IMPACT ANALYSIS OF IMPROVED COOKING STOVE IN LIVELIHOOD OF RURAL WOMEN :

A Case Study of Sindure VDC, Lamjung District, Nepal

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Submitted By

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Declaration

I hereby declare that the thesis entitled **Impact Analysis Of Improved Cooking Stove In Livelyhood Of Rural Women :A** case study of Sindure VDC, Lamjung District, Nepal submitted to the Central Department of Rural Development , Tribhuvan University , is entirely my original work preoared under the guidance and supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources in the course of preparing this thesis. The results of this thesis have not been presented or submitted anywhere else for the award of my degree or for any other purposes . I assure that no part of the content of this thesisss has been published in any form before.

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18-07-2016

RECOMMENDATION LETTER

The thesis entitled **IMPACT ANALYSIS OF IMPROVED COOKING STOVE IN LIVELY OF RURAL WOMEN** :**A case study of Sindure VDC**, **Lamjung District**, **Nepal** has been prepared by **ROSHMA KARKI** under my guidance and supervision. I hereby foeward this thesis to the evaluation committee for evaluation and approval.

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Prof. Dr. Prem Sharma

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10-07-2016

Approval Letter

The thesis entitled IMPACT ANALYSIS OF IMPROVED COOKING STOVE IN LIVELIHOOD OF RURAL WOMEN : A case study of Sindure VDC , Lamjung District, Nepal submitted by ROSHMA KARKI in partial fulfillment of the requirements for the Masters Degree (M.A) in Rural Development has been approved by the evaluation committee.

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18-07-2016

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I express my profound thanks to my family members, especially my husband Arun Karki for his continued support and encourage for the accomplishment of this work, without his support, the completion of this thesis would not have been possible. Finally, I would like to thank all my friends for their valuable suggestion, continuous encouragement and help throughout the research work.

Roshma Karki
Kathmandu
2016-07-18

ABSTRACT

This thesis entitled “Impact of Improved Cooking Stoves on Rural Women": A Case Study of Sindure Village Development Committee (VDC) has been conducted in Lamjung District of Nepal. This district is located 190 km far from the capital City of Nepal, Kathmandu. It is linked with the seasonal gravel road. Until 2014, fifty percent Households of the Sindure VDCs have installed improved cooking stoves (ICS).

This study mainly dealed with the impact of ICS on the rural women of Sindure VDC. This study covered three issues; time saving, fire wood saving and health related issues. A comparison study was done to find the impact of ICS over (TCS). Economic analysis and perceptional analysis on these issues were done to answer the main research question.

A purposive sampling technique of data collection method was applied to retrieve the data for empirical study. Forty respondents were selected purposefully for the purpose of data gathering. . Both primary and secondary data were used for this study. Primary data were derived from interviews with the help of a semi - structured questionnaire. A face-to-face method of interview technique of data collection method was applied to data collection. And secondary data were obtained from various sources such as books, journals, research reports, magazines .

The respondents of this study were all female. Majority of the respondents were Janajati and followed by a Dalit. Out of 40 HHS, It has found that 1 respondent switched to TCS. The finding revealed that an average time saves by using ICS compared to TCS is 30 min per day. It has also found respondent's involvement in other activities has increased due to the save in time . In addition, there was significant amount of fire wood saved by using ICS compared to TCS, which was almost a little bit less than half. Major health problems overcome due to use of ICS were; respiratory problems, eye born diseases, skin diseases and problems with the lungs.

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ABBREVIATIONS

AEPC:	Alternative energy promotion centre
ARI:	Acute Respiratory track Indicators
BEC:	Biomass Energy Component
CBO:	Community Based Organization
CRT/N:	Centre for Rural Technology/ Nepal
DDC:	District Development Committee
ESAP:	Energy Sector Assistance Programme
GoN:	Government of Nepal
HHs:	Households
ICS:	Improved Cooking Stoves
INGO:	International Non Governmental Organization
KII:	Key Informant Interviews
KW:	Kilo Watt
LPG:	Liquefied Petroleum Gas
MARR:	Minimum Attractive Rate of Return
MoEST:	Ministry of Environment, Science and technology
MW:	Mega Watt
NGO:	Non Governmental Organization
RE:	Renewable Energy
RETs:	Renewable/Alternatives Energy Technologies
TCS:	Traditional Cooking Stoves
TE:	Traditional Energy

TER: Traditional Energy Resource

VDC: Village Development Committee

WHO: World Health Organization

CHAPTER: I

INTRODUCTION

1. 1 Background of the Study

Wood fuel based cooking stoves are the most common way of cooking and heating food in developing countries. Developing countries consume little energy compared to developed nations; however, over 50 percent of the energy that they do use goes into cooking food. The average rural family spends 20 percent or more of its income, purchasing wood or charcoal for cooking. Living in the city provides no refuge either as the urban poor frequently spend a significant portion of their income on the purchase of wood or charcoal. Government of Nepal (GoN) started the promotion of Renewable/Alternative Energy Technologies (RETs) from Sixth Plan Period (1980-85) by introducing subsidies for installation of micro hydropower projects. Other RETs like biogas, solar energy, wind energy, improved cooking stoves, improved water mills etc. have been addressed from the subsequent plans. Alternative Energy Promotion Centre (AEPC) was established in 1996, under the Ministry of Environment, Science and Technology (MoEST), with the mandate of promotion and development of RETs to raise the living standards of the rural people. The present strategy of GoN for the development of renewable energy (RE) sector is the promotion and information dissemination of RETs by involving different GO, I/NGO, private sector, provision of subsidy and bank loan, encouragement of private sector participation through public private partnership, training and extension activities as well as monitoring and evaluation to ensure quality services to the beneficiaries (AEPC, 2009).

Among the various programs being executed through AEPC, Energy Sector Assistance Program (ESAP) came into existence since 1999 with support from DANIDA, and later Government of

Norway joined in the program as another supporting partner in 2003. Biomass energy component (BEC) is one of the components among three technical components of ESAP. BEC works on the demand driven approach in public private partnership concept.

The objectives of BEC are

- To improve capacity of local organizations to offer an affordable biomass energy solution to the rural communities with quality assurance.
- To improve gender, health, the environment and socioeconomic issue, including reduction of women and children's drudgery which will be addressed through implementation of biomass energy solution
- To adopt of biomass energy as a popular indigenous energy solution in the rural communities (AEPC, 2009).

In ESAP II, BEC has a target of 434,000 improved cooking stoves for mid hills and Terai and 5,000 institutional improved cooking stoves (IICS) as demonstrated in the demand driven approach. By the end of 2012 installation of the total improved cooking stoves has crossed 573,355.00 (AEPC, 2012).

To achieve the target in ICS within that time frame, there is an urgent need to conduct some demonstration projects with national campaigning. In this regard, Verdict Engineering Consultancy and Research Center in coordination with AEPC is implementing a project in Baglungpani. Based on the type and quality of cook stove, the energy required for the cooking depends. For example, in traditional and improved cooking stove the fuel wood required for cooking the same quantity of meal varies.

The stoves burn a mix of wood, hay, or cow dung that women collect from around their homes or, at times, far from the safety of their villages. The old-fashioned Chulhas cook slowly,

imparting a delicious flavor to the food that many Nepalese love. But everyone from the women cooking their meals to international health experts knows, that the smoke from the fires has a dark side, literally and figuratively

1.2 Statement of the Problem

The problem of cooking over an open TCS is the increased health problems brought on from the smoke, particularly lung and eye ailments, but also birth defects. According to the World Health Organization, "Every year, indoor air pollution is responsible for the death of 1.6 million people, that's one death every 20 seconds." Replacing the traditional 3-rock cooking stove with an improved one and venting the smoke out of the house through a chimney can dramatically improve a family's health (WHO, 2009).

Deforestation and erosion are often the end result of harvesting wood for cooking fuel. The main goal of most improved cooking stoves is to reduce the pressure placed on local forests by reducing the amount of wood the stoves consume. Additionally, the money a family spends on wood or charcoal translates into less money being available to be spent on food, education, and medical care; so an improved cooking stove is seen as a way of boosting a family's income.

Fuel is wasted, as heat is allowed to escape into the open air. This requires more labor on the part of the user to gather fuel and may result in increased deforestation if wood is used for fuel. Only one cooking pot can be used at a time. The use of an open fire creates a risk of burns and scalds. Especially when the stove is used indoors, cramped conditions make adults and particularly children susceptible to falling or stepping into the fire and receiving burns. Additionally, accidental spills of boiling water may result in scalding, and blowing on the fire to supply oxygen may discharge burning embers and cause eye injuries.

Every morning and evening, women in Nepal spend an hour or two cooking their rice, Dal,

Curry, and Roti or other flat bread. Most will prepare their meals over a smoky, 3-stone open fire or traditional clay or brick cook stove called a Chulha.

The stoves burn a mix of wood, hay, or cow dung that the women collect from around their homes or, at times, far from the safety of their villages. The old-fashioned Chulhas cook slowly, imparting a delicious flavor to the food that many Nepalese love. But everyone from the women cooking their meals to international health experts knows the smoke from the fires has a dark side, literally and figuratively.

