Smokeless homes:

Challenges for Increasing Use of Improved Biomass Cookstoves in Kisumu, Kenya.

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MSc Thesis (30 ECTS credits)
Science for Sustainable development
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To my precious jewels Kysha and Seth
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Abstract

In Kenya, 69 percent of populations depend on biomass fuels to meet their cooking needs. The incomplete combustion of biomass is performed in insufficiently ventilated settings thus exposing human health and environment to toxic pollution. To date, women and children in resource limited settings have been most vulnerable to severe respiratory infections. The promotion of the Improved Biomass Cookstoves has become a popular issue in policy, research and practice. Community Based Organizations have however faced serious challenges in increasing sustainable use of the cookstoves among users. This qualitative study investigates the role of Community Based Organizations in promoting the Improved Biomass Cookstoves through women’s empowerment initiatives. It applies focus group interviews, questionnaire and formal interviews. 11 interview forms were administered to 30 women, 2 key informants and 3 implementing Community Based Organization representatives in Dunga wetland community. A combination of previous research and this empirical study show that economic resources, small diameter stove designs as well as insufficient policy support hinder effective stove programmes. While there is general adoption, women lack sufficient income and ownership of land which is a significant resource to empowerment. Women informal financial networks are instrumental in driving behavioral change towards clean cooking in the community. Sufficient gender sensitive policy intervention and support can provide effective channels to ensure sustainable incomes of women, livelihoods and stove use.

**Key words:** Biomass, Dunga wetland community, Improved Biomass Cookstoves, Community Based Organizations, Wise- Kenya, Women’s empowerment

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BCTs</td>
<td>Behavioral Change Techniques</td>
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<td>CBOs</td>
<td>Community Based Organizations</td>
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<td>ED</td>
<td>Executive Director</td>
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<td>FGIs</td>
<td>Focus Group Interviews</td>
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<td>HAP</td>
<td>Household Air Pollution</td>
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<td>IAP</td>
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<td>IBCs</td>
<td>Improved Biomass Cookstoves</td>
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<td>KIs</td>
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<td>LICs</td>
<td>Low Income Countries</td>
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Chapter 1. Introduction and Purpose

“Energy interventions affect men and women differently. Both can benefit but only if their differential needs and differing ability to access energy services are properly understood [...] Gendered approaches can help empower women and reduce poverty. They can help deliver energy interventions that are effective, efficient and sustainable” - ENERGIA International Network.

Globally, 3 billion people depend on solid biomass fuels and traditional biomass cookstoves (TBCs) to meet their cooking requirements (IEA, 2018). Over 41 percent of these populations are households living in rural areas of resource limited countries (Amega & Jaakkola, 2016; Chafe et al., 2014; Smith & Mehta, 2003). The gender norms in many patriarchal societies regard women and girls as primary managers of household cooking (IEA, 2018). Consequently, the biomass related effects of household air pollution (HAP) are claimed to severely affect women in the company of young children below the age of five in many ways (WHO, 2014). Household Air Pollution (HAP) has been associated with the prevalence of the Obstructive Pulmonary Disease (OPD), pneumonia, Acute Respiratory Infections (ARIs), asthma and the Greenhouse gas emissions (Mortimer et al., 2017; Smith et al., 2000; Steg et al., 2005). The International Energy Agency (2018) has linked the annual cooking on TBCs to 4 million premature deaths among children (IEA, 2018).

The introduction of the Improved Biomass Cookstoves (IBCs) in the 1980’s in Sub-Saharan Africa has placed promotional campaigns at the centre of policy intervention and development (Gebreegziabher et al., 2018; Mehetre et al., 2017; Tigabu, 2017; Ameka & Jaakkola, 2016). It is claimed that proper and consistent use of the IBCs can minimise the effects of household biomass exposure (Rosenthal et al., 2018; Van der Kroon et al., 2013). Although stove distribution and general adoption progress is often hindered by population increases among resource limited settings (IEA, 2018), household sustainable adoption of the IBCs may have several benefits that are pertinent to Sustainable Development1 (SD). First, the general reduction of heavy consumption of wood fuel may ensure forest resource sustainability (Rogers et al., 2008). Second, sustainable stove adoption often enhances sustainable and low carbon economic development (Van der Kroon et al., 2013). Similarly, it is a mechanism of ensuring clean household cooking. Access to IBCs is significant for the effective clean cooking implementation programmes. Considering that poor access to IBCs affects women as primary users yet their participation in clean energy cooking is still lacking (IEA, 2018; Rosenthal et al., 2018; Shankar et al., 2015), realistic national policy interventions are relevant in understanding household adoption practices (Ezzati & Baumgartner,

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1 The 1987 World Commission report on Environment and Development which is known as the Brundtland Commission report defines Sustainable Development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”
Approaching household use of IBCs with a gender awareness view not only facilitates women’s empowerment but also minimizes the impact of abject poverty among them (ENERGIA, 2018). Investigating agency empowerment training on IBCs business activities is worthwhile (Shankar et al., 2015).

The heavy dependence on biomass fuels in low income countries (LICs) have since triggered the introduction, promotion and implementation of the IBCs (Amegah & Jaakkola, 2016). Several models of IBCs have hence emerged on market which among them are shown later in this study. Imperative to note is that charcoal, fuel wood, animal dung, crop residue and paraffin are some of the fuel sources that many households use for cooking. Introducing IBCs to communities was viewed as an effective channel of reducing the negative effects of biomass emission and pollution among households without necessarily hindering their cooking practices and needs (Mehetre et al., 2017). In a cohort study done by Rehfuess et al. (2013), IBC designs are built with either locally available material or with mass produced and advanced combustion materials. Although accessibility, affordability, durability and acceptability of IBCs are significant factors in influencing user stove sustainable adoption, users tend to prefer IBCs that are constructed with locally available resources and tools (Mehetre et al., 2017; Schirnding, 2001). Regardless of which model the users may prefer to adopt, charcoal fuel is a common fuel source used for household cooking (Schirnding, 2001).

1.1 Purpose and research questions

In Dunga wetland community in Kenya, women have partly adopted the IBCs as a clean cooking technology. Community Based Organizations (CBOs) as agents of change have spearheaded the clean energy initiatives with a goal to ensure safe, sustainable and pollution free households. The overarching purpose of this study is therefore to investigate the role of CBOs in promoting IBC adoption through women empowerment initiatives. Based on the research on Wise-Kenya, the following research questions have guided the study.

1. What are the motives behind the implementation of the IBCs as promoted by CBOs?
2. How does access to land affect the adoption of IBCs?
3. How do women view and portray their cooking and stove choices?
4. What limitations do CBOs face in promoting and implementing sustainable use of the IBCs?

1.2 Thesis disposition

The rest of the thesis is organized as follows; Chapter two presents the background and previous research in relation to this current study. Chapter three follows with a detailed presentation of the methodological processes that were used in order to fulfill the overall purpose of this study as well as to answer the related research questions. As the concluding remarks of this chapter, some of the main limitations that this study faced are presented. Chapter four presents the general description of the environment, social and economic view of Dunga wetland community combined with a general understanding of the operation of Wise-Kenya. Following is chapter five that is a combination of the analysis and discussion of the empirical material of the study. Finally, chapter six consists of the study’s concluding discussion. In this same part, my thoughts, policy recommendations and suggestions for further studies are addressed.
Chapter 2. Background and previous research

The overall aim of this chapter is to investigate current knowledge on the role of CBOs in IBC programmes and women’s empowerment initiatives. Due to the relevance of the IBCs to many biomass dependent nations, there is a large amount of research that has been conducted on policy implementation and sustainable adoption processes. Although I have not consulted all of the previous studies, the ones that have been majorly relevant in regard to this study have enabled me to obtain the current practical and theoretical understanding of the general adoption of the IBCs. This previous research is used in the analysis of my empirical findings. While many studies have tackled user adoption and challenges, not many studies have presented challenges that implementing agents of policy face in increasing the IBC programmes among at community level.

This chapter first dives into the general implementation background of the IBCs and biomass fuels to fully understand the stoves’ overall motive of promotion and implementation in Kenya. Thereafter, I will present the overall promotion of IBCs. Following Shankar et al. (2014) argument that the actual benefits of adopting the IBC technologies can only be achieved through consistent use of the stove, it is imperative for this chapter to understand why sustainable adoption of IBCs a challenge despite tremendous promotional and dissemination campaigns is still put in place for resource limited settings (Shankar et al., 2014). Further, a glance into IBC programmes to facilitate women’s empowerment schemes is also worthy of investigation from previous studies.

Understanding previous and current knowledge perceptions on IBC processes for clean cooking is subsequent to this chapter. Although some of research have been conducted in similar settings, some of the findings presented in this previous research are put in the context of Kenya. Lastly, the chapter will address current perspectives that are related to household income and fuel choices.

