College of Development Studies

Center for Environmental & Sustainable Development

The Role of Energy Saving Cook Stoves for Economic Benefits of Women: the case of Dessie Town."

A Thesis Submitted to Addis Ababa University Center for Environmental & Sustainable Development, in Partial Fulfillment of the Requirements for the Degree of Master of Environment and Sustainable Development

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DECLARATION

I Aberash Wedaj, Registration Number GSE/6391/11, do hereby declare that this thesis is my original work and that it had not been submitted partially; or in full, by any other person for an award of degree in any other University.

Submitted by:

Full Name Aberash Wedaj Signature…….…… date ……..

Approved by:

This thesis has been submitted for examination with my approval as university supervisor.

Name of Advisor ……..……. Signature …… date…….

APPROVAL

I undersigned certify that they have read and hereby recommend to Addis Ababa University to accept the thesis submitted by Aberash Wedaj and entitled "The Role of Energy Saving Cook Stoves for Economic Benefits of Women: the case of Dessie Town," in partial fulfillment of the requirements for the award of a Master of Arts Degree in Development Studies (Environment and Sustainable Development)

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God bless you all!

Aberash Wedaj

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ACRONYMS

ARS	Amhara Regional State
EEAP	Ethiopia Energy Access Project
EPA	Environmental Protection Agency
ESCS	Energy Saving Cook Stoves
GACCS	Global Alliance for Clean Cook Stoves
ICS	Improved Cook Stoves
MDGs	Millennium Development Goals
OLS	Ordinary Least Square
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
NCCSPE	National Clean Cook Stove Programme Ethiopia

Abstract

The study aimed to assess utilization of energy saving cook stove for women economic benefits, in the case of Dessie Town, Amhara Regional State, Ethiopia. The research employed both quantitative and qualitative (mixed methods) approaches. Descriptive and exploratory research designs were also used in the study. To conduct this study, the researcher used simple random sampling technique by which a certain number of households are selected at random from the population of women using energy saving cook stoves in Dessie town. In this study, only primary data was collected through structured questionnaire. Data collected through questionnaires was analyzed using quantitative descriptive and inferential statistics with the help of IBM SPSS software version 26. The study revealed that energy-saving cook stoves are generally perceived to be available and accessible in the community, with cost savings and quality being major incentives for their use. The study also found that using energy-saving cook stoves has a positive impact on daily lives, family income, and monthly cooking expenses. In addition, all independent variables, including availability and accessibility, awareness of benefits, cost, and socio-cultural factors, have a moderately positive relationship with the economic and social benefits of using energy-saving cook stoves. This suggests that there is room for improvement in promoting the use of energy-saving cook stoves, particularly among those who perceive them to be less available. The researcher recommends that interventions should be designed to increase awareness and promote the use of energy-saving cook stoves, particularly among those who perceive them to be less available. In addition, it is recommended that efforts should be made to ensure that energy-saving cook stoves are affordable and of good quality.

Key Words: Energy, Cook Stoves, Utilization of Energy-saving Cook Stoves

CHAPTER ONE

1. INTRODUCTION

1.1. Background

Clean energy is essential to human well-being. Over 1.1 billion people worldwide live without access to clean energy sources like electricity and nearly 3 billion people lack clean facilities to cook low supply of affordable and reliable energy which continues to affect the world's poor (FAO, 2017). In many parts of the world, women are responsible for cooking meals for their families. However, traditional cooking methods such as open fires and inefficient stoves contribute to environmental degradation and health problems for women and their families. As result, the use of energy saving cook stoves has been promoted as a solution to these challenges (Berg et al., 2019).

In Africa, approximately 90 million households still cook with traditional cook stoves, leading to high levels of indoor air pollution (Díaz-Vásquez et al., 2020). Energy saving cook stoves has been becoming increasingly popular around the world particularly among the woman because they have various merits like reduce fuel (wood, charcoal, and biomass) consumption safe and easy to use. They are also eco-friendly, as their use reduces environmental degradation and air pollution (Diaz-Vasquez et al., 2020). In connection to this, Bayu (2020) stated that energy saving cook stoves are designed to reduce the amount of fuel consumed during cooking, which can lead to cost savings and improved air quality. In fact, cooking has become one of the most dangerous daily activities for women in the developing world, thus the uses of thus the uses of traditional stove and cooking methods increases the socioeconomic, health and work burden to the women. Access to affordable clean energy in Africa remain one of the biggest challenges facing the continent and the situation is even alarming for the populations living in remote and rural areas (Matavel et al., 2022).

Ethiopia is also highly dependent on biomass energy sources, which account for about 99% of the rural and 80% of urban households (Benti et al., 2021). Women including girls have primary responsibility for preparing meals for their families. Furthermore, women and children

particularly girls are also responsible to collect biomass materials for household fuel which tack significant portion of their time which should have been spent on income-generation, education or other activities (Woldu, 2022; Yalew, 2022). As clearly indicated by Murshed (2022), energy-saving cook stoves are designed to use less fuel and emit less smoke than traditional stoves use of such methods do have socioeconomic, health and work load reduction role to the women and children of Ethiopia basically under the rural the rural setting. They significantly reduce the variety of fuels, including wood, charcoal, and biomass, where stove can be constructed in improved way using traditional/local materials in improved designs or more modern materials of energy-efficient designs.

The adoption of improved cook stoves (ICSs) contributes to the economic empowerment of women. In this regard (Berg et al., 2019; Marc and Sheng, 2016) reported that households that used ICS spent more than 14.4 minutes each day for collecting fuel wood, and women which significantly reduces their engagement in paid or income generating occupations. Therefore from this it can be deduced that women profit the most from use of efficient cooking stove technology since they spend less time gathering firewood and cooking in the kitchen (Kebeta, 2019).
According to Murshed, (2022), energy saving cook stoves can improve women's socioeconomic standing in a variety of ways. For example, they can reduce the time and energy women spend collecting firewood, allowing them to engage in income-generating activities. The study of the role of energy saving cook stoves for women economic benefit is important because it will explore the various advantage of the technology from Ethiopia setting and provide an provide an incite for development actors, policy makers and academic community. This study therefore seeks to investigate the role of energy saving cook stoves for women economic benefits, in the case of Dessie Town.

1.2. Statement of the problem

In general the technically inefficient cooking stoves used in many developing country like Ethiopia; make the women and children inactive participant in socioeconomic activities, which contributed results in difficulty of poverty alleviation and capacity building of the women and the childlike (Benti et al., 2021; Woldu, 2022; Yalew, 2022).Women and the childlike spend more time with their children:- incline to other responsibilities, improving existing economic opportunities, pursuing income-generating or educational opportunities and leisure activities and

rest (Yalew, 2022). Studies indicated that in almost all of the Ethiopian women are tasked with running the household activities and particularly in rural communities' women's are responsibilities for caring for children, cleaning the house, subsistence farming, pumping water, and cooking meals (Eshetu 2014; Jada and Berg, 2019; Benti et al., 2021). Households in rural areas frequently use traditional cook stoves that depend on biomass, which is another duty bestowed on women. The Ethiopian, energy sector tested by the dual challenges of inadequate access to modern energy and heavy dependence on traditional biomass energy sources to cover the growing demand of the country (Eshetu 2014; Benti et al., 2021; Woldu, 2022).

Women in practically every Ethiopian household are responsible for managing household chores, and in rural areas in particular, their duties sometimes extend to caring for children, cleaning the home, engaging in subsistence farming, pumping water, and preparing meals (Jada and Berg, 2019). Another task assigned to women is the usage of traditional, biomass-powered cooking stoves in rural households. Biomass collection is physically taxing and time-consuming, which leaves women with little time for other pursuits like furthering their education, taking part in community-based activities, or working in the economy—activities that can support women's economic benefit and, ultimately, the eradication of poverty(Teka, 2006; Sepe 2014; Kassa, et al., 2020). Women also devoted their entire day to taking care of their families. They carry out their everyday domestic tasks according to custom. However, several attempt to apply some basic manual technologies to reduce their workload and save time as well as energy for other productive and income earning activities (Sepe 2014; Kassa, et al., 2020).

Generally, the previous studies on energy saving cook stoves focus on the various advantages of the technology they lack to sufficiently assess economic role of the technology for the women. Therefore, this study was intended to investigate the role of energy saving cook stoves for women economic benefits: in the case of Dessie Town. Hence the study is expected to fill the available gaps in the community especially on the use of energy-saving stoves in women economic benefit.

1.3. Objectives of the study

1.3.1. General objective

The main objective of the study is to assess role of energy saving cook stove for women economic benefits, in the case of Dessie Town, Amhara Regional State, Ethiopia.

Specific objectives

The specific objectives of the study are described as follows:

1) To assess the current level of role of energy-saving cook stoves among women in Dessie Town.
2) To assess the benefits of energy-saving cook stoves on the economic status of women in Dessie Town.

1.4. Research questions

In order to address the stated problem, this study was primarily focused on answering the following basic research questions:

- What is the current level of utilization of energy-saving cook stoves among women in Dessie Town?
- What are the economic benefits of using energy-saving cook stoves for women in Dessie Town?