Nepal is endowed with good renewable energy potential. The major sources of renewable energy are hydropower, solar energy, various forms of biomass energy, biogas and wind energy etc. Despite huge renewable energy potential still around 85 percent of the total final energy consumption in Nepal is met by traditional biomass and only 56 percent of households in Nepal have access to electricity (AEPC, 2012). Majority of people in Nepal are living in rural areas and are poor. It is not possible to significantly improve the living standard of the rural poor if their demand for clean energy services is not met. Extension of national grid to reach those areas is not possible in many years to come due to the difficult terrain, high cost and also there is an enormous energy crisis in the country. Therefore, clean and sustainable energy such as renewable energy technologies are the solutions. Government of Nepal has been supporting for promotion and development of renewable energy technologies since past two decades with the support from development partners, and private sector. The initiative taken has been fruitful and there are significant achievements in the development of renewable energy in the country. Till date, around 12 percent population has access to electricity generated through renewable energy sources. Around 23 MW of electricity has been generated from micro hydro schemes, 12 MW from solar PV system, less than 20 KW from wind energy etc. More than 1.5 million households

are benefited from different renewable energy sources both for cooking, lighting and end users (AEPC, 2012). The Government of Nepal and various Development Partners have been providing financial and technical support to increase the access to clean renewable energy. But majority of the population under poverty level living in the rural remote areas are out of access to clean energy due to high initial upfront cost of the renewable energy technologies. The renewable energy services are not equitably distributed across Nepal. Past subsidy policies have been successful to mobilize people and communities mainly around the more accessible areas of the country to install renewable energy schemes. However, people living in the remote and very remote areas and the poor households are mostly deprived of such energy services due to the high initial cost of the renewable energy technologies, low income of households, and low capacity of the institutions involved in the development of renewable energy services at local level (AEPC, 2012).

Researchers can now list the ingredients of the smoke flowing from open fires and old-fashioned cook stoves. Most about 90 percent is carbon monoxide. The rest is a mix of volatile organic compounds, polyaromatic hydrocarbons, metals, and particulate matter including PM10 (which easily penetrates airways) and PM2.5 (the smaller fraction, which penetrates deep into the lungs). According to Fuel for Life, 24-hour levels of PM10 in homes that use solid fuels routinely reach 300–3,000 µg/m3 and may spike to 10,000 µg/m3 during cooking. By comparison, the WHO recommends no more than an annual mean of 20 µg/m3 and a 24-hour mean of 50 µg/m3 for PM10 (WHO, 2009).

Breathing the smoke from traditional cook stoves and open fires may have caused 1.96 million premature deaths worldwide in 2004, according to WHO risk factor estimates accompanying the 2008 report *The Global Burden of Disease: 2004 Update*. The diseases and conditions associated

with smoke exposure include pneumonia, chronic respiratory disease, heart disease, low birth weight, and probably tuberculosis and other diseases. Globally, an estimated 49 percent of deaths attributable to household use of solid fuel are due to pneumonia in children under age 5. In a meta-analysis of 24 studies in the May 2008 issue of the *Bulletin of the World Health Organization*, Bruce and colleagues reported that, despite "substantial" differences among the studies, "this analysis demonstrated sufficient consistency to conclude that risk of pneumonia in young children is increased by exposure to unprocessed solid fuels by a factor of 1.8." (WHO, 2008).

Many rural households use traditional cooking stoves (often only a hole in the ground) that use firewood, agro-residues and cow dung as fuel. These stoves have certain inherent defects: ·

- They are less than 10 percent efficient (in using the energy store in wood);
- The produced smoke stays in the kitchen due to absence of vent pipe and ill ventilation, which is harmful to the health of users and their families;
- Utensils and clothes are blackened by soot;
- The open fire results in risk of accidents with children burn and/or household fire;
- The stove needs regular blowing

To date, few non-governmental organizations, companies, and development and public health agencies that have tried to replace these traditional stoves have met with only isolated successes in large-scale programs. Now, AEPC intends to launch institutional improved cook stove initiatives in Nepal.

Deforestation is often the end result of harvesting wood for cooking fuel. The level of Jungle encroachment is gradually increasing and the threat is alarming. One of the major reasons is the use of wood as fuel for cooking and heating purpose. Similarly, women are the one who take

responsibilities of household chore including firewood collection and cooking. Therefore, large amount of time have to be spent by the women in collecting fire wood. Thereafter, it resulted over burden in their day to day schedule. Moreover, cooking over an open fire is increase health problems bought on from the smoke, particularly lungs and eye diseases.

1.3 Objectives of the Study

The general objective of the research is to explore the impact of Improved Cooking Stove in the lives of the ICS user's women of Baglungpani VDC of Lamjung District.

- To measure the effect of Improved Cooking Stove on cooking time compare to Traditional Cooking Stove.
- To explore the amount of firewood consumption of cooking between Improved cooking Stove and Traditional Cooking Stove.
- To ascertain the health benefits of the ICS compared to the traditional one.

1.4 Rationale of the Study

An improved cooking stove has gained significant popularity in the rural area of the Nepal. AEPC has been promoting different program under the energy sector program. Over the last decade thousand of ICS has been installed in the rural area of Nepal. The main aim of this program is to improve the livelihoods of the rural women. In addition, the ICS reduce the indoor air pollution, firewood consumption and working load of the women. "An improved cooking stove saves 30-35 percent of firewood. It also makes cooking faster. The amount of fuel wood saved depends on the type of ICS, the condition of fuel wood, the type and amount of food prepared, and the types of pots used for cooking. In rural areas where most fuel is gathered, very low-cost stoves can still be sold to some both electric and kerosene stoves have the added daily

cost of fuel, which in the case of the improved stove is nil (because improved efficiency alone accounts for all of the gain). The common subsidies and the foreign exchange requirements make kerosene imports burdensome for the national economies of many countries. Collecting firewood is one of the most important tasks for rural women, often taking several hours per day. Saving biomass energy for cooking and fuel wood collection time helps many women to learn how to read and write, as they have finally got enough spare time to attend literacy classes. In rural area, women and children are suffering from the indoor air population. The most common associated diseases with indoor air pollution are respiratory diseases such as lower respiratory infections among children and chronic obstructive pulmonary diseases among women. Children exposed to indoor smoke are more than twice likely to suffer from pneumonia than unexposed children and women exposed to indoor smoke air are more than three times likely to suffer from COPD than women not exposed. Other possible health impact includes lung cancer, tuberculosis, cataract, asthma, low birth weight etc. A WHO assessment found indoor air pollution to be the 8th most important risk factor for disease. It is a particularly important risk factor for acute respiratory tract infections (ARI) including bronchitis and pneumonia. Each year, IAP is implicated in the deaths of 1.6 million people (a death every 20 seconds). Because women and children spend the most time near the domestic hearth, they are especially vulnerable. Use of cleaner burning fuels, access to improved stoves and/or behavior changes could substantially reduce exposure to indoor smoke and associated diseases and ultimately promote the health condition.

Despite the enormous advantage of the ICS in the live of rural women, there is little knowledge comparative study had been conducted about the impact of ICS on the rural women of the Nepal. Therefore, this study is aiming to explore and compare the impact of ICS before and after in the rural women of the Baglungapani VDC of the Nepal.

1.5 Scope of the Study

The improved cooking stoves could play an important role to reduce the fuel wood consumption in the country within a short period of time. Similarly it enhances local level manufacturing base and employment opportunities and significant to scaling up the ICSs in rural area of the country.

1.6 Limitation of the Study

Basically the study has been done in Baglungpani VDC of Lamjung District. During the field visit and report writing the following topics were concluded here which can be bounded the study in some sense.

- The study is limited only Baglungpani VDC of Lamjung district although ICS program is promoted throughout the country.
- The emphasis was given only on qualitative information rather than quantitative.

1.7 Organization of the study

This entire research study is divided into five chapters. Chapter one starts with the introduction chapter and that includes background of the study, statement of problems, and objective of the study, rational of the study, scope and limitation of the study. Chapter two deals about the literature review including; theoretical review of the gender theory, an overview of the ICS, energy resource base of Nepal, policy related to renewable energy technology and conceptual framework of the research. Chapter three presents the methodology applied in the empirical section of the study that includes the selection of the study area, research design, sampling techniques, nature and source of data, tools and techniques of data collection and methods of data analysis. Chapter four presents the presentation of data, interpretation and analysis. Chapter five will wrap up research with the major findings, conclusion and relevant recommendation.

CHAPTER: II

REVIEW OF LITERATURE

2.1 Theoretical review: Gender theory

Sometimes it is hard to understand exactly what gender means. While dealing with development perspective we encounter different philosophy and perception about the gender. Understanding and making deep insights about the gender and its consequence in the development is most important. This study aims to identify the impact of ICS to the livelihood of the rural women.

