VAN HALL LARENSTEIN UNIVERSITY OF APPLIED SCIENCES.

The Effects of Adopting Improved Wood Stoves on the Welfare of Rural Women: A case of Kibaha District in Tanzania

---

A research Project Submitted to the Van Hall Larenstein University of Applied Sciences in Partial Fulfilment of the Requirements for the Masters Degree in Management of Development with Specialization in Rural Development and Gender

By
Neatness Stanley Bwenge
September, 2011

Van Hall Larenstein University of Applied Sciences

Netherlands

Permission to Use

In handing over this research study in partial fulfilment of the requirement for a Master degree, I agree that the library of this university may make it freely available for inspection. I further agree that permission for copying of this research project in any manner, in whole or in part, for scholarship purposes may be granted by Larenstein Director of Research. It is understood that any copying or publication or use of this research project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University in any scholarly use which may be made of any material in my research project. Requests for permission is copy or to make other use of material in this research project is whole or part should be addressed to:

Van Hall Larenstein University of Applied Sciencies
6708 PB, Wageningen
Postbus 441
Tel: 0031 317 486 262
Fax: 0031 371 486 280
Email: info@van hall-larenstein.com

Acknowledgement

I would like to express my gratitude to the institutions and people who made my field and thesis work a great success. I extend my profound appreciation to Larenstein University administration and academic staff for the invaluable knowledge imparted on me.

My thanks also extend to the Dutch government for awarding me a fellowship under (NUFFIC) without whose financial assistance and support it would have been impossible to study in the Netherlands and conduct my research in Tanzania.

My heart-felt vote of thanks goes to my supervisor, Marcel Put because of your inspiration and valuable comments, suggestions and guidance you made this thesis possible today.

I am sincerely grateful to my course coordinator Annemarie Westendorp. Throughout the course she was much of effort in teaching, guiding and advising me through the concepts gender and development. As a shoulder to lay on she has being that shoulder and as a mother to me, may God bless the work of your hands.

I would also like to thank TaTEDO as an organization I worked for, specifically the Executive Director and all staff for all the support I received from them since the day I expressed my ambition to study in the Netherlands

Specifically, I want to say thank-you my dear husband Alex Magere, who endured a long year of baby-sitting for our beloved Noela. To give me time for my graduate work. His encouragement, moral support and patience throughout my studying were the preconditions for all my efforts and achievements.

I thank my mother, father, sisters and brothers for their prayers before and during my studies in the Netherlands.

I am grateful to all RDG participants and the other MOD and APCM students for their support, encouragement during the study and cheerful moments we spent together. May God reward you all.

Most importantly, I thank God for letting me through the all period of my Master Programme in Van Hall Larenstein University.

It is difficult to mention each and everyone who supported me in this quest, in one way or another, but these few words are a token of my sincere gratitude to all of you.

Table of Contents

List of figures

List of Tables

Acronyms

CBOs	Community-based Organizations
CO	Carbon Monoxide
EAC	East African Community
GHG	Greenhouse Gases
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MoU	Memorandum of Understanding
NBS	National Bureau of Statistics
NGOs	Non-governmental Organizations
NO	Nitrogen Oxide
NSGRP	National Strategy for Growth and Reduction of Poverty
SME	Small and Medium Enterprise
TaTEDO	Tanzania Traditional Energy Development Organization
Tshs	Tanzania Shillings (currency)
UN	United Nations
UNDP	United Nations Development Program
URT	United Republic of Tanzania
VICOBA	Village Community Bank
WEO	World Energy Organization
WHO	World Health Organization

Abstract

The adoption and continued use of improved stoves in the developing countries is of social, economic and environmental concern. It is estimates that, two billion people from developing countries still depend on traditional biomass such as wood, dung and crop residues for cooking and heating. However, the use of biomass fuels is dominated by traditional technologies which have negative impact to the social – economic well-being of the household, especially to women who expend large amount of their time and physical efforts to supply fuel wood for the household. Recent studies are increasingly showing that, the household indoor air pollution from the use of inefficient biomass stoves would lead to over 1.5 million premature death per year, over 4000 per day, by 2030.

The dissemination of improved stoves in Tanzania like many other developing countries is therefore, perceived as instrumental in the efforts to combat the negative effects related to the use of traditional biomass stoves. The overall aim of this study was to contribute to the improvement of TaTEDO project by providing recommendations on the how the stove project can improve the welfare of rural women, so that the interventions can be replicated to other districts where women lack access to clean cooking energy

Drawing on field work a case study strategy was employed to study the effects of adopting improved wood stoves on the welfare of rural women in Kibaha district, Tanzania. The study is based on primary data collected from 26 randomly selected stove users and 4 key informants. The respondents were interviewed using a topic list. At the field level the study finds that; the improved wood stove project had contributed to the reduced fire wood consumption, reduced women's work load, smoke emissions and improved the incomes of stove users and artisans. The study concludes that, the improved wood stove project have substantially improved the welfare of rural women in Kibaha district, although it would have done better if the community, TaTEDO, local government authorities and community based organization would had put efforts together to promote improved wood stoves to the majority of the population. However, the study recommends: TaTEDO should put more emphasis on research prior to deployment of any stove project, consider to mainstream gender issues for the purpose of sustainability of the project and make effective use of the already recruited help of community based organisation. The results from this study will be a useful contribution for TaTEDO, researchers, policy makers, NGOs and groups involved in promoting renewable energy technologies.

Keywords: Welfare, indoor air pollution, improved stoves, firewood, TaTEDO

1.0 CHAPTER ONE: INTRODUCTION

This chapter is made up by background information of the research, problem statement, objective, research questions, the situation of energy sector and initiatives for promoting improved wood stoves in Tanzania.

1.1 Background

Promoting sustainable use of biomass by encouraging more efficient use of fuel wood is pointed out as one of the prerequisites to halving poverty by 2015 (United Nations, 2002). Today biomass fuel represents the most important renewable primary energy source which contributes to about 14 per cent of world's total energy demand, despite of being a global scientific and political agenda for many years (Offermann*et al.,* 2010). The world's dependence on biomass fuel has become one of the major anthropogenic causes of deforestation worldwide (UEA&E.S.R.C, 2011). World Bank (2010) estimates that, two billion people from developing countries still depend on traditional biomass such as wood, dung and crop residues for cooking and heating. The number is projected to rise from 2.7 billion today to 2.8 billion in 2030 (WEO, 2010). However, the use of biomass fuels is dominated by traditional technologies which have negative impact to the social – economic well-being of the household, especially to women who expend large amount of their time and physical efforts to supply fuel wood for the household. As a result they have fewer opportunities to pursue income generating activities (UNDP, 2000).

Households of rural areas in developing countries highly depend on firewood as the main source of cooking energy; this dependence exposed women who are mostly responsible for cooking to the hazardous gases emitted from wood burning, which causes serious respiratory infection (Kanagawa & Nakata, 2007). Moreover, World Energy Outlook (2010) estimates shows that, the household indoor air pollution from the use of inefficient biomass stoves would lead to over 1.5 million premature death per year, over 4000 per day, by 2030.

The East African Community (AEC) recognises the energy access gaps among East African Countries (Tanzania, Kenya, Rwanda, Uganda and Burundi). Currently 81 % of East African population lack of access to modern energy services thus poses a challenge to achieve the Millennium Development Goals by 2015 (EAC, 2007).

1.2 The Situation of the Energy Sector in Tanzania

Tanzania is endowed with substantial energy resources such as biomass, hydro, wind, natural gas, solar and coal. Biomass fuels from both natural forests and plantations account for more than 95.8 per cent of total energy consumption in the country mainly for cooking, heating and lighting. Like many other developing countries, the production and use of biomass fuel in the country is also dominated by traditional technologies which have negative consequences to the environment and the quality of life (TaTEDO, 2010). It has been established that most poor people use biomass as their source of energy and in many areas there is an increasingly shortage in supply, which adds more burden to women who are responsible for household cooking energy management(Clancy et al., 2002). Hence, women spent more time in fire wood collection, as well as exposed to indoor air pollution which causes eye and respiratory infections. On contrary, the accessibility to modern commercial energy such as fossil fuels and grid electricity is not widely available to the majority of Tanzanians (URT, 2002)

1.3 Initiatives for Promoting Improved Cook Stoves in Tanzania

There have been attempts by the government, local and international NGOs, and donor agencies to try and remedy the energy situation in the country. These initiatives towards developing and disseminating improved wood stoves started in the late 1980's through developed programmes and projects (Makame, 2007). At international level the country is committed to the implementation of Millennium Development Goals (MDG) by reducing poverty, hunger, diseases, gender inequality and environmental degradation by 2015., At the national lever the country is striving to alleviate poverty through the National Strategy for Growth and Reduction of Poverty 2005 frame work. The NSGRP mentioned energy as an important factor for achieving social economic development of the country (URT, 2005).

The 1992 Energy Policy document (reviewed in 2003) recognizes biomass as the main energy source for the majority of the country's population and added that, inferior energy services among poor households in rural and semi-urban areas mainly affect women. Moreover, the policy associates time consuming work in wood collection, exposure to health hazards through smoke emission by application of traditional biomass technologies. The document sets nine overall goals among which was to arrest wood fuel depletion by evolving more appropriate land management practices and more efficient wood fuel technologies (URT, 2003)

Thirteen years after the energy policy document was published, neither the goals nor the strategies stipulated in the document were anywhere close to being reached (NSGRP, 2005) (reference needed). In 2005 the government in collaboration with the donor community launched the National Strategy for Growth and Reduction of Poverty (NSGRP). NSGRP just like the documents that preceded it identifies access to reliable energy as the engine of economic growth. It also goes further to stipulate how unreliable and high-cost energy has undermined the country's efforts to reach the Millennium Development Goals (MDGs). The document points out that, "to achieve the MDGs access to reliable energy is a prerequisite" (NSGRP, 2005, p.8). A highly ambitious target is set to reduce the proportion of rural and urban "population depending on biomass energy for cooking from 90 percent in 2003 to 80 percent in 2010" (ibid: p.41).