1.5. Significance of the study

The findings of this study might have more significance for development actors, policy makers and academia empirical evidence so as to give an insight on the unpaid care work women in order to achieve gender equality and women's economic benefit providing .It helps the readers and end-users to better understanding of the gender aspects of improved energy saving cook stove and energy saving cook stove practice adoption which ensures sustainable development, environmental protection and safe human health in long run. Sustainable development is impossible without realizing women economic benefit and gender equality in the area of access to energy saving cook stove. It might also help policymakers to focus on and make inclusive gender and environmental issues as a priority in any sustainable development activities and used as background for policy amendments. Additionally, the findings of this study provides valuable insights into the economic benefits of energy-saving cook stoves for women in Dessie Town and other similar contexts, and helps to inform policymakers, NGOs, and other

stakeholders on the importance of promoting the use of energy-saving cook stoves for sustainable development.

1.6. Scope and delimitation of the study

The scope of the study was delimited to the role of energy saving cook stoves and their economic benefits for women. Hence, other benefits of energy saving cook stoves were not studied and were beyond the scope of the study. In addition, the geographical delimitation of the study included only the experiences of women living in Dessie Town, Amhara Regional State and did not involve any other geographical area.

The study was delimited methodologically as the data collection instruments for the study were only structured questionnaire and interview. Therefore, data was not collected through desk review, physical observation or other primary as well as secondary data collection methods.

1.7. Limitations of the study

The knowledge gap on the utilization of energy saving cook stove for women's economic benefits was one of the limitations to get detailed and conceptualized information from assessment of this research. In order to minimize the possible risks of the knowledge gap on the findings of the study, the researcher conducted a thorough literature review to identify relevant literature and incorporate them into the research design.

In addition, the sample size of the study was not large enough to generalize the findings to the entire population of women in Dessie Town. The study was subject to selection bias as the sample of women was not representative of the population of women in Dessie Town. For such limitations, the researcher increased the sample size through random sampling techniques to ensure a larger and more representative sample of the population. The study was also subject to data collection biases which affect the accuracy of the data. For this, the researcher used different methods of data collection such as questionnaire, and interviews, to triangulate data and increase the reliability of the findings.

1.8. Organization of the thesis

The study document is divided into five sections. The first chapter introduces the study's background information, problem statement, research questions, general and specific objectives, and significance. It also includes the research's scope and limits. The second chapter begins with

a survey of relevant literature on the research topics in question. The third chapter examines the research method and details the process for collecting primary data. The fourth chapter offers the findings of the research on the utilization of energy-saving cook stoves for women's socioeconomic benefits in Dessie Town, as well as the researcher's analysis and interpretation of the respondents' viewpoints. The fifth chapter discusses the summary of the primary results, conclusions, and suggestions.

CHAPTER TWO

2. LITERATURE RELATED

2.1. Theoretical literature review

2.1.1. Overview of energy saving cook stoves

According to Karanja and Gasparatos (2019), energy saving cook stoves are stoves that use less energy than conventional stoves. They use less fuel and reduce cooking time, resulting in substantial energy savings and fewer greenhouse gas emissions. Examples of energy saving stoves include wood stoves, pellet stoves, and rocket stoves, as well as improved cook stoves, which have been designed to use less fuel than traditional cook stoves. Energy saving stoves can also utilize alternative fuels such as solar, biodiesel, or biogas. Benefits include cost savings, improved indoor air quality, reduced deforestation, and improved health outcomes (Marc and Sheng, 2016).

Energy saving cook stoves is type of fuel-efficient cook stove designed for cooking food using a reduced amount of fuel or an alternative fuel source. These stoves are designed to save energy and cost, while also reducing environmental impacts from burning traditional fuels. Typically, they use up to 50% less fuel than open fires or traditional three-stone stoves. These stoves are also designed to reduce emissions of carbon dioxide and other pollutants into the atmosphere. Other benefits include providing a cleaner burning flame and improving health by reducing smoke in the kitchen, which are used worldwide and come in various sizes, shapes and designs (Taw and Bhangoo, 2015).

Various kinds of air ous kinds of energy-saving cook stoves developed so far some of the most commonly utilized types of energy-saving cook stoves are solar cooker rocket stove, bio stove, hay box cooker, clay pot cooker hay box cooker clay pot cooker a wood-burning stove, cooker with heat retention, biomass gasifies, cooktop with induction and pressure cookers (Murshed, 2022)

2.1.2. Characteristics of energy saving cook stoves

Energy saving cook stoves possesses different characteristics or features (EPA, 2004; Teka, 2006; Sully, 2012). The most known characteristics of energy saving cook stoves include improved combustion efficiency, heat containment, efficient fuel displacement and full optimization as detailed here under:

Improved combustion efficiency: Energy saving cook stoves use improved designs that allow for more efficient combustion of the fuel being used. This allows for lower emissions and more efficient heat transfer to the cooking surface.

Heat containment: Some energy saving cook stoves are designed to contain the heat of the fire within the chamber of the stove, either through improved design or insulation. This reduces the amount of heat lost through the walls and chimney of the stove, meaning more heat is directed towards the cooking vessel.

Efficient fuel loading: This refers to the number of times that a user needs to refuel the cooking stove in order to heat food. If a stove is designed to require fuel only as needed and does not need continuous refueling, it can save energy and time for the user.

Fuel displacement: Energy saving cook stoves can achieve a high level of efficiency by displacing the fuel around the cooking vessel, making sure that little fuel is wasted.

Fuel optimization: Energy saving cook stoves are designed to use the least amount of fuel necessary to do a certain job. For example, they may run on smaller amounts of fuel like twigs and small pieces of wood rather than larger logs.

2.1.3. Benefits of energy saving cook stoves

Rosenthal et al., (2018) summarized some of the main benefits of energy saving cook stoves include: increased energy efficacy lower fuel cost; reduced air pollution; increased safety ad user convenience as detailed under;

Increased energy efficiency: By using an energy-saving cook stove, it is possible to reduce the amount of energy needed to prepare meals, which allow conserving energy.

Lower fuel costs: Because less energy is being used to cook meals, those who use energy-saving stoves can potentially save money on fuel costs.

Reduced air pollution; - Burning wood and other traditional fuels for cooking can produce a large amount of smoke and other pollutants. By using an energy-saving stove, the amount of pollution released into the atmosphere can be reduced.

Increased safety: Traditional fuels can present a higher risk of fire or burns. An energy-saving stove is designed with safety features to reduce the potential for hazard.

User convenience: - Energy-saving stoves are designed for convenient and comfortable use, with features such as insulation for keeping food warm, pressure valves for regulating air flow, and adjustable grates to suit any cooking project.

2.1.4. Disadvantages of energy saving cook stoves

In fact, the energy saving cook stoves also have some disadvantages or drawbacks which include cost, availability, usability, maintenance and pollution problem.

Cost: - Energy-saving cook stoves may be substantially more expensive than traditional cook stoves, as result poor households abstain from the uses of the technology.

Availability: - Energy-saving cook stoves may not be readily available in certain areas of the world; this makes them hard to access it particularly in inaccessible remote rural areas.

Usability: - Energy-saving cook stoves often require special fuels, such as wood chips, pellets, or gas. This may complicate the user's experience and require additional training that many people may not have.

Maintenance: - Energy-saving cook stoves may require more maintenance than traditional cook stoves. This may include more frequent cleaning, more regular refilling of fuel sources and maintenance when get malfunction (broken).

Pollution: - Some energy-saving cook stoves still produce smoke, which can cause indoor air pollution, particularly if no well designed and constructed smoke removal system/facility. This can be especially detrimental to children, the elderly and pregnant women.

2.1.5. Energy saving cook stoves development in Ethiopia.

According to Tigabu, (2014), Ethiopia's energy supply is heavily reliant on biomass, which accounts for more than 95% of total energy consumption. In terms of sectorial consumption, households account for approximately 91.3% of total energy consumption, which basically come

from biomass fuel accounting for 98.5%. The contribution of biomass under, rural and urban household energy consumption accounts for 92 and 8%, respectively. Therefore, technical gains in energy efficiency are crucial for developing countries including Ethiopia, whose energy source is mainly reliant on biomass fuels like wood, charcoal, and agricultural leftovers, which require efficient use of the resources through adopting energy saving cook stoves. In connection, to these efforts are underway over the last 3 decades by government and non-government organization (NGOs).

The National Clean Cook Stoves Program (NCCSPE) is among the efforts for this purpose. The main target of NCCSPE is that the improved cook stoves play a significant role in reducing deforestation and biomass degradation through use of fuel wood saving feature of the stove ; reducing greenhouse gas (GHG) emissions as it has lesser smoke, and having other social and economic benefits (Tigabu, 201).

2.1.6. Energy saving cook stoves socioeconomic benefits.

Women's economic empowerment through energy saving cook stoves can be possible through the adoption of energy efficient technologies and implementation of policy frameworks. These can include access to finance and micro-credit, capacity building, resources and information, clean energy initiatives, and energy-efficiency standards and green energy access programmes. Additionally, women need to be provided with the capacity building and awareness rising to understand the importance of utilizing energy saving technologies (Murshed, 2022).

The main goal of utilizing energy saving cook stoves is to empower women economically by reducing their energy costs, reducing unnecessary time spent to gather high fuel wood and biomass owing to the inefficient cook stove and methods which indirectly contribute to more secured and stable livelihood (Beyene and Koch, 2013; Woldu 2022). In relation to this study conducted by Legesse et al., (2015) revealed that purposes of promoting energy saving stove include improving women's access to clean and affordable energy sources, providing them with financial literacy, and introducing energy efficiency measures that are tailored to their specific needs. Potential indicators to measure the success of utilizing energy saving cook stoves for women economic empowerment include, but are not limited to, increased household energy use and decreased energy costs, increased access to energy-efficient products and services, and increased access to financial opportunities or loans (Murshed, 2022).