That is necessary to understanding about the women and development, women in development gender and development and third wave feminism. The perspective and philosophical approach of defining the term gender is different over the time. The role of the women in the liberal approach is perceived as lagging behind the men, but the conviction is that position of women will improve when women are integrated in development (Boserup, 1970).

The neo-Marxist approach is different that they believe inequality between women and men is due to structural, namely as embedded in relations of production. They believe that inequality between the sexes can only be reduced if the relations of production changes. This implies that society has to change towards socialism. The Marxist-feminist approach is different. He maintains that it is not only modes and relations of production that cause and explain women's subordination. It is also due to the sex-gender cultural gender. These psycho-cultural processes also contribute to women's subordination.

The common discourse emerging from these genders the theories is that women and men are not equal that women lag behind men that men dominate or oppress women, and that women are subordinated to men. Such gender perspectives are to be found in recent literature on the subject.

According to Sachs (1996) women's knowledge, but argues that scientists, agricultural policy-makers and patriarchal family structures devalue that knowledge. She argues that although women do the majority of the work in agriculture, older men still own the land, control women's labors and make the agricultural decisions in patriarchal social systems. Perspectives and models are continuously changing. Leonardo (1991) argues that correction of the male bias started at the beginning of the 1970s by shifting the focus from women towards gender, to denote our concern with both sexes.

The perspective towards women has changed over time. Women in development (WID) approach, was originated as a result of three major feminist moments/waves concerning feminine conditions. Kabeer (1995) comes up with three different gender approaches thorough exploring development form a feminist perspective. She asserts that a limitation of the Women in Development (WID) approach was that it only focuses on women. But the advantage of this approach was that women emerged as a visible category in development research and policy. WID was grounded in a theory of 'irrational' prejudice and sex-role stereotype when that was needed was a theory of male power and conflicting gender interest's (Kabeer, 1995). Kabeer explains that after the WID approach came the gender relation's approach, aiming to bring power relations between women and men in the perspective.

The women and development (WAD) approach originated back in 1975 in Mexico City, as it sort to discuss women's issues form a neo-Marxist and dependency theory perspective. Its focus was to explain the relationship between women and the process of capitalist development in terms of material conditions that contribute to their exploitation. The WAD states that women have always participated and contributed towards economic development, regardless of the public or private spheres.

The Gender and development approach is originated in the 1980s by socialist feminism. It served as a transitioning point in the way in which feminist have understood development. It served as a comprehensive overview of the social, economic and political realities of development. It origin relates back to the Development Alternatives with Women for a New Era (DAWN) network, when it was first initiated in India. The DAWN program was then officially recognized in 1986 during the 3rd UN conference on women in Nairobi. The conference brought about activist, researcher and development practitioners globally. As they made discussion about the achievements made from the previous decade's evaluation of promoting equality among the sexes, and a full scope of the obstacles limiting women's advancements, especially in the developing world.

2.2 Review of Previous Study

Fuel Wood based cook stoves are the most common way of cooking and heating food in developing countries. Developing countries consume little energy compared to developed nations; however, over 50 percent of the energy that they do use goes into cooking food. The average rural family spends 20 percent or more of its income purchasing wood or charcoal for cooking. Living in the city provides no refuge either as the urban poor frequently spend a significant portion of their income on the purchase of wood or charcoal. Government of Nepal (GoN) started the promotion of Renewable/Alternative Energy Technologies (RETs) from Sixth Plan Period (1980-85) by introducing subsidy for installation of micro hydropower projects. Other RETs like biogas, solar energy, wind energy, improved cooking stoves, improved water mills etc has been addressed from the subsequent plans. Alternative Energy Promotion Centre (AEPC) was established in 1996, under the Ministry of Environment, Science and Technology (MoEST), with mandate of promotion and development of RETs to raise the living standards of

the rural people. The present strategy of GoN for the development of renewable energy (RE) sector is promotion and information dissemination of RETs by involving different GO, I/NGO, private sector, provision of subsidy and bank loan, encouragement of private sector participation through public private partnership, training and extension activities as well as monitoring and evaluation to ensure quality services to the beneficiaries (AEPC, 2009).

Users say the smoke burns their eyes and blackens their pots and kitchen walls. Health expert reports that smoke exposure increases the risk of numerous diseases. “Day in and day out, and for hours at a time, women and their small children breathe in amounts of smoke equivalent to consuming two packs of cigarettes per day,”(WHO, 2006).

The problem of cooking over an open fire is the increased health problems brought on from the smoke, particularly lung and eye ailments, but also birth defects. According to the World Health Organization, "Every year, indoor air pollution is responsible for the death of 1.6 million people that’s one death every 20 seconds." Replacing the traditional 3-rock cooking stove with an improved one and venting the smoke out of the house through a chimney can dramatically improve a family’s health (WHO, 2009).

Indoor air pollution (IAP) represents the fourth most important health risk factor after malnutrition, unsafe sex and unsafe drinking water and sanitation in the developing world. According to the World Health Organization (WHO), worldwide IAP is responsible for about 1.6 million deaths a year, particularly of young children and women. The major cause of IAP is burning of solid biomass fuels (wood, animal dung and agricultural residues) in open or traditional cook stoves built in poorly ventilated kitchens. More than 80 percent of Nepal’s population (approximately 20 million people), principally comprising the rural poor are exposed to dangerous levels of IAP and many people suffer from problems related to IAP. WHO

estimates that 2.7 percent of the national burden of disease in Nepal is attributed to solid fuel use and this causes 7500 deaths per year.

Cooking and heating with solid fuels such as wood, dung, coal or crop waste over open fires or stoves without chimneys can lead to indoor air pollution. This indoor smoke contains carbon monoxide, benzenes, aldehydes, small soot and dust particles and other health-damaging pollutants. More than 90 percent of particles emitted from combustion of wood and dung are fine particles that are less than 1 micron in diameter (pm1). These fine particles can remain suspended in the lungs when they are inhaled. The most common associated diseases with indoor air pollution are respiratory diseases such as lower respiratory infections among children and chronic obstructive pulmonary diseases among women. Children exposed to indoor smoke are more than twice more likely to suffer from pneumonia than unexposed children and women exposed to indoor smoke air are more than three times likely to suffer from COPD than women not exposed. Other possible health impact includes lung cancer, tuberculosis, cataract, asthma, low birth weight etc. A WHO assessment found indoor air pollution to be the 8th most important risk factor for disease. It is a particularly important risk factor for acute respiratory tract infections (ARI) including bronchitis and pneumonia. Each year, IAP is implicated in the deaths of 1.6 million people (a death every 20 seconds). Because women and children spend most time near the domestic hearth, they are especially vulnerable. Use of cleaner burning fuels, access to improved stoves and/or behavior changes could substantially reduce exposure to indoor smoke and associated diseases and ultimately promote the health condition.

An institutional improved cooking stove is a more effective and healthy way of using firewood compared to traditional stoves. "An improved cooking stove saves 30-35 percent of firewood. It also makes cooking faster. Institutional improved cooking stoves are the choice of hundreds of

households that do not have cattle to produce manure needed for a biogas plant, or that do not have enough money to install a biogas plant. The amount of fuel wood saved depends on the type of IICS, the condition of fuel wood, the type and amount of food prepared, and the types of pots used for cooking. While some commercial wood traders who sell fuel wood operate in this fashion, taking live trees as well as deadwood and debris, the type of deforestation resulting from the daily collection of fuel wood for household use takes a different form. Stoves can save up to 40 percent of the wood fuel normally consumed in open fires, and 25-35 percent of the fuel consumed in typical traditional stoves. The stoves can often pay for themselves in fuel savings within 1-2 months if the fuel is purchased. In rural areas where most fuel is gathered, very low-cost stoves can still be sold to some both electric and kerosene stoves have the added daily cost of fuel, which in the case of the improved stove is nil (because improved efficiency alone accounts for all of the gain). The common subsidies and the foreign exchange requirements make kerosene imports burdensome for the national economies of many countries.

Nepal is endowed with good renewable energy potential. The major sources of renewable energy are hydropower, solar energy, various forms of biomass energy, biogas and wind energy etc. Despite huge renewable energy potential still around 85 percent of the total final energy consumption in Nepal is met by traditional biomass and only 56 percent of households in Nepal have access to electricity. Majority of people in Nepal are living in rural areas and are poor. It is not possible to significantly improve the living standard of the rural poor if their demand for clean energy services is not met. Extension of national grid to reach those areas is not possible in many years to come due to the difficult terrain, high cost and also there is an enormous energy crisis in the country. Therefore, clean and sustainable energy such as renewable energy technologies are the solutions. Government of Nepal has been supporting for promotion and

development of renewable energy technologies since past two decades with the support from development partners, and private sector. The initiative taken has been fruitful and there are significant achievements in the development of renewable energy in the country. Till date, around 12 percent population has access to electricity through renewable energy sources. Around 23 MW of electricity has been generated from micro hydro schemes, 12 MW from solar PV system, less than 20 KW from wind energy etc. More than 1.5 million households are benefited from different renewable energy sources both for cooking, lighting and end users. The Government of Nepal and various Development Partners have been providing financial and technical support to increase the access to clean renewable energy. But majority of the population under poverty level living in the rural remote areas are out of access to clean energy due to high initial upfront cost of the renewable energy technologies. The renewable energy services are not equitably distributed across Nepal. Past subsidy policies have been successful to mobilize people and communities mainly around the more accessible areas of the Country to install renewable energy schemes. However, people living in the remote and very remote areas and the poor households are mostly deprived of such energy services due to the high initial cost of the renewable energy technologies, low income of households, and low capacity of the institutions involved in the development of renewable energy services at local level (AEPC, 2069).

