CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Nepal has about 25 million people, 85 percent of whom live in rural areas. The average per capita income of the nation is about US$220, derived mainly from agriculture. The major sources of energy consumed are derived from the biomass resources and imported petroleum products. Overall, traditional biomass is the largest single source of energy, providing about 97% of final energy demand and about 95% of the total population of Nepal dependent on traditional energy sources.

In Nepal, biomass energy, such as fuel wood, agri-residue and animal dung is used for cooking and heating purposes. Use of traditional stoves like chulos made out of mud, bricks and other open fire place consume more fuel wood and emit more smokes. Women are mainly responsible for cooking as well as collection of biomass resources, mainly fuel wood from the forest, (it is again a burden on women). Overall traditional biomass is the largest single source of energy, providing about 95% of the energy demand of the rural households (Singh R. B. 2005). Energy use patterns vary significantly between rural and urban areas and also among different economic levels.

Energy consumption patterns are characterized by a high dependence on biomas, and a heavy bias towards the household sector, with cooking as the primary energy consuming end use. Fuel wood supplies almost all of the cooking energy requirements. Population increase and the resultant environmental degradation have severely impacted the traditional biomass-based energy sources, especially in the rural areas. The energy scarcity has a disproportionate effect on women and girls children. The most obvious burden is that as fuel resources become increasingly scarce, women have to walk longer distances and invest a greater portion of time each day in gathering fuel wood.

Despite the efforts to develop new and alternative energy sources, still for some time to come, the vast majority of the people will have to depend on bio-mass such as fuel wood for satisfying their basic energy consumption in relation to cooking, heating and lighting. Almost all the energy consumption is based on traditional biomass resources of energy such as fuel wood, agricultural residues and animal dung. As a result of continuing forest degradation, the share of fuel wood energy consumption pattern is in declining trend. Consequently fuel wood is increasingly being replaced by lower grade fuel such as agricultural residues.

Women in rural areas use cook stoves that requires firewood to cook meals for their families. These stoves are inefficient, they consume a lot of firewood and they fill the kitchen with smoke. As a result, women spend a lot of time collecting firewood in distant forests. Consequently eye and lung diseases are common among the women and the children, who spend many hours in the smoke filled kitchen. By using improved cook stoves (ICS), rural people not only can save the firewood, reduce the cooking time, and make the kitchen smoke free, thereby protecting the eye and lung diseases. The ICS directly benefits those women and children, who normally collect the firewood and undertake the cooking.

Improved Cook Stove (ICS) development and dissemination activities were initiated in Nepal from early 1950s with the introduction of some Indian models Hyderabad and Magan stoves. Since then, a number of Improved Cooking Stove Programs (ICPs) have been promoted in rural communities of Nepal. In early 1970s, the focus was on improving the fuel efficiency of stoves. During 1980s, interest and efforts were revived when the National Planning Commission (NPC) included ICS in its development plan as an attempt to address the pressing fuel wood problem. The government's concern for fuel wood conservation was also reflected with the inclusion of ICS dissemination efforts as an important component of Food and Agriculture Organization (FAO) of the United Nations assisted Community Forestry Development Project (CFDP) in 1981. Besides, other donor organizations as well as International Non-Government Organizations (INGOs) initiated promotion and dissemination of ICS in various regions of Nepal with a top-down and supply-driven approach.

With the combined effort of government and other development organization, ceramic prefabricated models of ICS were disseminated in the different parts of the country. However, this model turned out to be not as appropriate as substantial breakage occurred during the prolonged and difficult transportation process, thus, delivering mixed results and limited success of ICS efforts in Nepal during 1980s.

In the early nineties, Research Center for Applied Science and Technology, Nepal (RECAST) re-launched the stove program made out of mud brick which was entirely based upon the Lorena Stove, developed and standardized in Guatemala in early seventies.

The improved stoves are scientific modifications of the traditional stoves. They ensure proper combustion and reduce looses due to convention and tradition and thus utilize the heat value of the fuel efficiently. However, about 25 years of continuous government initiated and donor sponsored stove development program in Nepal could fulfill only about 8.33% (maximum) achievements regarding the improved cook stoves by the year 2005 (Singh, R.B. 2005).

1.2 STATEMENT OF THE PROBLEMS

The rural area of Nepal depends heavily on forest and other biomass resources to meet its domestic energy demand. About 77% of energy come form fuel wood, and in the mid-hills 80% of total energy consumption is based on fuel wood, the sources of which are mainly public forests, community forest and private land.

The demand for biomass energy is rapidly growing as a result of both population increase and an increase in the various types of economic activity in rural communities. This has led to over exploitation of biomass (wood) resources for fuel and other uses clearing the forests for agricultural land causing a serious problem in fuel wood supply and environmental degradation. Growing population and unavailability of alternative energies also leads to loss of the forests in rural areas that is hard to compensate.

In recent years, the Siwalik area has come under tremendous pressure from illegal encroachment, which has increased the degradation by modern infrastructure development and illegal settlers. Forest areas have been declining in the Siwaliks of Ilam district over the past three decades. Forest clearing as a result of settling and logging, coupled with the poor socio-economic condition of local communities is the primary cause of forest degradation.

Ilam Siwaliks area is also prone to natural disasters. Monsoon floods, flash floods and debris flow, landslides, river cutting and forest fires have contributed significantly to soil loss, decline in forest area and loss of private property. The poor socio-economic condition of the local communities in the Ilam Siwaliks is one of the main reasons for forest degradation resulting decrease in fuel wood.

Settlers in Chulachuli VDC are migrant from the hills after the eradication of malaria in Terai and opening of the East-West highway in the mid-twenties (BS). Since there were no policies for settling such migrated people, they were forcefully settled in this area. As the population of encroachers grew in Chulachuli, as well as in the adjoining VDCs and districts, Siwalik area was put under tremendous pressure due to illegal logging and land use resulting rapid depletion in forest area affecting the livelihoods of the poor people. The increase in human population and their demands has put additional pressure on local resources.

Since the people in Chulachuli VDC has limited access to commercial fuels, energy consumed by the settlers comes from non-commercial sources like fuel wood, cow dung, agricultural residues, etc. The rate of fuel wood consumption per household, per year in the Chulachuli VDC was 14,600 kgs (IUCN Nepal, 1999) while national average fuel wood consumption was estimated to be about 800 kg per capita, per year, which was very high. The average household consumption per year was estimated at 9,125 kg. Per capita fuel wood consumption was 1629 kg per year which was double the national per capita consumptions of 800 kg.

Since population growth is in increasing rate, the consumption of fuel wood is also in increasing rate. This has serious implication for the conservation of the forest

area of the Siwaliks. Therefore, intervention of alternative energy sources such as bio-gas, improved cook stoves was seen very important not only for forest conservation, but also for improved health and sanitation and clean environment.

1.3 OBJECTIVE OF THE STUDY

The general objective of the study is to assess the impact of Improved Cooking Stoves on the rural livelihoods of Chulachuli VDC of Ilam District that includes the fuel wood consumption at the household level and impact on the health of women and children, time saving (collection of fuel wood and cooking), kitchen management and natural resource conservation.

Specific objectives:

- To assess the social impact of Improved Cook Stoves;
- To assess the efficiency of ICS in terms for energy consumption and time saving;
- To assess the impact of ICS on health and environment

1.4 RATIONALE OF THE STUDY

The growing scarcity of firewood and other consequences resulting from forest depletion, the search of alternative energy source is seen very crucial. Forests are now being rapidly depleted by indiscriminate and disproportionate felling of trees and illegal encroachment for settlements and agricultural purpose. As forest resources become scarce, the balance between what people need and what they can obtain would shift. As a result, people has to struggle to survive that becomes harder.

IUCN – The World Conservation Union, Nepal is supporting for conservation of Critical ecosystems of Ilam Siwaliks area. In this process, reduce pressure in the forest; improved cook stove was introduced in early 2001. However, there has not

been any study undertaken since the intervention. Thus, this study will try to assess the impact of improved cook stoves, in terms of efficiency, impact on health and environment and social impact.