2.1 Cooking on Biomass Cookstoves in Kenya

Although there seems no specific definition of an IBC, some studies have tried to define the stove. For example, Gebreegziabher et al. (2018) consider an IBC as one that accommodates fuel saving requirements, reduces on the cooking times and is conveniently used by users. In relative terms, the UNEP (2010) perceives an IBC as one “that is designed to maximize thermal and fuel efficiency, operate safely and reduces on the harmful emissions to human health”. For purposes of this study however, an IBC can be viewed as one which efficiently reduces biomass related HAP, enables less fuel consumption and accommodates all users’ cooking practices. Several types and designs of IBCs are hence on the current market among which are in figure 2.1. On the premise that IBCs use traditional biomass fuels just like TBCs, yet IBCs are expected to function differently unlike TBCs, Jürisoo et al. (2018) explain that wood among other fuels may require apportioning wood into small pieces in order to facilitate quicker combustion. Jürisoo et al. further argue for three basic characteristics of IBCs. Once fully heated, IBCs regulate temperature, flavor the food differently as well as produce less or no smoke.

2.2 Implementing the Improved Biomass Cookstoves

Global interest in the promotion and implementation of IBC programmes have been popular since the 1980’s (Gebreegziabher et al. 2018; Mehetre et al., 2017; Tigabu, 2017; Ameka & Jaakkola, 2016).
In LICs, an effective clean energy cooking technology that could nearly save 3 billion people from the health hazards of biomass fuels is of relevance. For this reason, Tigabu (2017) emphasizes that introducing IBCs was useful in addressing the impact of IAP in many households in LICs. The international community and major donor institutions like the Deutsche Gesellschaft für Internationalen Zusammenarbeit (GIZ) and World Bank (WB) are among the funders that have diligently committed support towards the IBC dissemination and promotion programmes (De la Sota et al., 2018; Tigabu, 2017; Urmee & Gyamfi, 2014; Foell et al., 2011; Kees & Feldmann, 2011). Similarly, other gender responsive international organizations like the ENERGIA International Network on Gender and Sustainable Energy have facilitated information sharing and action towards strengthening the IBC campaigns with an aim of promoting women’s empowerment in LICs (Foell et al., 2011).

Studying household energy to better understand the adoption processes of the IBC implementation is imperative. Studies like Olang et al. (2018) and Rogers et al. (2012) specifically argue that studying household energy is central to achieving SD for all. Especially if over 90 percent of populations in SSA are still dependent on fuelwood and charcoal to meet their cooking needs (Bailis et al., 2015; Rehfuess et al., 2006; Smith et al., 2004). It has been mentioned that biomass fuels (charcoal and firewood) make up the household cooking practices in LICs. Mehetre et al. (2017) statistically address this extent in some of the LICs. They claim that 69 percent of the population use charcoal as their staple fuel in Ghana. In comparison to Uganda, they find that while 80 percent of the population heavily relies on firewood, 15 percent are found to derive household cooking on charcoal fuel. Multinational actors like UNICEF (2008) have also found that close to 99 percent of population in Malawi are reliant on charcoal and firewood. Perhaps this is why IBC programmes are at the forefront of policy agenda in Malawi (Jagger et al., 2017). Subsequent to Kenya however, which is the main focus of this study, Nderegwa et al. (2011) note that 68 percent of population are biomass fuel dependent when meeting their cooking needs.

On the premise that global policy influence seeks to promote sustainable adoption of IBCs for both social and economic development of biomass dependent countries, adoption levels seem low in most countries. Statistics from the WB (2011) address the general household adoption in some of the heavily dependent biomass countries. While 166 households were found to have adopted the IBCs in China, 7 million households in SSA have similarly adopted the use of these stoves. One thing in common for these two un similar geographically located countries is that the incomplete combustion of biomass during the cooking sessions, often happens in insufficiently ventilated kitchens (WB, 2011).

Studies have studied some of the factors that should be put into consideration when implementing IBC programmes in LICs. Jagger et al. (2017) argue for the development of potentially affordable and accessible IBC designs. Other critical voices have further, cited fuel and time efficiency as relevant underlying factors in ensuring successful adoption and dissemination of IBCs.
implementation programmes (Gebreegziabher et al., 2018; Tigabu, 2017; Kees & Feldmann, 2011; Foell et al., 2011). These studies suggest that users are more likely to adopt the IBCs provided the different stove technologies are affordable and save them time and fuel expenses.

Foell et al. (2011) assert that cooking on TBCs poses serious damage to the environment and health. They conclude that the adoption of IBCs can drastically minimize occurrences of child mortality in children under 5 years. Given that women often perform cooking functions in the company of their young children, they are more susceptible to ARIs, OPD and Asthma (Mortimer et al., 2017; Smith et al., 2000; Steg et al., 2005). Studies also show that IBC programmes have attracted huge funding from the international community in most adopting countries. So, Kenya is not an isolated case. Despite the substantial funding and efforts geared towards the effective implementation of these IBC programmes Bensch et al. (2015); De la Sota et al. (2018), Urmee and Gyamfi (2014) have however observed that adoption rates have been low among many households in LICs. Tigabu (2017) partly explains that focus has only been committed towards the dissemination, development and installation of IBCs as opposed to household sustainable adoption capability. He therefore argues that understanding user sustainable adoptive potential is relevant for IBC successful implementation.

2.3 What is hindering the sustainable uptake of the IBCs?

IBC programmes in many LICs have not significantly picked up momentum because many dissemination programmes have been user-blind (Pokharel, 2003). Yet sustainable adoption² of IBCs is a significant indicator of successful implementation programmes (Ruiz- Mercado et al., 2011). Several studies have addressed the possible reasons for this scenario. Mehetre et al. (2017) claim that resource and technological related challenges have hampered the stove implementation programmes. Considering that TBCs are often in three stone local form, they are assumed to cost more than half or nothing at all as compared to the IBCs. Therefore Mehetre et al. (2017) confirm that the users lack the necessary resources to purchase the IBC. Mehetre et al. further explain that many IBCs are adopted without sufficient prior orientation of the intended users to effectively operate the IBCs. Similarly, Masera et al. (2005), Mubarak et al. (2012) associate the cost of purchasing the stoves as a hindrance for users from adopting the IBCs. In support, Urmee and Gyamfi (2014) explain that that users are unable to purchase the stoves due to insufficient income resources. In similar terms, Mehetre et al. (2017) specifically associate household income with low stove uptake.

Considering these deterrent factors, one may wonder how the majority poor can best benefit from IBC programs while having very limited resources. In response, Urmee and Gyamfi (2014) recommend shifting subsidies offered by the donors and governments to the manufacturer as a way of enabling users’ affordability of IBCs. In support of this recommendation, Debbi et al. (2014) acknowledge that subsidized stoves have enabled households to invest further in IBCs technologies. Given that Kenya has been at the forefront of IBC promotion and implementation these past years, Urmee and Gyamfi (2014) have acknowledged that the Kenya’s Jiko stove program has offered subsidies focusing on training of manufacturers and supporting of designers. This suggests that subsidies should be intended for the manufacturers and designers to be able to

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² Exclusive and consistent use of the IBCs for cooking.
offer low-cost IBCs to the end users. Understanding how effective this suggestion can be for a limited resource country, is worthy of further exploration.

Considering that educational skills are central to the economic and social development of any country, it is argued that low levels of educational skills related to IBC adoption may hinder users to fully understand the benefits associated with the stoves’ sustainable adoption (Eltayebmuneer & Mukhtar, 2003). As a matter of fact, Rahut et al. (2017) address education as a vital determinant in household energy choice for cooking. They confirm that in Malawi and Ethiopia, consumption of solid biomass fuels correlate with lower levels of general household education. Similarly, Limmeechokchai and Chawana (2007) and Pokharel (2003) explain that insufficient knowledge about the benefits of IBCs often hinder users from sustainably using the stoves. These studies in other words argue that many users adopt the IBCs without obtaining prior sufficient knowledge of the related benefits.

As a recommendation, De la Sota et al. (2018) explain that appropriate educational skills towards the operationalization of the IBCs should facilitate successful policy strategies in household energy use. Considering that there are few studies which have focused on the health aspects of the IBC implementation, Mobarak et al. (2012) argue for educational skills which should emphasize the health aspects in order to facilitate user knowledge of the health benefits of sustainable use of IBC technologies. The argument here is to instill educational skills in users so that they can best use the IBCs with prior sufficient knowledge. Promoting educational skills in adoption programmes have two-fold benefits that Rahut et al. (2017) give. First, there is guaranteed increase in employment opportunities among the users and designers. Second, it raises awareness levels that are vital in enhancing behavioral changes towards the adoption of clean energy sources for cooking.