Smokeless stoves and wood conserving stoves are terms used to describe stoves designed for developing country settings to reduce the health impacts of smoke from open fires inside dwellings. It is generally claimed that the new designs burn the wood (or other fuel) more efficiently. Important features may include a pipe (chimney) to vent the smoke and a different chamber design.

The use of stoves with chimneys in Guatemala reduced CO levels in the kitchen by about 90 percent and children's exposure by an average 50 percent over 48 hours. However, children are exposed to smoke when they go outside and when they go to other homes, so their individual CO exposure levels don't match levels in their own kitchen.

A modified version of the traditional cooking stove is the Improved Cook Stove (ICS) as shown in figure 4. Certain features have been modified to make them more efficient with respect to fuel wood consumption, make them convenient for cooking and much safer from a health point of view.

Traditional Institutional Cook stove are in use at hospitals, hostels, barracks, teashops and restaurants. Industries like wool dyeing, oil seed roasting for oil extraction and confectioners use them. Similar to household ICS, IICS can also be used for heating water by attaching to a back boiler or around the chimney pipe and for space heating by putting a cast iron or mild steel plate tight on the openings for pots/pans or by running a sheet metal pipe around the space to be heated.

Energy Resource Bases of Nepal

Biomass based Energy Resources

Bio energy implies the energy derived from organic biomass of recent origin available in different forms (solid, liquid or gas), from forestry, agriculture and other sectors. It included wood fuels, agro fuels and others, including mixtures plant and animal materials available on a renewable basis. It means the availability of biomass resources for energy production exists in abundance in the country.

The common biomass fuels that fall under the classification of Traditional Energy (TE) in Nepal included only the solid biomass fuels derived from plants and animals. Both woody and non

woody biomass derived from forests, shrub and grass lands and agricultural lands (crop harvesting and processing residues), as well as residues of animals in the form of excreta (mostly cattle dung). Recently the charred materials of some wild shrubs and other loose biomass materials were being compressed into biomass briquettes for energy.

The new boundary of Traditional Energy Resources (TER) extended beyond the territory of the forestry sector, embraced all types of trees, shrubs and herbaceous plants grown both inside and outside of forests, including non-forest lands, such as agricultural lands as well as organic waste materials derived as by-products of plant and animals, including industrial wastes, municipal solid wastes, etc. The new territory of bio energy, therefore, encompassed the agriculture, livestock, industry and human settlement sectors besides the forestry sector. Therefore, bio energy called for integration of the development activities in all of these related sectors.

Besides, the Environment sector, although it was not directly responsible for biomass production for energy, could influence through its policy and legislation in the development and use of modern bio energy applications, through proper management of industrial and municipal biomass wastes by sing them for energy production, also for reduction in atmospheric emission of greenhouse gases (GHGs). The human settlement sector could also play a significant role in this regard. In many countries the energy potential of municipal and industrial wastes and byproducts was being realized for heat, power generation instead of wasting them.

Biomass is the major sources of energy particularly in rural Nepal. Biomass fuels consist of both woody and non-woody biomass. The former comes from trees and shrubs, the latter from crop residues and other vegetation. Fuel wood from forest and tree resources, charcoal mainly from woody biomass, residues from different agricultural crops and animal dung are the major biomass based energy resources.

From the total TE consumption volume point of view, fuel wood stands first amongst different types of TE sources. Until recently, the use of charcoal for domestic energy has also remained insignificant. No forest in Nepal has been managed solely for energy purpose. Most fuel wood collected/assembled currently is either in the form of logging residues in forests derived after tree harvesting or in the form wood-processing by-products such as *bakal, tukra-taktri, chilka, kathko dhulo etc,* generated in saw mills and furniture factories. Some woody residues with energy potential are also generated in plywood, particleboard and fiberboard factories. The use of chemical pulpwood residue (black liquor, in liquid form) for energy production has neither been acknowledged nor reported in the statistics of related sector. The other important components of TE according to their ranking in total TE supply include the residues of animals and crops, respectively.

Wood fuel Resources

Wood fuels consist of woody biomass, i.e. stems, branches, twigs, etc., and saw dust and other residues from logging and wood processing activities, as well as charcoal from these sources. The primary sources of wood fuels are both forest and non-forest land. Forest and other wooded land include natural forests (including degraded forests), shrub lands, wood and timber plantations and woodlots, grasslands, non cultivated inclusion. Non-forest land here includes agricultural land, agro-forestry systems, road side plantation, home gardens, etc.

Currently, accessible National Forests (areas with more than 10percent crown cover) and shrub lands (areas with less than 10percent crown cover) as well as private and community forests, tree plantations in block or linear lines play a crucial role in fuel wood supply. These forests could be natural in origin or in the form of trees plantations, in blocks, lines or as scattered trees in public and community lands. Besides, private forests, and trees, including trees grown in non-forest

lands of different types also contribute to both locally consumed and commercially traded fuel wood production.

All forests, excluding private forests, whether marked or unmarked with forest boundary markers are treated as national forests, including waste or uncultivated lands, unregistered lands surrounded by or adjoining to forests, as well as paths, ponds, lakes, rivers or streams and reverie lands within forests. The legal definition of forest, according to MFSC-DoF (1999), includes all fully or partly covered areas by trees, including land use types such as Forest, Shrub land, Grassland, Non-cultivated inclusions, and other lands. Except the cultivated land, which is mostly registered under private or institutional ownership, all other land use types are owned and managed by the forestry or other related agencies in the public sector.

Nepal's forest resources have been regulated by Forest Act, 1993 and Forest Regulation 1995. This law and regulation has classified the forest into two broad categories for the management purpose. Such categories are National forests and Private forests. Nepal's current forest policy and legislation make a provision to earmark the national forests into a number of categories namely the Community forest, Leasehold forest, Government managed forest, Religious forest and the protected forest. Such categories were made to support the management purpose of the forests. Collaborative Forest regime is also added in Nepalese forest management system through the government directive. Additionally, buffer zone of the protected areas are also providing large amount of fuel wood resources for locals. National Parks and Wildlife Conservation Act (1973) and Regulation has also categorized different forest type namely the Buffer zone Community forest, Buffer zone Leasehold Forest and Buffer zone Religious Forest and Buffer zone private forest.

Forest land, shrub land, grass land, non-cultivated inclusion and cultivated land are the major

land use types in Nepal where forests and tree resources are existed in different intensity. The remaining land uses are grouped into other land categories that include water bodies, ice and snow coverage, rocky slopes etc.

2.3 Policies Review

Rural Energy Policy, 2063

According to the Rural Energy Policy, 2006 "Rural Energy" means energy that is environmental friendly and used for rural households, economic and social purpose such as Micro and Mini Hydro, Solar Energy, Wind Energy, Biomass Energy, etc. Rural energy is also known as renewable energy.

The overall goal of this policy is to contribute to rural poverty reduction and environmental conservation by ensuring access to clean, reliable and appropriate energy in the rural areas. In order to achieve this goal, the "Rural Energy Policy" will have following objectives:

- To reduce dependency on traditional energy and conserve environment by increasing access to clean and cost effective energy in the rural areas.
- To increase employment and productivity through the development of rural energy resources.
- To increase the living standards of the rural population by integrating rural energy with social and economic activities.

Subsidy Policy for Renewable Energy 2069 BS

It was felt necessary to make adjustment in the existing subsidy policy for increasing the access to more remote part of the country and to the poorest and socially disadvantaged people. In addition, this subsidy policy should encourage private sector to commercialize the renewable energy technologies, and focus on better quality and service delivery in rural areas. The current

subsidy policy is not smart and addresses the pro poor. The subsidy should link with the credit and it should be gradually replace by the credit in the long-term.

Considering the subsidy to promote the technologies, and reduce the initial upfront cost so that the low income households can afford the technologies to make the current subsidy policy equitable, inclusive and effective, this Renewable Energy Subsidy Policy, 2013 has been formulated. According to this policy

- No direct subsidy will be provided for the promotion of household mud improved cook stoves. But local bodies are encouraged to provide some financial support to install mud ICS to household with single woman, backward, disaster victim, poor and endangered ethnic group as identified by the Government of Nepal.
- The subsidy amount of Rs. 3,000 and Rs. 4,000 will be provided for household metallic improved cook stove for less than or two pot hole, and three pot hole types respectively. But such subsidy amount will not be more than 50percent of the total cost.
- The subsidy amount of Rs. 20,000 but not more than 50percent of the stove cost will be provided for the metallic improved cook stove to be installed in public institutions like public school, hospital/health post, police and army barracks, religious places, and orphanage homes.
- The subsidy amount of Rs. 2,000 but not more than 50percent of the stove cost will be provided for the metallic rocket stoves less than or two pot hole.