1.5 LIMITATIONS OF THE STUDY

The study mainly focuses on assessing impact of ICS on fuel wood consumption, cooking time saving, impact on health and environment. Although study was conducted in project area, the baseline was not available to compare the situation before ICS intervention. Therefore, information collected for before intervention could not be validated. The study tried to assess impact on social aspect only so the technical aspect of the ICS is lacking.

The study was focused only on one VDC of Siwaliks area. Therefore, the findings of this study may not be generalized in overall context of all Siwaliks area of Nepal as the study was conducted at a specific site with a limited sample.

CHAPTER TWO

REVIEW OF THE LITERATURES

TRADITIONAL COOKING STOVES

Traditional stove is a common stove that is widely used in rural areas to cook food and animal feed. Three stones stove, tripod, mud stove with one or two holes, etc are the traditional stoves. These stoves are inefficient; they consume a lot of firewood and fills the kitchen with smoke. These stoves are built in open space and fire is distributed widely even outside the stove. Therefore, pot could not absorb the heat so that takes more time to cook food. As a result, fire wood is used more and takes more time to cook. Due to this, women has to spend a lot of time collecting firewood and suffer from lung diseases and eye problems which are common in the rural areas. This also causes deforestation and imbalance in environment (REDP, 2003).

Defects of Traditional Stoves

- They are less than 10 percent efficient (in using the energy store in the wood)
- The produced smoke stays in the kitchen due to absence of vent pipe and 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;
- The stove needs regular blowing. (CRT Nepal)

IMPROVED COOKING STOVES (ICS)

Improved cooking stove is a device that is designed to consume less fuel and save cooking time, convenient in cooking process and create smokeless environment in

kitchen or reduce the volume of smoke during the cooking against the traditional stoves. Generally the improved cooking stove is a simple low cost technology that offers multiple benefits to the users including the biomass fuel-wood efficiency. The efficiency of these improved stoves is found to be 25-40 percent. (AEPC, 2000)

Improved cook stove (ICS) can be used for the same cooking purposes as its traditional. It can be used for cooking meals, boiling water and for cooking animal feed. ICS can be used for heating by adding a cast iron/mild steel plate put tight over the pot-holes for the pots or by putting a metal pipe around that space/room to make the hot air pass round the room through out the chimney. ICS can be used for heating water by attaching back water around the chimney

Technical Features

ICS is made of 3-part mud/earth, 2 parts straw/husk and 1-part animal dung. The whole structure is plastered smooth with the same mud mortar. ICS has tow fire openings for cooking and other. There is no need to blow the fire. It utilizes the heat, generated by burning fuel wood, more by the deflection of the flames and heated air inside it which travel to the second opening with the help of an in-built baffle located just below the second opening, before the hot air exits out of the chimney, which is made of un-burnt clay bricks that can be made in the village. The iron plates are fitted on the pot holes for pots. The pot holes are round in shape; the pot bottom fits tight on them. It can be made in different sizes and capacities to suit the family size and pot size. It can have one or more openings for pots/pans.

History of ICS Development in Nepal

The development of ICS in Nepal can be divided into three phases. The first phase of the introduction of "*Magan Chula*" which originated in India. At that time villagers started promoting ICS in some areas of Nepal. The program was aimed at uplifting the people and reducing exposure to smoke. However, the program lacked a scientific aspect of design, promotion and testing.

The second phase started in the early 1970s and focused on improving fuel efficiency, large mud stoves with a number of rings known as "Lorena stove". The main objectives during this period was to find a solution to reduce the accompanying deforestation. Dissemination of these stoves was slow because of critical application. In the late 70s, Research Centre for Applied Science and Technology involved in improvement of these stoves and renamed them chulo.

The third phase began in early 1980s and included Research and Development and This included a detailed assessment of cooking performance, standardized production, design methodologies to obtain higher performance and efficiency. The Lorena Stoves, Ceramic Insert Stoves and New Double Wall Stoves – these stoves were designed by RECAST with support from HMF/UNDP/FAO Community Forestry Development Project (CFDP).

Realizing the benefits of ICS promotion and dissemination, the National Planning Commission put target for disseminating 160,000 ICS during the Seventh Five Year Plan (1985-1990) which has been a integral component of development activities of many NGOs and INGOs. Their approaches have changed from top down to target oriented and subsidized approaches and demand driven approach increasing the level of acceptance and sustainability of ICS.

Nepal Government initiated a National ICS program with the Sector Assistance Program of the Danish Government since 1999 with the objectives to establish a sustainable framework and strategy for making available technically adaptable ICS in rural communities based on local capacity building and income generation.

The Present Status of ICS in Nepal

ICS program development and implementation in Nepal started fifty year back. ICS programs in rural Nepal had been of limited success. In the early stage, ICS activities were given relatively low priority as a result dissemination did not take place widely.

Later, ICS development took place on the development agenda among NGOs, INGOs, and GOs in Nepal, and there is now consensus about the importance of ICS and the need of a new innovative approach to ICS dissemination. Nepal Government had given the special priority in its ninth five-year plan (1997-2001) and some achievements were made during that period. During that period Government of Denmark and Nepal Government jointly supported a national ICS program under the Energy Sector Assistance Program (ESAP) for the first five year from 1999 to 2004 which was later extended up to 2005. Till date around 1,25,000 numbers of ICS have been disseminated that directly benefits more than 625,000 rural populations in Nepal. Around 2500 local people are trained as promoters or technicians, of them 50 percent are women, are directly employed in installation of ICS which has contributed to increase their income and poverty alleviation (Sapkota, 2005). However, the figure presented here are only the estimated number of AEPC projects. The numbers must be high since there has been no study to examine the real installation of ICS in Nepal.

Government policy on ICS and Subsidy

Government made a policy for promoting development and dissemination of ICS in rural and semi-urban areas. Formal ICS programs begun in Nepal in early 1950s. The NPC of Nepal for the first time included firewood problems in the sixth plan (1981-1985), under which solution to the firewood problems were sorted out. The seventh five-year plan (1985-1990) targeted to distribute 160,000 ICS out of which only 49,938 were distributed by the forest sector (WECS, 1994). In 1991 and 1992, the forest division distributed 7,544 stoves. In spite of such ambitious target, the seventh plan did not specify and implementing agency for this work.

The Eighth Five Year Plan (1992-1997) envisaged the distribution of 250,000 ICS out of which 100,000 were planned for the hill regions and the remaining 150,000 in the Terai. Such hypothetical figure obviously becomes unrealistic as long as provisions are not clearly specified for their distribution, extension and effective follow-up. The focus on numbers allows programs to appear successful even when many stoves are ultimately abandoned (WECS, 1994).

The aim of ninth plan was to install 250,000 ICS in the country but the success was 51,100 and training program in 45 districts but success record was in 39 districts only. The tenth plan again emphasized to promote, disseminate and installment 250,000 ICS in rural area (NPC, 2003).

The ICS technology is the cost effective, based on local material and could be installed with simple technical knowledge and training. So Nepal Government has taken policy not to provide subsidy in order to create household ownership in the program there by ensuring sustainability of the program, instead emphasis will be given to the information campaign.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 SELECTION OF THE STUDY AREA

The study was conducted in Chulachuli VDC of Ilam district where IUCN has promoted improved cooking stoves program as part of alternative energy promotion program aiming to reduce pressure on forest of the Siwaliks area. The study has covered all the 9 wards of Chulachuli VDC where the ICS has been installed.

3.2 RESEARCH DESIGN

The research design of the study employed descriptive design. Both qualitative and quantitative information were collected and analyzed to assess impact of ICS program on the rural livelihoods.

3.3 NATURE AND SOURCES OF DATA

The information was collected from both primary and secondary sources. The primary data collected for the study included household survey, key informants' interview and field observation. Secondary information were collected from reports of different organizations working in Siwaliks area, progress reports, different publications, district profile, previous study literatures and related websites.

3.4 UNIVERSE AND SAMPLING PROCEDURES

The universe of the study is all the households using ICS in Chulachuli VDC. Respondents for this study were selected purposively who had installed ICS in their households. A total of 90 respondents, equal number of women (45) and men (45) were selected.

3.5 DATA COLLECTION TECHNIQUES AND TOOLS

Information were collected both from primary and secondary sources. The primary information was collected through qualitative and quantitative techniques.