Sepe (2014) stated that to effectively implement the technology, it is important to take into consideration the different stakeholders involved, including governments, policy makers, local and international organizations, and research institutes. Additionally, it is equally important to ensure the participation of women in all stages, from the design to actual utilization of the energy saving cook stoves, while providing the necessary incentives and resources to ensure a successful implementation. Various literatures explained the socioeconomic benefits of energy-saving cook stoves are described in the following paragraphs.

For example Dey, Ali, and Miller, (2012), reported that compared to traditional stoves in different seasons, ICS might save more than 60% on fuel costs,(42-45% on cooking time and 25% and 47% of fuel materials (wood, charcoal, biomass…) over traditional and open fire stoves, respectively. Similarly, other literatures showed that because of the Ethiopian people's traditional requirement and high *Injera*-backing nature, *Mirt* energy efficient cook stove have saved 10-16% of their income and 50% of their fuel, allowing the poor to afford to cook their staple food and contributing to poverty (DFID, 2000; WVEKPT; 2009; GTZ 2008).

The average financial savings from reduced fuel wood usage are stated to be ETB 33 per household per month, with Tigray having the highest and Oromia having the lowest due to fuel wood availability and hence indicate significant price fluctuation (GTZ, 2008). Consumers in various regions of the country have noted that one of the most important benefits of *Mirt*, *Tikikil*, and other stove types have positive impact fuel and time and savings, reduce effort of households to spend collecting firewood. Households that collect firewood rather than buy it account for 11% of customers. These are mostly rural families. This set of consumers saves an average of 6 hours per week per home, but this ranges widely between 4 and 13 hours. The time saved by EECS on firewood collection has been used to meet domestic duties, entertainment (coffee time with neighbors and friends), childcare, and business (GTZ, 2008).

Despite the varied advantages, individual people have varying perspectives on the advantages of the stoves. ICS performance in terms of 'time saved' and 'use of saved time' when compared to traditional stoves vary. According to GTZ (2008) approximately 57% of responders, ICS saved significant amount of time over traditional stoves. The time saved might be used primarily for cleaning or sweeping rooms/surroundings (40.9%), caring for children (21.5%) and household animals (14%), stitching kantha (13.6%), fuel collection (8.6%), and so on. The majority of

consumers reported that savings from firewood purchases were used to meet a variety of domestic and other expenses, including the purchase of food, firewood, water, telephone, and electricity bills, education fees, entertainment, and social obligations, child care and management, the purchase of children's clothes and foods, and so on (GTZ, 2008; Dey,Ali, and Miller, 2012) .

Improved stoves reduce the demand for cooking energy by improving heat transfer, which reduces the need for fuel material, and hence the time spent collecting fuels using traditional cooking methods, as well as the improve speed of cooking. Therefore, intervention in the technology benefits women in particular by reducing their heavy workloads in collecting and supplying fuel wood, as well as their exposure to flame hazards, high smoke emissions, and toxic pollutants (WVEKPT 2009).

The issue is not only in Ethiopia only but also in other developing countries. For example study conducted by Karekezi et al., (2003) indicated that in Eritrea, the average distance travelled to obtain firewood is 10 kilo meters, where women and children are responsible in the majority (80-90%) of cases the workload and burden is amplified by inefficient cook stoves and open fire. In the same is true for Uganda, fuel wood collection areas have declined, resulting in longer distances traversed to get fuel wood. Travelling great distances to collect firewood often leaves rural Africans with little time for other tasks, resulting in low agricultural output and little time to pursue educational opportunities owing to less use of energy saving cook stoves which increase amount of fuel (Karekzi et al., 2003).

2.1.7. Indicators for women's economic benefits of energy saving cook stoves

Economic benefits of energy saving cook stoves can be indicated by their increased access and control over resources, such as energy saving cook stoves. Studies (e.g., Eshetu 2014b; EPA, 2004; Teshome, 2014) identified some indicators of women's economic benefits relation to energy saving cook stove include.

Improve women ownership of energy saving cook stoves technology: If women own and control the cook stove, they have more agencies in deciding when and how to use it.

Improved health and time-use: Women who use energy saving cook stoves may experience improved health due to reduced exposure to smoke and have more time for other activities.

Increased income: If women are able to sell the surplus energy produced by the cook stove, this can provide a source of income.

Improved decision-making power of women: Women who are financially empowered are more likely to have a say in household decisions, including decisions related to energy use.

Increased Women's access to education and training: women who use energy saving cook stoves may have more time and resources to access education and training opportunities.

Reduced economic burden on women: Using energy saving cook stoves can reduce fuel costs, which can be a significant burden for low-income households.

2.2. Empirical literature review

The utilization of energy saving cook stoves for women economic empowerment has been widely studied. A number of studies have focused on the economic and social impacts of these cook stoves in societies with energy deprivation. For example study by Mendoz (2013) n Bangladesh found that the introduction of energy saving cook stoves for women had immediate economic impacts, such as improved income and to engage in various financial products, which enhanced their increased access to utilities like electricity and water using the saved money and time as they able to engage in income generation activities. The findings suggest that access to energy saving cook stoves provided women with increased financial autonomy and increased access to wage labor, which ultimately led to increased female economic empowerment.

Nguyen (2015) research in Vietnam on the socio-economic effects of women's access to energy saving cook stoves revealed that women's employment was positively affected by having access to efficient cook stoves, as they were able to move away from time-consuming fuel gathering practices and devote more time to activities that could improve their financial circumstances. The study also found that access to energy saving cook stoves enabled women to participate in more economic activities outside the home and increased household income. A study of energy saving cook stoves in India by Nayak and Jain (2016) was conducted to analyze the economic impacts of switching from traditional fuel sources to energy efficient cook stoves. The study found that women who adopted energy saving cook stoves had reduced expenditure on fuels and were able to dedicate more time to productive activities and household income generating activities. In addition, the study found that the economic empowerment of women was a direct result of their

ability to save time and money. A study by Chataisia (2016) in Nepal studied the impact of energy saving cook stoves used advance social indicators such as gender empowerment, education and health outcomes. They found that access to these cook stoves facilitated increased access to livelihood opportunities, increased educational attainment by girls, and improved health due to reduction of indoor air pollution. In addition, the study found that access to energy saving cook stoves increased women's sense of independence and empowerment, which in turn had a positive effect on the socio-economic standing of the women and their households. Kassa et al., (2020) studied the factors affecting the adoption of fuel -efficient stove in Dessie Zuria Woreda." The study showed that the educational level, family size, distance from the city, awareness, access to training, time spent collecting fuel wood, and membership in an organizations group were found to be significant in determining the probability of fuel-efficient stove adoption. The biggest impediment to adopting fuel-efficient stoves was discovered to be a lack of information about the benefits of the stove and the cost of the stove.

A study conducted by Eshetu. (2014) on "factors affecting the adoption of fuel-efficient stoves among rural households in Borena Woreda: north central Ethiopia" using descriptive survey research revealed that the most common source of fuel is wood, followed by animal manure and bushes; the sources are own plantation and kebele forests indicating importance of use of energy saving cook stove. However, due to financial problem (66.7%) of households and lack of availability (25.9%) of modern energy -efficient stoves impacted use of the technology in the study area, the Chi-square test and the binary logistic regression analysis result show that the income level of the household head and the educational level of the spouse were the primary variables that increase the propensity of stove adoption. Overall, these studies demonstrate that energy saving cook stoves are effective tools for women's economic empowerment in energy deprived societies. These cook stoves enable women to save time and money which can be used to dedicate more energy to economic activities and generate much needed income. Access to energy saving cook stoves creates various opportunities for women to increase their socio-economic standing and improve their livelihoods.

However, those researches which were conducted previously could not effectively assess the utilization of energy saving cook stoves for women economic empowerment, in the case of Dessie town; rather they were aimed to assess role energy saving cook stoves for women

economic benefit in other countries. In addition, the research methodologies used in those researches were also not appropriate and relevant in some cases. Due to these reasons, this research will try to fill the gap seen on previous researches by using appropriate methodologies, data collection instruments, better data analysis methods and will assess role of energy saving cook stoves for women economic benefit , in the case of Dessie town, ARS, Ethiopia.