IICS can have 1-3 openings for cooking pots, one behind the other as shown in figure 2.3. It is made of bricks/stones in a mud and mortar mixture, 3 parts each, 2 parts rice husk/straw pieces and 1 part animal dung. Firewood is burnt under the first opening and the flame and hot air are directed to the second then third openings in turn by the baffles, before exiting the cook stove

through the chimney (made from un burnt bricks or iron sheet metal). An iron grid supports the burning firewood and let's air into the cook stove and ash and charcoal to settle below.

Environmental and Efficiency Implications

- ICS saves up to 35 – 40 percent of fuel wood.
- The work place is smoke free and neat.
- The cleaning of pots is easier (less soot).
- All materials used in the ICS can be used again and again.
- Operation is convenient and easy. Disadvantages/Limitations
- ICS needs regular but easy maintenance.
- Poor quality of workmanship and dimensional variations during construction may not render efficiency as claimed. It may lose dimensional accuracy if not maintained frequently.

2.4 Conceptual Review

This study is going to reveal the impact of ICS on the rural women of the Baglungpani VDC of the Lamjung district. Basically, this study focused on the three aspects; social impact, economic impact and environmental impact. Within the social impact two issues gender equity and women's workload due to the use of ICS explored. Gender equity leads to the well-being of the women's life on the one hand and reduced workload save the time of working hour of women. Ultimately, it results better livelihood of the rural women. Economic impact is the next issues discussed in this study. Less consumption of fire wood due to improved ICS resulted less investment in fire wood purchase. Thus, it results saving of income as a result they can invest saving money in family health and education expansions. Environment impacts include reduction of eye infections, skin diseases and deforestation due to less indoor pollution. This resulted positive impact in the health of the rural women. These all results better livelihood of the rural women.

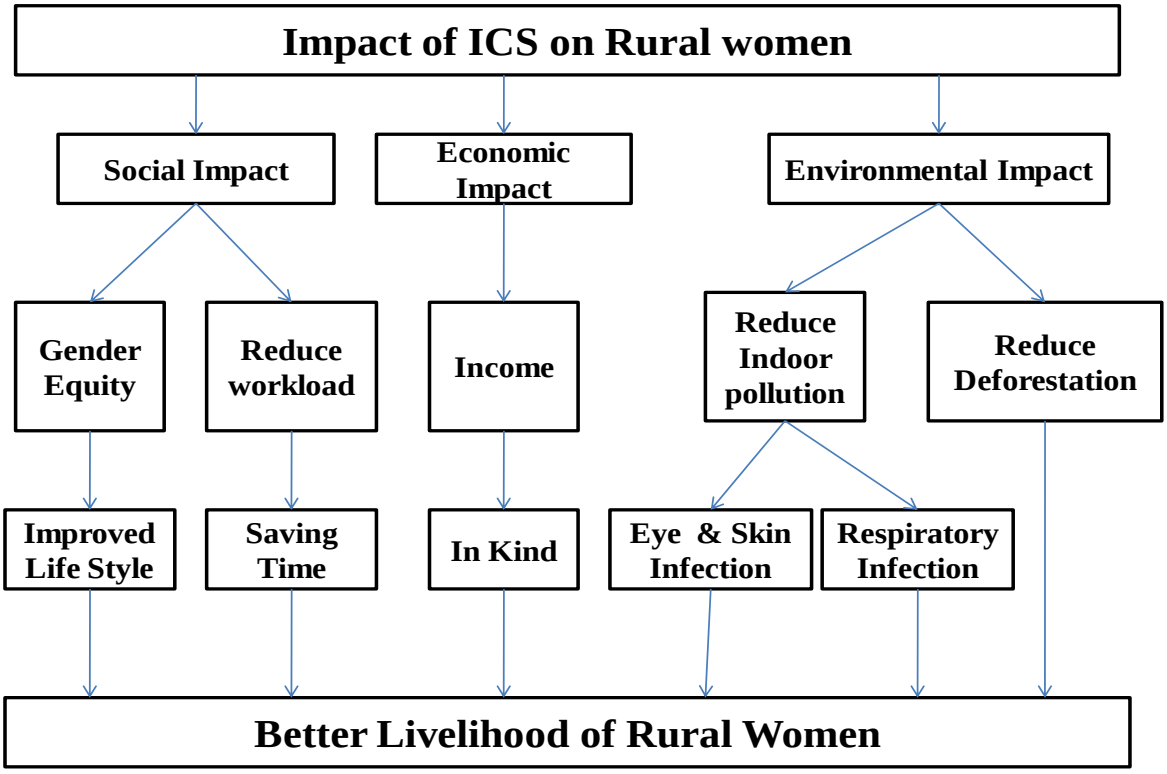

Figure 2.1. Conceptual Framework

CHAPTER: III

RESEARCH METHODOLOGY

Research methodology is a process of completing the study. This section deals with the methods and techniques of data collection and analysis used in this study. It described the essential and experienced views of all academic work of the study. It clarified the concepts and gives the importance of the study. This is the comparative study where both quantitative and qualitative technique of data collection and analysis is applied.

3.1 Research Design

The study is mainly micro level study deals with impact of Improved Cooking Stoves on women of Sindure VDC of Lamjung district. Thus, the study is based on both descriptive and analytical research design. Comparative study was carried out to find the impact of ICS on the lives of Sindure VDC of the Lamjung district.

3.2 Sampling Procedure

Purposive sampling procedure was applied to retrieve the data for the empirical study. First, by using purposive sampling technique study area was selected. Once the study area was identified respondents were selected by using the random sampling technique(lottery method). A total of 40 respondents have been interviewed to retrieve the information for the empirical study.

3.2.2 Selection of the Study Area

A prior contact was made with the DDC Lamjung to select the study area for empirical research. In consultation with the focal person of AEPC and researcher convenience, Sindure VDC of the Lamjung district was selected. This VDC is one of the average VDC of the Lamjung district in

terms of development; road access, education and health facility. Therefore, Sindure VDCs are selected for this study. Purposive sampling technique was applied to select the VDC and ward numbers. It has been verified that purposive sampling is better in term of getting more and reliable information compared to any means of sampling techniques where holistic information is required.

3.2.2 Selection of the respondents

Purposive sampling technique was applied to retrieve the data from the respondents. Total number of sample taken for this study was 40. All the respondents were female for this study.

3.3 Nature and Sources of Data

This study is based on both primary and secondary data. The primary data are collected from the ICS users of the Baglungapani VDC of the Lamjung with the help of semi-structure questioner. A face-to-face interview technique was used for primary data collection. Secondary data are obtained from the various sources such as books, journals, research reports, magazines, newspapers and other reliable sources. Both quantitative and qualitative date is collected for this study.

3.4 Tools and Techniques of Data Collection

Both qualitative and quantitative data were collected. The primary sources of information were collected from field sites.

3.4.1 Observation

Observation is a purposeful, systematic, and selective way of watching and listening to an interaction or phenomenon as it takes place (Kumar, 2011). Applying the participant observation method, research areas were observed. Participant observation method is a process of

observation where researcher participate in the research activities of the group being observed in the same manner as its members, as its members with our without their knowing that they are being observed (Kumar, 2011). The main attention had been paid for quality of work, design technology, use of wood, time saving between two stoves and capacity, participation, benefit sharing and sustainability of ICS.

3.4.2 Key Informant Interviews

Any person-to-person interaction, either a face-to-face or otherwise, between two or more individuals with a specific purpose in mind is called a Key informant interview (Kumar, 2011). Key informant interviewing is repeated face-to-face encounters between the researcher and informants directed towards understanding informant's perspective on their lives, experiences, or situations as expressed in their own words (Kumar, 2011). The purpose of key informant interviews is to collect information from a wide range of people—including community leaders, professionals, or residents—who have firsthand knowledge about the community. A face-to-face technique of data collection method of interview was applied to retrieve data from the respondents. Interview techniques for qualitative data collection methods are most helpful in getting the story behind a participant's experience and the interviewer can pursue in-depth information around the topic (McNamara, 1999). In this study, ICS uses women were the key informant interviews.

3.4.3 Scheduled questionnaire

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Questionnaire for this research study includes the questions related to the socio-economic status of the people, age, caste group, family size. Similarly, questions includes related to the ICS and health related issues.

3.4.4 Case Study

The case study design investigates an area where little is known or where you want to have a holistic understanding of the situation, phenomenon, episodes, site, group or community (Kumar, 2011). The case study design tries to find out the answer to the main research question by investigating the holistic situation of the case. Thus, several steps have to be taken. First, the sources of data are identified, strategies for data collection discussed and finally, the process of data analysis is explained.