1.4 Tanzania Traditional Energy Development Organization

Tanzania Traditional Energy Development Organization (TaTEDO) is a non-governmental organization established in 1990, with the mission of improving access to modern energy technologies to the rural and urban areas of Tanzania. The organization works with the government, CBOs, local and international NGOs and donors in up-scaling access to sustainable modern energy technologies and services. Currently, their activities cover 19 districts in eight regions in mainland Tanzania. The organization was established as an initiative to support government policy and contributes to the on-going countries and global efforts of achieving MDGs, the National Energy Policy (2003) and the National Strategy for Growth and Reduction of Poverty (TaTEDO, 2009). According to TaTEDO (2010) the problem associated with inefficient production and utilization of wood fuels in Tanzania includes: increased women burden on firewood collection, indoor air pollution from greenhouse gas emissions (GHGs), the destruction of land through deforestation, desertification, loss of generic resources, and soil erosion to mention some.

1.5 Problem Statement

To solve the problem caused by inefficient stove technologies in developing countries the introduction of improved cook stoves has been put into action. Proponents of improved wood stoves technologies claim that improved stoves offer social, environmental and economic benefits (Barnes et al., 1994). Also, improved stoves are said to reduce indoor air pollution and hence reduce the risk of eyes and respiratory problems to women and children who spend most of their time in the kitchen (WHO, 2005). In Tanzania, for more than twenty years TaTEDO has been implementing programmes and projects on improved cook stoves for poverty reduction and environment conservation. However, little is known on the effects of improved wood stoves on improving the welfare of rural women in Tanzania. This is particularly important because traditionally, cooking is exclusively done by women and cooking along with responsibility for other family members occupies a major portion (51–54%) of a women's daily life (Chowdhuryet al.2011:p89). In doing so, the rural women play a significant role in procuring and processing fuel for domestic energy consumption. This calls for the need of further research that would explore the effects of improved wood stoves on rural women's welfare.

1.6 Research Objective

To contribute to the improvement of TaTEDO project by providing recommendations on the how the stove project can improve the welfare of rural women, so that the interventions can be replicated to other districts where women lack access to clean cooking energy

1.7 Research Question

To what extent has the implementation of improved wood stove project been successful in improving the welfare of rural women of kibaha district?

1.7.1 Sub Research Questions

a) To what extent does the adoption of improved wood stoves has influenced the income of rural women of Kibaha District?
b) To what extent does the adoption of improved wood stoves has influenced eye and respiratory infections among rural women of Kibaha district?
c) To what extent does the adoption of improved wood stoves has influenced the work load of rural women of Kibaha District?
d) What are the characteristics of the improved stove project?

CHAPTER TWO

2.0 Literature Review

The purpose of this chapter is to review several studies related to key concepts of the research topic. Specifically, the chapter will give an overview on rural women welfare, improved cook stoves and later will explore the effects of improved cook stoves to rural women and the experiences of the projects that introduces improved stoves.

2.1 Overview of Key Concepts

2.1.1 Rural Women Welfare

From a feminist sociological perspective Subramanian (2000) defines welfare service to include development interventions targeted at disadvantaged groups. He further attributes the role of welfare state in relation to reduced women work load through design and dissemination of improved models of wood fired stoves to the rural areas

Ahmed et al.,(2009) mentioned income as an important dimension for accelerating human welfare, in which improved living standard, health, social and political development can be attained through.

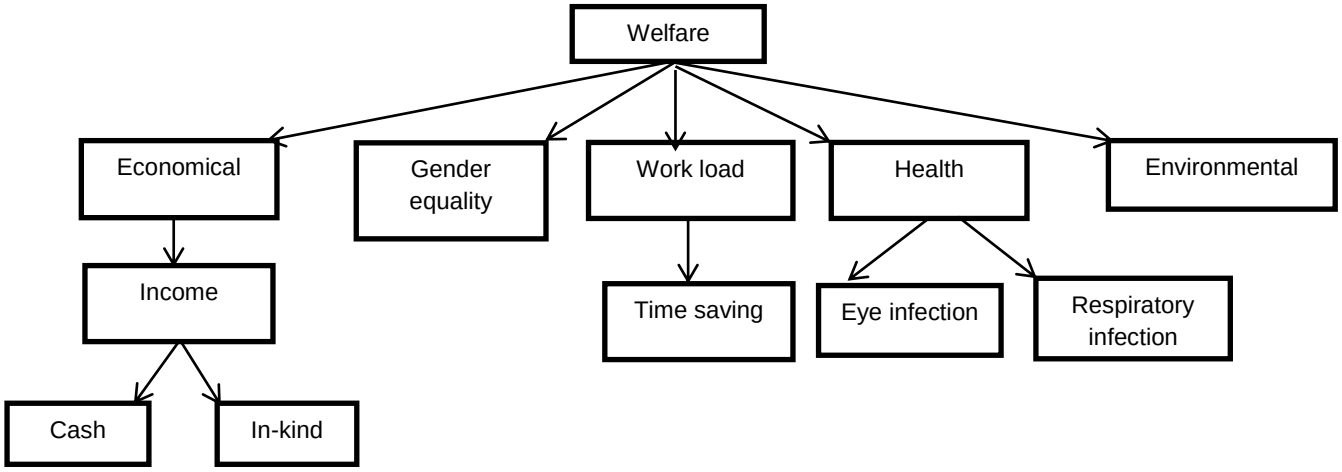
URT (2003), defined welfare in relation to increased access to improved energy services in rural areas, that will facilitate the sustainable economic growth.

Adedayo et al., (2010:439-450) defined welfare to mean the state of well-being, in terms of health, nutrition, income, happiness and safety of the household.

The study done by TaTEDO (2004) before commencement of the project revealed that, the adoption of improved cook stoves among rural and urban households may contribute to improved welfare through ; income generation and employment opportunities for small and medium enterprises operated by women promotes gender equality by reducing women work load for collecting fire wood, improved women heath due to improved burning process of biomass fuels hence, reduces emissions of harmful gases and saves time of women and children for collecting and transporting fire wood

Although, the concept of welfare has been defined differently by different authors as presented above, for the purpose of this study it is understood that improved well-being of rural women is related to; income (cash), health, gender equality, work load and time saving, as presented in figure 1 below. However, the study will not consider environmental issues.

Figure 1: Un-revelling of welfare concept



Source: Own source

2.1.2 Gender Equality

According to IPPF (2011), Gender equality does not imply that women and men are the same, but that they have equal value and should be accorded equal treatment

UNFPA (2011), defined gender equality is, first and foremost, a human right. Women are entitled to live in dignity and in freedom from want and from fear. Empowering women is also an indispensable tool for advancing development and reducing poverty.

TaTEDO (2004), indicated gender equality as one of welfare, therefore this study would study want to find out to what extent does the improved wood stoves has influenced the decision making powers in the household

2.2 Effects of Improved Cook Stoves to Rural Women

Ergeneman(2003), associates improved cook stoves to the internal and external benefits they offer to the household and community consecutively. The internal benefits includes; reduced concentrations of smoke and indoor air pollution; money and time saved in acquiring fuel; and reduced biomass use. The external benefits include: less pressure on forest and energy resources; reduced greenhouse gases; and skill development and job creation in the community

Ezzati et al., (2000:p 578) relates improved cook stoves concept to the aspects of improved public health from the exposure of indoor smokes and reduction on wood fuel consumption and thus deforestation.

Household Energy Network, (2010) relates the concept of improved cook stoves to the aspects of time saving in cooking (increasing efficiency), as well as, to creating a smokeless environment in the kitchen.

Kanagawa & Nakata, (2006) revealed that, in developing countries women are traditionally responsible for cooking, the dependence of rural households on inefficient cook stoves has exposed women to high concentration of hazardous pollutants such as Nitrogen oxide (NO) and carbon monoxide (CO) which results into serious respiratory and eye diseases to women. Hence, promoting women's access to efficient cooking stoves would improve women's health, save money and time spent for collected wood fuel

World Bank (2010) study on "Improved Cook stoves and Better Health in Bangladesh" shows that, although the country has made significant achievement towards attaining the Millennium Development Goals, which include a two-thirds reduction in infant and child mortality by 2015, indoor air pollution from traditional cook stoves still remains a major concern for 25 million households, despite a number of initiatives aimed at addressing it. Also, WHO (2007) estimates that as much as 3.6 per cent of the total burden of disease in Bangladesh is attributable to exposure to indoor air pollution; 32,000 children below 5 years of age die annually due to acute lower respiratory infections, and 14,000 adults die due to chronic obstructive pulmonary disease.

The introduction of improved cook stoves can do more than reducing kitchen air pollution, they also, reduce the work load of women and children on fuel collection, hence it gives more tome for women to engage in productive activities especially income generating activities (Republic of Kenya, 2010) However, reduced time for fire wood collection give more time for education of rural children especially girl child (Panwar et al., 2009)

Robinson&Lokina(2010: p 79-85) find out that, like in many other economic poor countries, many rural villagers in Tanzania depends on Non-timber forest products (NTFP) such as fire wood, vegetables, forest fruits and forest medicinal plants, hence forest resources plays a significant role to the rural livelihood, income generation and consumption.

The Women in Development Policy (2000), supports the contribution of energy inputs in accelerating women development, among the strategies developed in the policy for reducing women works load with regards to wood-fuel is to promote and encourage use of low-cost and renewable energy technologies, such as biogas, electricity, together coupled with use of firewood and charcoal saving stoves in rural areas, would reduce the additional daily workload of women for fetching firewood (URT, 2000).