3.5.1 Household Survey

Interview has been conducted to the respondents of the ICS households. Detailed form of semi-structured questionnaire was developed to cover the information like socio-economic aspects of the respondents, fuel wood consumption practices, information regarding ICS, information on health, time consumption for fuel wood collection, cooking and cleaning the kitchen as well as additional opportunities for economic development. The questionnaire was developed in Nepalese language, pre-tested, rectified and finalized before the real implementation in the field. Local enumerators were hired to fill up the questionnaires.

3.5.2 Key Informants Interview

Information was also sought from key informants like teachers, ICS promoters, project staff and staff from other organizations working in that area to validate the information acquired from the interview. The issues were explored on effectiveness of ICS and its benefits in the rural areas. Detailed checklists were prepared to acquire information from the key informants.

3.5.3 Observation

In order to validate the data received from key informants interview and questionnaire survey, observation was also done by visiting few ICS installed households. Observation mainly focused on use of constructed ICS and cooking time.

3.6 DATA ANALYSIS AND INTERPRETATION

The collected information was analyzed using the Statistical Package for Social Science (SPSS 13.0). Output tables and charts are presented in the report wherever deemed necessary.

CHAPTER FOUR

A BRIEF DESCRIPTION OF STUDY AREA

4.1 THE STUDY AREA

Locally known as Churiya hills, the Siwaliks in Nepal are the first and the lowest ridges of the Himalayan mountain system occupying an estimated 13% of the country's landmass. Geologically, the composition of Siwalik rocks are very soft and easily erodible and therefore, prone to soil erosion and landslides.

The Ilam Siwalik area lies between 87 38'45" and 87 57'30'' east and 26 40' and 26 50' north and consist of hills, steep land slopes, gorges, large span of river and ephemeral streams. Most of the land cover is in the southern Siwalik Hills, which are made up mainly of gravel, pebbles and conglomerates of sand and limestone. The Siwalik area of Ilam district covers 358 sq.km (5,868 ha) and lies in six village development committees (VDCs) namely Banjho, Chisapani, Chulachuli, Danabari, Mahamai and Sakphara. The area has five major river systems, of which the Mai Khola is the main river with the highest catchments area. Flash floods in tributary streams, landslides and river cutting of agricultural land are major problems in the area. The area lies in the southern part of Ilam district where around 50,000 people are residing. Most of the forest of Ilam district lies in this area.

Chulachuli VDC lies in the northern boarder of Jhapa district and consists of flat; denude land with large spans or river bed i.e. the Chaju River and Bidhuwa River and temporary streams. The study area is located in between 26o 42 to 26o 47' N Latitude and between 87o 40' to 87o45' E longitude and the elevation ranges from 160 to 532 meter above sea level (masl).

According to the census 2001, total number of population in Chulachuli VDC is 18,176. Male and female populations account 9018 (49.61%) and 9158 (50.38%) respectively. Total household in the VDC is 3349 and average member per household is about 6. Literate population of the VDC is approximately 15950. Male

literacy is 7899, 49.5% and female literacy is 8052, 50.48%. Major occupation in the VDC is agriculture where above 90% are involved.

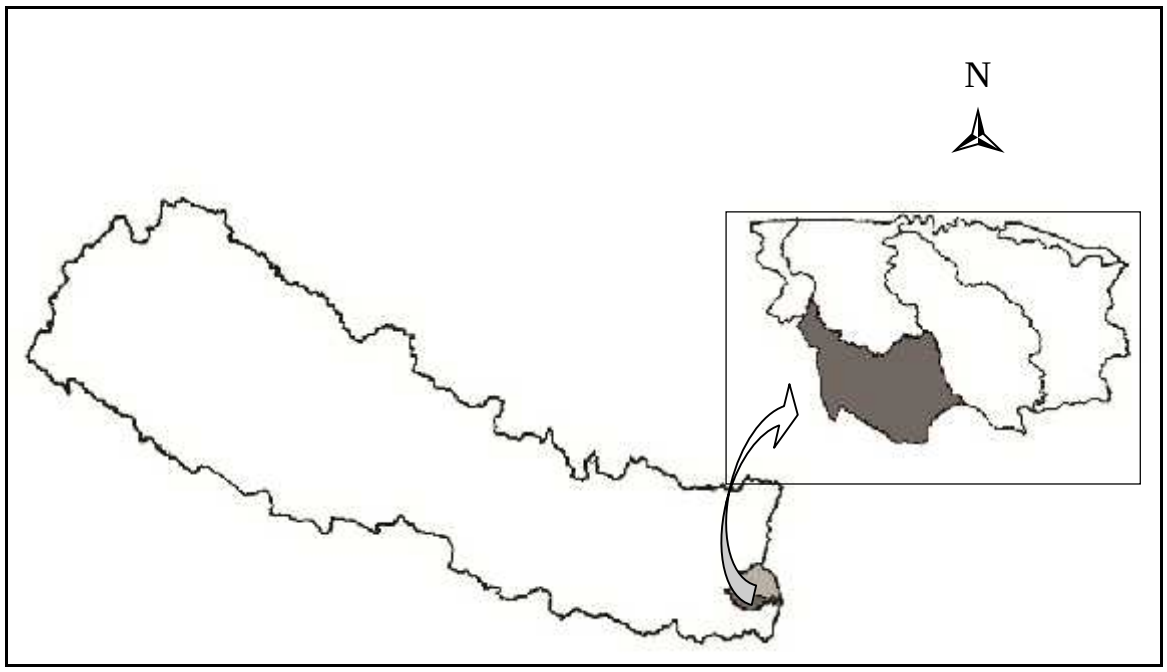

Figure 1: Map of the study area; Chulachuli VDC of Ilam District

4.2 IUCN PROJECT OFFICE

IUCN Nepal's field project started its activities in Siwalik area in 1999 targeting to benefit 51, 627 population residing in 9,271 households in six Village Development Committees (VDCs) of Ilam District, Nepal. The project aims to conserve the ecosystem functions and biodiversity of the fragile Siwaliks zone and support local livelihoods.

The major activities of the project are community forest management, flood control, conservation awareness, income generating activities through green enterprises and energy promotion for clean environment. The energy program in Ilam Siwalik has been promoting Bio-gas and Improved Cooking Stoves (ICS).

The project activities are implemented through local partners like Women Apex Body (WAB), Community Forest Network (CF Network), Flood Control Committee (FCC), CBOs and local NGO.

Since 2001, the project has adopted the strategy to involve women in conservation activities. However, it was difficult to mobilize women due to their low literacy, limited awareness on conservation, poverty, work drudgery, limited income generation opportunity and dependency on forest resources. The project developed focused programs for women to empower them and enhance their capacity. As a result, now there is a network (WAB) of 64 women groups in Siwaliks area committed for conservation of Siwaliks.

4.3 ENERGY INTERVENTION IN ILAM SIWALIKS

Energy Program in Ilam Siwaliks started in 2001. It was necessary to reduce work drudgery of women to involve them in conservation and development activities and it was also important that pressure on forest should be reduced to conserve the fragile ecosystem of Ilam Siwaliks. With this aim, initially, bio-gas was promoted by negotiating with Biogas Construction Cost on minimum price and subsidy.

Later, it was realized that poor population of the community was not able to access the facility of bio-gas because they had to own few number of cattle land. And these are the groups who are mostly dependent on the forest resources. Therefore, the ICS was introduced targeting poor and disadvantage households of the community since the cost was lower than of biogas. The project also set up a revolving fund of NRS. 25,000.00, targeting the poor for accessing the fund to construct ICS. The fund had to be refunded within the period of six months.

In Chulachuli VDC only, around one hundred ICS have been installed. Of the total households, around 56% are janajati using ICS. The project has trained 11 people as promoters. Of them, 7 (64%) are Women and 4 (36% are men).

CHAPTER FIVE

DATA ANALYSIS AND PRESENTATION

5.1 SOCIO-ECONOMIC STATUS OF THE RESPONDENTS

This chapter includes various demographic measures such as age, sex, religion, marital status, occupation, education, income and family type of the respondents. These variables are measured to examine the respondent's nature and perceptions towards eye disease.