3.5 Data Analysis and Interpretation

Data analysis involves the identification, coding and categorizing the patter found in the data (Woods, 2011). Information gathered through the interview was analyzed to find the demographic characteristics of ICS users. Thereafter, general description of the ICS users is presented. Comparative study of ICS users; time saving and fire wood saving was calculated and average mean score presented through the bar chart. Qualitative information was adopted in descriptive way. To visualize information different charts, tables were presented.

CHAPTER: IV

ANALYSIS OF THE STUDY

This chapter presents the results of the empirical research. It provides the answers to the main research question "What is the impact of ICS on women of the Sindure VDC of the Lamjung district"?

4.1 General information about the respondents

4.1.1 Age category of the respondents

Table one presents the respondent's age category and its numbers. Around one third (35 percent) of the respondents are in the category of 40- 49 age group followed by 8 (20 percent) in the category of 30-39 categories. Least respondents (5 percent) are in the category of 70-79 that is tow in number. Equal numbers 12.5 percent of respondents are in the Age Category of 20-29 and 60-69.

Table 4.1. Age category of the respondents

Age Category	Number of respondents	Percentage
20-29	5	12.5
30-39	8	20
40-49	14	35
50-59	6	15
60-69	5	12.5
70-79	2	5

Source: Field Survey 2015.

4.1.2 Caste distribution of the respondents

Nepal is rich in its cultural heritage as well as the caste and ethnicity. People having different caste and ethnic group reside on same locality in harmonic atmosphere. The caste distribution of the respondent also shows the same pattern which can be seen in the table 2. The majority of the respondent (65percent) is Janajati followed by Dalit (32.5 percent). Least respondents 1 (2.5 percent) fall under the category of other respondents.

Table 4.2. Caste distribution of the respondents

Descriptions	No of respondents	Percentage
Dalit	13	32.51
Janajati	26	65
Others	1	2.5

Source: Field Survey 2015.

4.*2* General situation of the ICS

4.2.1 General information

Improved Cooking Stove installation activities under the AEPC program in Sindure VDC of the Lamjung district of Nepal were started from 2067 BC. Thirty three HH's respondent has installed ICS in the year of 2068 BS and remaining seven HH's has installed it in the year 2069 BS respectively. Out of 40 ICS, 97.5 percent (39) were still in operation. But one (2.5 percent) ICS was malfunctioning. The reason behind this was that compared to TCS it was found that the heat produced is less. The result revealed that average investment by per household per ICS was Rs 1,200.00 (excluding subsidy). The result shows that the majority of the households (97.5 percent) have mud stove and only one (2.5 percent) HH has Iron ICS. In addition, (22) 55 percent

respondents were familiar about the Iron ICS. Similarly, 10 percent (4) respondents use the only ICS for both purpose cooking and heating while 90 percent (36) respondents use both improved ICS and traditional one for cooking and heating purposes. Though, the majority of the respondents using Mud their preference were in Iron ICS. Out of 40, 33 (82.5 percent) respondents said that Mud stoves are not suitable for heating purpose.

4.2.2 Level of satisfaction with the ICS

Figure two presents the respondents' satisfaction on ICS. The majority of the respondents 75 percent (30) are satisfied with the ICS. Ten percent (4) are not satisfied with use of ICS. Fifteen percentages are (6) are neutral.

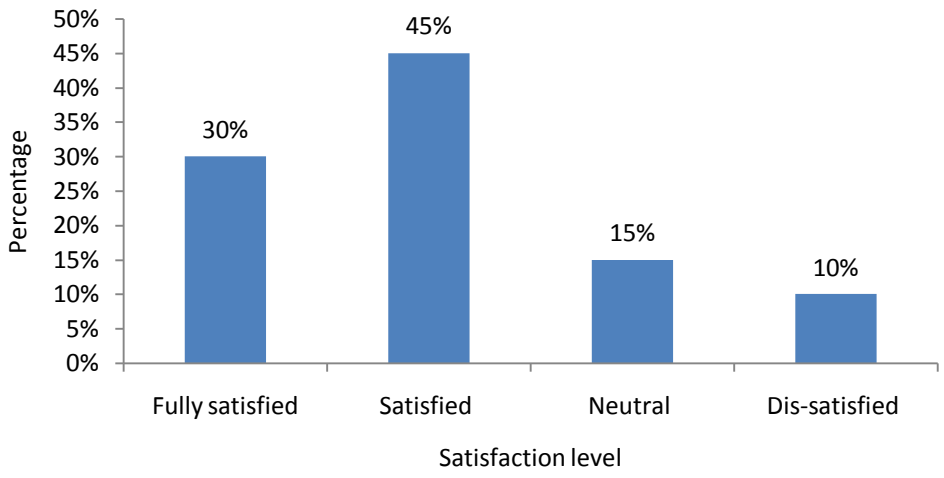

Figure 4.1. Level of satisfaction with ICS

Source: Field Survey 2015.

4.3 Use of fire wood before and after ICS use

4.3.1 Firewood consumption pattern

Figure three shows the use of ICS and TCS for different purpose. The percentages of the respondents that have used ICS for different purpose were; cooking (100 percent), feed preparation (82.5 percent) and hearing (87.5 percent) respectively. Similarly, the percentage of the respondents that have used TCS for different purpose are; feed preparation (22.5 percent) and heating purpose (12.5 percent) respectively. The amount of wood consumed per item; cooking, feed preparation and heating are similar in an average of 1.5 kg per day. In an average total amount of wood consumed per day was 4.5 kg. The majority of the respondents (80 percent) does not have their own private Jungle and depend on the community forest for firewood collection. Similarly, 20 percentages of the respondents have their own private Jungle for firewood collection. Women are responsible for the fire wood collection (26) followed by the men (11). Three respondents said that both men and women are involved in the firewood collection.

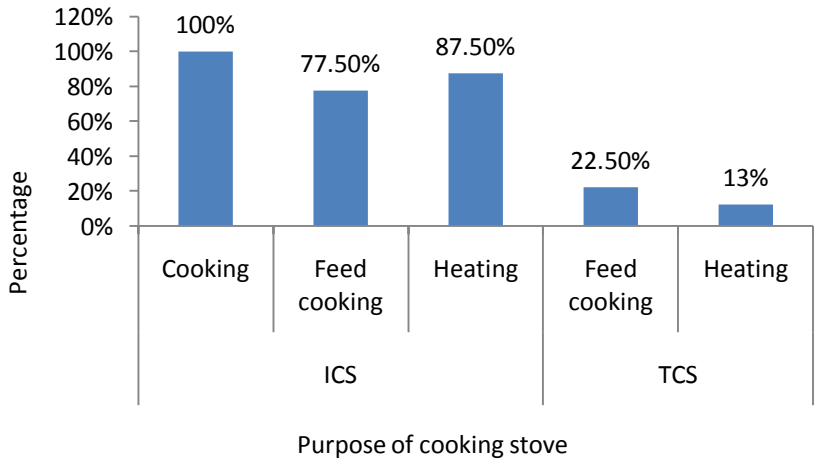

Figure 4.2. Multiple purposes of ICS and TCS uses

Source: Field Survey 2015

4.3.2 Firewood consumption between ICS and TCS

Figure four presents the average amount of firewood consumption in using ICS and TCS. It indicates that the amount of firewood consumption in using ICS is almost half (0.5 Vhari) compared to TCS (0.92 Vhari).

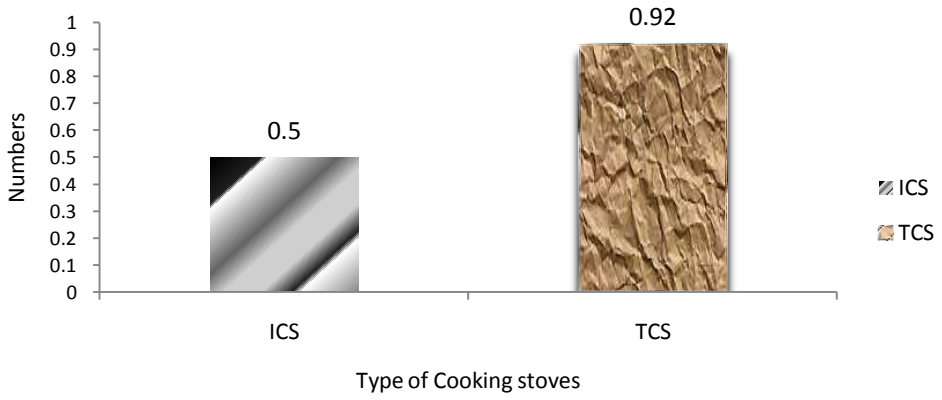

Figure 4.3. Amount of firewood consumption between ICS and TCS

Source: Field Survey 2015.

4.4 Comparison of time spent in using TCS and ICS

4.4.1 Respondents perception on time spend in using ICS and TCS

Figure five shows the perception of the respondents of saving time after using ICS compared to the TCS. Out of 40 respondents, 80 percent (32) believe that time is saved by using ICS compared to TCS. However, 20 percent (8) don't believe that time is saved.