Further studies have explored the notion of gender dynamics in IBC programme implementation. Agarwal (2014), Shankar et al. (2015) and Troncoso et al. (2007) argue that lack of clear understanding of the gender dynamics at play during household decision making hinders sustainable adoption of IBCs. It has been understood that in patriarchal societies, the main decision maker is often a male. Agarwal (2014) further explains that women often lack the necessary resources to transform themselves into better decision makers in clean energy cooking practices. Given the fact that women and men have unequal share of resources, women are most limited in all forms of development (Agarwal, 2014). Agarwal (2014) therefore suggests that policy reconsideration in the gender dynamics could be fundamental in ensuring the sustainable adoption of the IBCs.

2.4 Using IBC programme platforms to enable women’s economic power

“Empowerment extends beyond economic empowerment. It is about freedom to choose and the ability to define and exercise the rights, both inside and outside the home”- ENERGIA International network.

Globally, energy has been identified as a significant factor in the gender dynamics of several LICs (Listo., 2018). Ryan (2014) address that energy and gender are intertwined concerns for energy research and policy practice. In many cases, women have been perceived as being better at searching for “green knowledge”3 (ENERGIA, 2017; Rahut et al (2017). A perspective that Rahut

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3 Knowledge that is regarded as useful in protecting the environment
et al. (2017) argues for that women are more receptive towards adopting to clean energies for cooking in the household as compared to their male counterparts.

Especially when put in the context of women’s predefined role of household cooking and management in most SSA countries (Agarwal, 2014; Foell et al., 2011; Rahut et al., 2017). In similar terms, Loo et al. (2016) positions women at the forefront of global focus in clean energy programmes by virtue of their primary role in household cooking. Despite of Foell et al. (2011), Kees and Feldmann (2011), Urme and Gyamfi (2014) associating the burden of collecting, transporting and processing biomass fuels for cooking on women and children, they argue that women often lack the necessary resources for energy development.

The past ten or so years has seen increasing concern of global energy shifting towards gender relations in many biomass dependent countries. Foell et al. (2011), Ryan (2014), and Smith (2010) assess some of the main international agencies that are committed to promoting sustainable adoption of IBCs. The explanation given is that the advocacy conducted by organizations such as ENERGIA International Network on Gender and Sustainable Energy in facilitating empowerment initiatives among several countries has enhanced gender mainstreaming in energy policy and practice. Imperative to note, ENERGIA (2017) asserts that there is a direct correlation between IBC uptake and increased access to income opportunities for women. The quote above however becomes relevant provided that the ultimate rights of women can extend beyond their home vicinity.

2.5 Household income vis-a-vis fuel choices

Previous research shows that unless household income levels are boosted to a level where both men and women are able to make decisions regarding clean cooking, sustainable adoption programmes are bound to fail. Elias and Victor (2005), Kroon et al. (2013), Muller and Yan (2016), and Rahut et al. (2016) have empirically studied the influence of household income on fuel choices. They conclude that increases in household income are subsequent to adoption of new fuel types and technologies. Kroon et al. (2013) specifically note that the deep understanding of household income vis a vis fuel choice can enable better policy intervention and support. Similar to Van der Kroon et al. (2013) and Masera et al. (2000), the tendency to switch between biomass fuels and electricity depends on increase in household incomes.

2.6 Concluding perspectives and significance of the study

Since the introduction of the IBCs in LICs, several studies have been conducted regarding the IBC general performance and uptake among the intended users. Studies have maintained that consideration of the users’ different tastes and preferences is necessary if sustainable adoption is to be achieved. It has been argued that women take the center place in embracing sustainable energy for cooking initiatives given their pre-defined role by society. Several studies have argued for the role of education and knowledge in understating the health benefits of adopting the IBCs for household cooking. Considering that women have disproportional access to household income, energy programmes that involve the gender dynamics often influence women’s ability to make better fuel choices that are vital for their households (ENERGIA, 2017; Agarwal, 2014).
In my understanding, none of the studies have explored the role of CBOs in promoting IBC adoption through women empowerment initiatives. This study therefore intends to contribute to this knowledge gap.

**Chapter 3. Methods and Materials**

The purpose of this chapter is to present the methodological processes that I employed to find answers to the related research questions as well as aiming to fulfill the objective of the study. In the first part of the chapter, I will first inform what inspired Kenya and specifically Dunga wetland community as my case study. Then I will present its ethnographic description before I dive into the specific data collection and analysis methods. While presenting these methods, I will highlight the different strengths and weaknesses that the study faced. As an ethical requirement in qualitative studies, reflections of several issues will also be presented.

The findings presented in this study are based on a qualitative case study data that was obtained from questionnaires which were administered to 6 structured focus group interviews (FGIs) with 30 women users of the IBCs, 3 formal interviews with the CBO representatives and 2 key informant interviews. Method triangulation\(^4\) was employed to allow for identification of consistency and divergence of themes (Herington et al., 2017). Employing qualitative method approaches for data collection in this study enabled me to deeply understand and observe the different interactions of the participants and their general adoption and practices of the IBCs. The study was conducted between March 20\(^{th}\) through April 6\(^{th}\), 2018.

### 3.1 Selecting and accessing the study setting

This study was conducted on Dunga wetland community, a resource limited community in Kenya that is significantly making transformation towards clean energy for cooking by adopting the IBCs. Given that Kenya’s clean energy access situation is typical of many LICs (Ulsrud et al., 2015), combined with its immense efforts in promoting the use of IBCs for cooking (GACC, 2018), this study found Kenya relevant for study. Similarly, Dunga wetland community was selected based on reliable recommendation of an alumnus of Linköping University who was also a native of Kisumu county. There were additional benefits in conducting a study in Kisumu county. First, its close proximity to Uganda made it possible for my family to offer me the necessary support of child minding during my field work. Second, the presence of my personal recommendation assured me further safety in a strange community.

The three-wheeled and two wheeled motorcycles were used for transport in this community. They are locally known as the *tuk-tuk* and *piki-piki* respectively. The author of this study often used the tuk-tuk as it was regarded as safe in traffic. Accessing Dunga wetland community often took about 30-45 minutes depending on which type of motor bikes the author used.

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\(^{4}\) Sourcing of data from different sources, actors and points in time during the entire field work (Tracy, 2013; Burton & Steane., 2004; Herington et al., 2017)
3.2 Data collection and analysis

Method triangulation was a technique used in this study to serve purpose of identifying any kind of consistency or difference in the responses and observations during the course of the field study (Herington et al., 2017). A search into previous and current scientific articles was conducted to gain in-depth understanding of the area of study. Most of the scientific articles were extracted from Linköping university database although google scholar was also occasionally used. Other articles were identified through citations found in secondary studies. The grey literature used in the study was obtained through the respective organization databases. The main interest was into the general implementation of the IBCs in LICs. Peer reviewed scientific articles that dated 2000 and above were purposefully selected. Some form of text analysis was performed to identify themes and codes. In other words, consulting previous studies was a complimentary guide into identifying suitable data collection methods for this particular study (Baxter & Eyles, 1997).

3.3 The Focus Group Interviews

“People for whom social constraints are oppressive are in best position to understand those constraints better than others” (Sismondo, 2011). Putting this in context, bringing together participants who shared the same experiences and challenges adopting to the IBCs would best fulfill the aim of this current study. Although the study focused on participants who had been actively involved in IBC programmes of Wise-Kenya for at least 2-4 years, FGIs with women of all ages were conducted in order to understand the different perspectives into their cooking choices and the overall adoption of the IBCs. FGIs were conducted at Wise-Kenya offices which were located at Dunga wetland pedagogical center. Translation from English to Dholuo (language of command in Dunga wetland community) was performed by the OD of Wise-Kenya. Participants were selected three weeks before the actual field work. Selection was done by Wise-Kenya. Although women of all ages were enrolled in IBC programmes of Wise-Kenya, women who had adopted the IBCs for a sufficient period of time (1-5 years) were purposefully selected.

Each FGI (See figure 3.1) comprised of 5 women and lasted between 1.5-2 hours. FGIs were conducted in the mornings and afternoons for a period of three days. In order to get a deeper understanding of participant experiences with the IBCs and after the end of the FGIs, two participants were selected as key informants (KIs). Selection of these KIs was performed by the author because they displayed a well-informed attitude towards the Wise-Kenya clean energy initiatives. A day was spent with each one of the KIs in order to better understand and assess their interactions with the IBCs in their households. In relative terms, KIs were interviewed in order to probe and obtain the “unsaid” perspectives of their experiences with the IBCs. I mention unsaid because it was assumed that there would be unintentional withholding of vital information during the FGIs. A KI guide was used to direct the focus of my discussion with the informants. As Lapan et al. (2012) recommend using a translator who possesses strong knowledge and understanding of the study population, interpretation of all the interviews was conducted by the OD of Wise-Kenya. As a native of Dunga community and a top manager at Wise-Kenya, the OD therefore offered deeper knowledge and understanding of the overall IBC implementation. Likewise, using the OD as the interpreter made communication during the FGIs and KI interviews less challenging. It should be noted that any form of addition or omission of information during the translation process was strongly cautioned prior to the FGIs in order to avoid bias which would affect the study.
Having employed FGIs had three advantages for this study. First, given that each FGI consisted of women with different views, opinions, ages and perceptions, the nuance of experiences that Tracy (2013) mentions was realized during the course of all the FGIs. Second, I gained familiarity with some of the vernacular words that were often used among the participants. A case in point was *jiko* (cookstove) and *Safuria* (cooking pot). Third, similar to what Ritchie and Lewis (2003) and Tracy (2003) mention, employing FGIs enabled this study to reach a large number of women given the little time I had in the field.

