWF which supported groups with machines used to make the briquettes. Then there is also Nsamizi which trained people to make briquettes but using traditional ways basically hands not machines."* KII_KRC focal person

Respondents further expressed concern about the use of briquettes that communities are not sensitized enough. Yet, there is available market both within and outside the settlement considering the prevailing high energy needs.

> *"We have so many restaurants in the settlement and when you check, none of them are using briquettes; meaning, they lack knowledge on the benefits of using briquettes. Maybe they have not even tried to use them. So, with KRC, we are going to give it a test. And for the market, we shall target those restaurants. But also, we plan to do business in what we call post-ability analysis."* KII_KRC focal person

3.3.3 Electricity use variations among refugees and host communities.

There are slight variations on energy use for lighting among respondents in the study communities. Use of solar for lighting dominates both in refugee settlement and host communities, although majority of the respondents do not use any of the two (Table 5).

TABLE 5: ELECTRICITY USE VARIATIONS AMONG RESPONDENTS

Variable	Refugees	Host communities
Source of lighting	N=277	N=109
Solar	70 (25.2%)	29 (26.6%)
Electricity	6 (2.2%)	24 (22.0%)
Both	47 (17.0%)	19 (17.4%)
None	154 (55.6%)	37 (34.0%)
Additional use of energy accessed	N=74	N=53
Lighting Only	37 (50.0%)	12 (22.6%)
Lighting and Charging	36 (48.5%)	35 (66.0%)
Cooking only	0	2 (3.8%)
Charging only	1 (1.5%)	4 (7.6%)

Table 5 indicates that 55.6% and 34% of the respondents do not have access to either grid electricity or solar energy for lighting in both host settlement and host communities respectively. Host communities dominate access to grid electricity (22%) and solar (26.6%). Only 2.2% access grid electricity in the settlement and 25.2% use solar.

Regarding additional electricity uses, the host communities dominate use of energy for lighting and phone charging (66%). 37% of respondents use it for lighting only in the settlement and 22.6% in host communities. Results further show that only 2 respondents (3.8%) of those who have access use electricity for cooking in host communities and none uses electricity for cooking in the refugee community. Visibly, there were wide variations on electricity use between the refugees and host communities in all aspects of lighting, cooking and charging. These variations will guide project implementation interventions in both the settlement and host communities.

It should be noted that the type of energy used determines the time taken to prepare food. The study indicates that majority of mothers spend a big portion of their valuable time preparing food for their households. Only 26.2% of respondents spend less than one hour while preparing food for their households; 27.7% spend between 3 to 4 hours while 25.91% spend up to and above 8 hours preparing food for their families. In Kyangwali settlement, mothers or generally females in the household are the ones largely responsible for cooking. Use of firewood-sometimes not well dried, is largely responsible for a long time taken while cooking or preparing meals for the family. Alternative energy sources are poised to reverse this trend and save some of this time that would be transferred to focus on other productive activities.

3.4 Factors that affect energy use

3.4.1 Employment status of respondents

The level of employment determines the ability of the project target population to adopt new technologies since most of them will be paid for under this project. Table 6 shows employment types in the project area.

TABLE 3: TYPES OF EMPLOYMENT SEGREGATED BY NATIONALITY STATUS

Variable	Refugee	Host community
Type of employment	N=110	N=60
Casual labor	34 (30.9%)	11 (18.3%)
Formal employment	9 (8.2%)	13 (21.7%)
Self employed	67 (60.9%)	36 (60.0%)

The study results show a slight variation in employment patterns among the respondents in refugee settlement and host communities. In Table 6, the refugee settlement dominates in casual labor while the host community dominates in formal employment. This is perhaps explained by the nationality status of both communities as it might be easy for the nationals in the host communities to get formal employment compared to refugees. There was no statistical difference among the self-employed between the refugee settlement and host communities.

3.4.2 Income sources for the respondents

Farming is the main source of income in both refugees and host communities. Trading contributes the least. Results show that the average income earned monthly from those respondents who were practicing farming was 323,990.2 shillings (US$ 1 is equivalent of UGX 3560); earnings from trading were at average 175,871.4 shillings, salary was at average 219,119.0 shillings while average earnings from remittances were 240,179.4 shillings as shown in **Error! Reference source not found.**7. Further s egregation was made to depict the earnings by refugees and host communities and from the refugee's average earnings from salary were 136,482.8 Ugandan shillings while the same was 225,337.9 Ugandan shillings among the host communities.