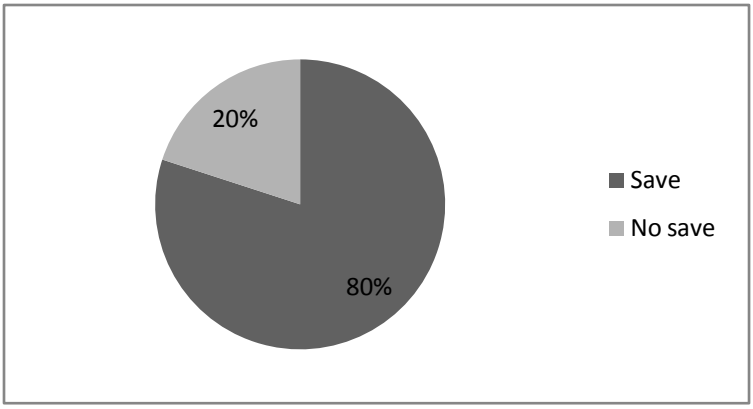

Figure 4.4. Perception of respondent on cooking time by ICS and TCS

Source: Field Survey 2015.

4.4.2 Time spent on firewood collection before and after ICS

Figure six shows the average time spent in firewood collection before and after the ICS installation. Before ICS installation, in an average per household go to Jungle 4.22 days per week to collect fire wood compared to 3.92 days per week after ICS installation. The majority of the household goes to Jungle for multiple purpose task like- firewood collection, Grass collection and animal rearing.

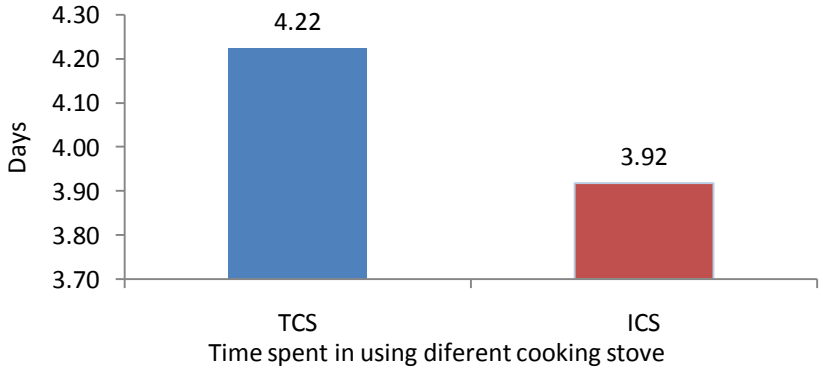

Figure 4.5. Time spent in fire wood collection in ICS and TCS

Source: Field Survey 2015.

4.4.3 Use of saving time in different purpose

Result in table three shows the involvement of respondents in different activities that have saved from the used of ICS instead of TCS. The majority of the respondents (32.5 percent) were involved in other works followed by 25 percent was involved in extra earning. Similarly, 10 percentages of the respondents was participated social work. Similar percentages of the respondents six and four were presented in the group meeting and child caring. Other work includes such as Kitchen gardening and education of children.

Table 4.3. Respondent's involvement in different works

Description	Numbers	Percentage
Caring for children	7	17.5
Participate in extra earning	10	25
Participate in group meeting	6	15
Social work	4	10
Other works	13	32.5

Source: Field Survey 2015.

4.5 Health issues of ICS and TCS (impact of health)

4.5.1 Respondents perception on improvement in health after ICS uses

Figure seven indicates that the majority of the respondents, 82 percent agreed that ICS improved the health condition of ICS users and 18 percent did not think so.

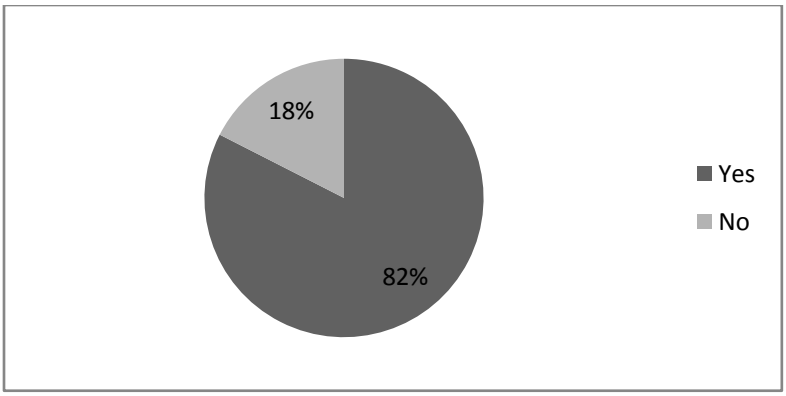

Figure 4.6. Respondent perception on health improvements after use of ICS

Source: Field Survey 2015.

4.5.2 Respondents perception in different health related problems

Result in Table four shows the respondent's perception/prioritize in the different health related issues. It is revealed that problems of respiration is the major health problems comprises highest percentage (40) of the respondents have respiratory problems. Open cook stove has two fold disadvantages; it does not have outlet for smoke and it takes more time to cook. So women have to engage more time inside the kitchen. That may be the reason that majority of the women has respiratory problems. Thereafter, similar numbers of respondents have problems of eye infection, lungs and skin infection having the 20, 17.5 and 17.5 percentages respectively. Least percentage (5) of the respondents has other problems.

Table 4.4. Perception of the respondents in the different health related problems

Description	Numbers	Percentage
Problems in respiration	16	40
Problems of eye infection	8	20
Problems in lungs	7	17.5
Problems in skins	7	17.5
Other problems	2	5

Source: Field Survey 2015.

4.6 Impact of ICS on women life through use of ICS

ICS has multi-fold impact on the women's life of Sindure VDC of the Lamjung district. Foremost, women's workload has significantly reduced by decreasing the time that women had invested earlier in fire wood collection and cooking. Thereafter, women can use their leisure time in other activities like, child caring, off-farm and on-farm activities. Furthers, women's participation in the social work like, group meeting, educational program, training and workshop has increased. It gave opportunities women's to engage in social work as well as to have exposure to the outside environment. This has positive impact on the women's empowerment. Similarly, women have involved in both on farm and off-farm activities like, vegetable farming and goat farming. Thereafter, women have involved in the sale of overproduce vegetable which was the one of the major income source in many household of the VDC of the Lamjung. Moreover, income from sale of vegetable was used in the child's education, health care and to buy daily household requirements. To sum up, women of the Sindure VDS has significant impact of ICS.

CHAPTER: V

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of findings of the study and discussions. The purpose of the discussions is to answer the research question that was formulated in the research proposal by interpretations of research findings, giving own opinions on the findings, explaining the implications of the research findings, and make suggestions for future research. Therefore, this chapter presents the summary of findings of the study and discussions on it.

5.1 Summary

The aim of this study was to explore the impact of the ICS on women of Sindure VDC of the Lamjung district. Therefore, only female respondents were selected purposefully for this study. The majority (65 percent) of the respondents were Janajati followed by Dalit (32.5 percent). The highest percentages of (35 percent) respondents fall under the age category of 40 - 49. Least numbers of the respondents were in the age category 70- 79. 97.5 percent of the respondents had installed mud stove while only 2.5 percent has Iron ICS. It was found that 97.5 percent of the ICS are in well functioned. Stoves are installed under the AEPC program and average household's contribution per mud stove is Rs 1200.00. Individual household members (women who involved in cooking and firewood collection) save 0.3 days per week. 0.42 Vhari wood fuels are saved from the use of ICS compared to the TCS. Average firewood consumption per day is 4.5 kg. The majority of the respondents are agreed that the use of ICS both reduces the incidence of health born diseases particularly eye born and skin diseases. Comparison study of ICS and TCS indicated use of ICS save time of women as well as firewood consumption compared to

TCS. Eye born disease, lungs and respiratory disease are the major disease that reduces after using ICS compared to the TCS. And the level of satisfaction by using of ICS is high.

5.2 Conclusion

Impact study of improved cooking stove in the lives of rural women of Sindure VDC of the Lamjung district of Nepal has been carried out successfully. The study revealed that the impact analysis of the improved cooking stove over the traditional cooking stove and presents the facts and situation. It has been expected that the problems of cooking over an open fire such as health problems, lung and eye ailments, deforestation and saving of waste fuel as well as time saving of rural women have been solved. In addition, time consumption by using ICS compared to TCS is almost half. The workplace becomes smoke free and neat. All materials used in the ICS can be used again and again. Operation is convenient and easy. ICS needs regular, but easy maintenance.

Social acceptance and adoption easier compared to disseminating totally alien technologies. Financial, economic and risk analysis establishes the fact that both TCS and IICS are not financially feasible, but ICS has a financial benefit over TCS.