Conversely, employing FGIs in this study turned out into a hectic and challenging method of data collection for the author. Given that the I could not communicate deeply with the participants in Dholuo, language barrier coupled with my limited logistical resources made the FGIs quiet challenging. The challenge of language barrier was however, minimized by using questionnaires with predefined questions as Wibeck (2010) clarifies. Further, note taking and selective observation during the entire field work helped in gathering further relevant data that for my study. As another manifestation of challenges, conducting FGIs turned out costly as regarded the logistical means. At the end of each interview small incentives consisting of washing soap and sugar were offered to the participants as a way of compensating them for their time committed towards this study.

### 3.4 The questionnaires

Given the language barrier and limited time in the field, questionnaires were used to compliment the FGIs. Based on Bowling, (2005) advise to qualitative researchers to put into consideration the literacy levels, visual and physical capability of the participants before administration of the questionnaires, 30 questionnaires were administered to 30 participants. The questionnaire consisted of five sub sections. The first section comprised the social demographic background of the participants, the second section addressed the overall household literacy background. The third section captured possession of land as a productive asset. The fourth related section was used to obtain the participants’ fuel cooking practices. In the last section, participants were asked to give their own perceptions of the underlying behavioral change techniques towards IBC stove adoption.

Before participants filled the questionnaires, their informed consent was obtained in both verbal and written form. Upon obtaining participants ‘consent, their free will to participate in the interviews as well as assurance to protect their identity were particularly emphasised.

### 3.5 The Interviews

The Executive Director (ED) and the OD of Wise-Kenya were interviewed as representatives of the community implementing agents of the IBCs in Dunga wetland community. Additionally,
although not among the main study population, a non-governmental organization representative was also separately interviewed to gain comparison in opinions and ideas as regards the overall implementation of the IBCs. Considering Brinkmann’s and Kvale’s (2015) argument on ethical consideration when conducting qualitative research, the absence of participant consent risks the study to “moral and ethical dilemma”. All interviews in this study were therefore recorded using a digital recorder and upon participant consent as mentioned in the previous paragraph. As a similar advantage, recording interviews was also useful during the data analysis process as the recordings captured what I could have been missed by either error or omission during the interview sessions. Just like FGIs, interviews lasted for 1.5-2 hours.

3.6 Identity in the field

My position in the field was two-fold. I was both an insider and outsider. As a Ugandan female national, I was viewed as an insider by some participants by virtue of my African descent. Yet, being a Swedish-based student and unable to speak neither Kiswahili nor Dholuo made me an outsider as I was not of Kenyan origin. There were strengths and limitations to this. The insider position enabled me to more freely interact with the women especially during the KIs sessions. Trust was quickly built among some of the respondents as they perceived me as one like them. This was also by virtue of my gender. The outsider position however was viewed as a “resourceful researcher”. A case in point is in during the FGIs, women tended to diverge the discussions into “personal requests”. Following this scenario, I was able to understand that some of these women although they were married, they were solely responsible for meeting the educational needs of their dependants. Where dependants were either grandchildren whose parents had died or their biological young children. A kind of data that would be useful in the data analysis process of this study. As a limitation, my provision of audience to the women in this regard meant shifting the intended focus of this study. Although the OD attempted to remind the women that I was just conducting an academic study.

3.7 Construction of validity

As mentioned earlier in this chapter, methodological triangulation was used to boost validity (Padgett, 2003; Rhodes et al., 2014). At the end of the FGIs, the questionnaires were checked to see if they were fully answered or if there were any explanations required from the participants before they left the interview setting. In other words, data analysis started from the time I conducted interviews until the end. Verbatim quotes were used to emphasize the results of the study. Some of the verbatim quotes used in presenting the results were edited for clarity. Interviews were all transcribed, coded and qualitatively analyzed using the MS excel programme.

The main objective and aim of this study were presented to the participants at the beginning of all interviews. All the field observations were noted in my note book. Although there was language deficiency, the OD’s role to translate was restricted to only what the participants said instead of what was based on her pre-existing knowledge and experiences with IBCs. This means that the OD’s role was only to translate the questionnaire to the participants, the participants’ answers and my questions whenever necessary. As analysis was conducted early in the field work and based on what Creswell and Miller (2000) regard as a common practice useful in establishing validity in
qualitative research, member checking\(^5\) was used to check for credibility of my observational findings. It is at this point that I shared some of my observational field notes with the participants to obtain their confirmations. I was however, unable to conduct member checking with one of the participants due to her abrupt withdrawal from the FGI.

3.8 Working with the results

The audio recording interviews were transcribed, and verbatim quotes and expressions were edited for clarity. Pseudonyms\(^6\) were used to protect the participants’ true identity. No specific software was used to analyze the data due to the small study sample. While analysis started as early as the first interview, transcription of the interviews was done after completion of field work. Themes were developed from the repetitions, similarities, transitions that frequently occurred in the empirical data (Ryan & Bernard, 2003). No specific software was used to analyze the data due to the small study sample. Percentage and frequency tables were used to display the structure of the findings (Brinkmann & Kvale, 2015).

3.9 Ethical considerations

The overall purpose and significance of the study was clearly explained all the participants. Confidentiality and anonymity were assured during the interviews as a way of protecting participants’ identities. This meant that their private information would not be disclosed to unauthorized parties to this study. In doing this, it was also another way of protecting me from any instances of moral questioning (Brinkmann & Kvale, 2015). Participants’ free will to participate or withdraw from the interviews anytime they wished was further emphasized. Participants were assured that the findings would only be used for academic purposes. Participants were made aware of the presence of the recording and camera system that I had with me. Therefore, the photographs used to compliment the empirical findings of the study were upon participant consent. Member checking was granted if further information and clarity was necessary.

3.10 Limitations to the study

In addition to what was earlier mentioned, this study faced several limitations. FGIs often started and ended later than the appointed times. This was because participants had to first cater for their household needs and sometimes had to jump out of the discussions to breastfeed or talk on phone. It was a challenge to keep track of the proceedings of the FGIs with such interruptions. The OD however constantly reminded participants of the importance of keeping time for smooth interview processes.

Although an interpreter was employed for the study, this study acknowledges that language barrier could have affected this study in one way or the other. Although the OD was multilingual, it is

\(^5\) The process of taking data and interpretation back to the study participants with an aim of confirming the credibility of the gathered information (Creswell & Miller, 2000)

\(^6\) Withholding the true identities of the participants from being disclosed to unauthorised audience.
possible that some information could have been unintentionally omitted or withheld during the translation process from *Dholuo* to English and back.

**Chapter 4. Understanding Dunga wetland community and Wise- Kenya**

This chapter presents a detailed environmental, social and economic overview of Dunga wetland community as well as an over view of the general work of Wise- Kenya.

### 4.1 Dunga wetland community

Dunga wetland community is situated in Kisumu county the third largest city located in the western region of Kenya. It lies on the shores of Lake Victoria, a fresh water lake shared among riparian states of East Africa (Uganda, Kenya and Tanzania). Figure 4.1 maps the location of Dunga wetland community. The wetland community is situated at about 5 kilometers from Kisumu city. High levels of energy poverty\(^7\) characterize all communities in Kisumu (Commission on revenue allocation, 2011). The majority of people rely on subsistence farming for livelihood (Loo et al., 2016). While poor infrastructural development characterises this wetland community, there is high dependence on biomass fuels which has consequently been claimed to have contributed to the prevalence of the ARIs among populations (Sikoliya et al., 2002).

Close proximity to Lake Victoria as shown in figure 4.2, serves several purposes for this community. It is a source of employment for women as fish mongers and papyrus sellers. To the men, the majority are fishermen and boat makers among others. Further, its diverse papyrus wetland in combination with its rich biodiversity, it is a possible eco-cultural tourist destination. Students amongst others frequent this community for study visits. Although *Kiswahili* is a national language in Kenya, *Dholuo* is used for communication in the wetland community.

At the time of this study, Dunga wetland community appeared green. This was partly due to the warm and wet weather conditions at the time.