5.1.1 Age and Sex Composition of the Respondents

Table 1 below gives the glimpse of age group and sex composition of the respondents.

Table 1: Age and Sex of Respondents

Age group of the respondents	**Sex of respondent**			
	Female	**%**	**Male**	**%**
Below 20 years	5	5.56	0	-
21 - 40	24	26.66	19	21.11
41 – 60	13	14.45	21	23.33
61 and above	3	3.33	5	5.55
Total	**45**	**50.00**	**45**	**50.00**

Source: Field survey 2006

Age group was categorized as below 20 years, 21-40 years, 41-60 years and above 61. Majority of the male respondents was seen in the age group of 41- 60 years (23.33%) and majority of the women were seen in the age group of 21-40 years (26.66%).

5.1.2 Religion and Ethnicity

Majority of the respondents were Hindus (71.11%) followed by other religion groups (24.44%) that included mostly Kirat. Since Chulachuli VDC has more Janajati population, the number of respondents from Kirat Religions is seen significant.

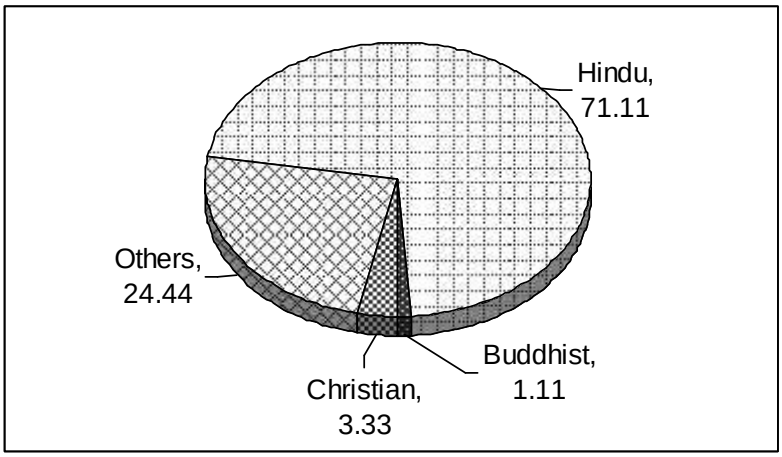

Figure2: Religions of the Respondents

Of the total respondents 53% are Janajatis. Janajatis here includes Rai, Limbu and Tamang and disadvantaged ethnic castes. Rest 22% is from Brahmin and Chhettris, 11% is Newar and 14% is Dalit.

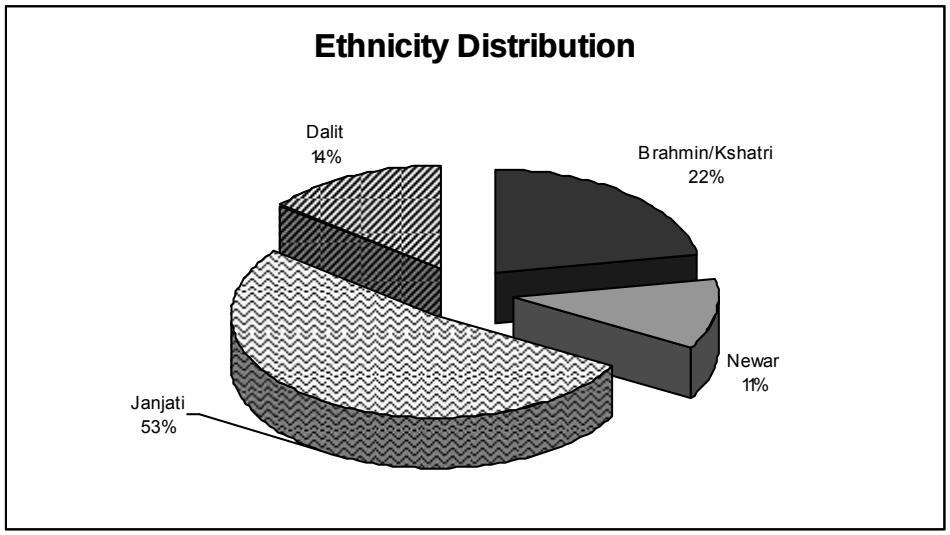

Figure3: Ethnicity of the Respondents

5.1.3 Marital Status and Family Type

Of the total respondents, 92 percent were married and living together while only 8 percent were unmarried. Most of the respondents (63%) were from joint family and 37 percent were from nuclear family. This indicates that joint family is still a common practice in the rural setting of Nepal.

Table 2: Marital Status of the Respondents

Marital status of the respondents	Frequency	Percent
Unmarried	7	7.78
Married	83	92.22
Total	**90**	**100.00**

Source: Field survey 2006

The total population of female members was 250 and male members were 257 in 90 households.

5.1.4 Education Status by Sex

Of the total respondents 36.67 percent were found literate. 33 (21.11+12.22) percent of the total respondents have completed their primary and lower secondary education. But the small number of respondents (8.88%) have completed their secondary and higher secondary.

Table 3: Marital Status of the Respondents

Education Status of the respondents	Frequency	Percent
Illiterate	19	21.11
Literate	33	36.67
Primary education	19	21.11
Lower secondary	11	12.22
Secondary	4	4.44
Higher secondary and above	4	4.44
Total	**90**	**100.00**

Source: Field survey 2006

The literacy status of Chulachuli seems fairly satisfactory. Among the respondents male literacy rate is slightly higher (52%) than that of female (48%).

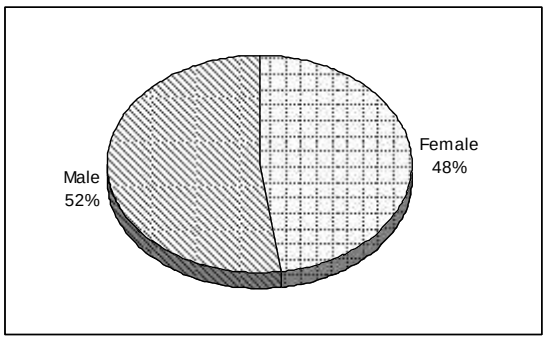

Figure 4: Literacy status of the Respondents by sex

5.1.5 Main Occupation of the Respondents

The figure 5 below presents the major occupation of the respondents. Nepal's more than 75 percent population relies on agricultural products. It shows that most of the respondents too rely on agriculture.

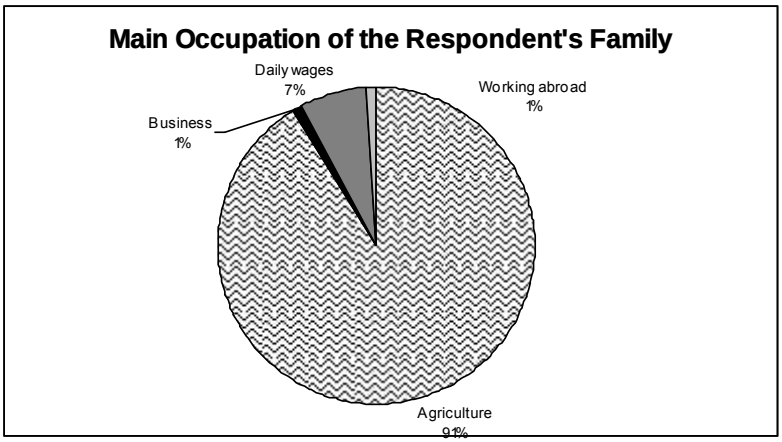

Figure 5: Main Occupation of the Respondents

Majority of the respondents, 91 percent, were dependent on agriculture followed by daily wages (7%). Very small size of the respondent was engaged in business and working abroad.

5.1.6 Food sufficiency

The chart (figure 6) below gives the glimpse of food sufficiency of the respondents. Of them 35 percent of the respondents have food sufficient for 3 to 6 months. Although the significant numbers of respondents are dependent on agriculture, the production is not sufficient for consumption for whole year. These people work for others and are paid for their labor. There are 24 percent respondents who get sufficient food to eat for 9-12 months from their own farmland production. Likewise, 19 percent have food sufficient for 6-9 months and less than 3 months. Very small size of population has food sufficient for 12 months and could sale the surplus.