2.3. Conceptual framework of the study

The study was guided by the following conceptual framework which was used to explain the relationship between role of energy saving cook stoves and women economic benefits (Availability of energy-saving cook stoves, Access to energy-saving cook stoves, Awareness of the benefits of energy-saving cook stoves, Cost of energy-saving cook stoves and Socio-cultural factors). After reviewing the theoretical and empirical literature, the researcher developed the following conceptual framework (figure 1):

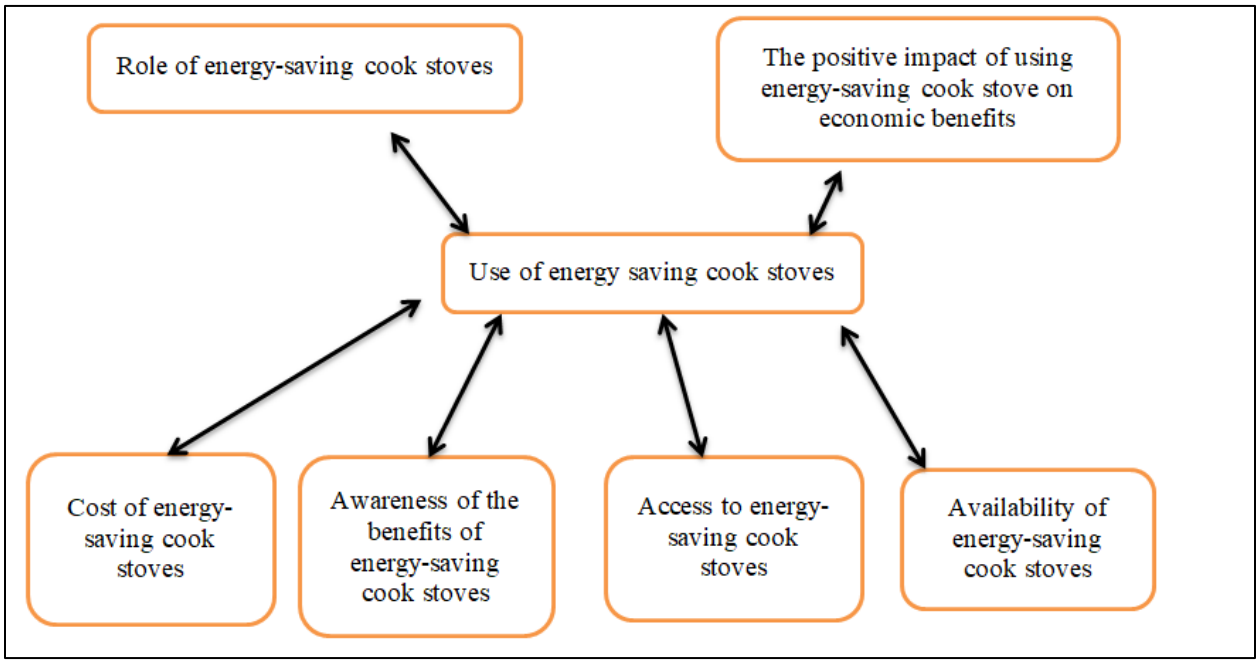

Figure 1: Conceptual Framework of the researcher

The independent variables were factors that are expected to influence the use of energy-saving cook stoves in Dessie Town. These include the availability and accessibility of energy-saving cook stoves, awareness of their benefits, cost, On the other hand, the dependent variables are the positive impacts of using energy-saving cook stoves on economic benefits. Overall, the conceptual framework of the study suggests that the Role of energy-saving cook stoves among

women in Dessie Town was influenced by a range of factors, including the availability, accessibility, and cost of the stoves, as well as socio-cultural factor

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. Description of the study area

The study was conducted in Dessie Town. Dessie aged more than a hundred and ten years old, is a multi-ethnic city in north-central Ethiopia. Located on the Addis Ababa- Mekele road in South Wollo Zone of the Amhara Region, in geographic term city located between 11°03' to 11°17'N latitude and 39°33' to 39°44'E (Figure 2) with an elevation ranging between 2470 and 2550 meters above sea level. According to CSA, Dessie in 2005 occupied an estimated area of 15.08 square kilometers, which gave the population density of 11,213.79 people per square kilometer. The city is chosen because of the various interventions on energy saving stove promotion over the last 2 to 3 decades by various non-governmental organizations (NGOs), government officer of the Women Associations and private development organizations so to enhance better access and awareness

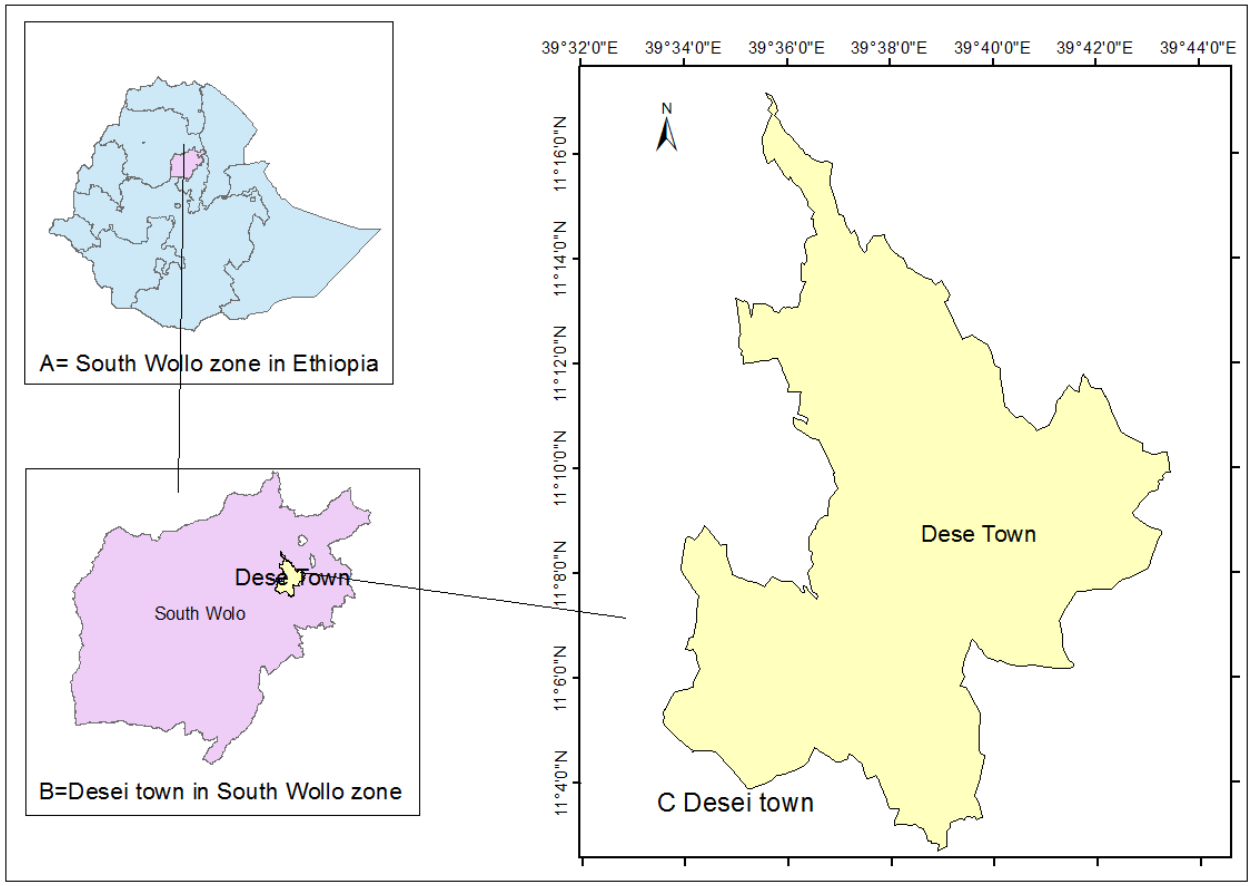

Figure 2: Location map of the study area

3.2. Research methods

3.2.1. Research approach and design

The study employed a strategy that contains various methods and tools which are relevant to get the desired research outcome. Accordingly, the research employed a mixed research design approach which combines both quantitative and qualitative methods and can be beneficial in providing a more comprehensive understanding of a research problem. In this regard, the quantitative research uses numerical data and statistical analysis to identify patterns and relationships in the data. This approach is useful for testing hypotheses, making predictions, and generalizing findings to a larger population. On the other hand, qualitative research, on the other hand, uses non-numerical data such as text, images, and audio to understand the meaning and experiences of individuals. This approach is useful for gaining a deeper understanding of complex phenomena, uncovering new insights, and exploring the perspectives of participants (Cresswell, 2009). By using both quantitative and qualitative methods, a mixed research

approach can provide a more holistic understanding of the research problem. Quantitative data can provide a broad overview of a phenomenon, while qualitative data can provide in-depth insights into the experiences and perspectives of individuals. In addition, mixed research approach can also increase the validity and reliability of research findings (Cresswell, 2012).

As this study aims to assess role of energy saving cook stove for women's socio-economic benefits, in the case of Dessie Town, both descriptive and exploratory research design were adopted. This research adopted an exploratory design focusing on qualitative data, using semi-structured interviews. Exploratory research design allows researchers to gain a general understanding of a topic or problem before committing to a specific research question or hypothesis. It also allows for the discovery of new ideas or perspectives that may not have been considered previously (Cresswell, 2012). Descriptive research design, on the other hand, provides detailed information about a specific topic or population, which can be useful for identifying patterns, trends, and relationships. This information can then be used to make informed decisions or develop interventions (Cresswell, 2012).

3.2.2. Data source and types

According to Mugenda, (2003), there are two data types and sources: primary and secondary data types/sources. For this particular study, only primary data was used which is to be collected through structured questionnaire and interview. The primary data sources were mainly used to gather facts about utilization of energy saving cook stove for socio-economic benefits of women, in the case of Dessie Town. The research used only primary data sources to fully answer the research questions.

The structured questionnaire provides a standardized way to gather data from a large number of participants, while the interview allows for more in-depth and detailed information about the participant's experiences. Together, these two data sources can provide a comprehensive understanding of the research topic. Structured questionnaire is useful for collecting large amounts of quantitative data in a standardized and efficient manner. An interview, on the other hand, is a conversation between a researcher and a participant in which the researcher asks open-ended questions. This method allows for the collection of qualitative data and can provide in-depth insights and understanding of the participant's experiences, opinions, and perspectives.