World Bank (2011), denotes that, there is mounting evidence showing that inefficient burning of biomass fuels contributes to climate change effects at the national and global level, however the replacing of traditional stoves to improved cook stoves or switching to liquefied petroleum gas (LPG) is only affordable by high income households of urban areas
Moreover, lack of standards and quality control, short term financing, and supply driven approach in the past, has been associated with failure to the implementation of improved cook stoves in most of the developing countries (World Bank, 2011)

Makame (2007: p 246) found that, improved charcoal stoves are believed as real option for reducing charcoal consumption in urban areas, and thus reducing the rate of deforestation. The rate can be reduces only when the stoves are adopted and consistently used by the majority of

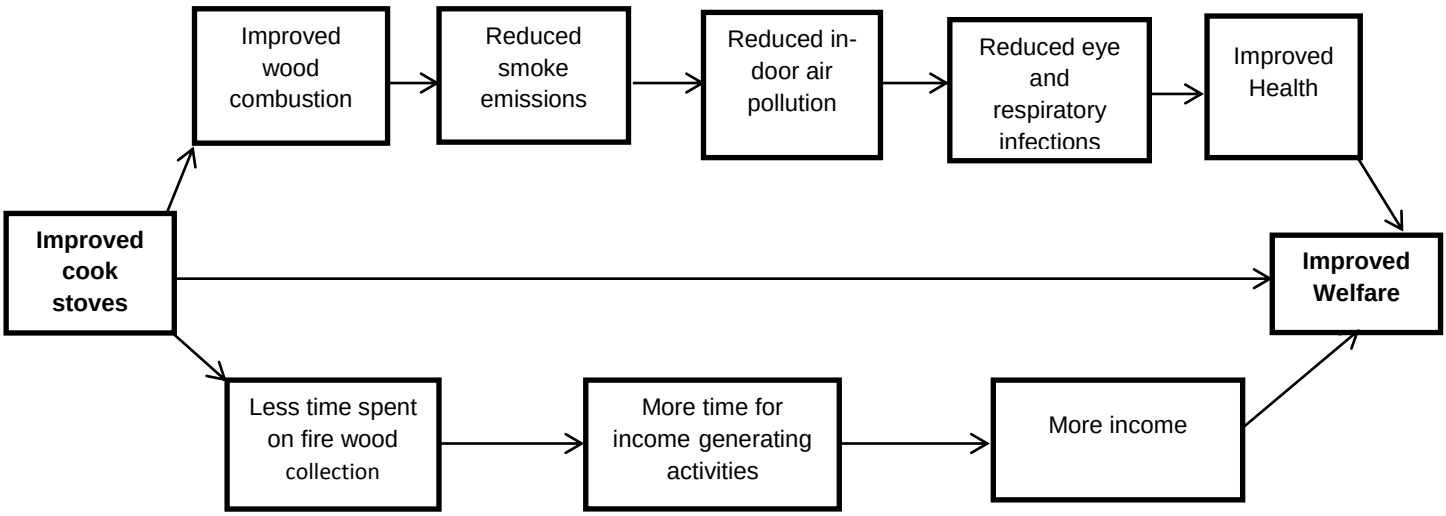
the urban population. However, the adoption can be affected by; lack of information and education about the benefits of the stove, poor stove quality and costs.

Another study done by (Wold Bank,2009: p292) shows that, the use of traditional open fires has increased the time spent for fire wood collection by rural women in terms of cutting, travel , carrying , preparation of fuel for burning and use, hence it prevent women from engaging more fully in other tasks. However, the uptake of improved stoves requires that women have control of their own sources of income

Sohel et al., (2010) shows that, the introduction of improved cook stove in Bangladesh has reduced the dependence of people on forest, by reducing the amount of fuel wood required to meet the household cooking energy needs. 79% of improved stove users consume approximately 3 kg per day, in contrast to 74% of the traditional cooking stove users said to consume about 10 kg of fuel wood per day.

This study will adopt the definition given by Ergeneman (2003), who defined improved wood stoves in relation to the internal and external benefits they offer to the user. Also, the benefit entails some coloration with the concept of welfare presented earlier in this chapter. However, the study will consider only the internal benefits including to include; reduction in fuel wood consumption, reduced smoke in the kitchen and time saving.

Figure 2: Causal diagram



Source: Own source

Figure 2 above, represent the cause and effect relationship between improved wood stoves and welfare, as per various studies and arguments presented in the above discussions.

CHAPTER THREE

3.0 Methodological Considerations

This chapter presents a systematic representation of the research objective which includes steps that were taken in order to achieve the research objective. The chapter starts with a presenting the research design, followed by sampling techniques used to acquire the study population. Also, the chapter describes the process of data collection and analysis. Methodological strengths and limitations will be discussed later, in order to reveal any possible drawbacks and effectiveness that, the researcher encountered and their implication to the results presented in chapter four. Finally, the chapter ends by discussing ethical issues encountered during data collection.

3.2 Research Design

This study used both qualitative and quantitative approach based on empirical data collection from the field. The qualitative party of the research was meant for respondents themselves to make sense of, or interpret the effects of adopting improved wood stoves on their welfare, as Creswell (2007, p40) pointed out that "This detail can only be established by talking directly with people, going to their homes or places of work and allowing them to tell the stories imaginative by what we expect to find or what we have read from the literature".

For the purpose of contributing to the existing body of knowledge, the research involved the review of literature from books, journal articles and internet searching. Among others, the literature review was done for two main purposes; first, to reveal detailed information from different authors about the effects of adopting improved wood stoves on rural women's and to justify the problem of lack of knowledge about the topic. Proper citation were taken from literatures as references and back up evidence to support the chapter on literature review, and later was used to verify the field work findings in chapter four.

Also, a case study strategy was employed to gather empirical data from the field. This strategy was selected based on its potential ability of providing in-depth information on the subject matter (Verschuren & Doorewaard, 2010). In order to reveal the in-depth information from respondents, the method constituted by a topic list, which was used as a guide during the discussions. A selected sample of 30 respondents was divided into two groups; 26 stove users and 4 key informants. This selection was done in order to acquire, the views of both the project beneficiaries and the implementers.

Before, starting data collection, with the company of TaTEDO partner of Kibaha district, the researcher visited the village government offices of Msangani and Kipangege, and made a self-introduction together with the purpose of doing the research. After a short discussion with the village leaders, the researcher was given a go ahead to proceed with data collection process. This was the only formal arrangement which permit a new person to acquire information from villagers.

Visits to the identified respondents were accompanied by TaTEDO partner. The partner was responsible to take the research to the respondents and introduce the researcher to the respondents. Then, the researcher was given an opportunity to explain the intention of the visit and the result of the information to be collected. After each introduction the TaTEDO partner

left the researcher and the respondent to proceed with the discussion. In all household which were visited, the researcher received a warmly welcome from the respondents, this was attributed by the company of TaTEDO partner who was claimed to visit these household often for the purpose of mobilizing people to adopt improved wood stoves. However, in all households visited, only women were involved in cooking activities.

The improved stove users as respondents were asked to provide information about the effects of adopting improved wood stoves on their welfare as the main beneficiary in which the project was built upon. Again from the key informants (TaTEDO and village leaders) were in good position of giving their views on the subject matter with regard to their position in the implementation process.

3.3 Sampling Selection

3.3.1 Village Selection

Data were collected from Msangani and Kipangege villages of Kibaha district. The two villages were purposely selected based on the criteria that, these two villages were directly involved in the implementation of improved wood stove project. Also, the two villages are surrounded by a reserved forest, of which the government of Tanzania announces a total burn on harvesting forest products, including fire wood (URT, 2007). Therefore, the implementation of improved wood stoves in these villages was sought to provide relief to women, who are traditionally responsible for fire wood collection.

3.3.2 Selection of Stove Users

The study involved a total of twenty six women stove users. The respondents were selected from the two villages (i.e. thirteen women each village). The respondents were divided into two groups; the first group consisted of twenty respondents, ten respondents from each village), this group was involved in a semi-structured interview. The second group comprised of six respondents (i.e 3 women each village) were involved in a focus group discussion. All the respondents were randomly selected amongst users of improved wood stoves. Whereby, names of all people who adopted improved stoves were written down on small pieces of paper. Then papers were mixed in a box and then randomly, the researcher picked the pieces of paper one by one until the required number of respondents is reached. The same procedure was repeated in all villages.

3.3.3 Selection of the Key Informants

The study also involved four key informants (Project manager of improved wood stoves, one field staff and two village leaders) who are purposely selected. The key informants from TaTEDO were selected to provide detailed information on the characteristics of the project. The criteria for selecting key informants based on the involvement of the informant to the project implementation. On the other hand, the village leaders from Msangani and Kipangege consecutively, were selected due to the fact that, the village leaders were involved from project development phase to evaluation. Therefore, they were also believed to have important experience on the project implementation.

3.4 Data Collection Techniques

The data collection methods employed in this study were: semi-structured interviews, focus group discussion (FGD), field observation and literature search.

3.4.1 Focus Group Discussion

Refers to an interview using predominantly open questions to ask interviewees about a specific situation or event that is relevant to them and of interest to the researcher (Bryman, 2004)

3.4.2 Field Observation:

Apart from conducting interviews and group discussion, the study also benefited from direct field observation. The field observations were done concurrently with interviews. Observable features in the field such as smoke emission in the kitchen; stove design and fire wood consumption was noted. Documentary search was done prior to and after field work. Therefore, this mixture of methods was used in order to accomplish what (Yin and Bryman) refer to as triangulation – the use of multiple sources of evidence as well as seeking for convergence between the sources (Yin, 2003, pp.7-13; and Bryman, 2004).

3.5 Data Collection Process

Initially, the list of topics to be discussed were translated from English to Swahili language before field work. This was done in order to facilitate easy communication between the researcher and respondents. All interviews were conducted during cooking hours which varies from one household to another, but most ranged between 11:00 am – 15:00 pm for lunch preparations. A maximum of three interviews were conducted per day.

Before starting data collection process, the researcher conducted a pre-test checklist interview to explore the understanding of the respondents and key informant on answering questions. For example it came out that, some of the questions in the topic least were repetitive. This helped the researcher to identify some weakness in checklist interview questions and it enabled to refine those interview questions. During interview sessions the research had to perform three tasks; interviewing, listening and recording. The writing was done at the end of each interview.
Although, in a few occasions the researcher failed to meet the respondents on the agreed time, because of the harvest season, the researcher made an effort to come back several times up to late evenings so as to make sure that, the intended number of respondents is reached.

3.5.1 Epistemology in Data Collection

By employing Interpretive epistemology, the research was in a position of understanding the behaviour, concepts, actions, beliefs from respondent's own viewpoints. The focus was to see how the respondents (improved stove adopters) give an account on the effects of adopting improved wood stove on their welfare as rural women

3.6 Data Analysis Process

The data collected from the field was summarized and paraphrased while preserving the original details and meaning as accurately as possible. Data were summarized and presented in tables, while others in descriptive words. Similarities as well as differences in response were noted.
The results were compared with review of literature and new research findings were discussed and presented in chapter four.

3.7 Strengths and Limitation of Methodology

The researcher had experienced a positive welcome, which in return facilitated high levels of cooperation during the interview sessions. Although, some of the respondents when asked to state their wealth status (whether poor, middle class or rich) they seem to be hesitant. For example one respondent from Msangani village said *"I don't know about our wealth status, let us wait for my husband until he comes back"* but later she said her family is a middle class and she gave reasons for their belonging in that category.