ICS program has been adopted a demand driven and participatory approach, social mobilization is essential for the success and sustainability. Social mobilization is an approach and tool that enables people to organize for collective action, by pooling resources and building solidarity required to resolve common problems and work towards community advancement. It is a process that empowers women and men to organize their own democratically self-governing groups or community organizations, which enable them to initiate and control their own personal and communal development, as opposed to mere participation in an initiative designed by the

government or an external organization. Effective social mobilization goes beyond community organizations, harnessing the potential and efforts of government, non-governmental sector and citizens to work towards sustainable social, economic and political development. Since promoters are the ones who build stoves, they are a crucial part of the program to have an in-depth reach to the local beneficiaries and they should be made able to create their own market to sell their product which will ultimately help meet the program targets. In this context, a need has been felt to train local people as different aspects of social mobilization in the promotion and dissemination of biomass energy technologies. This will help build their capacity and will ultimately help in the effective dissemination of improved stoves and other bio-mass energy technologies in the program areas.

5.3 Recommendation

The research was conducted to explore the impact of ICS on the women of Sindure VDC of Lamjng district of Nepal. Basing on the results of the concluded research, it is clear that ICS has impact on the lives of rural women. And, the research was able to make the following recommendations.

Recommendation to NGOs/INGO's

- Women in rural areas have the main responsibility for cooking and others kitchen activities. Therefore, in the process of ICS identification and need assessment the needs of women should be considered.
- The design for particular location should be developed from a bottom up approach for the sustainability of the project. Therefore, the project implementing organization as well as private sectors should consider these aspects at the time of project designing.

- ICS has positive impact on the women life but it has observed that users were not well known about its positive impact. Therefore, it is recommended to promote and develop ICS awareness and promotional program to motivate the rural people toward the encouragement to install the ICS plant.

Recommendation to Private sectors/Research institutions

- From the study it has been revealed that rural people use firewood for multiple purposes; cooking, feed preparation and heating. Therefore, private sectors should consider these multiple functions before designing of the improved cooking stove.
- For future prospects, the ICS needs to be evaluated and assessed further through Research and Development (R&D). This activity will result in the appropriate stove for the specific user in the village. ICS Promotion Unit in the district needs to be established to provide thorough explanation and knowledge of concepts, structure and purpose of IICS and provide more insights to participants into the carbon markets. Therefore, further research is required on these aspects.
- Research is needed for proper selection of material, wall thickness, size and height of the chimney. Present technology does not justify heat low thermal diffusivity that is necessary to restrict heat loss through stove walls, bottom and top surface along with chimney.

Recommendation to ICS users/Governments sectors

- Sustainability of the ICS is one of the major aspects. So there should be some sorts of mechanism to ensure the continuous use of ICS in the long run. Therefore, both community people and implementation partners should develop a mechanism that can

handle overseen the continuous operation of the ICS in the long run.

- Therefore, local communities and government organization should consider the coordination mechanism for effective operation of the ICS after the phase out of the project.

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APPENDICES

Annex 1

Questionnaires

1. Profile of the respondent:

Name	Age	VDC	Ward No	Caste	Gender	Family member total

2. General information about ICS:

   a. Year of ICS installation

   b. How much amount did you invest for ICS?

   c. Is your ICS still in operation?

      i. Yes

      ii. No

   d. Type of ICS installed:

Iron ICS	Mud ICS

   e. Do you please tell me the type of cooking technology that is/are familiar most?

TCS	LPG	ICS	Boigas

3. To what purpose do you use wood? (specially for cooking and heating)

Only cooking food	Cooking for feed	Heating purpose	All purpose

4. What is the amount of wood consumed per day after ICS installation? (Kg if possible or Vari)

5. What is the amount of wood consumed when you used TCS? (Kg if possible or Vari)

6. If question no 4 is for either all or at least more than one: What is the amount of wood consumed per item after ICS installation? (Kg. If possible-Vari and I Vari equivalent to X kg)=

Wood used for cooking	Wood used for animal feed	Wood used for heating purpose

7. If question no 4 is for either all or at least more than one: What is the amount of wood consumed per item while using traditional cooking stove?

Wood used for cooking	Wood used for animal feed	Wood used for heating purpose

8. Do you have own jungle for collecting wood fuel?

   a) Yes b) No

9. If, no how can you get fuel wood?

   i) Community forest

   ii) Purchase from private wood collector

   iii) Government forest

10. Who collects the fuel wood from the Jungle? (If Qsn no 9 and 10 have answer of yes and community forest and Government forest)

    i) Women

    ii) Man

    iii) Children

iv) Both men and women

v) All of them

11. If questions no 11 answer is IV or V, could you please tell me how much time allocation for men and women for collection wood fuel? (Put on percentage)

Women	Men

12. Do you think ICS reduces the working load of women?

a. Yes

b. No

13. If questions no 12 answer is yes. How much time is saved on an average per day for collection wood fuel?

14. If questions no 13 answer is yes. For what purpose do you spent the time that saves from collecting firewood after ICS installation?

a. Caring for the children

b. Involving in development organization

c. Participating in social work

d. For extra earning

e. Participating in group meeting

15. Do you notice any improvement in health after using ICS?

a. Yes

b. No

16. If question no 15 is yes. What were health related problems did you have while using TCS?

    a. Problems with lungs

    b. Problems on respiration

    c. Eyes infection

    d. Others

17. To what extent do you satisfied with the ICS?

Fully satisfied	Satisfied	Neutral	Dissatisfied	Fully dissatisfied

18. Do you have any suggestion on ICS?

Annex 2

Name of the respondents	Age	VDC/Ward no
Bina Gurung	60	Baglungpani - 2
Padam Kumari Gurung	50	Baglungpani - 2
Nar Kashi Gurung	40	Baglungpani - 2
Chandra Maya Gurung	66	Baglungpani - 1
Bin Maya B.K	44	Baglungpani - 6
Sun Kumari Gurung	47	Baglungpani - 2
Tas Kumari Gurung	44	Baglungpani - 6
Prem Kumari Gurung	55	Baglungpani - 2
Shanta Kumari Gurung	60	Baglungpani - 2
Aas Maya Gurung	54	Baglungpani -1
Aas Maya Tamang	26	Baglungpani - 1
Ram Kumari Shrestha	28	Baglungpani - 1
Salina Tamang	25	Baglungpani - 6
Shanta Kumari B.K	45	Baglungpani - 6
Bee Maya B.K	46	Baglungpani - 6
Laxmi Gurung	35	Baglungpani - 1
Rasta Kumari B.K	60	Baglungpani - 1
Aaiti Kumari B.K	45	Baglungpani - 1
Biba B.K	44	Baglungpani - 2
Bina Gurung(a)	50	Baglungpani - 2
Indra Maya Tamang	40	Baglungpani - 2

Man Kala Gurung	60	Baglungpani - 2
Tirtha Maya Gurung	59	Baglungpani - 1
Shanta Kumari Gurung(a)	45	Baglungpani - 2
Bhou Maya Gurung	38	Baglungpani - 2
Khusi Maya Tamang	48	Baglungpani - 1
Ganga Tamang	33	Baglungpani - 1
Padma Gurung	45	Baglungpani - 9
Dil Kumari B.K	29	Baglungpani - 6
Takuli Gurung	75	Baglungpani - 2
Bee Maya Gurung	35	Baglungpani - 2
Chandra Maya Gurung	46	Baglungpani - 2
Bich Maya Gurung	66	Baglungpani - 1
Sital Devi B.K	61	Baglungpani - 1
Shanta Kumari B.K	43	Baglungpani - 2
Man Devi Gurung	24	Baglungpani - 6
Budh Kashi Gurung	39	Baglungpani - 6
Radhika Gurung	49	Baglungpani - 1
Prem Kumari B.K	34	Baglungpani - 6
Dol Maya Tamang	56	Baglungpani - 1

Annex 3

Case study

Maya Gurung is a resident of Baglungapani VDC of the Lamjung District of Nepal. She has five members in her family. As every woman of the rural Nepal, she also had a responsibility of household chores including caring for her child, raring of livestock's. She had spent her time on cooking, firewood collection, rearing of livestock's and grass collection. There is no other source of energy beside biomass (wood) for cooking and heating purpose. Therefore, she had spent significant time in firewood collection and cooking. Thus, to wake up early, involving household chores, going to the jungle for firewood collection was her daily scheduled since she got married. Consequently, she was busy whole day from early in the morning to late evening. Therefore, she did not give enough time to care after her child and participation in the social work. At the same movement, smoke coming from the open stove made the indoor pollution. This has negatively affected to her small child.

Maya Gurung knew about the ICS from his neighbor in 2067 BS. Next year she installed ICS in her home with the support of AEPC program. She noticed that ICS has many advantages over the TCS. One of the main advantages is that her kitchen became neat and clean compared to the previous one. She further expressed excitingly that smoke coming from the wood is almost nil. She also shared that there is less chance of fire born and negative effect of smoke. Similarly, she also told me that there is less time consumed in firewood collection and also less firewood is required for cooking compared to previous one. Now, she joined in the community group and has some spare time to spend time with her family. Happily, Bina said, "I can spend one day per week in social work".

Annex 4

Some glimpse of research

Interview with one of the respondents; retrieving the information

A sample of Improved Cooking Stove

A sample of Iron Improved Cooking Stove