3.2.3. Data collection procedure

This procedure is designed to provide a comprehensive understanding of the utilization of energy-saving cook stoves among women, and how it relates to their socio-economic benefits status. Accordingly, the research followed a serious of data collection procedure for studying the utilization of energy saving cook stoves for women's socio-economic benefits which includes the following steps:

i. Identifying the target population: The target population for this study was women living in Dessie town who are currently engaged in production and selling of energy saving cook stoves such as Amhara cooking stove Association it has 30 members.
ii. Developing a survey instrument: The survey instrument includes questions about the women's current cook stove usage, their socio-economic status, and their perceptions of energy saving cook stoves, and the like.
iii. Selection of participants: Participants were selected through simple random sampling which involves randomly selecting a given number of elements from the target population. This procedure helps ensure a representative sample of the target population is obtained.
iv. Administer the survey: The survey was administered in person,

3.2.4. Sampling design and sample size determination

Target population

Population is the entire aggregation/total of items from which samples can be drawn. Determining type and method of sampling mainly depends on the types of population that the study covers (Kothari, 2004). The target population for the utilization of energy saving cook stoves for women's socio-economic benefits in the case of Dessie town was women living in the town who are currently using energy saving cook stoves. This means that the target population includes working women in different sectors role energy saving cook stoves to promote their economic standing. According to International Livestock Research Institute (2018) report which looked at energy conservation through improved cooking stoves in Dessie Town, more than 700 households are estimated to have adopted energy conserving cooking stoves.

Sampling design and sampling techniques

To conduct this study, the research used simple random sampling technique by which a certain number of households are selected at random from the population of women using energy saving cook stoves in Dessie town. Simple Random Sampling involves randomly selecting a given number of elements from the target population (Kothari. 2004). This technique was applied due to the fact that all households have equal chance to be selected in a sample. The rationale behind for the selection of this sampling technique is its advantages on providing representative samples and data.

Sample size

Among the estimated 700 households that are estimated to have adopted energy conserving cooking stoves in Dessie Town, 450 households are estimated to be women who have adopted energy saving cooking stoves (ILRI, 2018). To determine the sample size from a given population, the research used the Taro Yamane method for sample size calculation. Therefore, the sample size was determined by the statistical formula below (Yemane, 1967):

n = N/(1+N(e)2)

Where:

n is the sample size

N the study population

e the margin of error (level of precision)

Considering the target population of 450 who are actively engaged in energy saving cook stove users the sample size is determined as follows:

n= N/ (1+N (e) 2)

As shown in Table 2, at a confidence level of 95%, the sample size for this particular research is determined as follows: (Yemane, 1967): n=N/ (1+N*e2) = 450/ (1+450*(0.05)2) = 450/213= 212

Table 1: Survey respondents by group category

No	Target Group	Number of survey respondents		
		Male	**Female**	**Total**
1	Amara Energy Saving stove association member	15	35	50
2	Energy saving stove usage women's	20	92	112
3	Women and children social affair staff member and enterprise office *woredas* and *kebele* level	25	25	50
	Total	60	152	212

3.2.5. Data analysis methods

For this study, data was analyzed using both descriptive and inferential statistics techniques. In descriptive statistic, the research used percentages, correlation and frequencies as well as mean and standard deviation that help to analyze the data. On the other hand, inferential techniques such as regressions particularly Ordinary Least Square (OLS) were employed which shows not only the relationships or associations existing between variables but also helps to analyze the extent to which one (independent) variable predicts the other (dependent) variable.

On the other hand, the collected raw data was tabulated quantitatively and analyzed statistically using the Statistical Package for Social Sciences (SPSS) Version 26. Key findings were also interpreted and reported accordingly. The collected data was also analyzed using descriptive statistics and inferential statistics such as chi-squared test, t-test,

3.2.6. Informed consent and ethical approval

The study proposal was reviewed and approved by Center for Environment and Development Studies under the umbrella of the College of Development Studies, Addis Ababa University Ethical Review Board. The board reviewed and approved the research proposal in accordance based on the guidelines as the study involved human participants in the household surveys, focus group discussions and key informant interviews.

In addition, the data collection and the entire research activities were conducted in line with the ethical standards following usual social sciences approaches. As the research topic require due ethical protocol and care the entire data collections (questionnaire survey, FGDs and KIIs) performed by due ethical considerations during data collection. Accordingly, the first page of the survey questionnaire contained basic ethical considerations to inform respondents on the purpose of the data collection and provided brief information about the confidentiality and use of the collected data for the research purposes only. They were also informed that all personal

information including the respondent's name and any futures that might lead to identification of respondents would be anonymized in the research outputs too. The participants were also informed that participation was voluntary and that they could ask any question or withdrew from the interview at any time. With this, the survey, focus group discussions and key informant interviews were carried out with full consent of the respondents and due consideration of ethical issues.

4. CHAPTER FOUR

5. RESULT AND DISCUSSION

5.1. Description of characteristics of respondents

The survey was administered among sampled respondents out of the total 212 survey respondents sampled for the interview 196 questionnaires were properly completed, resulting in a 92.45% response rate. The remaining 16 (7.5%) questioners were not properly completed which had missing,and data fallacy;- therefore, these questioners are rejected from analysis .As shown on table 2 below, this demonstrates that data can be analyzed and conclusions drawn because the response rate was sufficient to do the analysis (Wu et al., 2022).

The demographic profiles of the study sample households were described using descriptive statistics analysis result. Descriptive statistics was done using frequency counts and percentage for demographic information such as age, marital status, literacy level, how long have they been using energy saving cook stoves, family size, the head of the household, and monthly income of the household (in Birr).

The demographic characteristic of survey respondents is given in table 2 showed that based on gender of survey respondent, 57.8% were female and the remaining were males. Out of the total 196 sample respondents, the largest age group was found between 36 and 45 years, accounting for 40.8% of the sample respondents. The second and third largest age group of the survey respondents range from 26 to 35 years and from 46 to 55 years making up 31.1% and 16.3%of the sample respectively. The smallest age group 56 and above years, representing only 4.59% of the sample. The majority of respondents in the sample are between the ages of 26 and 45 years, accounting for 71.94% of the total sample. The remaining 28.1% of the sample was divided between the youngest and oldest age groups, with 7.14% of respondents being 18-25 years old and 21.9% being 46 years and above. Therefore, the survey respondents are in active working age that has better access for information and have better exposure to adopt new technology (Morris and Venkatesh, 2000)

As shown in the table 2, majority 128 (65.3%) of the respondents were married whereas 68 (34.7%) of the respondents were single but there was no respondent who got divorced.

Just for simplicity, the education status of survey respondent was grouped into two as literate and illiterate. Accordingly, the great majority (78.6%) respondents were literate (at least can read and write), while the rest (21.4%) were literate who cannot read and write. This indicates that majority of the respondents can understand the contents of the questionnaire and offer meaningful replies. It is well known that new technology adoption has direct relation with education status, as there is likelihood of technology adoption by educated individuals than illiterate and high level of adoption with increased educational level (Bucciarelli et al., 2010).

According to Table 2 above, the majority of respondents (55.1%) have a family size of 1 to 3 members followed by 36.73% of respondents who have a family size of 4 to 5 members. Only a small proportion of respondents (8.16%) have a family size of 6 to 10 members. It is important to note that there are no respondents with a family size of more than 10 members in this sample. This could be due to the fact that large families are relatively rare in the population from which the sample was drawn. In terms of cumulative percentages, it can be seen that 96.83% of respondents have a family size of 1 to 5 members, while only 3.17% have a family size of 6 to 10 members. This suggests that larger families are relatively uncommon in the population from which the sample was drawn. This implies that the majority of respondents have small to medium-sized families, with a family size of 1 to 5 members. Here it is vital to underline that family size determine resource required for household, thus large family size household require more fuel material for cooking purpose. Therefore, large family size households particularly in urban setting likely to use energy saving cook stoves so as to reduce the pressure for fuel material need and the associated costs as they have to cost more to purchase the fuel martials (wood, charcoal, wood chips, etc).

Table 2: Socio-demographic characteristics of respondents

Variable	Frequency	Percentage (%)
Response Rate		
Questionnaires administered	212	100
Questionnaires properly filled	196	92.45
Questionnaires with missing data	16	7.5
Gender		
Female	113	57.8
Male	83	42.2

Variable	Frequency	Percentage (%)
Total	196	100
Age distribution		
18-25 years	14	7.14
26-35 years	61	31.1
36-45 years	80	40.8
46-55 years	32	16.3
>56 years	9	4.6
Total	**196**	**100**
Marital Status		
Married	128	65.3
Single	68	34.7
Total	**196**	**100.0**
Educational status		
Literate (can read and write)	154	78.6
Illiterate (cannot read and write)	42	21.4
Total	**196**	**100.0**
Family Size		
1 to 3	108	55.1
4 to 5	72	36.7
6 to 10	16	8.2
Total	**196**	**100.0**
Years used energy saving cook stoves		
Less than 1 year	15	7.65
2 to 5 years	68	34.69
6 to 10 years	81	41.33
11 to 15 years	26	13.27
Above 15 years	6	3.06
Total	**196**	**100.0**

Source: Researcher's Own Computation (2023)

The survey revealed that the majority of respondents (41.3%) have been using energy-saving cook stoves for 6 to 10 years, which was followed by 34.7 % of respondents who have been using the stove for 2 to 5 years. Respondents who reported that they have been using energy-saving cook stoves for over 15 years were small (3.06%) proportion of respondents.