The field work was very interesting to the extent that, the research has broadened researcher's insights about the adoption of improved wood stoves, which was not considered and expected during planning of the study. For example, some of the respondents appreciated the functioning of improved wood stove; hence they constructed one stove at their permanent households and another in their farms where they live during farming season. This would add more knowledge to the project implementers about the replicability of the project for better planning

However, one thing was experienced to be a limitation to the study. By the time data were collected most of respondents were still harvesting and transporting their harvest. This made the researcher to visit one house several times, sometimes up to late evenings until the respondents was found. Also, during interview session respondents were attending other responsibilities like attending their young children when they come back from school.

3.8 Ethical Issues

Like many other researches, this research also observed ethical issues because at some points it dealt with sensitive matters like income. The consideration of these ethical issues was done in order not to cause any harm to the respondent. During the study the following ethical considerations were careful observed

3.8.1 Informed Consent

Before data collection in the field, all respondents who were involved in the research were made aware of nature, purpose and the outcome of the research. During the introduction, the researcher explicitly described what is expected from the respondents. It was made clear that the findings from the research will be used for academic writings and publication only.
All respondents and key informants from the village government agreed to give their names but they didn't want their names to appear in any publications.

3.8.2 Interview Ethics

During interview sessions the research made a request to the respondents or informants to find a quiet place where they will be comfortable to talk. But most of stove users choose to sit in the

kitchen where their husbands normally do not enter. The researcher explained the need of recording for the purpose of revising the discussed issues. Also, the same explanations were given when the researcher took picture for the purposes of thesis defence.

CHAPTER FOUR

District and the project

4.1 Project Coverage

The integrated wood fuel project was implemented from 2007 – 2010, in both rural and urban areas of nineteen districts in eight of Tanzania: namely Arusha, Coast, Dar es salaam, Kilimanjaro, Mwanza, Rukwa, Shinyanga and Tanga. The selection of project areas were based on; outcomes of the previous activities and the need for scaling- up uptake and use of the modern energy technologies and services (2) notable energy and environmental problems, (3) their geographical location as major sources of charcoal to urban centres i.e. Dar es Salaam, Tanga, Mwanza (3) their potential for modern energy technologies adoption, (4) the economic growth of low and middle class, and (5) the availability of organisations which are already TaTEDO partners or potential for becoming one (TaTEDO, 2006). The improved energy technologies and services resulting from the implementation of the proposed project was expected to have high impacts on both income and non-income poverty dimensions, thus significantly contribute to the achievement of the National Strategy for Growth and Reduction of Poverty (NSGRP) targets and the Millennium Development Goals (TaTEDO, 2007) .

4.2 Study Area Profile

This study was carried out in Msangani and Kipangege villages of Kibaha. The District is located in eastern side of Tanzania. It is in between latitude 606'-7005'S and longitudes 38027'-39010'E, most of the area lying at altitude below 100m. The district area is 1630km² and is divided into three divisions, nine wards and 25 villages. Kibaha has a population estimated at 136,402 (NBS, 2009) of which males are 68,479 and females 67,923, with a total of 30,417 households. The annual growth rate is estimated at 3.3%. The majority of the inhabitants are small-scale farmers of cashew nuts, cassava, rice, simsim, fruits and vegetables. Some people also practice animal husbandry including cattle, goats and poultry farming. The district consist of 3 reserved forests but owning 99,000 ha or 45.4 per cent of regional reserve area(URT, 2007) over 90 per cent of households in the district depend entirely on firewood as their primary source of energy for cooking. Kerosene is widely used as source of energy for lighting. However, more than 80 per cent of the households use traditional three stone fire places for cooking while electricity is almost non-existent (NORAD, 2009).

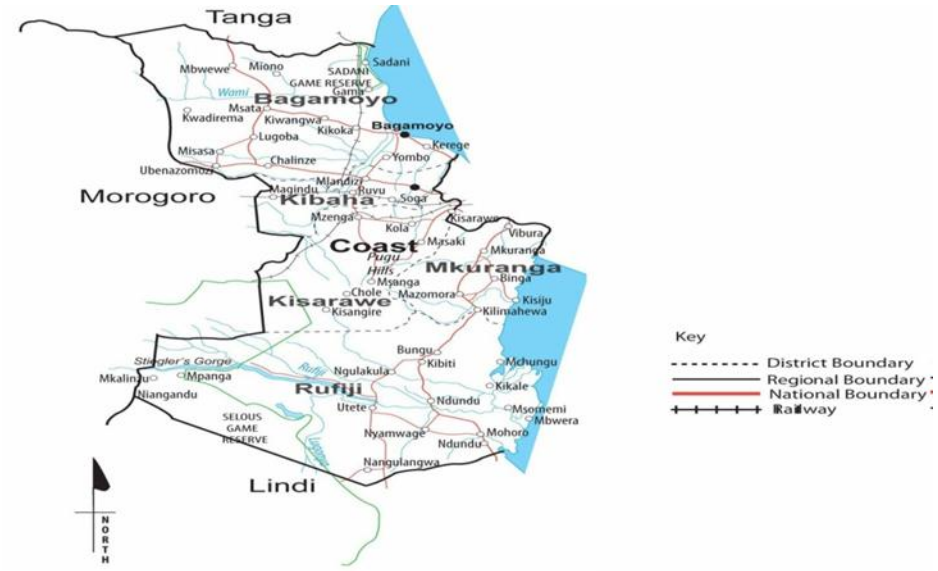


Figure3: Map of Kibaha district

4.3 Types of Improved Cook Stoves Promoted

The project promoted two types of improved wood stoves; the high cost and the low cost. The low cost mud stoves also known as Ukombozi Stoves are mostly constructed for household uses. The stove is made up of clay soil (ant hill soil) ashes, (slippery leaves, water and fresh cow dung. All these materials are locally available and can be obtained from rural areas freely. The shape of the stove is either, round, rectangle or triangle with fire chamber and three pot rests at the top of the stove (See stove picture in annex 2). According to the project manager, the construction is done by artisans who were formally trained by TaTEDO. Initially the stove user is responsible for collecting all the materials needed for a stove construction, and then he/she contact the artisans and pay him/her a maximum of Tshs 1500 (0.75 euro cents)

On the other hand, the project also promoted high costs improved wood stove for household and institutional use. The stove is made up of stones or bricks, cement, iron bars, lime and sand. The construction costs depend on the price of the raw material in particular areas. However, this type of stove was not found to be adopted by all the interviewees.

4.3 Project Objectives

The overall objective of the project is to contribute to sustainable development and poverty reduction by enhancing access to modern energy technologies and services for consumptive and productive needs in households, SMEs and social service centres.

The specific objective is to increase the income of the rural and urban beneficiaries through reduced costs and increased efficiency of wood fuels

4.4 Expected Results

The immediate impact of the project includes: increased employment and income generation opportunities for the beneficiaries, reduced incidences of respiratory diseases due to minimised indoor air pollution resulted from emissions of greenhouse gases (GHG), reduced workload for women and children on firewood collection and enhancing monetary savings for purchasing wood fuel (TaTEDO, 2006). To accomplish this, the following indicators were developed:

Table 1: Project indicators

Intervention logic	**Objectively verifiable indicators**	**Sources of verification**
Goal: contribute to sustainable development and poverty reduction by enhancing access to modern energy technologies and services for consumptive and productive needs in households, SMEs and social service centres	1.Percentage of rural and urban population in the project area below poverty line, reduced from the average of 35.7 per cent to 30 per cent by the end of year four 2. Indoor air pollution due to use of fire wood in households, reduced in the project areas by 40 per cent from the 2003/04 baseline of 910kg/HH/year	1.Household budget survey 2.National environment monitoring reports
Purpose: increased income of the rural and urban beneficiaries through reduced costs and increased efficiency of wood fuels	1.Net income generated by individual producer in the project area increased from the 2003/04 baseline average of Tsh 60,000 (30 euros) per month to a minimum of 110,000 (55 euros) / month by year four 2. Time for collecting fire wood by the users (Women and children) reduced from the 2003/04 baseline average of 4hours/person/per day to maximum of 1 hour / person / day	1.Perfomance reportsand or SMEs business records Project monitoring reports

Source: TaTEDO project logic framework matrix 2006

4.5 Implementation Methodology

According to the project document, the project has been implemented using a participatory approach. Whereby, beneficiaries, partners and TaTEDO associates at the grassroots have been facilitated to participate and closely involved in the identification, planning, implementation, monitoring and evaluation of the project activities. Participatory Rural Appraisal methods and processes were used to form village and district energy teams, which are working in collaboration to facilitate and coordinate all energy related issues, including the execution of the jointly agreed energy development plans and budgets (TaTEDO, 2006). The selection of this

methodology was based on the belief that, involving beneficiaries in identifying, discussing, deciding ad planning will provide the most effective solutions for their needs and constraints

From the interviews it was revealed that, 40 per cent of respondents were consulted during planning meetings, although the project was already designed. They participated by coming up with a list of development interventions, in which finally they prioritized and developed a plan which was signed by the village leaders. 35 per cent participated in training, which were delivered on construction of improved wood stoves, charcoal making and baking by using charcoal oven. However, 25 per cent claimed not to be well informed about the project.

With regard to monitoring and evaluation, in few occasion respondents saw TaTEDO partner passing through the households, and asks for the progress and constrains they face from using improved wood stoves. However, the project manage reported that, every month they were receiving monitoring reports from the partner, and sometimes the TaTEDO monitoring staff conduct monitoring visits to all project areas.

4.6 The Rationale of the Project to the Beneficiaries

The project manager pointed that, limited access to energy is a problem that has disproportionate effect on women, especially in rural areas. Women often spend large amounts of time and physical efforts to collect fuel for their household and productive needs, using their own labour to carry heavy loads over increasingly long distances at great risk to their health and safety. Furthermore, other health hazards arise from the fact that women do most of the cooking in poorly ventilated kitchens. These women and their young children are exposed to large amounts of smoke and particulates from indoor fires and suffer from a number of respiratory diseases.