TABLE 4: INCOME SOURCES OF RESPONDENTS

Variable	N	General average	Refugees average	Nationals average
Earnings from Farming	134	323,990.2	112,012.5	452,154.9
Earnings from trade	117	175,871.4	116,404.1	243,829.8
Salary earnings	47	219,119.0	136,482.8	225,337.9
Remittances	109	240,179.4	98,830.2	378,573.8

3.4.3.1 Savings and expenditure patterns of respondents

Individual saving culture is key in determining their ability to spend on essential services. Respondents' saving patterns are illustrated in Figure 1.

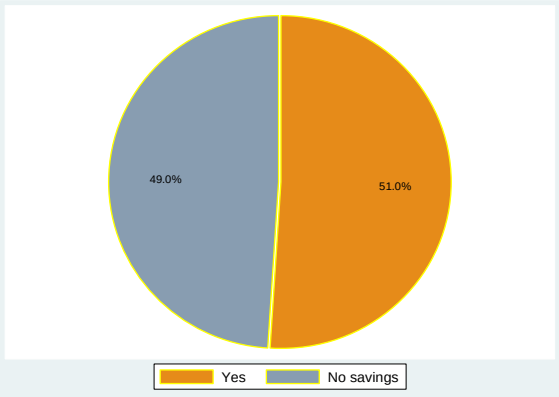

FIGURE 1: SAVING PATTERNS AMONG RESPONDENTS (N=386)

Figure 1 shows that about half of the respondents (51%) save part of their earnings while 49% mentioned that they were not saving any money. Respondents were using several saving options that included banks, cooperatives, group savings, households, VSLAs, among others. This is a good indication of the ability by the project targets to afford the energy technologies.

3.4.3.2 Expenditure patterns among respondents

Looking at the monthly expenditure patterns from the data, it came out clearly that cooking fuel was the most common cost that both refugees and host communities spent their incomes on (Table 8).

TABLE 5: MONTHLY COOKING EXPENSES AMONG RESPONDENTS (IN UGX)

Variable	Refugee mean (STD)	Host community mean (STD)
Expenditure of cooking fuel	33342.9±41865	24074±21220
Expenditure on Lighting	13904±10595	7777±7947
Expenditure on charging	7305±4136	6375±3160

Variable	N	Min	Max	Mean	STD
Expenditure on cooking fuel	221	1000	300000	38024	±31275
Expenditure on charging phones	25	2000	20000	7152	±3880.24
Expenditure on Lighting	25	2000	50000	13480	±10742.1
Expenditure on cooking using energy	2	10000	50000	30000	±16329.9

According to Table 8, refugees were on average spending 33,342.9±41,865 Ugandan shillings while host communities were spending 24,074±21,220 Ugandan shillings per month on cooking fuel. Those who were able to spend on lighting, refugees were on a monthly basis averaging 13,904±10,595 expenditure on lighting while host community members were spending on average per month 7,777±7,947 Ugandan shillings. On phone charging, those that had phones; refugees spent 7,305±4,136 Ugandan shillings on a monthly basis for charging while host communities pent on average 6,375±3,160 Ugandan shillings monthly

3.4.4 Smartphone ownership and use

Study results show that smart phone ownership is limited to a few individuals (**Error! Reference s ource not found.**2). While majority would wish to own them, they cannot afford the cost of buying them.

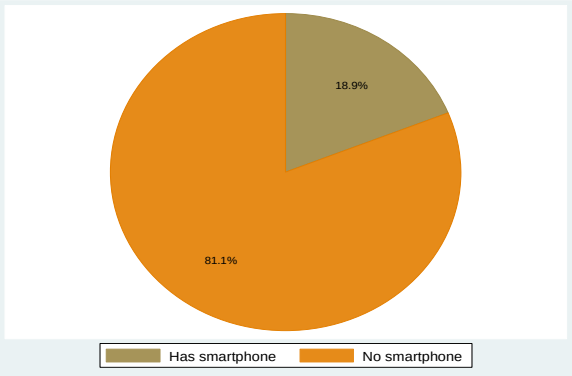

FIGURE 2: SMARTPHONE OWNERSHIP AMONG RESPONDENTS(N=386)

Figure 2 shows that only 18.9% of respondents had smartphones (mainly household heads and working youths) while about 81.1% of respondents never had them. Most respondents indicated that they would wish to have smart phones in order to access services like whatsapp, facebook and internet surfing, but cannot afford to purchase them.

> "*In both the refugees and nationals setting, not many have smart phones. But there is some category of people who have smart phones. Some of the older youths have them more than the younger ones. The majority of people don't have smart phones and by the way, some people don't even have phones at all."* KII_Natural Resources officer-LWF
>
> "*To own a smart phone depends on the level of education in Kyangwali."* FGD_Male-Kyeya

The study further established the relationship between smartphone ownership and use of internet in both the settlement and host communities. Results show no significant difference of smartphone ownership in both refugees and host communities (Table 9).