In terms of cumulative percentages, it can be seen that 80.8% of respondents have been using energy-saving cook stoves for 10 years or less, while 19.2% have been using the stove for more than 10 years (Table 3). This suggests that the adoption of energy-saving cook stoves may have increased in recent years, as a larger proportion of respondents have been using the technology

for shorter periods of time. This shows that energy-saving cook stoves are being adopted by a considerable proportion of respondents, with the majority having used them for at least 2 to 5 years. The data could be useful for policymakers and organizations that promote the use of energy-saving cook stoves, as it provides insight into the length of time that people typically use them.

Table 3: Years used energy saving cook stoves

Variable	Frequency	Percentage (%)
Less than 1 year	15	7.65
2 to 5 years	68	34.69
6 to 10 years	81	41.33
11 to 15 years	26	13.27
Above 15 years	6	3.06
Total	**196**	**100.0**

5.2. Current level of energy-saving cook stoves uses

5.2.1. Effect of the availability of energy saving cook stoves

As shown on the table 4, the questioner was administered conserving their agreement, i.e., strongly disagree (1), disagree (2), not sure (3), agree (4) and strongly agree (5). The mean responses value for statement 1 which state that '' Energy-saving cook stoves are easily available in my area'' was 4.06 indicates that respondents, on average, agreed that energy-saving cook stoves are easily available in their area. The standard deviation value of the same statement (SD=1.06) indicates that there was some variability in the responses, with some respondents strongly agreeing while others may be less certain.

Based on the data obtained from the table 4, high mean value (Mean=4.13) for statement asking the supply compared to the actual demand indicates that, on average, the respondents agreed that there are enough energy-saving cook stoves availability in their area to meet the demand. The standard deviation value was (1.02, this) suggests that some variability in the responses, with some respondents strongly agreeing while others may be less certain.

Table 4: Effect of availability of energy-saving cook stoves

Statements/Questions	**N**	**Mean**	**Std. Dev.n**
Energy-saving cook stoves are easily available in my area.	196	4.06	1.06
There are enough energy-saving cook stoves in my area to meet the demand.	196	4.13	1.02
It is easy to find a shop that sells energy-saving cook stoves in my area.	196	3.89	.94
Local authorities provide enough support to promote the use of energy-saving cook stoves.	196	3.75	.89
The availability of energy-saving cook stoves is a major barrier to their use in my community.	196	2.47	1.08
Overall Mean & SD Values	196	3.66	1.00
Valid N (listwise)	9		

Source: 2023 field survey

The response to question concerning 3,i.e ‘’ it is easy to find a shop that sells energy -saving cook stoves in my area ” nearly most respondents agrees as there are shops at nearby as verified by the mean value of 3.89 indicates that on average, agreed that it is easy to find a shop that sells energy-saving cook stoves in their area with standard deviation value of 0.94 showed that there was relatively low variability in the responses, with most respondents agreeing that it was easy to find a shop.

The response to question 4, ‘Local authorities provide enough support to promote the use of energy -saving cook stoves” where the mean value of the response was 3.75, shows that respondents, on average, agreed that local authorities provide enough support to promote the use of energy-saving cook stoves. The standard deviation of the response 0.89 suggests that there is relatively low variability in the responses, with most respondents agreeing that local authorities provide enough support.

The question stating “ availability of energy-saving cook stoves is a major barrier to their use in my community” nearly question stating “availability of energy-saving cook stoves is a major barrier to their use in my community’’ nearly about half agreed but the rest not as verified by the

mean value for statement was (2.47) this indicates that on average, somewhat neutral or slightly disagree that the availability of energy-saving cook stoves is a major barrier to their use in their community. The standard deviation value of 1.08 suggests that there was relatively high variability in the responses, with some respondents strongly disagreeing while others may feel that availability is a major barrier.

As shown in the table 4, the overall mean value of the licker scale was 3.66 indicates that on average, the respondent's had a moderate perception of the availability of energy-saving cook stoves. The overall standard deviation value of 1.00 suggests that there was a relatively high degree of variability in the responses, with some respondents perceiving energy-saving cook stoves to be widely available while others may perceive them to be less available.

The findings indicate that respondents generally perceived energy-saving cook stoves to be available and accessible in their community. However, there may be some room for improvement in terms of addressing concerns around the availability of energy-saving cook stoves and promoting their use, particularly among those who perceive them to be less available.
Focus group discussion and key informant interviews also indicated that energy saving cook stove groups established by different NGOs and GOs created fertile ground to improve availability and access of the stove at relatively reasonable location and affordable price. Therefore, access and availability of the technology don't limit the utilization of the stove. Studies conducted in various parts of the country also affirmed that the promotion and extension and supports of different NGOs and Government office like water, mine and energy bureaus over the last 2 to 3 decades created conducive condition for expansion of the energy saving cook stove (Beyene and Koch, 2013; Eshetu, 2014; Kebeta, 2019; Kassa et al., 2020). However, the adoption and utilization of the technology is not at expected level compared to the effort (Eshetu, 2014; Kassa et al., 2020).

5.2.2. Effect of the access of energy saving cook stoves

Table 5 shows survey households access to energy saving cook stoves. Majority of the survey respondents indicated that they have easy access to energy-saving cook stoves. On average mean value of 3.86 who reported that they agreed have easy access to energy-saving cook stoves with

standard deviation of 0.79 which indicates that there was relatively low variability in the responses, with most respondents agreeing that they have easy access. The access for energy-saving cook stoves in the area was assessed (question #For statement 2) revealed that, on average, most respondent agreed (mean= 4.150) that it is easy to obtain energy-saving cook stoves in their area. The standard deviation value of 0.83 suggests that there was relatively low variability in the responses, with most respondents agreeing that it is easy to obtain them.

The effect of cost on uses of energy saving cook stove was assessed, accordingly majority of respondent reported that they are not sure the effect of cost as on average (mean=2.19) the cost of energy-saving cook stoves not as such a major barrier to accessing the technology. The standard deviation value of 0.96 suggests that there was relatively high variability in the responses, with some respondents strongly agreeing while others may be less certain.

The distance to the nearest energy-saving cook stove supplier/shop was assessed and the assessment revealed that the average perception of respondent was between not sure and agree to the question ‘’the distance to the nearest energy-saving cook stove supplier/shop is a major barrier to accessing’’ with, the mean value of 2.57 which indicates that on average, perceived the distance to the nearest energy-saving cook stove supplier/shop is optimal barrier to accessing the technology. The standard deviation value of 1.00 indicates that there was relatively high variability in the responses, with some respondents strongly agreeing while others may be less certain.

To the question, distance to the nearest energy-saving cook stove supplier/shop is a major barrier to accessing’’ showed that on average majority (mean value = 2.82) respondent’s perceived the lack of transport somehow but not strongly barrier to accessing energy-saving cook stoves. The standard deviation value of 0.81 shows that there was relatively low variability in the responses, with most respondents agreeing that the lack of transport is a major barrier.

Table 5: Effect of access to energy-saving cook stoves

Statements/Questions	N	Mean	Std. Dev.n
I have easy access to energy-saving cook stoves.	196	3.86	0.79
It is easy to obtain energy-saving cook stoves in my area.	196	4.15	0.83
The cost of energy-saving cook stoves is a major barrier to accessing them.	196	2.19	0.96
The distance to the nearest energy-saving cook stove supplier/shop is a major barrier to accessing them.	196	2.57	1.00
The lack of transport is a major barrier to accessing energy-saving cook stoves.	196	2.82	0.81
Average Score	196	3.12	.88
Valid N (listwise)	196		

Source: 2023 field survey

As shown on the above table 5, the overall mean value of 3.12 indicates that on average respondents, had a moderate perception of their access to energy-saving cook stoves. The overall standard deviation value of 0.88 suggests that there was relatively optimal variability in the responses, with most respondents having a similar perception of their access.

In a nutshell, the findings indicate that respondents generally perceive that they had moderate access to energy-saving cook stoves, with most respondents agreeing that they had easy access to them. However, as per the respondent ‘s perception, the cost of energy-saving cook stoves, the distance to the nearest supplier/shop, and the lack of transport have moderate barriers to accessing the technology, indicating that something needs be done to address these barriers and make energy-saving cook stoves more accessible to the community.

5.2.3. Effect of the awareness of energy saving cook stoves

Table 6 presented the sampled respondents’ awareness on the benefits of using energy-saving cook stoves, which show that they agreed that they are aware about its benefit as confirmed by the licker scale measurement with the mean values were 3.92 and standard deviation of 0.80. Almost all respondents agreed to the question ‘’do you know where to get information on in the

benefits of using energy-saving cook stoves?'' with mean and standard deviation values of 4.00 and 0.75 respectively. This shows that respondents knew where to get information on in the benefits of using energy-saving cook stoves. According to the above table 6, the benefits of using energy-saving cook stoves were well advertised in their community as the mean and standard deviation values were 3.58 and 0.91 respectively.