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\(^7\)“Lack of access to adequate, reliable, affordable and clean energy carriers and technologies for meeting energy for cooking especially those enabled by electricity to support economic and human development”- (Pachari & Rao, 2011)
Women in the company of their young children are primarily responsible for all household cooking. The children were often seen wrapped behind their mothers’ backs during cooking sessions. *Ugali*\(^8\) and *Nyoyo*\(^9\) served with tilapia fish are staple meals in the community. Cooking meals is done inside insufficiently ventilated settings as well as in open space.

At the time of this study, Dunga wetland community appeared green as shown in figure 4.2. This was partly due to the warm and wet weather conditions at the time.

According to some of the women in the community, cooking inside the poorly ventilated settings is performed in order to protect the food from domestic animals and small children. Other community members however regard it as a way to protect themselves from the scorching sun. Further, poor infrastructural development characterises this wetland community.

### 4.2 Overview of IBC adoption in Dunga wetland community

In Dunga wetland community, cooking is generally performed in open spaces. Charcoal and wood are the primary sources of fuels. Charcoal is generally bought while it was seen that strips of wood was being collected by young children and their mothers. It was however unestablished at the time of the study the cost of a charcoal gallon as community members gave relative responses when asked about the cost of charcoal. The OD informed the study that charcoal in the wetland community is often sold in sacks and gallons. Although women are the main cooks, it was understood that they often depend on their husbands for provision of stoves for cooking because most of them lacked the economic power to do facilitate stove purchases.

### 4.3 Wise- Kenya operational activities

Wise-Kenya is a CBO operating its activities in Dunga wetland Community. all their activities are conducted at their offices that are located at Dunga wetland pedagogical center. According to the OD, Wise-Kenya is a 5-year-old CBO that started its operations in Dunga wetland community since 2013. Wise-Kenya’s mandate is to empower women of under privileged backgrounds around Lake Victoria area and the related highlands in Kisumu county through sustainable livelihoods. It is also concerned with environmental sustainability, eco-tourism as well as small business

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\(^8\) A starchy staple dish of Kenyan households that is prepared through vigorous stirring (Loo et al., 2016)

\(^9\) A slow cooked traditional dish made of corn and beans (Loo et al., 2016)
enterprises like the making of charcoal briquettes as a possible alternative fuel source. Under the overall leadership of the founder and the ED, the community organization is operated by a team of 5 women members namely; the OD and three team leaders. Although still in its early stage, most of its activities are sponsored by local and national grants. Operations are also financed through the sale of the artisan works and provision of consultancy in other parts of the county. It has both local and international sponsors. International donors also provided several computer desk tops to facilitate the information and Technology skills for women in this community.

Given that Dutta et al. (2017) regards energy access as a vital factor in transforming women’s livelihoods through income generation activities, Wise-Kenya’s formulated the “smokeless homes initiative”, which inspires women pain the community to participate in the promotion and adoption of the IBCs. Wise-Kenya overarching goal here is to ensure environmentally friendly and sustainable enterprises.

[...] The IBC was introduced to the community in order to promote eco-friendly and clean cooking channels among households [...] household access to clean energy is a vital right to the marginalized people of this community- OD Wise-Kenya.

At the time of the study, 150 women were enrolled onto this initiative. It was understood that through this initiative, women are also endowed with skills in designing and making IBCs. While the Kenyan Ceramic Jiko (KCJ) and the Rocket IBC shown in figure 3.1. are the commonly used types of IBCs, through the “smokeless homes initiative”, women are taught to make these stoves using the available raw materials like old scrap and clay. It was further acknowledged by the OD that durable raw materials like the vermiculite cement mixed with clay would be most preferable but are often costly for Wise-Kenya’s current economic form. A confirmation provided by the NGO owner;

“Vermiculite cement is a durable material [...] it expands during the heating process and it preserves heat hence saving charcoal. (Local NGO owner)

In an interview with the OD, she mentioned that it is the same stoves that Wise-Kenya sells back to the community at a “relatively low cost”. I mention relatively low cost in quotes because the affordable cost perceived by the users and the providers of stoves seems contentious as will be shown in the following chapter. Conversely, Clancy et al. (2007) regard women who are economically standing to be in best position to contribute to the purchasing of the IBCs on behalf of their families. Women energy empowerment schemes like the “smokeless home initiative” are perhaps necessary in transforming women into good energy product sellers and service providers (Dutta et al., 2017).

The ED further clarified that Wise-Kenya’s goal is to expose the community women to several entrepreneur skills through training so that they can sustain themselves and their households without Wise-Kenya’s support.

\[10\] “Process of awareness and capacity building of women leading to a more equitable participation in decision-Making and enabling them to exercise control over their own lives” (Clancy et al., 2007)
Chapter 5. Results analysis and discussion

“Kenya has good policies, but their implementation is sabotaged by corruption [...] financial support from the national government and private sector often lands in the wrong hands” - ED of Wise-Kenya.

This chapter is a combination of the results and discussion of the study’s empirical findings. The main aim of this chapter is to answer the study’s research questions to which the findings are presented.

5.1 Demographic understanding of the participants

Table 4.1 presents the first findings of the demographic characteristics of this study’s participants who were among the beneficiaries of Wise-Kenya IBC initiatives and programmes. It was found that the average (38.2 years) majority of the participants were aged between 19-70 years of age. Where the majority (16, 53%) were between 19-32 years. This could suggest that this proportion of participants were in their productive years. Among the majority (80%) proportion were married, 7% were single, 10% were widowed and 3% were separated. These demographic characteristics were useful to this study because they served me guidance in understanding how and to what extent I could engage them into this study. Given that married participants in this study were more reserved in their responses as opposed to the single and separated participants, the married participants’ responses were relevant to my study as concerned the household decision maker and their extent to which they can make these decisions.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19-32</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td>33-47</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>48-61</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>62+</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

5.2 What are the motives behind the implementation of the IBCs as promoted by CBOs?

Globally 1.3 billion people live in poverty that claims 70 percent of women in female headed households in rural areas of LICs (Clancy et al., 2007). Given that women and men have disproportional access to resources and decision making, efforts to ensure equal ownership of productive resources are hampered (Clancy et al., 2007). Most often, the contribution of women as key actors in all sectoral initiatives of their communities is often over looked (Thomas, 2010). In reference to Dutta et al. (2017) and Clancy et al. (2007), women as primary managers of household cooking often lack sufficient resources to sustain themselves. Despite women’s often weak resources, they are important sources of household income in many male dominated households (Clancy et al., 2007).
The OD informed this study that a Participatory Needs Assessment (PNA\textsuperscript{11}) was performed and suggested that Wise-Kenia should strongly take into consideration the intended users’ tastes and preferences if IBC uptake was to be maximized in the community. Understanding that Clancy et al. (2007) argues that introducing IBCs should be able to minimize the burden of collecting and purchasing of fuel, the findings from Wise-Kenia representatives show that the introduction of IBCs in Dunga wetland community was to influence women to adopt to clean energy cooking technologies and mechanisms. Additionally, it was aimed to motivate more women entrepreneurs into sustainable enterprises which are necessary for improvement of their livelihoods (ED, Wise-Kenia). Among the sustainable enterprises that Wise-Kenia engages women in is the designing of the IBCs as well as the making of art and crafts for sale. The OD therefore suggests that financially empowered women can afford purchasing an IBC that costs 1500 Kenyan shillings (equivalent of about 132 Swedish kronor).

5.2.1 A glance into the “smokeless homes initiative”

*We train women in as many skills as possible so that they are in position to sustain themselves beyond Wise-Kenia. [...] the making of charcoal briquettes, computer studies, art and crafts. [...] we hope to start manufacturing our own stoves in the near future. (OD, Wise-Kenia)*

*The skills that we impart in the women are easily accepted if we work in close cooperation with the connectors. [...] because the kyama leaders are often respected by members [...] they can easily gather these women to attend some of these skill trainings. [...] once these connectors have understood the introductory part of the skill, they thereafter inspire and convince the other women into attending our skill trainings. (ED, Wise-Kenia).*

Considering that charcoal briquettes is a possible sustainable alternative fuel source to primary biomass fuels such as wood, charcoal, crop residue and paraffin (Thomas, 2010), The OD informed this study that through activities performed in the “smokeless homes initiative” women are taught the necessary skills in making charcoal briquettes. It was found that empowerment schemes are not isolated from the role of informal women groups. In a separate interview with the ED, she also explained that empowerment activities are enhanced through the use of connectors\textsuperscript{12}. It was identified that these are often leaders of local women saving groups like Kyamas\textsuperscript{13}. Through engaging these connectors, the smokeless homes initiative documented a 50 percent savings on household daily fuel consumption. This was because during skill training sessions the connectors enrolled other women to adopt to the IBCs for cooking (ED, Wise-Kenia).

One of the benefits of using the IBCs has been the ability to reduce fuel use due to the stoves’ high heat retention (Loo et al, 2016; Rhodes et al., 2014). A key respondent confirmed this.