The village leaders mentioned that, the project was relevant to complement efforts of the government to preserve the environment.
Also, women from focus group discussion added that, the project has provided some relief especially on fire wood collection, which is a women activity parse. *"I used to go for fire wood collect even with my big pregnancy"*

4.7 Project Implementation Strategies

4.7.1 Accessibility of the Technology

The project document pointed, the establishment of appropriate and strong institutional framework at the local level was the contributing factor for successful project implementation. The structure builds strong and feasible partnership among TaTEDO, District Sustainable Energy Development Committees (DiSEDCs), entrepreneurs, Community Based Organization and beneficiaries. Therefore, the framework enables beneficiaries to access the technology at the local level (TaTEDO, 2006).

According to the interviews, 50 per cent of respondents agreed to experience easy accessibility of the technology immediately after the project has been introduced. This was attributed to the presence of village stove artisans and materials for stove construction were locally easy available. However, 30 per cent of the interviewee urged that, at some point it was difficult to get an improved wood stove due to the fact that, cow dung was not available because the pastoralists had moved to other districts.

4.7.2 Affordability of the Technology

From the interviews it was revealed that, the affordability of the technology was mostly associated with the income status of the household. With regard to this , 90 per cent of the respondents fall under middle and rich class were able to pay the costs of stove construction in cash however, the remained 10 per cent who were categorised as poor, experienced difficulties to adopt the stove. One respondent said *"I asked the artisans to construct a stove for me, then I paid her 3 kg of maize after harvest"* When asked on the possibility of acquiring loans from Village Community Bank (VICOBA) (explain), the respondent said *"I go for VICOBA loan when I want to pay school fees of my children or to start a small business"* VICOBA is a village savings and loans scheme based on groups of between 25-30 people saving together and lending to individuals within the groups

However, TaTEDO reported to consider the income situation of its target groups. In case of improved stoves, the organization has developed two prototypes; the low coast and high cost stoves. The low cost is mostly adopted by people of low income in rural areas, whereby the materials for stove construction are freely locally available. Moreover, the organization has linked the target group with Micro credit Institutions (MFI's) such as SACCOSS and VICOBA in order to enable the people of low income to access loans without possessing collaterals.

4.7.3 Challenges Faced the Project

The evaluation report (TaTEDO, 2009) mentioned encountered challenges to include: Low budget allocation for sustainable energy infrastructure hindering popularization and promotion of improved cook stoves, taxation of energy equipments affects the ability to extend services widely, energy policy that is lacking effective strategy and legal framework to support adoption of improved stoves. Also, low public awareness of energy policies and strategies, prevalence of poor governance and corruption in the energy sector and the perpetuation of cultural beliefs that undermine full participation and ignore benefits to men and women.

CHAPTER FIVE

5.0 Presentation of Research Findings

This chapter presents the findings and analysis of the data from the field. The chapter starts with background information of the respondents. Followed by the experience of the respondents before and after the adoption of improved wood stove, in relation to; fire wood consumption, work load, smoke emissions and income.

5.1 Background Information of the Respondents

5.1.1 Age classification of the respondents

Table: 2. Age classification of respondent

Age group	No. of responses	Percentage
Between 21 – 30 years	12	60
Between 31 – 40 years	5	25
Between 41 – 50 years	3	15
Total	**20**	**100**

Source: Own field work

Table 2 above shows that, 60 per cent of the respondent's age ranges between 21 – 30 years. At this age all respondents reported to be married with at least two children. While 15 per cent of the respondent's age ranged 41 - 50.

From the focus group discussion, out of 6 respondents 50 per cent of respondents age ranged between 21 – 30 years, while 50 per cent ranged 31 – 40 years.

5.1.2 Family size

According to the respondents, the size of the family was said to influence the household's decision whether to adopt improved wood stove or not and also influences cooking practices as whole.

Table: 3 Family size

Average No. of people per household	Number of responses	Percentage
4 people	4	20
8 people	6	30
13 people	10	50
Total	**20**	**100**

Source: Own fieldwork

The table above reveals that, 50 per cent of the interviewed households were found to consist an average of 13 people. The family members considered includes; father, mother, children and

other dependants. However, one family consist of three people (mother and two children) in Msangani village was found to be a female headed household

Results from focus group discussion shows that, 90 per cent of the interviewed household have an average of 16 people, only 10 per cent have 8 people

5.1.3 Wealth and Household Cooking Practices

During field work the level of family wealth was considered to have an influence over household cooking practices. In determining the wealth of the family, respondent were told to grade themselves whether their rich, poor or middle class and give reasons to why they have graded themselves in the respective situation.

Table 4: wealth and cooking practices:

No. of meals cooked per day	Wealth			Total
	Poor	Middle	Rich	
Between 0 – 1 meal	1 (50%)	-	-	1 (5%)
Between 2 – 3 meals	1 (50%)	13 (78%)	1 (33%)	15 (75%)
Between 4 – 5 meals	0	2 (13%)	2 (67%)	4 (20%)
Total	2	15	3	20 (100%)

The table 4: above entails that, 75 per cent of all interviewed respondents, cooks between 2 – 3 meals per day. The number of meals cooked per household per day was also determined by the wealth status of the household. Whereby; 10 per cent were categorized as poor class, who eats once a day, they live in a mud thatched roofed house, they does not own land and they send their children to government schools. 75 per cent were categorised as middle class with the ability to afford 2-3 meals per day. They fall under this category on the bases that; they live in an iron roofed block house, they own at least one hectare of land, and they send their children to government school. However, 15 per cent fall under reach class category, who cooks more than 3 meals per day. The criteria's for this class includes; owning a saving account, ability to send their children to private schools, they constructed iron roofed bloc house and they own more than two hectares of land.

Also, the interviews indicated that, the adoption of improved stoves did not influence the number of meals cooked in the household, it rather reduced the time spent in cooking. According to the respondent from Msangani village *"the improved wood stove had never changed my cooking time table, but it fasten the cooking process"*

5.2 Effects of Adopting Improved Wood Stoves

5.2.1 Fire Wood Consumption

As they were asked on their experience with the abandoned stove, all 20 (100 per cent) of the interviewed respondents agreed to use traditional wood stoves (three fire places) as the main source of cooking device since time immemorial. According to the respondents, the traditional wood stove has been experienced to consume more fire wood due to the presence of three

open outlets which allows more air which facilitate high speed of wood burning. , 11 out of 20 respondents both from Msangani and Kipangege villages argued that, fire wood consumption also depend on the family size, type of meal cooked, state of the fire wood (wet or dry) and the number of meals cooked per day. According to one respondent from Msangani village said *"when the number of people in my household increases, I have to go to the forest every day because I cook more food than normal quantities"* Furthermore they added that, for a household with 11 – 15 members consumes between 20 - 30 pieces of fire wood per meal., as shown in table 4 below.

Table 5: Fire wood consumption in pieces per day

Average No. of people per household	**Average No. of pieces of fire wood consumed per meal per day**			
	Before	**No. of responses**	**After**	**No. of responses**
4 people	**8**	**3**	**4**	**2**
8 people	**15**	**6**	**5**	**6**
13 people	**25**	**11**	**8**	**12**
Total		**20**		**20**

Source: own fieldwork

In comparison with tradition firewood stoves, the adoption of improved wood stove has reduced fire wood consumption for more than 50 per cent. This was agreed by all respondents regardless of family sizes. as clearly shown in table 5 above, with traditional wood stoves, the family size of average number of 13 people who uses an average of 25 pieces of wood per meal, were now consuming 8 pieces of wood per meal. In addition, 50 per cent of respondents from focus group discussion mentioned that, during the fasting month they have experienced a more reduction in fire wood consumption because they cook two meals and most of them are soft meals like porridge which took few minutes to be ready TaTEDO added that, due to high efficiencies, improved wood stove consumes less firewood, simultaneously generates enough heat and thus less money is spent on purchasing firewood.

5.2.3 Work Load

It was imperative for the researcher to investigate the experience of women about the work load on fire wood collection, in order to find out whether the adoption of improved wood stoves has any influence on women's work load.

Table 6: Work load

Average No. of people per household	Average No. of trips before adopting improved wood stoves per week				Average No. of trips after adopting improved wood stoves per week			
	2	4	6	Total	2	4	6	Total
4	1	1	-	2	4	0	0	4
8	0	6	1	7	1	6	0	7
13	0	0	11	11	0	9	0	9
Total	1(5%)	7(35%)	12(60%)	20	5(25%)	15(75%)	0	20

Source: Own fieldwork

Table 6 above, reveals the situation on women's work load before and after adoption of improved wood stove. Based on the number of people in the household, 60 per cent of the household with the everage number of 13 people were going for fire wood collection on average of 6 times per week. However, the distance from the household to the village forest depends on where the household is located. Although, 80 per cent of respondents in Msangani village mentioned that, to reach the village forest they have to walk for about one hour. Furthermore, they spent between 1 – 2 hours for collecting and arranging fire wood into loads.

Compared to the traditional wood stove, the same household with average number of 13 people were now going 4 times a week. Therefore the improved wood stoves has been reported to reduce number of trips from 6 to a maximum of 4 trips per week, as presented in table 6 above. The reduction also, has reduced the time spent on fire wood collection from maximum of 4 to 2 hours per day and from 24 to 8 hours per week respectively.

The project document revealed that, women and children from the two villages were reported as main supplies of firewood, accounting for 60 and 23 per cent respectively. The transportation of firewood in many areas is not less than 4 hours or 6 kilometres distance. The adoption of improved wood stoves has reduced time needed for fetching firewood by 45 per cent. Time saving has been achieved through increased thermal efficiency of the stove (TaTEDO, 2006).

However, the evaluation report (TaTEDO, 2010), the adoption of improved wood stove has resulted to an average of 70 percent reduction in fire wood consumption. Households using the improved wood stove consumes on average 1, 728 Kg of fire wood annually that is annual saving of 1,152 Kg, compared to the traditional three stone stove that consumes an average of 2,880 Kg/year. Therefore, time for fire wood collection was also reduced from 4 to 1 hour per day.

5.2.4 Income

In discussing this, 65 per cent of the respondents reported that, traditional wood stove had contributed to the reduced income of their family, through the increased time spent on fire wood collection and cooking as whole. Hence, they had less time to engage in small business like gardening, chapati making, fish vending and fruit selling. According to respondents from kipangege village, small business was and still the main source of income generation for coastal

women, due to the fact that, most of them are not employed in formal sector. However, 6 respondents were not aware whether the traditional stove has influenced their income in any way.