However, the data obtained from table 6 with mean and standard deviation values of 2.15 and 0.68 respectively, indicates that the lack of awareness of the benefits of energy-saving cook stoves was not a major barrier in their community. The study investigated respondents' awareness on the benefits of using energy-saving cook stoves and their sources of information on the topic. The results suggest that the sampled respondents are generally aware of the benefits of using energy-saving cook stoves and know where to get information about them. The findings imply that respondents had a positive perception of the benefits of energy-saving cook stoves and were knowledgeable about where to get information on them.

The study also looked at the level of advertising of the benefits of energy-saving cook stoves in the respondents' community. The results show that the benefits of using energy-saving cook stoves were well advertised in their community, which may have contributed to the respondents' awareness of the benefits. In connection to this, FGDs and KIIs also verified that awareness of the benefits on energy-saving cook stoves was not a major barrier in the study community This suggests that there may be other barriers that slowed the adoption of energy-saving cook stoves in the community that the study did not investigate.

Table 6: Effect of wariness for the benefits on Energy-Saving Cook Stoves

Statements/Questions	**N**	**Mean**	**Std. Dev.n**
I am aware of the benefits of using energy-saving cook stoves.	196	3.92	.80
I know where to get information on the benefits of using energy-saving cook stoves.	196	4.00	.75
The benefits of using energy-saving cook stoves are well advertised in my community.	196	3.58	.91

Statements/Questions	N	Mean	Std. Dev.n
The lack of awareness of the benefits of energy-saving cook stoves is a major barrier to their use in my community.	196	2.15	.68
Average Score	196	3.41	.79
Valid N (listwise)	196		

Source: 2023 field survey

5.2.4. Effect of the cost of energy saving cook stoves

As shown on table 7, majority of the respondents replied that the cost of energy-saving cook stoves was reasonable as the mean and standard deviation values were 4.27 and 0.96 respectively. Similarly the follow-up question also attested the above response the respondents reported that, the cost of energy-saving cook stoves was not a major barrier in their community as the majority respondents remained neutral, i.e., mean value of 2.28 and standard deviation value of 0.74. On the other hand, the mean and standard deviation values of 4.05 and 0.82 respectively for question related to the cost savings associated with using energy-saving cook stoves were a major incentive to their use. The survey also indicates that respondents are willing to pay more for energy-saving cook stoves if they were of higher quality. This is due to the fact that the mean value was 3.58 and standard deviation value was 0.92.

In general, the overall mean value of 3.58 indicates that the cost of energy-saving cook stoves was considered reasonable by the majority of the respondents, and it was not a significant barrier in their community. The cost savings associated with using energy-saving cook stoves were found to be a major reason for their use. The studies show that the respondents are willing to pay more for higher quality energy-saving cook stoves. The findings imply that cost savings and quality were important factors in promoting the use of energy-saving cook stoves.

Table 7: Effect of the cost of energy -saving cook stoves

Statements/Questions	N	Mean	Std. Dev.n
The cost of energy-saving cook stoves is reasonable.	196	4.27	0.96
The cost of energy-saving cook stoves is a major barrier to their use in my community.	196	2.28	0.74

Statements/Questions	N	Mean	Std. Dev.n
The cost savings associated with using energy-saving cook stoves are a major incentive to their use.	196	4.05	0.82
I would be willing to pay more for energy-saving cook stoves if they were of higher quality.	196	3.70	1.15
Average Score	196	3.58	.92
Valid N (listwise)	196		

Source: 2023 field survey

5.2.5. Sociocultural factors on use of energy saving cook stoves

As shown on table 8, social norms and beliefs in their community encouraged the use of energy-saving cook stoves with mean and standard deviation values of 3.92 and 1.08 respectively.

Similarly, majority of respondents agreed that using energy saving cook stoves is seen as a sign of modernity and progress in my community, as the liker scale measurement showed mean and standard deviation values of 4.15 and 0.94 respectively. Thus, the survey revealed that using energy-saving cook stoves was seen as a sign of modernity and progress in their community. The survey also showed that using energy-saving cook stoves was seen as a woman's responsibility in their community as the mean and standard deviation values of 3.87 and 0.76 respectively.

The respondents agreed that they are comfortable with using energy saving cook stoves in front of other people with the licker scale measurement mean and standard deviation values of 3.97 and 0.89 respectively. This indicated that respondents were comfortable with using energy-saving cook stoves in front of other people. The findings the study suggest that social norms and beliefs in the community encourage the use of energy-saving cook stoves, which is seen as a sign of modernity and progress. However, the responsibility for using energy-saving cook stoves is often seen as falling on women. Despite this, the respondents in the study were generally comfortable using energy-saving cook stoves in front of others. Overall, the findings show that social norms and beliefs play an important role in promoting the use of energy-saving cook stoves, but there may be gendered expectations around who is responsible for their use.

Table 8: Socio-cultural factors for using energy-saving cook stove

Statements/Questions	N	Mean	Std. Dev.n
Social norms and beliefs in my community encourage the use of energy-saving cook stoves.	196	3.92	1.08
Using energy-saving cook stoves is seen as a sign of modernity and progress in my community	196	4.15	.94
Using energy-saving cook stoves is seen as a woman's responsibility in my community.	196	3.87	.76
I am comfortable with using energy-saving cook stoves in front of other people.	196	3.97	.89
Average Score	196	3.98	.92
Valid N (listwise)	196		

Source: 2023 field survey

5.2.6. Survey household's agreement on the utilization of energy-saving cook stoves.

As shown on the table 9, the questioner was administered conserving their agreement, i.e., strongly disagree (1), disagree (2), not sure (3), agree (4) and strongly agree (5). The mean responses value for statement 1 which state that '' I use energy-saving cook stoves on a regular basis.'' was 4.02 indicates that respondents, on average, agreed that energy-saving cook stoves are easily available in their area. The standard deviation value of the same statement (SD=1.221) indicates that there was some variability in the responses, with some respondents strongly agreeing while others may be less certain. Based on the data obtained from the table, mean value (Mean=3.93) for statement asking the supply compared to the actual demand indicates that, on average, the respondents agreed that I would recommend the use of energy-saving cook stoves to others. The standard deviation value was (1.297, this) suggests that some variability in the responses, with some respondents strongly agreeing while others may be less certain.

Table 9: Survey household's agreement on the utilization of energy-saving cook stoves

Statements/Questions	N	Mean	Std. Dev.n
I use energy-saving cook stoves on a regular basis.	196	4.03	1.221
I would recommend the use of energy-saving cook stoves to others.	196	3.93	1.297

Statements/Questions	N	Mean	Std. Dev.n
I believe that using energy-saving cook stoves has had a positive impact on my daily life.	196	4.01	1.251
I believe that using energy-saving cook stoves has had a positive impact on the social status.	196	3.81	1.181
I believe that using energy-saving cook stoves has had a positive impact on my family's income.	196	3.83	1.285
I believe that using energy-saving cook stoves has reduced my monthly cooking expenses.	196	3.69	1.288
Valid N (listwise)	196		

Source: 2023 field survey

The response to question concerning 3, i.e. ‘’ I believe that using energy-saving cook stoves has had a positive impact on my daily life. ” high most respondents agrees as there are shops at nearby as verified by the mean value of 4.01 indicates that on average, Most of them agreed that believe that using energy-saving cook stoves has had a positive impact on my daily life with standard deviation value of 1.251showed that there was relatively low variability in the responses, with most respondents agreeing that it was easy to find a shop. The response to question 4, ‘I believe that using energy-saving cook stoves has had a positive impact on the social status.” where the mean value of the response was 3.81, shows that respondents, on average, agreed that believe that using energy-saving cook stoves has had a positive impact on the social status. The standard deviation of the response 1.181 suggests that there is relatively low variability in the responses, with most respondents agreeing that positive impact on the social status.

The response to question 5, ‘I believe that using energy-saving cook stoves has had a positive impact on my family's income.” where the mean value of the response was 3.83, shows that respondents, on average, agreed that believe that using energy-saving cook stoves has had a positive impact on my family's income. The standard deviation of the response 1.285 suggests that there is relatively low variability in the responses, with most respondents agreeing that positive impact on my family's income. The question stating “I believe that using energy-saving cook stoves has reduced my monthly cooking expenses.” nearly question stating “believe that

using energy-saving cook stoves has reduced my monthly cooking expenses'' nearly agreed the mean value for statement was (3.69) this indicates that on average, agreed using energy-saving cook stoves has reduced my monthly cooking expenses. The standard deviation value of 1.288 suggests that there was relatively high variability in the responses; with some respondents strongly agree while others may feel that availability is a major barrier.

As shown in the table, the overall mean value of the licker scale was 3.66 indicates that on average, the respondent's had a moderate perception of the availability of energy-saving cook stoves. The overall standard deviation value of 1.00 suggests that there was a relatively high degree of variability in the responses, with some respondents perceiving energy-saving cook stoves to be widely available while others may perceive them to be less available. The findings indicate that respondents generally energy-saving cook stoves and promoting their Utilizations positive impact on the daily life, social status and family's income in their community.