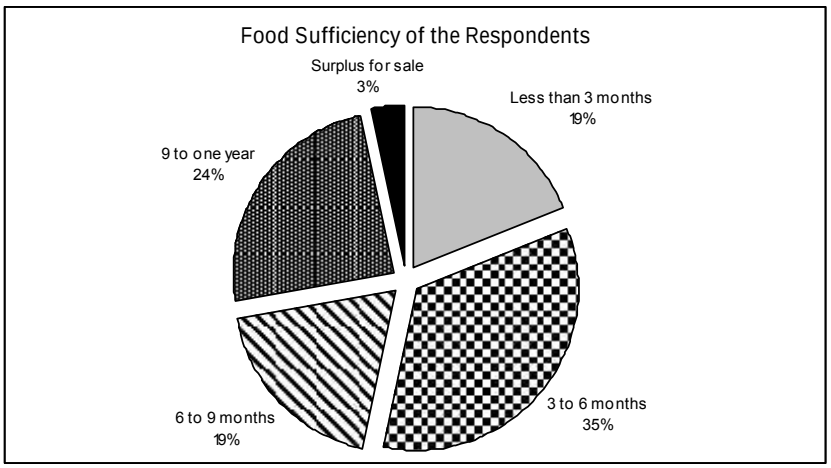

Figure 6: Food Sufficiency of the Respondents

Overall impression of the findings is that the majority of the population has food sufficient for only 1 to 9 months. Only 27 percent respondents have food sufficient throughout the year. To manage the food deficiency, these people borrow money from the moneylender or go to work as daily wage labor. Some of the respondents have reported that they have business and some of them go to abroad earn.

5.1.7 Monthly Income from non-agricultural work

Income of the respondents was categorized in different ranges that are presented in the chart (figure 7) below.

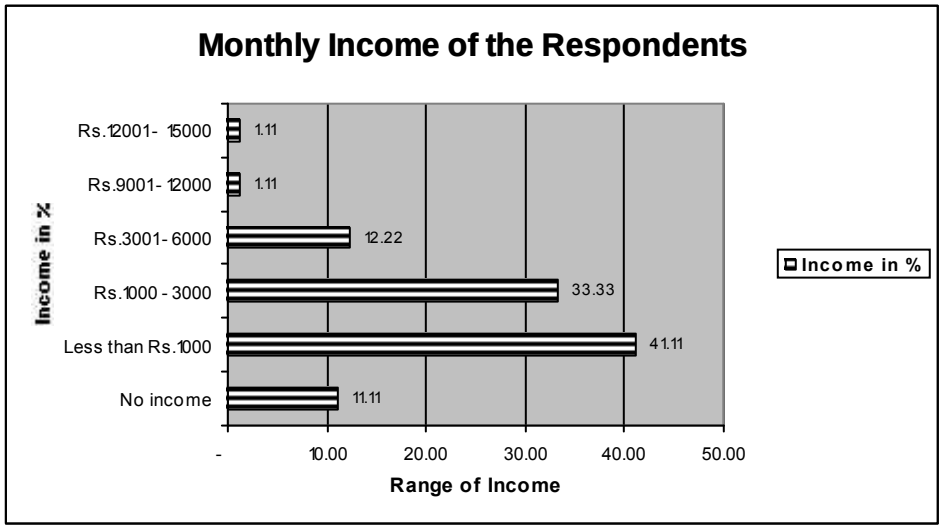

Figure 7: Monthly Income of the Respondents

A diverse range of income was observed among the participants. A large population of the respondent (41%) has income of less than Rs.1000 per month. 33.3 percent earns income of Rs.1000 to Rs.3000 per month whereas 12 percent makes income of Rs.3001 to Rs.6000. There are some respondents (11%) who are solely depended on agricultural income only. Again, this has proved that living of people in Chulachuli is completely dependent on subsistence farming. They do not have other opportunities for their livelihood.

5.2 SOCIAL IMPACT ON ENERGY TECHNOLOGY INTERVENTION: ACCEPTANCE OF ICS BY THE COMMUNITY

This section of the chapter includes types of stoves used, age of ICS, inspirer for its installation and use of ICS after installation.

5.2.1 Types of Stove Used

Two-hole ICS has been found favorite in Chulachuli VDC since all the households have installed it. The main reason behind this is the benefit of cooking two utensils at a time thus saving fuel wood as well as time.

5.2.2 Age of ICS

Majority of the ICS (68%) were constructed 2-4 years back. Twenty two percent was constructed 1-2 years back. About 9 percent were found to be constructed less than one year while 1 percent of ICS was older than 4 years. This shows that use of ICS is accepted by the people in Chulachuli VDC.

Table 4: Duration of ICS Installation

When the ICS was installed	Frequency	Percent
Less than 1 year	6	6.67
1 year	2	2.22
1 to 2 years	20	22.22
2 to 3 years	40	44.44
3 to 4 years	21	23.33
More than 4 years	1	1.11
Total	**90**	**100.00**

Source: Field survey 2006

5.2.3 Inspiration for ICS Installation

Organization's workers' role has been found vital in pursuing households to make decision in installing ICS as about 49 percent of the share as inspirer goes to them. Inspiration by neighbor (20%) is also important as non users see and hear the experience of neighboring ICS user about the function, merits and demerits of ICS. Likewise, the role of promoter as inspirer & motivators is also fairly reflected by the promoter's activities (17%). The role of friends and groups members in inspiring to install ICS was not seen significant. Small number of respondents (4%) reported that they themselves took initiatives to install the ICS.

Table 5: Motivators to install ICS

Motivator to install the ICS	**Frequency**	**Percent**
Promoter	15	16.67
Neighbor	18	20.00
Friends	6	6.67
Organization's activists	44	48.89
Group member	3	3.33
Others	4	4.44
Total	**90**	**100.00**

Source: Field survey 2006

The role of friends and groups members in inspiring to install ICS was not seen significant. Small number of respondents (4%) reported that they themselves took initiatives to install the ICS.

5.2.4 Use of Installed ICS

Even though ICS was introduced in the era of 70s, it was not able to gain popularity due to several reasons. Mostly reported reasons were technical problems due to which people stopped using ICS in mid way. This study also tried to examine whether people are giving continuation to use ICS. However, the finding of this study is seen fairly positive. It shows that majority of the respondents (82%) are using ICS after installation. From this, we can conclude that the perception towards ICS has been changed and people are accepting the improved technology.

Table 6: Use of Installed ICS

Are you continuously using installed ICS at your home?	Frequency	Percent
Yes	74	82.22
No	16	17.78
Total	**90**	**100.00**

Source: Field survey 2006

At the same time, about 18 percent respondents reported that they are not using ICS. The reasons they have noted are complication in use of ICS like fuel wood combustion is low and takes long time to cook. Other important reasons were lack of experienced technician, chimney placed in wrong place and chula installed in wrong place, difficult to light fire. Likewise, not having separate kitchen to install ICS was reported for not using ICS.

5.2.5 Frequency of Maintenance

Operation and maintenance is one of the vital aspects in the successful dissemination of ICS. The frequency of maintenance here means not repairing but frequent maintenance like chimney cleaning. As smearing with cow dung and mud is a daily job, this is not accounted under maintenance category. Even though ICS needs frequent maintenance of ICS than the traditional stoves, majority of the respondents (32%) reported that they have not done any maintenance. Those who have done, they have done once or twice as reported by 29 percent.

Table 7: Frequency of stove maintenance

Frequency of Stove Maintenance	Frequency	Percent
1 time	17	18.89
1 to 2 times	26	28.89
2 to 3 times	14	15.56
More than 3 times	4	4.44
Not yet repaired	29	32.22
Total	**90**	**100.00**

Source: Field survey 2006

This shows that ICS users do not have to spend more time and cost in repair and maintenance.

5.3 IMPACT OF ICS

This section analyses the impact of ICS on the basis of perception of the ICS using households. The impact will be analyzed on firewood consumption, saving in cooking time, impact on health and environment. The analysis will be made by comparing the situation of before and after installation of ICS.

5.3.1 Impact on fuel wood consumption

This section focuses on the impact made by ICS on reducing fuel wood at the household level. Usually stoves are used for cooking food, heating water and making animal's food.