*Through the skills training sessions I am aware of the benefits of using this Jiko [...] my daily consumption of charcoal and wood has since reduced.*

\textsuperscript{11} “A systematic approach to setting organizational priorities in which trained evaluators and program stakeholders share responsibility for all substantive and procedural decisions” (Ross & Jaafar, 2006).

\textsuperscript{12} Communicating with people who are exposed than communicating to the locals.

\textsuperscript{13} Informal community women financial saving group.
5.2.2 Education and sustainable adoption: An intertwined relationship of clean energy cooking

Based on table 5.2, it is shown that half (50\%) of the participants attained secondary education as their highest level of education. Primary level was attained by 47\% of the participants while 3\% of the participants attained adult education. Clarity about what could have entailed adult education was beyond the focus of this study.

Table 5.2: Education attainment of participants

<table>
<thead>
<tr>
<th>Education level</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Secondary</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Tertiary</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Others (adult education)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Although all participants could read and write, it was identified that the younger participants better expressed themselves with limited challenges as compared to their elderly counterparts. It can therefore be acknowledged from this point that all participants had a certain level of literacy.

Considering that Rahut et al. (2017), regards education and skill endowment as pre-conditions to women’s empowerment and their supposed sustainable use of IBCs, Wise-Kenya influences women into learning computer skills where computer lessons were provided at no cost. Given the education background of the participants, provision of these skills would further suggest that women would be enlighten and hence become competitive community members. It was however observed that the participants were not aware of these free services. It was unestablished however if this reaction suggested that women generally lacked the necessary information about the cost of the training. One participant was seen asking;

*Do you mean [...] we can have these lessons for free? (Participant X)*

Two possible suggestions can be drawn to this kind of reaction, first is the poor communication among Wise-Kenya and the intended beneficiaries and second, participants were just expressing their curiosity for new knowledge besides using IBCs. Similar to demonstrating of the use of IBCs, Debbie et al. (2014) argue that it is through these demonstrations that users deeply learn the required skills. In confirmation, the OD would go a long way in demonstrating to the women how these computers were used. Acknowledging that these abrupt demonstrations could have disrupted the focus of the FGIs, it was evident that the participants were willing to acquire these new skills.

In a separate observation, when participants were asked about what influenced them to adopt the IBCs, none of them based their response with neither an environment nor health perspective. In confirmation some responses were captured.

* [...] the way it makes my life easy [...] within a minute food is ready [...] the way it saves charcoal and my time (Participant B)*
It reduces the budget [...] and spending less of my time (Participant C)

 [...] it saves fuel [...] it is not time-consuming (Participant X)

Similar to what Evans et al., (2017), Limmeechokchai & Chawana, (2007); Pokharel (2003) and Tayeb et al., (2003) observed, it was established from this finding that that there was a general lack of environmental awareness among participants. As Beltramo (2015) argues, further public information awareness campaigns should be used to address all the associated benefits of using the IBCs.

5.3 How does access to land affect the adoption of IBCs?

It is claimed that access to and control over land as a productive asset is indicative of empowerment and sustainable adoption of IBCs among households (Pachari and Rao, 2011). As a matter of fact, Muraoka et al. (2018) argue that lacking access to land is relative to lacking the necessary decision-making power which consequently leads to disempowerment of a person. It should however be clarified be in this current study that access to land is synonymously used to mean possession of the absolute rights over land.

While access and ownership of productive assets are vital components of the overall household decision making functions, table 5.3 indicates that the majority (53%) of the participants lacked access to land as a productive asset as opposed to the 43% that had access to land.

Table 5.3: Participant access to land

<table>
<thead>
<tr>
<th>Access to land</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>13</td>
<td>43</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Others(father)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

It was understood that land in Dunga wetland community is either bought, inherited or squatted/rented. Considering that Chamberlin & Ricker Gilbert (2016) associate land with generating household income and food production in many rural areas, the findings however suggest that few women are economically able to own such productive assets. This means that they are unable to buy the IBCs and their eventual sustainable use is hampered.

Based on further probing, it is shown in table 5.4 that while 37% of the participants bought the land, they had access to the 7% inherited the land from either their fathers or husbands and the 57% included those generally who lacked access to land for reasons that they were still under their parents’ care or their husbands owned and accessed that land.

Table 5.4: Method of land acquisition

<table>
<thead>
<tr>
<th>Method of acquisition of land</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bought</td>
<td>11</td>
<td>37</td>
</tr>
</tbody>
</table>
It was established that a woman only inherited land from her husband in the absence of a male child in her marital home. In isolated cases, although some participants explained that the sexual satisfaction of their husbands was the easiest way obtain land, it did not guarantee the ultimate rights over such land. One participant explains below:

[...] when I learnt that my late husband had another woman for whom he bought a piece of land [...] I denied him conjugal rights on many occasions until he obtained a bank loan and bought me a piece of land too. [...] his family took the land away when he died. (Participant V)

Given that Clancy et al. (2007) imply that strong household decision making relations have a direct impact on energy services, it can be established from these findings that there is a direct link between access to land and decision-making power and therefore land is a strong productive asset for the participants.

*I do not have land but for those that have it [...] can use it for building and farming* (Participant D)

*I do not have any land but those who have it do not have to pay house rent [...] instead they use that money for something else like buying food*” (Participant T)

62% of the participants who owned land mentioned that their husbands had ultimate rights over activities conducted on it. Similar to India, the heavy male domination could imply that women generally lack access to land which hinders their household bargaining power (Pachari and Rao, 2011). It is argued that the ability of women to make major household decisions is equal to having purchasing power over IBCs (Clancy et al., 2007; Dutta et al., 2017). This could imply that the inability to engage in household decision making limits women to participate in the resource allocation processes of their communities (Clancy et al., 2007).

5.4 How do women view and portray their cooking and stove choices?

Table 5.5 is a representation of the participants’ fuel sources used among their households. The results show that there was simultaneous use of charcoal (34%), paraffin (34%) and wood fuel (33%). Similarly, it was identified that IBCs (50%) were used alongside TBCs (50%). As shown earlier, IBCs are modified stoves that are primarily made to consume less fuel due to their high heat retention, while TBCs are conventional stoves that are either in three stone form. It is however imperative to note that the use of charcoal and wood fuel makes these two types of stoves seem similar. Although previous studies like Masera et al. (2005); Mehetre et al. (2017) and Mubarak et al. (2012) have established that insufficient economic resources and technological challenges mainly hinder users from comfortably using the IBCs it shows in this study that stove designs made of a small diameter could not accommodate users’ wide cooking pots. A finding that has been confirmed by Adkins et al. (2010); Debbi et al. (2014); Mukhopadhyay et al. (2012) and Rhodes et al. (2014). This was further confirmed by participant X;
I am not able to cook Ugali on this jiko (IBC)..., it is too small yet to save on the fuel I use daily, i have to cook a large meal enough for lunch and dinner [...]. (Participant X)

Table 5.5: Household energy for cooking

<table>
<thead>
<tr>
<th>Fuel sources</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charcoal</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Wood</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>Crop Residue</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Electricity</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Paraffin</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>others</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

While Muller & Yan (2016); Rahut et al. (2016) consider the tendency to switch between fuel sources as often influenced by household incomes, Loo et al. (2016) associate this fuel switching to the users’ desire to cook their local dishes (Ugali) in large volumes and yet in the shortest time possible. According to the participants of this study however, insufficient financial resources, scarcity of charcoal and weather conditions were influencing factors to the simultaneous use of IBCs and TBCs. One participant confirms this as below;

*When it rains it is hard for us to find wood fuel[...] we then have to buy paraffin or charcoal. (Participant Y)*

Considering that wood is portrayed as a valuable and inferior economic good in many biomass dependent settings (Kroon et al., 2013), it can be acknowledged that wood, charcoal and paraffin are the main energy sources used among the participants regardless of their impact on the environment and health (Kroon et al., 2013). Despite the temporary ban on charcoal logging and burning in Kenya, it was found that charcoal dealers continued to trade in the community.

* [...]when the government banned charcoal burning, it is the fisher men who have helped us to access charcoal to meet our fuel needs. [...]these smugglers hike the price too high to afford (Participant Z)*

It was further established that the temporary ban on charcoal production and logging at the time of this study created scarcity of charcoal in the wetland community. Being that the community is in close proximity to Lake Victoria, charcoal was accessed illegally from the neighboring country, Uganda. This suggests that the ban did not leave populations with cheap alternative sources of fuel. In a further observation, although women were being trained in the making of charcoal briquettes at wise- Kenya, there was no impact on the participants’ cooking fuel choices. The OD however explained that user attitudes towards briquettes (since they were locally made out of dried human faeces) prevent women from embracing them as a fuel source.