However, 30 per cent of the claimed that, the improved wood stove project has created self-employment and income to the women stove artisans. According to the respondents, they are involved in construction and selling of household firewood stoves. Whereby, they construct up to 10 stoves per week (average price is Tshs 1500 = 0.75 euro cents per stove. This amount is only for labour costs, other construction materials such as clay soil, ashes and cow dung are collected by the stove own prior to construction work. However, before the project these women were mainly involved in farming and fish vending, and their average income per month was Tshs 30,000 (15 euros)

From the focus group discussion it was reported that, the adoption of improved wood stove has reduced the time spent on fire wood collection from 4 to 2 hours per day, hence more time is allocates for productive and social engagement including; income generation and social/political activities such as participation in meetings and aspiring for local leadership positions. For example, five respondents had joined the Voluntary Community Bank (VICOBA) where they save small amount of money in groups, and then they can take loan for starting small business.

In addition, the project targeted to improve the income of stove artisans from Tshs 60,000 (30 euro's) to Tshs 110,000 (55 euro's) per month. This was realized to be ambitious. The stove artisans revealed that, the average income per month was Tshs 45,000 (23 euro's), however recently they have experienced a more reduction in their income, due to the fact that, majority of the population are residing in the farmers, hence they don't receive enough orders.

5.2.5 Smoke Emissions

All 20 respondents agreed that, traditional wood stove emits a lot of smoke which cause eye infection (red eyes), coughing, dizziness, and headache. they also mentioned that, these diseases has cost them a lot of money for hospital bills. Besides, other respondents due to low income situation were not able to access health centres for proper treatment. As a result they have developed chronic eye diseases to the extent that some were accused to practice witch craft, and threatened to be killed by their neighbours.

After adopting improved wood stoves, 16 respondents out of 20 said, the improved firewood stoves have substantially reduced smoke emissions. This has been supported by respondents through reduced incidence to respiratory infections, eye, flue and headache. However, 2 respondents admitted to experience smoke emissions, due to the fact that, they use improved wood stove along with traditional one. Apart from reducing smoke, improved wood stoves were also reported to improved kitchen cleanness and reduced the risk of burning children due to its closed design.

The project also targeted to reduce the smoke emissions by 40 per cent from the 2003/04 baseline of 910kg/HH/year. Although the interviewees were not in a position to quantify the reduction, but they agreed to experience a significant reduction in smoke emission, which was also attributed to the reduced incidence of respiratory and eye infections. However, the researcher observed slight emissions.

5.3 Gender Equality

The discussion on gender equality entails to reveal the influence of improved stoves on decision making aspect in the household. All respondents agreed not to realize a change in household decision making. One respondent from Msangani village said *"the head of the household (husband) is entitled to make all the decisions concerning our families, we are only assistants when our husbands are not home"* However, 15 respondents out of 20 said, the adoption of improved wood stoves contributed to improved social relationship between wives and husbands to the extent that, husbands can spent some times in the kitchen while their wives are cooking. As a result, this has contributed to the improved communication between wives and husbands.

CHAPTER SIX

6.0 Analysis and Discussions

This chapter will discuss the field data presented in the proceeded chapter. The discussion will be verified by the literature from various authors presented in chapter two.

6.1 Background Information of the Respondents

6.1.1 Age classification of respondents

As it was revealed from the findings presented above, only women were found to be responsible for fire wood collection and cooking as whole. This is supported by the work Chowdhuryet al., (2011:p89), "traditionally cooking is exclusively done by women and cooking along with responsibility for other family members occupies a major portion (51–54%) of a women's daily life. In doing so, the rural women play a significant role in procuring and processing fuel for domestic energy consumption"

More than 50 per cent of the respondents aged 21 – 30. At this age most women were considered to be young and energetic to handle family responsibilities. It was also revealed that, the improved stoves were more adopted by women of this age group. When the researcher asked why, the response was because, the burden of fire wood collection was carried by them alone. Most of them were observed to have young children who could not assist their mothers to collect fire wood; therefore, improved wood stoves seem to be of more advantage to them. However, 15 per cent of the respondents aged between 41– 50 were found not very active in firewood collection, due to the fact that, these women had older children and sometimes the wives of their sons who could assist them to collect fire wood.

6.1.2 Family Size

The study indicates direct relationship between the family size and fuel wood consumption, which in return was mentioned to be one of the driving forces for adopting improved wood stoves. According to the respondents, the size of the family influences fire wood consumption in such a way that, when the family is bigger more food is needed to be cooked, hence more wood fuel. This has led to increased work load on fire wood collection. For example; table 5 shows that, before adopting improved wood stove, the family of between 11 – 15 members went for fire wood collection 5 – 6 trips per week, compared to a family of 6 – 10 members who went 3 -4 trips per week.

6.1.3 Wealth and Household Cooking Practices

From the interviews it was revealed that, 75 per cent of the respondents were categorised as middle class wealth status. The criteria for this categorization among others include; they own at least 1 hectare of land, constructed a block cement house with iron roofed, they afford to send their children to government schools and the ability to cook 2 – 3 meals a day. Therefore, any associated impact resulted from improved wood stoves, would have advantaged the middle class than the poor class households. The researcher also observed that, household with characteristics like; mud houses with thatched roofs were seen to use traditional wood stoves. Although to some extent the decision whether to install improved stove was a matter of priority.

The household cooking practices were found to be the same before and after adoption of improved wood stoves. Still most of the interviewed household's cook 2 – 3 meals a day depending on the season. According to the respondent from Msangani village *"the improved wood stove had never changed my cooking time table, but it fasten the cooking process"* With regard to the food taste, most of the interviews responded that, the improved cook stoves has improved their food taste, due to the fact that, cooking with a traditional stove cause a smell of smoke in their foods.

The study done by (Wold Bank, 2009: p292) revealed that, the use of traditional open fires has increased the time spent for fire wood collection by rural women in terms of cutting, travel , carrying and use. Hence it prevents women from engaging more fully in other tasks. However, "the uptake of improved stoves requires that women have control of their own sources of income"

6.2 The Influence of Improved Wood Stoves on Firewood Consumption, Work Load, Health and Income

6.5.1 Firewood Consumption

Likely to what is portrayed in the literature about the benefits of improved stoves; users interviewed the same perception of the stoves' benefits. In the literature the account of how improved stoves could play a role in reducing fire wood consumption is clearly pointed out. The reasoning behind this claim is as follows: since improved stoves are more efficient, people who adopt the stoves can reduce the amount of firewood collected for their daily needs. The study results revealed that, the improved wood stoves has significantly contributed to the reduction of fire wood consumption by more than 50 per cent. In order to prove the reduction in firewood consumption, the research had a question on the number of pieces of firewood used per day compared to traditional stove. Interestingly, the answer was 6-9 pieces of wood.

However, one household was witnessed using a traditional stove and improved concurrently, the respondent also, admitted to experience the reduction of fire wood consumption compared to when she was using two traditional stove. When she was asked why she didn't go for improved stove only, she responded that, *"I am both stoves because I have different sizes of cooking pan"*

The above findings are also supported by Ergeneman(2003), the author associates improved cook stoves to the internal and external benefits they offer to the household and community consecutively. The internal benefits include; reduced biomass use. Also, in defining the concept of improved cook stove Ezzati et al., (2000:p 578) relates concept to the aspect of reduction on wood fuel consumption

TaTEDO also added that, high efficiencies of improved wood stoves are the main reason for the reduction of fire wood consumption (TaTEDO, 2007).

6.2.2 Work Load

Users views on the influence of improved wood stoves on work load were largely attributed to the reduction of fire wood consumption discussed above. This experience was expressed in

terms of time spent on fire wood collection and transportation. In comparison with traditional wood stoves, an improved wood stove has reduced time spent on fire wood collection and transportation from 4 to 2 hours per day. With traditional stoves, respondents spent 4 hours per day, and 5 – 6 numbers of days per week, in totality they spent 20 to 24 hours per week, on fire wood collection only. Spending all this time entails that, women had experienced less time for income generating activities as well as resting. From the individual interviews and focus group discussions indicates that, with improved wood stoves respondents spent 2 to 6 hours per work. Following this reduction, more than 60 per cent of the respondents agreed to have more time for small business like, fruits, snacks, vegetable and selling of khanga and vitenge. The money obtained from their business is used to buy kerosene, foods, uniforms, books and sometimes they pay school fees for their children.

Women in Development Policy (2000), mentioned that, the use of firewood and charcoal saving stoves in rural areas, would reduce the additional daily workload of women for fetching firewood" (URT, 2000).

Ahmed et al.,(2009) mentioned, the introduction of improved cook stoves can do more than reducing kitchen air pollution, they also, reduce the work load of women and children on fuel collection, hence it gives more time for women to engage in productive activities especially income generating activities (Republic of Kenya, 2010)

In addition, due to the fact that school going children accompanied their mothers to the fire wood collection, the improved woodstoves also, has freed them from this burden; hence it was reported to improve their school attendance and performance. Two respondents from the focus group discussion mentioned that, their daughters were missing schools up to three days per month. Therefore, these findings are culminated by the arguments of (Panwar et al., 2009), reduced time for fire wood collection give more time for education of rural children especially girl child

6.2.3 Smoke Emissions

Smoke emission was mentioned by all respondents to be one of a major downside of traditional fire wood stoves and a driving force to abandon it. The smokes emitted from the stove were associated to cause respiratory infections, dizziness and headache to women and young children who spent most of their time in the kitchen. 92 per cent of the respondents agreed the substantial reduction in smoke emission from the use of improved wood stove. Although, the researcher observed a slight presence of smoke in the kitchen. When the researcher enquired explanations, the response was attributed to wood moisture content. However, it was also observes that, smoke emits more in poor ventilated kitchens compared to well ventilated ones, because well ventilated kitchens allow enough air to support wood burning process.

Ezzati et al., (2000:p 578) relates improved cook stoves to the aspects of improved public health from the exposure of indoor smokes. Also, Kanagawa & Nakata, (2006) supported this argument by saying, "promoting women's access to efficient cooking stoves would improve women's health, save money and time spent for collected wood fuel"

Apart from smoke reduction, the research found out that, improved wood stove also contributed to the improved kitchen cleanness. However, the closed design of the stove has been

mentioned to reduce the incidences of children burning. *"Nowadays if I left my children in the kitchen because I am sure there will be safe"*

From the findings and discussions it can be said that, the improved wood stove can contribute to the reduced smoke emissions when adopters have well ventilate kitchens and the use of dry wood.