5.3.1.1 Fuel wood consumption before Intervention of ICS

The Table below shows the quantity of fire wood used before installation of ICS. Before using ICS, average fuel wood consumption for each household was about 30kg per day which means 900kgs (30x30) per month. Therefore, total annual fuel wood consumption by each household is 10.8 (900kgsx12/1000) tons. The fuel wood consumption was within the range 25.58 to 33.65 kg in 95% confidence level.

Table 8: Distribution of Fuel Wood Consumption by Traditional Cooking Stoves

	Fuel Consumption (Kg)
Mean	29.62
95% Confidence Interval for Mean Lower Limit Upper Limit	 25.58 33.65
Standard Deviation	8.86
Minimum	12.00
Maximum	40.00

Source: Field survey 2006

5.3.1.2 Fuel wood consumption after Intervention of ICS

The data presented in the table 9 below shows that after the installation of ICS. A significant change is seen in fuel wood consumption. The consumption of fuel wood by a household is reduced almost half in the quantity.

Table 9: Fuel wood consumption by Improved Cooking Stoves

	Consumption Qty. (Kg)
Mean	14.83
95% Confidence Interval for Mean Lower Limit Upper Limit	 12.82 16.85
Standard Deviation	4.42
Minimum	6.00
Maximum	20.00

Source: Field survey 2006

Average fuel wood consumption by the ICS per day is about 14.83kgs that means 445 (14.83x30) kg/month. Lower and upper level of fuel wood consumption by 95% population is about 13-16 kgs/day which is much lower than that of TCS (25.58 to 33.65 kg). Therefore, annual average consumption of fuel wood per household after using ICS is 5.34 (445kgsx12/100) tons per year.

5.3.1.3 Benefits from the Intervention

The study revealed that after the ICS installation, the average saving volume of fuel wood is about 14.79 kgs. per day which is about 444kgs (14.79x30) per month. The lower limit and upper limit of fuel wood saved per day is between 12.76kgs to 16.81kgs. Thus, the annual average saving of fuel wood per household is 5.33 tons (444x12/1000) tons per year.

Table 10: Fuel wood saving by a household using Improved Cooking Stoves

	Fuelwood Saving (Kgs)
Mean	14.79
95% Confidence Interval for Mean Lower Limit Upper Limit	 12.76 16.81
Standard Deviation	4.45
Minimum	6.00
Maximum	20.00

Source: Field survey 2006

The ICS users were found to use the fuel wood from the community forest for preparing food at home, boiling water and preparing animal feeds for their livestock. Before the intervention of ICS, their average consumption of fuel wood is noted as 900kgs per household per month. The total annual fuel wood consumption by the total 90 households before intervention was 972 tons (900kgsx90x12/1000). After the ICS installation, the total annual fuel wood consumption by the 90 households lowered by about 50 percent i.e. 480.6 tons. Thus, from 90 ICS intervention in the Chulachuli VDC, total of 39.93 (14.79x30x90/1000) tons fuel wood was saved per month. Hence the total annual fuel wood saving per year is about 479 (39.93x12) tons.

5.3.1.4 Time Consumption for Cooking

It was not that easy to identify time utilization by respondents in terms of direct benefits. Normally people do not record time for any work they do in the rural areas. Every activity is seen as routine work that is not recorded in their memory too. However, respondents mentioned that there has been decrease in cooking time after installation of the ICS. Majority of the respondents (about 67%) reported that cooking time has been reduced. The finding is presented in the Table below.

Table 11: Time taken by traditional stove and ICS

Cooking time	**Traditional stove**		**ICS**	
	Frequency	Percent	Frequency	Percent
Less than 1 hour	20	22.22	60	66.67
1 hour	57	63.33	26	28.89
1 to 2 hours	13	14.44	4	4.44
Total	**90**	**100**	**90**	**100**

Source: Field survey 2006

5.3.1.5 Time consumption before Intervention of ICS

The Table below shows the average time required to cook before installation of ICS. Before using ICS, average time consumption for each household was about 2.04 hours per day. The lower and upper limit of time consumption is 1.73–2.35. Therefore, total hours saved from cooking is 61.2 (2.04 hoursx30 days) hours per month that is 2.55 days per month.

Table 12: Time consumed by Traditional Cooking Stoves to cook food

	Time consumption (hour)
Mean	2.04
95% Confidence Interval for Mean Lower Limit Upper Limit	 1.73 2.35
Standard Deviation	0.68
Minimum	-
Maximum	3.00
Range	3.00

Source: Field survey 2006

5.3.1.6 Time consumption after Intervention of ICS

The study revealed that after the installation of ICS, the cooking time consumption has reduced by more than 50 percent. A significant reduction in cooking time is seen after the intervention. After the use of ICS, cooking time was reported 1.6 hours per day. At the 95% confidence limit, lower and upper limits for cooking time are 1.24 and 1.96 respectively. Therefore, compared with time consumed by traditional stove, ICS could save time by 0.44 hours per day.

Table 13: Time consumed by Improved Cooking Stoves to cook food

	Time consumption (hour)
Mean	1.60
95% Confidence Interval for Mean Lower Limit Upper Limit	 1.24 1.96
Standard Deviation	0.79
Minimum	-
Maximum	2.50
Range	2.50

Source: Field survey 2006

However, there were few respondents reporting that there was no reduction but took more time to cook food. The reasons they explained were smoke was not going out properly and fuel wood combustion was low. Therefore, there are still some technical errors resulting negative impact on dissemination of ICS.

5.3.1.7 Time saved after the Intervention of ICS

The study revealed that after the ICS installation, the average time saved is 0.44 hours per day which is about 13.2 hours (0.44x30) per month. The lower limit and upper limit of time saved per day is .05 -.83 hrs per day at the 95% confidence level.

Table 14: Time saved to cook food by ICS

	Time Saved (hrs.)
Mean	0.44
95% Confidence Interval for Mean	
Lower Bound	0.05
Upper Bound	0.83
Standard Deviation	0.86
Minimum	(2.50)
Maximum	2.00
Range	4.50

Source: Field Survey 2006

5.3.1.8 Benefits seen after the Intervention of ICS

The study also revealed that fuel wood collection time was 1 hour as reported by about 37 percent respondents. There were also a significant number of respondents who reported that it takes more than 4 hours (20%). Therefore, we could conclude that although fuel wood collection time remains the same, the frequency of fuel wood collection would be reduced by the intervention of ICS since the findings has shown significant amount of fuel wood consumption is reduced.

Table 15: Time for Fire Wood Collection after ICS Installation

Time for firewood collection	**Frequency**	**Percent**
Less than 1 hour	3	3.33
1 hour	33	36.67
1 to 2 hours	14	15.56
2 to 3 hours	6	6.67
3 to 4 hours	16	17.78
More than 4 hours	18	20.00
Total	**90**	**100.00**

Source: Field survey 2006

More than that, during informal discussions women reported that 'Children are now not engaged in getting fuel wood collection from the community forests'. This implies that this is giving direct benefit to children providing free time for education. Likewise, women go to community forests for fuel wood collection, three times a month spending 5-6 hours each time so in all, 15-18 hours per month and also time saved from cooking. With the introduction of ICS, the requirement for fuel wood has gone down so time for fuel wood collection has been reduced. However, they still require fuel wood for cooking animal feeds which is cooked in open fire outside the kitchen.

5.3.1.9 Utilization of Saved time

Regarding the utilization of the time saved due to reduction in cooking time, majority of the respondents have reported use of the saved time for field works, engaged in income generating activities, caring livestock and cleaning the house. The table below presents the number of responses marked for the activities performed utilizing the time saved from cooking after ICS intervention.

Table 16: Utilization of Time Saved from the Use of ICS

Activities performed utilizing the saved time	No. of Responses	Rank
Farming	19	I
Income generating work	14	II
Livestock care	14	III
Cleaning	10	IV
Water collection	4	V
Helping children learn	2	VI
Leisure	2	VI
Attending meeting	1	VII
Total	**66**	

Source: Field survey 2006

5.3.2 Impact on Health and Environment

5.3.2.1 Health Problems

Indoor air pollution is a significant threat in households using traditional stoves. More than 75 percent people living in rural areas of Nepal, burn biomass (wood, crop residues, and dung) for cooking and heating. Specifically, indoor air pollution

affects women and small children far more than any other sector of society. Women typically spend three to seven hours per day by the fire, exposed to smoke, often with young children nearby.