5.4.1 What influences women to adopt IBCs for cooking?

Although it has earlier been established that participants simultaneously use the IBCs and TBCs, table 5.6 outlines and shows that the common benefits that that generally influenced participants
to adopt the IBCs for their cooking needs. Participants generally acknowledged that fuel saving (34%) and the support given by Wise-Kenya (34%) were outstanding factors that influenced them to sustainably use the IBCs. Time and money saving (28%) were also cited factor in this regard. Findings however show that school (2%) and peer impact (2%) have less impact on IBC sustainable adoption among the participants.

<table>
<thead>
<tr>
<th>Participant adoption of IBCs</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saves charcoal</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Saves time, money</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>School recommendation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Peer impact (because friends and neighbours use it)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Wise-Kenya personnel</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

In order to further understand participants’ perceptions of the above influencing factors towards adopting the IBCs, it deemed necessary to capture for how long the participants had used the IBCs. Despite the introduction of IBCs in 2014 in Dunga wetland community, it was identified that the majority (83%) of the participants had adopted the IBCs for a period between 12 – 24 months. 10% had used the stoves for more than 24 months and a 7% for 6-12 months respectively. Based on these results, it can be considered that although IBCs had only been introduced to the community for nearly four years, IBCs have had a slow and minimal impact to the participants by the fact that users simultaneously use TBCs and IBCs.

Although participants may generally have adopted the IBCs, it is further suggested that there are relatively high levels of household economic poverty. This was shown in the daily meal consumption among participants. Findings show that to most participants, affording more than two meals a day may be a luxury. 97 % of the participants mentioned that they had 1- 2 times meals a day. Only 3 % afforded a meal for 3-4 times a day. While some participants explained that having two meals a day saves them from high fuel use, time and financial costs, one participant informed this study that having two meals a day was intentional as it is the only way through which she could save for the Kyamas;

[...] my husband leaves money for me to buy food for lunch. [...] I instead skip lunch and take it to kyama where I can accumulate interest at the end of the month” (Participant X)

It has been observed that the tendency for women to forego meals to meet obligations of their savings groups is a common practice in many limited resource settings like Kenya. While women in Kibera community may practice a “merry-go-round” saving scheme (Lambe & Senyangwa 2015), women in Dunga community practice the Kyamas. Although it was found that women’s savings with the Kyamas is often done without their husbands’ knowledge, at the time of receiving their monthly shares, women are able to cater for their small needs like buying mobile phones or clothes. These findings therefore imply that policy intervention and support towards creation of

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14 Saving for an asset (fridge or television set) by putting money in a jar.
sustainable income generating activities may boost women’s empowerment as well as limiting their absolute dependency on men.

5.4.2 Using Behavioral Change to facilitate IBC adoption?

It has been claimed that behavioural change is a vital factor to ensuring sustainable use of IBCs (Datta and Mullainathan, 2014; Mukhopadhyay et al, 2011). Without clearly understanding the behavioural change mechanisms at play into stove adoption, IBC programmes are less likely to pick huge momentum (Godwin et al., 2015). Based on Lambe & Senyangwa (2015) argument of many BC programmes barely making it past the pilot project phase despite the heavy international donor funding, it was therefore imperative for this study to explore the different BC mechanisms that participants regarded as being effective towards their sustained adoption of IBCs.

The participants expressed as shown in table 5.7 that social support\(^{15}\) (73%) is a major technique to sustained cooking practices in the wetland community. Comparatively, reward and threat\(^{16}\) was found to have influence on 20 % of the participants.

<table>
<thead>
<tr>
<th>BCT</th>
<th>Frequency(f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social support</td>
<td>22</td>
<td>73</td>
</tr>
<tr>
<td>Reward and threat</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Shaping Knowledge</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

5.4.2 Revisiting limitations to sustainable IBC adoption

Table 5.8 is a representation of some of the major challenges that participants cited as hindering them from sustainably adopting the IBCs.

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single fuel purpose</td>
<td>multi fuel purposed designs</td>
</tr>
<tr>
<td>Small diameter</td>
<td>better designs that suit traditional cook pots</td>
</tr>
<tr>
<td>Cost of purchasing the stove</td>
<td>free or subsidised offers</td>
</tr>
<tr>
<td>Heavy to carry for business purposes</td>
<td>change to lighter stove designs</td>
</tr>
<tr>
<td>Poor quality and heat retention</td>
<td>provide durable ones</td>
</tr>
<tr>
<td>Un user friendly</td>
<td>provide better informatory sessions before actual purchase</td>
</tr>
<tr>
<td>Lack of awareness of the full benefits</td>
<td>Use of peers (friends and neighbours)</td>
</tr>
</tbody>
</table>

\(^{15}\) “Involves providing resources and facilitating influence”. Wise- Kenya as a trusted community agent ensures that the adoption of IBC appears desirable and eventually starts to become the norm hence “leading people to desire to emulate and model it”. An example is Wise- Kenya offering advice on clean fuel choices (Goodwin et al., 2015)

\(^{16}\) “Either making the adoption of behaviours seem attractive or making failure to adopt the behaviour seem threatening”. In other words, what desirable or undesirable impact would users face or avoid by adopting such behaviour Goodwin et al., 2015)
The results show that it is generally acknowledged that participants cook meals in large quantities in order to save fuel and time. Given that the current stoves were said to be small in diameter, stove designs of wide diameters were suggested by participants. It was however unestablished whether the re-designs would or would not change the cost of IBCs. In Fingelton-Smith (2018) study, he relates commercialisation of cookstoves as leading to strong dissemination processes. In this current study however, it was found that participants cannot afford the current market price of stoves. If stoves with a small diameter cost 1500 Kenya shillings, one can establish how much a stove with a wider diameter would cost for the manufacturers, suppliers and users. A possible suggestion could be that that stove redesign would not make any difference if the small diameter related IBC is already too expensive for the users.

Considering that some participants were fishmongers, it is not perhaps surprising that their daily income revolves around roasting/frying fish before selling it. Two challenges were identified from this statement. First, the IBCs are supposedly heavy to be carried twice daily by fish mongers. Second, the stove’s heat retention makes their work cumbersome as they cannot carry the stove when it is still hot. While Evans et al. (2017) also notes these challenges, key respondent 1 addresses her own experience.

*I cannot do away with this jiko (TBC) because I do not have to carry it to the beach every time I am going to sell my fried fish* (Key respondent 1)

One participant informed that using the IBC required her to have proper ventilation else her household suffocates in stove heat. The key respondent17 (see figure 4.3) cooks inside her two-roomed insufficiently ventilated house with her 4 grandchildren. She explains that;

*On hot days like this one [...] when the jiko is fully heated [...] it gets too hot in here [...] sometimes we are forced to carry it outside for it to first cool* (Key respondent)

These results support the finding that the effect of HAP in biomass dependent households of limited settings (Mortimer et al., 2017; Smith et al., 2000; Steg et al., 2005, WHO, 2014).

As earlier mentioned, in one of the trainings conducted ahead of the introduction of the IBCs in the wetland community, it was claimed by the OD that participants received prior information regarding the full benefits of adopting the stove. Participants however suggested that the provision of sufficient informational sessions would enable them to gain the understanding of the benefits of using the IBCs for cooking. This result implies that prior information was insufficient for the users.

17 Reference picture used upon key respondent’s consent.
to feel that they understood the full befits of using the stove. One participant suggested that learning from peers had been a good dissemination system for the required knowledge.

Considering that the role of peers gave less impact in influencing sustainable behaviour towards stove use, participants regarded peers to be a neighbour, friend or member of the their Kyama group.

[...] by telling your friend about the advantages of using the IBC [...] (Participant Y)

[...] by spreading the advantages of those who do [...] not know about them (Participant X)

[...] we as women could combine effort and contribute money to buy our own Jikos (Participant Z)

Although different from what was earlier understood by the researcher as regarded the most influencing BCT for the participants, these results suggest that there is a likely impact of the role of peer groups in influencing women’s sustainable use of the IBCs. Jürisoo et al. (2018) found similar results in Kenya and Zambia.

5.5 What limitations do CBOs face in promoting and implementing sustainable use of IBCs?

While Fingleton-Smith (2018) claims that “energy access is often dominated by the “feel good stories from NGOs”, empirical findings of this study show that CBOs/ NGOs face challenging situations that hamper successful operations of implementing sustained IBC usage. The ED of Kenya and the NGO owner confirmed this result.

[...] Kisumu had several donor funded organizations that closed operation a few years ago. [...] the populations still think that any initiative is donor funded. [...] they expect free stoves, free solar lamps. [...] we cannot convince them that we are not donor funded. (ED, Wise- Kenya)

As mentioned before [...] women to make the charcoal briquettes as an alternative fuel source would provide them with extra income in addition to the arts and craft making (ED, Wise- Kenya)

Similar to this finding, Ecofuel Africa has successfully trained 1, 250 women producers of the charcoal briquettes in Kenya (Dutta et al., 2017). This suggests that with proper and sufficient support, women in Dunga wetland community can too benefit from these skills.