TABLE 9: SMARTPHONE OWNERSHIP AND INTERNET USAGE

Variable	Refugees	Host communities
Smart phone ownership	N=277	N=109
Yes	44 (15.9%)	29 (26.6%)
No	233 (84.1%)	80 (73.4%)
Access to internet	44	29
Yes	36 (81.8%)	26 (89.7%)
No	08 (18.2%)	3 (10.3%)

Table 9 further shows that among those who had smartphones, a sizeable number had access to the internet among both refugees and host communities, although there were complaints of poor network connections. The project team indeed, verified this during data collection. Poor internet network,

limited knowledge on use of these smartphones and lack of money to buy internet data largely explain limited access by some respondents.

3.5 Challenges faced with cooking and lighting energy

A number of challenges were noted from the study respondents related to energy for cooking and lighting. Major challenges were reportedly encountered in relation to firewood access. As the main source of energy for cooking and also due to increase in population of the refugees, the demand for firewood is increasingly becoming high. This is coupled with the decreasing forest cover due to other factors like conversion to agriculture. Forest cover has gradually reduced and yet there are no replacement programs in place. Furthermore, the distance from the settlement to Nguse forest where people are allowed to collect firewood once a week is long. This complicates the already worsening problem.

The other challenge affecting firewood access is the fact that some of the women are harassed on their way to or within the forest; and sometimes raped by unknown people. Some people think it is men from the host communities who are presumed to be hostile to the refugees as earlier observed. These are huge abuses of human rights and life in the settlement. In one of the FGDs, one youth male had this to support this assertion:

> "*We have Hoima sugar people who are working [sugar plantation] from that forest, there are many men and these guys are raping our women and girls therefore it's a big challenge and so it's risky for them(refugees) to go the forest*" FGD_Youth male.

There is limited knowledge coupled with less sensitization on clean energy solutions and their availability to the communities-both refugees and host communities, in addition to limited supply of these technologies. Limited lighting means communities endure some hardships like intrusion of red ants which is a challenge to the communities caused by lack of enough lighting. It was observed that most solar users just have one bulb in the house but they still endure darkness in the remaining parts of the house.

Limited market for clean energy technologies like briquettes discourage residents from engaging in such activities to the extent of abandoning them completely. Even at the production stage, some respondents complained of lack of raw materials to make them. This then forces settlers especially girls, boys and women to resort to firewood.

> "*In times when raw materials for making Briquettes are getting scarce, women, girls and boys have to cover a long distance to Maratatu in search for firewood, this is where they encounter challenges of rape, and the risk of being attacked by wild animals."* FGD_Weka Hakiba

3.6 Gender considerations

Results from discussions especially in key informant interviews and focus group discussions show that there are challenges faced by men that are different from those faced by women in both the refugee setting and host communities. Much as all face almost the same challenges especially of access to social amenities, it appears women face more hardships in their quest for example to access firewood to prepare meals for their families. The distance from the settlement to the forest where they collect firewood is a big burden to the women mostly. This is in addition to using firewood that is most of the time not dry enough thereby requiring more time than usual for preparing meals for their

households. As if that is not enough, some of them are raped and sexually molested while in the forests.

> "*When they go to the forest to collect firewood on Wednesday, there are higher chances that women get raped in the forest and that is part of the gender issues and also a protection concern in that regard."* KII_Natural Resources focal person CARE

> *"We face a challenge of long distances in search for firewood. Also, the host communities have gardens where they get firewood which is not the case with the refugee settlement, for example a national can have a tree and they cut it to get firewood unlike refugees who don't even own pieces of land where we can get firewood."* FGD_Male kavule

Whereas women are always involved in most of the energy related projects, they are usually less involved in programs aimed at promoting such issues. Women for example contribute less on radio programmes compared to men who call in and can ask questions or give recommendations.

> "*Of course, there are so many gender issues, when it comes to energy especially for cooking, it is mostly the women who suffer. Even if it comes to issues of climate change, it is women who are mostly affected compared to men, but then I realized that in most of the projects and engagements, women are not involved. I have actually made that alarm so many times when I have appeared for radio talk shows where I appear every week." KII_ Energy and environment officer LWF*

Issues of rape and other forms of sexual harassment affect women especially when collecting firewood. Women are a key target because they dominate firewood collection (refer to Table 3). It's a pity that affected women fear reporting such incidents to authorities because of fear of losing their livelihood source.

> *"Yes, it [rape]is common mostly in the forest. And when it happens, the victims fear to report because since it happened in the forest, they don't know the people that did it on them. And some workers are the ones who do harm on those refugees since they know that they won't report as they fear to be denied support"* KII_ Natural resources focal person CARE Kyangwali

3.7 Opportunities available

Despite the situations in the study area, there are still opportunities that can be utilized for proper program implementation. These either point to what is lacking and can be provided or to what is available and can be enhanced/utilized further for proper project implementation.