This survey also revealed that significant proportion of the households were suffering from various health problems before ICS installation because of smoky environment resulting from traditional stoves. It was observed that biomass fuels were the main cooking source. Most commonly cited health problems were eye problems (ranked as no. 1 problem) and headache (ranked as no 2 problem) Likewise, several other problems like cold flue, respiratory problem, chest pain and cough were also reported frequently.

Table 17: Health Problems before the Installation of ICS

Health Problems	No of Responses	Rank
Eye sickness	90	I
Headache	89	II
Respiratory problem	59	III
Cold flu	59	III
Chest pain	52	IV
Cough	49	V

Source: Field survey 2006

5.3.2.2 Improvement on Health after Intervention

Reportedly health problems have been greatly subsided after the ICS installation. Previous studies have also revealed that the significant improvement is seen in smoke-borne diseases such as eye illness, eye burn, respiratory problem, headache and diarrhea due to installation of biogas and improved cook stoves in the rural areas.

Reduction in the above illustrated health complaints were also observed in this study that could be validated to some extent from the data presented below.

Table 18: Health Situation after Intervention of ICS

Exists health problems after ICS installation?	Frequency	Percent
Yes and health condition is same as before	5	5.56
Yes but not serious as before	28	31.11
No problems at all	57	63.33
Total	**90**	**100.00**

Source: Field survey 2006

5.3.2.3 Cost implication on health before and after intervention of ICS

Of the total household surveyed, about 68 percent reported that they used to spend Rs.1000-Rs.3000 annually for treatment. However, after intervention, this has been reduced to less than Rs.1000 as reported by 70 percent respondents. The table below gives the glimpse of money spent for treatment before and after intervention of ICS.

Table 19: Annual Treatment Cost while using Traditional Stoves

Annual treatment cost while using traditional stove	Using TCS		Using ICS	
	Freq.	Percent	Freq.	Percent
Less than Rs.1000	20	22.22	63	70.00
Rs.1000 to Rs.3000	61	67.78	14	15.56
Rs.3000 to Rs.6000	9	10.00	13	14.44
Total	**90**	**100.00**	**90**	**100.00**

Source: Field survey 2006

5.3.2.4 Impact on Environment

The study also tried to assess the impact of ICS on environment which was completely based on the general perception of respondents. Highest number was ranked for reduction in fire wood collection which means pressure in the forest is reduced. However, this is not scientifically proved.

Table 20: Impact on Environment

Impacts	No of responses	Rank
Firewood collection load is reduced	72	I
Illegal tree falling is reduced	50	II
Decrease in firewood sale	27	III
Others	24	IV
Forest is more dense before 5 years ago	17	V

Source: Field survey 2006

Other impacts reported are reduction in illegal tree felling from the forest and decrease in firewood sale. Again, this supports conserving the forest. Respondents also reported that they have seen forest more dense than 5 years before. Again, no such measures are adopted to verify this saying.

5.3.2.5 Other Improvements Seen on Environment

Majority of the respondents reported that the surroundings are seen more greenery than before (project intervention). Even though, ICS is a small component of energy promotion program in Ilam Siwaliks area, the finding shows that it has contributed significantly in forest conservation as reported by about 16 percent respondents. Like wise, people feel that pollution has been reduced such has indoor air pollution due to smoke coming out from traditional stoves.

Table 21: Other environmental Benefits of ICS

Other environmental improvements after ICS use	Frequency	Percent
No Idea	5	5.56
Clean environment	1	1.11
Clean house	4	4.44
Forest conservation	14	15.56
Good	1	1.11
Good health	1	1.11
Green surrounding	39	43.33
No improvements	1	1.11
No pollution	22	24.44
River control	2	2.22
Total	**90**	**100.00**

Source: Field survey 2006

5.3.2.6 Impacts on Sanitation and Reduction in Women's drudgeries

Majority of the respondents (about 36 percent) reported that the utensil remain clean due to ICS. Earlier, women used to cook on open fire so the utensils turned black due to smoke and all the houses too turned black which took lots of time and energy. But women are relief from this problem resulting good sanitation and reduction in their work drudgeries. The table below also shows the impacts seen in different areas.

Table 22: Other impacts seen after ICS installation

Impacts	Frequency	Percent
No Idea	8	8.89
Clean house, effective	1	1.11
Clean surrounding	39	43.33
Easy to clean utensils	32	35.56
Good health	5	5.56
Good result	2	2.22
Less respiratory diseases	1	1.11
Less smoke	2	2.22
Total	**90**	**100.00**

Source: Field survey 2006

Besides, above illustrated impacts, ICS installation also had other socio-economic impacts, which are particularly helpful in decreasing drudgery of women members. The reduction in drudgery had been through decrease in cooking time, smokeless environment, clean house, etc. During informal discussions, women also reported that they have time to participate in the group meetings.

5.4 OTHER BENEFITS

The question was explored to get respondents view whether they have seen any addition opportunity after the intervention of ICS. For ICS program, ICS promoters have been trained by the project. There are over ten ICS promoters in Chulachuli VDC (Source: ICS Field Office). As reported by member of Women Apex Body, the promoters are making income by making ICS in the villages. One of the ICS promoters, Ms. Geeta Kumal alone has earned over 10,000 rupees from installing ICS.

5.5 CONTINUATION OF USING ICS

The study tried to find out whether people are still interested in continuing ICS. About 92 percent respondents showed their willingness to continue using ICS. The major reasons they gave for willingness were less firewood required, less time consumed for cooking, utensils remain clean and easy to use.

Table 23: Continuation of ICS use

Would you continue using ICS?	Frequency	Percent
Yes	83	92.22
No	7	7.78
Total	**90**	**100.00**

Source: Field survey 2006

CHAPTER SIX

MAJOR FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 MAJOR FINDINGS

6.1.1 Socio-economic Status of the Respondents

- Average household size of the respondents was 6;
- About 72 percent of the respondents were Hindu followed by others religion groups (24.44%) that included mostly Kirat.
- Ethnically 53 percent respondents were Janajatis, 22 percent Brahmin/Chhettris, 11 percent Newar and rest 14 percent Dalits;
- About 63 percent respondents were literate with most of them completing their primary and lower secondary level education. Thus, the educational status of the respondents seem fairly satisfactory;
- Agriculture was found to be main occupation of the respondents (91%) followed by daily wages (7%);
- Even though agriculture is the main occupation, the production is not sufficient for whole year. 35 percent of the respondents have food sufficiency only for 3-6 months.
- A large number of populations (41%) have income of less than Rs.1000 per month while 33 percent earn Rs.1000 – Rs.3000 per month.

6.1.2 Acceptance of ICS

- All the respondents were found to be using 2 holes type ICS for cooking. About 44 percent ICS were constructed 2-3 years back. The study shows that people are accepting this technology. 92 percent respondents reported that they will continue using the ICS.

- About 49 percent respondents reported that people working in the development organization were the main motivators to install ICS.
- Majority of the respondents (82%) are still using the installed ICS. This shows the success of ICS program since perception of people towards ICS has been changed and people are accepting improved technology. Those who were not using ICS reported that technical problem was the main reason to abandon the use of ICS.
- Thirty two percent of the respondents reported that maintenance was not required since the installation of the ICS. This might the reasons that people have been using ICS continuously.
- Even though alternative energy promotion activity started in early 2001 in Chulachuli VDC, the coverage of household is very low. Only about 3 percent of total households have installed ICS.

6.1.3 Impact of ICS in terms for energy consumption and time saving

- ICS has been able to save 14.79 kg fuel wood per household per day that means about Rs.15 per day is saved if this is converted to monetary value.
- ICS has been able to save time around 0.44 hours per day.
- Fuel wood collection time was reported 1 hour by 37 percent respondents. The findings shows that the frequency of fuel wood collection time could be saved since ICS saved significant amount of fuel wood per day.