5.3. Economic role of energy saving stove

Pearson's correlation coefficient was applied to calculate the change on the availability energy saving cook stoves and its benefit on socio-economic sector over the study area. Accordingly, as it has indicated in Table 10 the Pearson correlation depicts that [r=0.681], this shows that and availability of energy saving cook stoves have a great contribution to the economic benefit of the study area. Moreover, the correlation also indicates that the energy saving cook stoves are very vital for the community over study area because energy saving stoves may reduce cooking time and it is environmentally friendly. Moreover, to explore the awareness of the improved energy saving cook stoves among the respondents, a questionnaire was posted to them asking whether they had heard of the improved energy saving cook stove. The respondents know about the improved energy saving cook stove while only responded to lack information about the new technology (Table 10). From the findings over the study area it can be deduced that majority of the residents of the study area are aware of the existence of energy saving cook stoves and this could be a reason for its adoption [r=0.651] and some of the household's economy is dependent on the cook stove production. To find out whether cultural beliefs and household practices affected the adoption of the improved cook stoves, a question was asked if cultural beliefs and practices had an influence on adoption of energy saving cook stove. The results show that

cultural believes and household practices do not affect the adoption of the improved cook stoves (Table 10)

Table 10: Correlation Statistics for Economic and Social Benefit Variables

Economic and Social Benefit Variables		**Economic and Social Benefit**
Availability of Energy-Saving Cook Stoves	Pearson Correlation	.681**
	Sig. (2-tailed)	0.000
	N	196
Access to Energy-Saving Cook Stoves	Pearson Correlation	.518**
	Sig. (2-tailed)	.000
	N	196
Awareness of the Benefits of Energy-Saving Cook Stoves	Pearson Correlation	.651**
	Sig. (2-tailed)	.000
	N	196
Cost of Energy-Saving Cook Stoves	Pearson Correlation	.685**
	Sig. (2-tailed)	.000
	N	196
Socio-Cultural Factors	Pearson Correlation	.521**
	Sig. (2-tailed)	.000
	N	196

Source: 2023 field survey

CHAPTER FIVE

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Based on the objectives of the research and the summary of findings, the following conclusions and recommendations can be made: The study has revealed that energy-saving cook stoves are generally perceived as being available and accessible in the community, with cost savings and quality being major incentives for their use. The findings of the study revealed that energy-saving cook stoves are generally perceived to be available and accessible in the community, but there is room for improvement in promoting their use, particularly among those who perceive them to be less available. The cost of energy-saving cook stoves, the distance to the nearest supplier or shop, and the lack of transport were not perceived as major barriers to accessing them. The study found that awareness of the benefits of using energy-saving cook stoves was not a significant barrier in the community, but there may be other barriers to their adoption that the study did not investigate. The cost savings associated with using energy-saving cook stoves were found to be a major incentive for their use, and quality was also an important factor. Social norms and beliefs in the community were found to encourage the use of energy-saving cook stoves, but there may be gendered expectations around who is responsible for their use.

The results of the study revealed that using energy-saving cook stoves has a positive impact on respondents' daily lives, family income, and monthly cooking expenses. This suggests that promoting awareness and addressing gendered expectations could further enhance the adoption of these stoves in the community. Additionally, the study highlighted the need for targeted interventions to increase accessibility and affordability of energy-saving cook stoves, particularly for marginalized groups. By addressing these barriers and fostering a supportive environment, communities can collectively contribute to reducing energy consumption and mitigating the impact of climate change. Furthermore, it is crucial to recognize that sustainable behavior change requires continuous education and engagement with community members. Therefore, ongoing efforts should focus on empowering individuals with knowledge about the benefits of energy-saving cook stoves while challenging gendered stereotypes and promoting equal responsibility for their use among all household members. Ultimately, by integrating these findings into policy-making and community development initiatives, we can foster a more sustainable future for all

and costs, and socio-cultural factors such as social norms and beliefs, have a moderately positive relationship with the economic and social benefits of using energy-saving cook stoves. The stepwise regression analysis revealed that all variables slightly influence the economic and social benefits of using energy-saving cook stoves.

The study also found that using energy-saving cook stoves has a positive impact on daily lives, family income, and monthly cooking expenses. In addition, all independent variables, including availability and accessibility, awareness of benefits, cost, and socio-cultural factors, have a moderately positive relationship with the economic and social benefits of using energy-saving cook stoves. This suggests that there is room for improvement in promoting the use of energy-saving cook stoves, particularly among those who perceive them to be less available.

6.2. Recommendations

The researcher came up with the following recommendations taking into account the findings of the study and conclusions made.

- Interventions should be designed to increase awareness and promote the use of energy-saving cook stoves, particularly among those who perceive them to be less available.
- Efforts should be made to ensure that energy-saving cook stoves are affordable and of good quality Government, Non -Government and Community Leaders.
- Programs should be implemented to encourage the adoption of energy-saving cook stoves, highlighting their economic benefits and emphasizing the positive impact they can have on families' daily lives and monthly cooking expenses.
- Socio-cultural factors such as social norms and beliefs should be taken into consideration when designing interventions to promote the use of energy-saving cook stoves.
- Further research should be conducted to investigate other potential barriers to the adoption of energy-saving cook stoves that were not explored in this study.

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Annexe

Annexe I: Survey Questionnaire

Addis Ababa University

College of Development Studies

Center for Environmental & Sustainable Development

Dear Participant,

I am a student in the post graduate program of Addis Ababa University, College of Development Studies, Center for Environmental & Sustainable Development.

This questionnaire is designed to assess the Role of Energy Saving Cook Stoves for Women Economic Benefits, in the case of Dessie Town". Completion of the questionnaire is completely voluntary. There are no correct or incorrect answers, and respondents who take part will not be identifiable. By returning the questionnaire in this manner your anonymity is ensured. Returning this questionnaire will be considered as your consent to participate in the survey. The study is to be conducted in partial fulfillment of the requirements of the Degree of Master of Environment and Sustainable Development. Please answer all questions. The information obtained through the questionnaire will be treated as confidential and will only be used strictly for academic purposes. Your participation will be highly appreciated.

Thank you in advance for all your cooperation and kind consideration.

Best regards,

Aberash Wedaj

Part I: General Profile of Respondents

1. Age (in years):- _____
2. Marital status: - 1. Single □ 2. Married □ 3. Divorced □
3. Literacy Level:
   1. Literate (can read and write) □ 2. Illiterate (cannot read and write) □
4. How long have you been using energy saving cook stoves?
   1. Less than 1 year □ 2. From 2 to 5 years □ 3. From 6 to 10 years □
   4. From 11 to 15 years □ 5. Above 15 years □
5. Total number of household members in your family (family size)?

a. 1-3 □ b) 4 -5 □ c) 6 – 10 □ d) More than 10 □

Part II: Please indicate your level of agreement on the availability of energy-saving cook stoves, access to energy-saving cook stoves, awareness of the benefits of energy-saving cook stoves, cost of energy-saving cook stoves, and socio-cultural factors.

Rate the following statements by putting a tick mark "√" where,

1=Strongly Disagree, 2=Disagree, 3=Not sure, 4=Agree, 5= Strongly Agree

S/N	Statement/Questions	5	4	3	2	1
I.	**Availability of Energy-Saving Cook Stoves**					
1	Energy-saving cook stoves are easily available in my area.					
2	There are enough energy-saving cook stoves in my area to meet the demand.					
3	It is easy to find a shop that sells energy-saving cook stoves in my area.					
4	Local authorities provide enough support to promote the use of energy-saving cook stoves.					
5	The availability of energy-saving cook stoves is a major barrier to their use in my community.					
II.	**Access to Energy-Saving Cook Stoves**					
1	I have easy access to energy-saving cook stoves.					
2	It is easy to obtain energy-saving cook stoves in my area.					
3	The cost of energy-saving cook stoves is a major barrier to accessing them.					
4	The distance to the nearest energy-saving cook stove supplier/shop is a major barrier to accessing them.					
5	The lack of transport is a major barrier to accessing energy-saving cook stoves.					
III.	**Awareness of the Benefits of Energy-Saving Cook Stoves**					
1	I am aware of the benefits of using energy-saving cook stoves.					
2	I know where to get information on the benefits of using energy-saving cook stoves.					

3	The benefits of using energy-saving cook stoves are well advertised in my community.					
4	The lack of awareness of the benefits of energy-saving cook stoves is a major barrier to their use in my community.					
IV	**Cost of Energy-Saving Cook Stoves**					
1	The cost of energy-saving cook stoves is reasonable.					
2	The cost of energy-saving cook stoves is a major barrier to their use in my community.					
3	The cost savings associated with using energy-saving cook stoves are a major incentive to their use.					
4	I would be willing to pay more for energy-saving cook stoves if they were of higher quality.					
V	**Socio-Cultural Factors**					
1	Social norms and beliefs in my community encourage the use of energy-saving cook stoves.					
2	Using energy-saving cook stoves is seen as a sign of modernity and progress in my community.					
3	Using energy-saving cook stoves is seen as a woman's responsibility in my community.					
4	I am comfortable with using energy-saving cook stoves in front of other people.					

Part II: Please indicate your level of agreement on the utilization of energy-saving cook stoves.

Rate the following statements by putting a tick mark "√" where,

1=Strongly Disagree, 2=Disagree, 3=Not sure, 4=Agree, 5= Strongly Agree

S/N	Statement/Questions	5	4	3		1
I	**Utilization of Energy-Saving Cook Stoves**					
1	I use energy-saving cook stoves on a regular basis.					
2	I would recommend the use of energy-saving cook stoves to					

	others.					
3	I believe that using energy-saving cook stoves has had a positive impact on my daily life.					
4	I believe that using energy-saving cook stoves has had a positive impact on my family's income.					
5	I believe that using energy-saving cook stoves has had a positive impact on the social status.					
6	I believe that using energy-saving cook stoves has reduced my monthly cooking expenses.					

Thank You!