While Evans et al. (2017) associate the lack of policy support and funding in LICs with hindering the purchasing of the IBCs, it was acknowledged by the ED that inadequate national policy support has hampered successful IBC programmes in Dunga wetland community.

[...] the county budgets intended for the development of Kisumu rarely reach the small individually owned CBOs like Wise-Kenya [...] it is the much larger CBOs that receive some of the support [...] they are more vocal in the community (ED, Wise-Kenya)

She further acknowledged that although the national government has well planned policies, corruption hinders these policies to make the necessary impact. Sikoliya et al. (2002) confirm that corruption tendencies are a norm in resource limited settings. Similarly, the results established that although that the temporary ban on charcoal production and logging was a well-intended policy
regulation, populations were never left with alternative fuel sources in place. This result was confirmed by the population consumption of smuggled charcoal from Uganda into Kisumu.

The ED was further quoted and explained that the existing gender inequality practices and low-income levels among women hampers sustainable adoption of IBCs. de Groot et al. (2017) confirm this result where they explain that prospective efforts of achieving SD are often hindered by gender inequality in major economic sectors.

*The unequal access to services and resources in Dunga wetland favors men above women [...] for example all the top positions in the management of the wetland hub (ED, Wise-Kenya)*

Considering that Dulla et al. (2017) find that women are disempowered right from their households, and de Groot et al. (2017) emphasize that clean energy programmes barely consider empowerment programmes, women’s bargaining power into resource allocation and benefits can be of great challenge (Pachari & Rao, 2011).

Chapter 6. Conclusions and possible policy considerations

This study has investigated the role of CBOs in promoting IBC programmes through women empowerment initiatives in Dunga wetland community. The analysis has shown that CBOs like Wise-Kenya play a vital role in promoting sustainable adoption of IBCs among household cooking practices. This coincided with their efforts in striving to promote women’s empowerment in the community by instilling skills that may transform women into strong decision makers starting from their respective households. Policy intervention channelled towards supporting community women entrepreneur skill development may be useful to enhance women’s potential to engage in stove manufacturing and purchasing processes (Fingleton-Smith, 2018; Tigabu, 2017). Findings from this current study, confirmed by previous research, has shown that community women’s informal financial networks (the Kyamas) are also instrumental in the promotion of sustainable adoption of the IBCs. Cooperation and inclusion of the knowledge from community groups into national policy can contribute to sustainable behaviours towards clean cooking (Shankar et al., 2014).

It has been shown that women lack the ultimate access to land as a significant productive asset for Dunga wetland community. Moreover, access to land may strengthen the overall financial status of households yet its distribution has been understood to benefit men as opposed to women. Despite women being trained in artisan skills and making of charcoal briquettes to improve their livelihoods, their disproportionate access to land limits their decision-making power which calls for gender aware policy programmes that will enhance women’s empowerment.

Like in other biomass dependent LICs, IBCs in Kenya are generally adopted. It can be considered that that the notion consistent and ultimate use of the stoves is still complex (Debbi et al., 2014). The simultaneous use of Charcoal, wood and paraffin alongside IBCs and TBCs suggests combined effort of deeper understanding of the challenges faced among the manufacture, the implementers

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18 Women’s access to productive resources
and the users. This rests on the premise that these challenges may hamper successful energy programmes aims.

It has been noted that well-intended future energy policies like the charcoal logging and production ban by the national policy makers should provide support for promoting alternative sources of fuels (like the charcoal briquettes). This kind of support may boost the promotion and adoption of cleaner fuel sources. In similar terms, policies like these should be embraced by the entire East African Community instead of being limited to Kenya as a way of limiting illegal charcoal logging and trading from the neighbouring countries.

Although unestablished, the simultaneous use of biomass fuels (charcoal, wood and paraffin) among participants perhaps poses a consistent threat on the health and environment of the users. This continuous exposure to biomass therefore requires stove designs that can ensure lesser or zero exposure to smoke for households and the general environment (Jürisoo et al., 2018).

Finally, this study cannot claim that it has explored all issues surrounding the object of study for this empirical study. It is however certain that its findings and recommendations will contribute to reliable knowledge and information necessary to inform effective policy interventions and development. Given that Dunga wetland community is among the small resource limited settings that have adopted IBC technologies for household clean cooking, similar studies should be conducted in other settings for contrast and comparison of the role of CBOs in promoting IBC programmes through women empowerment initiatives.

Future qualitative studies can investigate the role of the informal women financial networks in fostering BC among IBC users. Similarly, a deeper understanding of the what a “reasonable cost” of the IBC would be for the users is necessary for enabling exclusive use of IBCs.

**Acknowledgements**

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My sincere appreciation goes to the staff and women of Wise- Kenya whose participation gave meaning to this study. Thank you for opening the doors to your lives for me. For the staff of Charlottenborg school and Myran pre-school in Motala municipality, thank you for gracefully keeping my children to enable me to pursue my studies.
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References


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19 This thesis uses the Environment and international Journal reference format.


GACC 2015a. Understanding Impacts of Women’s Engagement in the Improved Cookstove Value Chain in Kenya. A collaborative study by Johns Hopkins University, Bloomberg School of Public Health, USA; ESVAK Community Development Initiatives, Kenya and Envirofit, Ltd Kenya


Appendices

Appendix i: Interview guide

Community policy interview guide

1 How do you disseminate ICSs programmes in this community?
2 What is the percentage of men and women actively engaged in the adoption programmes of the ICSs in their households?
3 How does gender inequalities among households impact the sustainable adoption of ICSs in Kisumu?
4 In which ways have you empowered women in this community?
5 What major challenges have you faced in implementing the ICSs in this community?
6 What suggestion can you give in order to enhance sustainable ICS adoption across households in terms of policy, science and research?

Appendix ii: Participant questionnaire

Improved Biomass Cookstoves: challenges for policy implementation in Dunga wetland community, Kisumu- Kenya

Name………………………….
Sex…………………………….
Village……………………….

Social Demographic Background

1 What is your age……..

2 What is your marital status?
   a) Single
   b) Married
   c) Widow/Widower
   d) Divorced
   e) Separated

3 What is your level of education?
   a) Primary
   b) Secondary
   c) Tertiary
   d) Others
4. What is your main source of income?
   a) Farming
   b) Business
   c) Formal employment
   d) Others

5. What is your religion?
   a) Protestant
   b) Catholic
   c) SDA
   d) Muslim
   e) Others

6. Who is the head of this household?
   a) Husband
   b) Wife
   c) Single male
   d) Single female
   e) Others

**Household Education**

7. Do you have any children?
   a) Yes
   b) No

8. If yes, are they all in school?
   a) Yes
   b) No

9. If no, please elaborate why
   ……………………………………………………………………………………………
   ……………………………………………………………………………………………

10. Who caters for their education?
    a) Husband
    b) Wife
    c) Others

11. How has education influenced your household choice of energy for cooking?
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
Productive Assets

12 Do you own land?
   a) Yes
   b) No

13 How did you acquire this land?
   a) Bought
   b) Inherited
   c) Squatter
   d) Others

15 Who decides on the use of this land?
   a) Self
   b) Husband
   c) Wife
   d) Son
   e) Daughter
   f) Others

16 If (land is owned), how does this affect household’s standard of living? Please elaborate.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................

Household Energy for cooking

17 What is the source of energy for cooking in this household?
   a) Charcoal
   b) Wood
   c) Crop residue
   d) Electricity
   e) Paraffin
   f) others

18 What type(s) of stove do you use for cooking?
   a) Traditional
   b) Improved
   c) Cleaner
   d) Others

19 Who is responsible for cooking in this household?
a) Wife  
b) Husband  
c) Daughter  
d) Son  
e) Others

20 If ICS is used, what influenced you to use it?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

21 For how long have you used this ICS in your household?

a) 1-6 months  
b) 6-12 months  
c) 12-24 months  
d) others

22 How often do you cook for your household?

a) 1-2 times a day  
b) 3-4 times a day  
c) 5-6 times a day

Behaviour Change Techniques (BCTs)

23 Which type of BCT would you relate with sustainable adoption of ICSs in your household?

a) Social Support  
b) Reward and threat  
c) Shaping Knowledge

24 Are there any challenges you find in using an ICS? Please elaborate.

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

25 Are there any suggestions that you can give to increase the sustainable adoption of ICSs among households in this community?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
Appendix iii: Key informant guide

Key informant guide

1. How do you derive livelihood?

2. Why did you choose to use an IBC for cooking in your household?

3. What challenges have you experienced so far by using the IBC?

4. What types of fuel sources do you commonly use for cooking?

5. In your opinion, how would you recommend as a way to meet the challenges you face with using the IBC?