6.2.4 Income

Due to the fact that, wood fuel from both villages was obtained for free from the village forest, hence respondents did not incur any cost over it. Most of the respondents experienced the influence of improved wood stoves over their income through the calculated time spent on fire wood collection and transportation as discuss in sub topic 5.2.2 previously. The direct increase in income was realized by stove artisans who were trained by TaTEDO. The artisans specialized in constructing and selling stoves to the households. In this case, they realized an increase of their income which was not realized before the project. As it was presented in the findings chapter, one trained artisan constructs up to 10 stoves per week (average price is Tshs 1500 = 0.75 euro cents per stove. This makes the average income per artisan to be 36 euro's per month and 436.36 euro's per year. The earned income is spent for school fees, buying uniform, books and some for food .although, now days the market has decreases due to poor harvest, this in return has an implication to the sustainability of the project.

6.2.5 Gender Equality

One of the questions that the researcher asked the respondents was about the contribution of improved wood stove to the gender equality in the household. The quest was meant only to evaluate the aspect of decision making powers. All the interview respondents seem not to realize any change in the way household decisions were made before adopting improved stoves. Moreover, it was revealed that, the decision whether to adopt the improved stove was in the hands of the men, because he is the controller of household income and final decision makers. Respondents argues *"the head of the household (husband) is entitled to make all the decisions concerning our families, we are only assistants when our husbands are not home"*
However, 15 respondents out of 26 said, the adoption of improved wood stoves contributed to improved social relationship between wives and husbands to the extent that, husbands can spent some times in the kitchen while their wives are cooking. This has been attributed due to absence of smoke emissions and clean environment of the kitchen.

Also, TaTEDO mentioned explicitly to consider gender issues before and during project designing and throughout project cycle. Women have been particularly encouraged and supported to participate in trainings as well as income generating activities related to wood fuel technologies like construction of improved wood stoves, charcoal making and baking by using charcoal oven. All these activities were geared to improve women's income.

CHAPTER SEVEN

7.0 Conclusions and Recommendations

This chapter presents the summary of major findings which were derived from the study. The recommendations are made on the basis of research findings. The objective of the study is to contribute to the improvement of TaTEDO project by providing recommendations on the how the stove project can improve the welfare of rural women, so that the interventions can be replicated to other districts where women lack access to clean cooking energy

7.1 Conclusions

To what extent does the adoption of improved wood stoves has influenced the income of rural women of Kibaha District?

The study found that, the adoption of improved wood stoves has influenced the income in two ways; first, the reduction in firewood consumption has reduced the time for fire wood collection from 4 to 2 hours per day, hence women have more time to engage in income generating activities such as food vending, fish vending, gardening, fruit selling and chapati making. In addition, the income earned from the fore mentioned activities enabled them to join in micro – credit schemes such as VICOBA, where they can save and take loans for expending their businesses and other household uses such as paying school fees, buying books and uniforms for their children.

Second, the improved wood stove project was said to create employment and income to the women who were involved in stove construction. Before the project, these women were involved in farming and fish vending. Their average monthly income was Tshs 30,000 (15 euros) . The improved wood stove project has reported to increase their income to Tsh 45,000 (23 euroe) per month. However during faming season they experienced the reduction of their income because most of the people's priority is directed to the farming activities.

To what extent does the adoption of improved wood stoves has influenced the work load of rural women of Kibaha District?

The reduction in fire wood consumption revealed a direct collaration on women's work load. The finding indicates, on the basis of the family size, adoption of improved has said to reduce the number of trips on fire wood collection by than 50 per cent/ week / household. Before the adoption of improved wood stoves, the household with average number of 13 people were used to go on fire wood collection t times a week, but the same family after adoption of improved wood stoves went on fire wood collection 4 times per week. Also, the time spent on fire on fire wood collection and transportation has been reduced from 4 to 2 hours a day.

To what extent does the adoption of improved wood stoves has influenced eye and respiratory infections among rural women of Kibaha district?

Although, the respondents were not in a position to quantify the amount of smoke that has been reduced through the adoption of improved wood stove, 80 per cent of the respondents mentioned that, the improved wood stoves has substantially contribute to the reduced smoke

emissions, hence reduce the incidences of eye infections, dizziness, headache and coughing. However, 10 per cent of the respondents still experience smoke in their kitchen , due to the fact that, they use an improved wood stove along traditional stove.

Apart from smoke reduction, the improved wood stove was also reported to improve the kitchen cleanness and reduce the risk of burning children due to its closed design.

7.2 Recommendations

The research found that, although the project implementers claim to execute participatory methodology at all levels of project implementation. The findings revealed that, the community did not participate full. Instead they were consulted to agree with the plan which was already prepared by the project implementers. Therefore, for the purpose of increasing project ownership and sustainability, the study recommends that, TaTEDO should consider mobilizing and not consulting the community from project designing, planning, implementation as well as evaluation.

Although, 80 per cent of the respondents agreed on smoke reduction from improved wood stove, however 10 per cent still experience smoke emissions from because they use both improved wood stove along with tradition. The study recommends, TaTEDO should conduct reconnaissance surveys (research) to find out the reasons to why some of the stove adopter still use traditional stoves besides the benefits offered by improved ones. This will help TaTEDO to incorporate the needs and preferences of the people and come up with solutions that suite the local situation.

This study also reveals that all stove users were ignorant on whether the project has influenced their gender relations in the household. This was greatly contributed by the lack of gender mainstreaming strategies since the project designing took place. Mainstreaming of gender issue by TaTEDO will contribute to the project sustainability as well as men would be in a position to understand that, the decision to adopt improved stove is a priority of the household rather than seeing it as women business. A community sensitizing approach that carries a message about gender equality with regard to improved stoves could make a difference on people's acceptance, perception and likelihood to facilitate quick adoption and use of the technology. However, men should be the primary targeted audience.

One of the major shortcomings of the promoted improved wood stove is based on the quality and durability of the stove. The current low cost stove promoted by TaTEDO is made up of clay soil mixed with cow dung. This type of stove was reported to break after 2-3 years, and then the owner is required to incur another cost for repair or construct a new one. Therefore, there is a great need for TaTEDO to improve the quality of the stove by adding strong materials which will make the stove to last longer. In relation to this, in the new suggested design the aspects of smoke emissions should be carefully taken into account. Stove chimney is proposed to be introduced, in order to make sure that all the smoke is taken out and leave the kitchen free from smoke.

Moreover, for the purposes of acquiring reliable data on smoke reduction. TaTEDO should consider the need of conducting sample studies in collaboration with the Ministry of Health, to verify the extent of the effects of improved wood stoves on the reduction of pulmonary and eye

infections. Instead of relying on approximated percents which does not exactly portray the real situation.

8.0 References

Adedayo et al., (2010). Access of rural women to forest resources and its impact on rural household welfare in North Central Nigeria. *Forest Policy and Economics*, [e-journal] Volume 12, Issue 6, July 2010, Pages 439-450, available through: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VT4-502NK72-1&_user=533256&_coverDate=07%2F31%2F2010&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_acct=C000026798&_version=1&_urlVersion=0&_userid=533256&md5=e71b1f4077a59a48ef39121198ddee66&searchtype=a [Accessed 26 April 2011]

Ahmed et al., 2010.Contribution of Rural Women to Family Income Through Participation in Microcredit. *American Journal of Applied Sciences*, [e-journal] 8 (3): 238-245, 2011 available through: http://library.wur.nl/sfx_local?sid=Elsevier:Scopus&issn=15469239&isbn=&volume=8&issue=3&spage=238&epage=245&pages=238-245&artnum=&date=2011&title=American+Journal+of+Applied+Sciences&atitle=Contribution+of+rural+women+to+family+income+through+participation+in+microcredit%3a+An+empirical+analysis&aufirst=F.&auinit=F.&auinit1=F&aulast=Ahmed&_service_type=getFullTxt [Accessed 26 April 2011]

Barnes, D.F., Openshaw, K., Smith, K.R. & van der Plas, R. (1994) what makes people cook with improved biomass stoves. *A comparative international review of stove programs. Washington,DC: The World Bank*.

Bhattacharya *et al.,* (1999). Emissions from biomass energy use in some selected Asian countries. *Energy*, [e-journal], 25 (2000) 169–188, available through:http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6V2S-3YJYPKB-4-3&_cdi=5710&_user=533256&_pii=S0360544299000651&_origin=gateway&_coverDate=02%2F29%2F2000&_sk=999749997&view=c&wchp=dGLbVlb-zSkzV&md5=f5a1e01fa52b8930c65b34ae666b07e0&ie=/sdarticle.pdf [Accessed 29 April 2011]

Bryman, A. (2004) *Social Research Methods*. Oxford University Press.
Clancy, J. et al., 2002. The Gender - Energy- Poverty Nexus: Finding the energy to address gender concerns in development. [Online] available at :< www.sarpn.org.za/documents/.../P342_Skutsch_Batchelor.pdf> [Accessed 30 April 2011]

Creswell, J. W., 2007. *Qualitative enquiry and Research Design: Choosing Among Five Approaches*. Second Edition, Sage Publication

East African Community, 2007. Strategy on Scaling Up Access to Modern Energy Services. [online] Available at: http://tatedo.org/cms/images/publications/reports/eastrategy.pdf. [Accessed 31 May 2011]

Ergeneman, A., 2003. Dissemination of Improved Cook stoves in Rural areas of Developing World. [online] Availableat:http://www.punchdown.org/rvb/mogogo/EriStoveAPA_Report.pdf. [Accessed 01 June 2011]

Ezzati et al., 2000. Comparison of Emissions and Residential Exposure from Traditional and Improved Cookstoves in Kenya. *Environment Science and Technology*, [e-journal] 34, 578-583 accessed through: http://pubs.acs.org/doi/full/10.1021/es9905795 [Accessed 15 May 2011]

Household Energy Network, 2010. Improved Cook stoves. [Online] Available at:http://www.hedon.info/Improvedcookstove [Accessed 01 June 2011]

International Planned Parenthood Federation, 2011. Gender equality. [online] Available at: http://www.ippf.org/en/Resources/Articles/What+is+gender+equality.htm [Accessed 06 August 2011]