The lack of sensitization among the respondents on the importance and advantages of clean energy solutions is a good basis for CARE and partners to explore as they implement the PROSPERs project; for example, briquettes use is an opportunity that can be harnessed by CARE and partners to implement solar ACE cook stove capitalizing on the available market. Some community members have acquired training in briquette making. This is an opportunity that the project can build on to scale up the interventions.

> *"We had a study tour of selected members of the community for intensive training and workshop in Mukono organized by Nsamize. We were trained on how to make briquettes and our group was given a machine used in making briquettes. We returned and trained other members of the community in making briquettes*" FGD_Weka Nkaiba.

There is limited supply of lighting facilities as grid-electricity is limited to offices. This presents an opportunity for alternative source such as solar lamp that is part of the ACE cook stove.

4.0 **CONCLUSIONS AND RECOMMENDATIONS**

4.1 Conclusions

d) High dependency on wood fuel for cooking has negative impacts on the environment especially Nguse forest where the refugee community has been allowed weekly access for firewood. Similarly, the associated challenges involved in firewood collection such as rape are a danger to society and abuse fundamental human rights of the citizens.

e) The project area presents a lot of synergies between PROSPERS project and work previously done by other development partners such as LWF, Nsamize, CARITAS and AAH which include group formation, promotion of renewable energy technologies, trainings and supporting communities with briquettes production equipment. These are good for easy adoption especially in relation to promotion of briquettes production and marketing.

f) There is some form of employment or income generating activity for most members in the project area. This presents a good opportunity for the target beneficiaries to pay for energy technologies promoted by the project.

4.2 Recommendations.

h) CARE and implementing partners should prioritize leveraging on previous work by other development partners in the project area such as LWF, Nsamize, CARITAS and AAH. Such interventions include engaging existing community groups in communities like in Kavule and Weka Hakiba that had even started collecting money to buy the energy stoves. This is key for easy penetration and uptake of the program.

i) In order to ensure effective stove distribution and collection of installment payments, ACE MOUs with leadership and individual members should boldly clarify on payment terms and penalties in case of non-compliance. Penalties should be agreed upon by the two parties. This is good for better follow-up of members and payment recoveries.

j) CARE International should design clear messages to create a massive campaign promoting clean cooking using solar ACE One stove and briquettes in the project area. The campaign should also preach against dependency on fuel wood for cooking and associated challenges. This will help in addressing the urgent energy needs within the settlement and host communities.

k) Considering that farming is the main source of income in the project area, promotion and marketing of energy technologies should be heightened during the harvesting seasons when the target beneficiaries have cash at hand after sale of their produce. Success will largely depend on a well thought payment plan that favors the earning patterns of the target beneficiaries.

l) For quick market penetration, the project should target women and youth as key agents of change. This recommendation is based on the fact that women are affected by or are responsible for firewood collection in both refugee settlement and host communities. Besides, there is demonstrated successes among women and youth groups that have been sustained over time compared to those of men in the project area. Women groups are also known for successful VSLAs and SACCOs and therefore will propel project success

m) There is need for dedicated and hands-on training on use of agricultural waste for briquettes making. This is very important for the beneficiaries to appreciate this type of waste since it is abundant and locally generated from the predominant farming activities. Use of agricultural waste will diversify inputs for briquettes production and reduce dependency on charcoal remains which are also scarce in the project area.

n) The study further recommends that a team of technicians should be selected from the community and trained to provide after sales and regular maintenance services whenever required. This will address most of the concerns raised by respondents concerning sustainability of the energy technologies citing examples in previous projects implemented in the area.

References

Orlando, et al., 2018. *Getting to Gender Equality in Energy Infrastructure: Lessons from Electricity Generation, trnasmission ad Distribution Projects.,* Washington, DC:: s.n.

UBOS, 2020. Uganda Bureau of Statistics Abstract.

UNHCR, 2020. *Uganda Settlement Profile Kyangwali - August 2020.* [Online]
Available at: https://data2.unhcr.org/en/documents/details/78785
[Accessed 13 June 2021].

UNHCR, 2021. *Uganda Comprehensive Refugee Response Portal.* [Online]
Available at: https://data2.unhcr.org/en/country/uga
[Accessed 13 June 2021].

Appendices:

Appendix A Table showing details of key informant interview respondents

Name	**Organization**	**Designate**
Arike James Dada	CARE	Natural Resources focal person
Okeng Alfred	KRC	Energy and Environment Project Officer
Godfrey Peterson Baguma	UNHCR	Energy and Environment officer
Kamoga Arafat	LWF	Natural Resources Focal person
Akampa Frank	OPM	Energy and Environment Focal Person