Kanagawa, M. &Nakata, T. (2007). Analysis of the energy access improvement and its socio-economic impacts in rural areas of developing countries. *Ecological Economics*, [e-journal] 6 2 (2 0 0 7) 3 1 9 – 3 2 9, Accesses through:http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-4KCXJH1-1&_user=533256&_coverDate=04%2F20%2F2007&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_acct=C000026798&_version=1&_urlVersion=0&_userid=533256&md5=4af9263b3c58cce62b55e002eed5614b&searchtype=a [Accessed 18 May 2011]

Leyaro et al., (2010). Food prices, tax reforms and consumer Welfare in Tanzania 1991–2007.*International Tax Public Finance,* [e-journal](2010) 17: 430–450, available through: http://www.scopus.com/record/display.url?eid=2-s2.0-77955846949&origin=resultslist&sort=plf-f&src=s&st1=welfare+in+tanzania&sid=osmJDhZ8fxPnZ8dtZwG8LVx%3a40&sot=b&sdt=b&sl=55&s=TITLEABSKEY%28welfare+in+tanzania%29+AND+PUBYEAR+AFT+1999&relpos=15&relpos=15&searchTerm=TITLE-ABSKEY(welfare%20in%20tanzania)%20AND%20PUBYEAR%20AFT%201999# [Accessed 18 May 2011]

Makame, O.M., (2007). Adoption of improved stoves and deforestation in Zanzibar,*Management of Environmental Quality,* [e-journal], Volume 18 issue 3, pg 246, Available through: http://www.emeraldinsight.com/journals.htm?issn=1477-7835&volume=18&issue=3 [Accessed 20 May 2011]

National Bureau of statistics (NBS, 2005). City Population. [online] Available at: http://www.citypopulation.de/Tanzania.html [Accesses 27 May 2011]

NORAD, 2009.Environmental and Socio-Economic Baseline Study – Tanzania. [online] Available at:www.norad.no/en/_attachment/235912/binary/165668?download=true [Accessed on 27/05/2011]

NSGRP (2005) The National Strategy for Growth and Reduction of Poverty, [online] Available at:<http://www.tanzania.go.tz/pdf/nsgrptext.pdf> [Accessed 31 March 2011].

Offermann, R. et al., 2010. Assessment of global bioenergy potentials: Mitigate Adapt Strategy Glob Change (2011) 16:103–115 , [e-journal] DOI 10.1007/s11027-010-9247-9, Available through: <http://www.springerlink.com/content/n17465lg63427064/fulltext.pdf> [Accessed 28 April 2011]

Panwar et al., 2009. Mitigation of greenhouse gases by adoption of improved biomass cook stoves, *Mitigate Adapt Strategy Global Change*) 14:569–578 Available through: http://abs.sagepub.com/content/43/4/707.full.pdf+html [Accessed 10 June 2011]

Republic of Kenya, 2010. Gender, Improved Cook stoves and Development in Kenya. [online] Available at:www.scode.co.ke/Review.doc. [Accessed 01 June 2011]

Robinson, E.J.Z &Lokina, R.B., (2010). A spatial–temporal analysis of the impact of access restrictions on forest landscapes and household welfare in Tanzania.*Forest Policy and Economics,* [e-journal] 13 (2011) 79–85, available through: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VT4-5178VYJ-1&_user=533256&_coverDate=01%2F31%2F2011&_rdoc=1&_fmt=high&_orig=gateway&_origin=gateway&_sort=d&_docanchor=&view=c&_acct=C000026798&_version=1&_urlVersion=0&_userid=533256&md5=32fb6082480d9afc3a5f38ee28e429f6&searchtype=a [Accessed 14 May 2011]

Sohel, et al., 2010, Linking Biomass Fuel Consumption and Improve Cooking Stove. [online] Available at : http://www.worldenergy.org/documents/congresspapers/65.pdf. [Accessed 14May2011]

Tanzania Traditional Energy Development Organization, 2004. *Develop Energy Africa: Tanzania Case Study- Improved Wood fuel Saving Technologies.* Arusha, Republic of Tanzania 23 – 29 March 2008. Arusha: TaTEDO

Tanzania Traditional Energy Development Organization, 2006. *Integrated Improved Wood fuels Services for Poverty Reduction in Tanzania*.
[proposal document] TaTEDO Collection.Dar es salaam. TaTEDO Library

Tanzania Traditional Energy Development Organization, 2008. Dedicated to Scaling Up Access to Integrated Sustainable Modern Energy Technologies and Services for Poverty Reduction. [online] Available at:http://tatedo.org/cms/images/publications/annualreports/ar2008.pdf. (Accessed 31 May 2011)

Tanzania Traditional Energy Development Organization, 2009. Committed to Enabling Rural Majority in Tanzania to Access Sustainable Modern Energy Services for Poverty Reduction. [online] available at: http://tatedo.org/cms/images/publications/annualreports/ar2009.pdf, [accessed 31 May 2011]

Tanzania Traditional Energy Development Organization, 2010. Biomass Energy Situation in Tanzania. [online] available at:<http://www.tatedo.org/cms/index.php?option=com_content&view=article&id=5&Itemid=18> [Accessed 02 May 2011]

Tanzania Traditional Energy Development Organization, 2006. *Integrated Modern Energy Services for Sustainable Development and Poverty Reduction Programme* . [proposal document] TaTEDO Collection.Dar es salaam. TaTEDO Library

United Nations, (2002). *Report of the world summit on sustainable development*. Johannesburg, South

United Nations (UN) (2009). Women, poverty & economics. [online] Available http://www.unifem.org/gender_issues/women_poverty_economics/.[Accessed 17 May 2011]

United Nations Development Program, 2000. Gender and Energy: How is Gender Relevant to Sustainable Energy Policies? [online] Available at: <www.undp.org/energy/publications/2000/.../chapter2.doc> [Accessed 07 May 2011]

United Nations Population Fund (2010). Gender equality: Empowering women. [online] Available at:http://www.unfpa.org/gender/empowerment.htm. [Accessed 06 August 2011

United Republic of Tanzania , 2005. National Strategy for Growth and Reduction of Poverty 2005(NSGRP). [online] Available at: http://tatedo.org/cms/images/publications/reports/mkukuta.pdf. [Accessed 31 May 2011]

United Nations Population Fund, (2011). Gender equality: A cornerstone of Development. [online] available at: http://www.unfpa.org/gender/ [Accessed 06 August 2011]

United Republic of Tanzania, 2000. Policy on Women in Development in Tanzania. [online] Available at: http://www.tanzania.go.tz/pdf/policyonwomenindevelopment.pdf. [Accessed 31 May 2011]

United Republic of Tanzania, 2003. The National Energy Policy. [online] Available at: http://tatedo.org/cms/images/publications/reports/energypolicy.pdf. [Accessed 31 May 2011]

United Republic of Tanzania, 2007. Coast Region Social-economic Profile. [online] Available at: <http://www.tanzania.go.tz/regions/COAST.pdf >[Accessed 09 May 2011]

United Republic of Tanzania, 2009. Poverty and Human Development Report.[online] Available at: <http://www.povertymonitoring.go.tz/WhatisNew/PHDR%202009%20text.pdf> Accessed on 09 May 2011]

University of East Anglia & Economic and Social Research Council, 2011. The Governance of Clean Development. [online] Available at: <http://www.uea.ac.uk/dev/gcd/working-paper-series> [Accessed 10 May 2011]

Versschuren, P. and Doorewaard, H., 2010. *Designing a Research Project*. 2nd ed. The Hague: Eleven international publishing.

WHO (2005) Indoor air pollution and health. [Online]. Available at: <http://www.who.int/mediacentre/factsheets/fs292/en/print.html> [Accessed 20 April 2011].

Word Bank, 2009. Gender in Agriculture Sourcebook. Washington DC.
World Bank, (2011).Household Cook stoves, Environment, Health, and Climate Change. [online] Available at: http://cleancookstoves.org/wp-content/uploads/2011/05/Household-Cookstoves.pdf [Accessed 05 May 2011]

World Bank, 2010. Improved Cook stoves and Better Health in Bangladesh. [online] Available at:<http://zunia.org/uploads/media/knowledge/Bangladesh%20Improved%20Cookstove%20Report_28-06-10%20%20EPB003(10-11)_WB_1294304827.pdf >[Accessed 26 April 2011]

World Energy Outlook, (2010). Energy Poverty. How to make energy access universal?: http://www.worldenergyoutlook.org/docs/weo2010/weo2010_poverty.pdf [accessed on 18 May 2011]

Yin, R.K. (2003) *Case study research: Design and methods*. London, Sage.

ANNEXES

Annex 1: Interview Topic List

A : A topic list for improved stove users in Msangani and Kipangege villages

1. Background of the respondent ;(name of the village , age of the respondent , family size , wealth , contacts and household cooking practices)
2. The experience about abandoned technology in relation to; (fire wood consumption, work load, Smoke emissions, income and gender equality,
3. The adoption of improved wood stove (how they came to know about the technology, motives behind the adoption of improved stove and the realized benefits),
4. Income costs (ways of obtaining fire wood) If they purchase
5. The amount of money spent on fire wood per day before and after the adoption of improved stove Work load on fire wood collection before and after the adoption of improved wood stove (the distance to the fire wood collection, time spent in collection and transporting, how often they go on fire wood collection per week
6. Influence of improved stove on income (the experience of income situation before and after the adoption of improved stove)
7. Influence of improved stove on Health (the situation of smoke emissions, the effects of the smoke on their health)

B: Topics for TaTEDO key informants

1. The rationale of the project to the beneficiaries
2. The achievement of the goal, purpose and activities based on the indicators
3. The realised contributions of the technology in terms of :

- Reducing women work load
- Improved health
- Improved income
- Time saving

4. The strategy that TaTEDO put in place that supports smooth implementation of the project in terms of;

- Coverage
- Resources, both human and Financial
- Capacity of the organization
- Accessibility of the technology
- Affordability of the technology
- Working facilities e.g. office, vehicles

5. The sustainability of the project
6. Challenges faced by the organization
7. Participation of other stakeholders in the project implementation

- Government (Policy making)

- Local government authorities
- Local NGO’s and CBO’s

C : Topics for Village leaders

1. Experience on the implementation of improved wood stove project
2. The realised contributions of the technology in terms of :

- Reducing women work load
- Improved health
- Improved income
- Promoting gender equality

Annex 2: Improved Wood Stove Picture

A girl from Msangani Village cooking with the improved wood stove