6.1.4 Impact of ICS on health and environment

- The study revealed that eye problem and headache were the mostly reported health problems by the respondents. However, respiratory problem, cold flu, chest pain and cough were also significantly reported.
- The above reported problems are reduced significantly as reported by 63 percent of the respondents.

- Before using ICS, the expense for treatment was ranged from Rs.1000 to Rs.3000 as reported by 68 percent. This amount was reduced to less than Rs,1000 reported by 70 percent.
- Fuel wood collection load has been reduced after installation of ICS. Likewise, illegal tree felling has been controlled and decrease in fire wood sale was ranked second and third respectively.
- Green surrounding (43%), no pollution (24%), forest conservation (16%) were reported as other benefits from the ICS.

6.1.5 Other benefits from ICS

- Clean surrounding and easy to clean utensils were reported significantly, 43% and 36% respectively.
- ICS promoters are earning money from construction of ICS. One promoter has earned Rs.10,000 from installation of ICS in the village.

6.2 CONCLUSION

- The success of the energy intervention program largely depends on whether the users accept the ICS. The study findings show that respondents are accepting the improved technology knowing its benefits and efficiency.
- The Energy intervention program is quite successful in Ilam Siwaliks in terms of increasing number of the ICS. Funds for ICS programs are also well mobilized benefiting the poor segment of the area.
- ICS installed in the VDCs are mostly 2 to 3 years old. This shows that the benefits form the ICS are visible so the villagers accept it. Majority of the respondents (82%) are using ICS. Staffs of development organizations working in the area were seen as active player in motivating people to install ICS. Although promoters are trained even in information dissemination, their role was not reported significantly

- The technical issues of ICS in accepting technology matter a lot. Usually, in the rural areas new technology are not accepted due to maintenance problem. However, in the case of Chulachuli VDC, a fair number of respondents (32%) have reported that the ICS did not required maintenance to date. Similarly, 28 percent reported that maintenance was 1-2 times after the construction. This shows that, maintenance was not a great problem in using ICS.

- The findings of the study show that ICS is fairly effective in reducing forest pressure. The finding shows that each household saves about 15 kg of fuel day each day which is Rs.45 per day. Not only energy, money is also saved.

- Likewise, each household saved 0.44 hours per day. This time was used in the field, engaged in income generating activities caring livestock and cleaning house. After ICS installation, time is saved from two activities i.e. from fuel wood collection and from cooking activities. Since study revealed that fuel wood consumption by use of ICS is reduced, it would also save time in collecting fuel wood. The women and children do not have to go to forest frequently to collect fuel wood.

- Due to use of ICS, utensils also get less dirty and take less time to clean. This was reported frequently by the respondents. Another frequently reported activity was field work. They get ample time to work in the field. Similarly, respondents also were involved in Income Generating Activities.

- After the installation of ICS majority of the households have relieved from eye problem and headache. All of those who complained about chest pain and respiratory problems got their got their condition improved after ICS installation. About 70 percent respondents reported that medical expenses were reduced subsequently after using ICS.

6.3 RECOMMENDATIONS

- A wider level promotion for ICS installation, specifically in its technical aspects is required as people are still hesitant to install ICS because of technical issues;
- Baseline to measure impact of ICS is missing. Therefore, there is need to conduct baseline survey to assess impact at the end of the project. Non users survey should be conducted to help compare in the future;
- Although government has given some space for ICS promotion in its 10th five year plan, implementation in the field is negligible. ICS program is seen as the program of development agencies only. Thus, this should be integrated with VDC level program. This also helps to sustain the program in the long run;
- IUCN field office implemented ICS activity to reduce pressure in the forest targeting the poor and disadvantage segment of the area. The study should be conducted to assess whether these groups have access to this service.
- More awareness programs and encouragement installing ICS in the community is required.
- Training to build ICS should be provided to the local people, so that they can make ICS themselves and help to build for other local people also.

ANNEX I

BIBLIOGRAPHY

AEPC website: www.aepcnepal.org/sp/ics.php

AEPC, 2004, *"Final Report on Impact Study on Improved Cooking Stoves Program Effectiveness"*, Dhobighat, Lalitpur

CRT Nepal website: www.crtnepal.org

CRT Nepal, 2000, *"Status of Improved Cooking Stove Technology in Nepal,* Tripureshwor, Kathmandu.

CRT, Nepal, 2005, *"Improved Cook Stove (ICS) Development: A Case from Nepal"* Tripureshor, Kathmandu.

DDC/REDP, 2003, "Sudhariyeko Chulo Eak Parichaya: Biseshta ra Awastha", Charikot, Dolakha.

ICIMOD website: www.mtnforum.org/apmn/ics1.htm (Dec 2001), e-conference paper.

Nepal Government/NPC 2002, *"Tenth Five Year Plan"*, Babar Mahal, Kathmandu.

Sapkota, S.K., 2005, "The Present Status of ICS in Nepal", www.aepcnepal.org/sp/ics.php

Singh R.B., 2005, "The Status of Traditional Biomass Fuel Resources in Nepal and the Fate of Redential Energy Consumption through the Domestic Cooking Devices", Journal of the Institute of Engineering, Vol.5, No 1, Pulchowk, Kathmandu, Nepal.

WECS, 1994/95, *"Perspective Energy Plan: Socio-Economic (Gender) Issues in Energy Development"*, Kathmandu, Nepal

QUESTIONNAIRE ANNEX II

A Study on the Impact of Improved Cook Stoves in Rural Livelihood: A Case Study of Chulachuli VDC of Ilam Distritct

I would like to ask you some questions on the impact made by improved cook stoves that was promoted and supported by IUCN Nepal. Please share your experiences and give your invaluable inputs to make this program more effective. Your statements and résumé will be kept confidential and will not be used for other purposes.

1. General Information of the Respondents

<table>
<tr><td colspan="3">a) Name: b) Caste/ethnicity
c) Sex: ..... Female ..... Male d) Age… e) Religion…</td></tr>
<tr><td colspan="3">f) VDC….. g) Ward No. … h) Name of group (if member) .....</td></tr>
<tr><td>i) Marital status
☐ Unmarried
☐ Married
☐ Widow/widower
Other (specify if any)</td><td>j) Main Profession of the family
☐ Agriculture
☐ Business
☐ Wages/ labour
☐ Student
☐ Job holder
Other (specify if any)</td><td>k) Education
☐ Illiterate
☐Literate
☐Primary level
☐Lower secondary level
☐Secondary level
☐Higher education</td></tr>
<tr><td>l) Family type
☐Nuclear ☐Joint</td><td colspan="2">m) Members eating in the same kitchen
Total No..... Female ..... Male .....</td></tr>
</table>

2. Economic condition

<table>
<tr><td>a) For how many months can farming feed you?
☐ Less than 3 months
☐ 3-6 months
☐ 6-9 months
☐ 9-12 months
☐ 12 months and surplus to sell
☐ No land</td><td>b) What do you do if it insufficient for consumption from farming?
☐ Wage labourer
☐Share-crops farming
☐ Business
☐ Service
☐Foreign employment
☐None
Other (specify if any)</td><td>c) What is your family’s other profession besides farming?
☐None ☐Rs. 6000-9000
☐Less than Rs. 1000 ☐Rs. 9000-12000
☐Rs.1000-3000 ☐Rs. 12000-15000
☐Rs.3000-6000 ☐Above Rs.1500</td></tr>
</table>

3. Information on ICS installation

a) When did you install ICS at your home? ☐ Less than 1 year ☐ 1 year ☐ 2 years ☐ 3 years ☐ 4 years ☐ more than 4 years	b) Which type of stove have you installed? ☐ One hole ☐ Two holes ☐ Three holes
c) Who motivated you to install ICS? ☐ Promoter ☐ Neighbor ☐ Friends ☐ Group members ☐ Other (Specify if any).....	d) Are you using the stove? ☐ Once ☐ Twice If no, why? …… ……

If you are using the stove please respond to the following questions:

a) For what purpose do you use ICS? ☐ Cooking ☐ Boiling water ☐ Make animal food ☐ Make liquor ☐ Heating room ☐ Other (Specify if any).....	b) How often have you done maintenance after installing ICS? ☐ Once ☐ Twice ☐ Thrice ☐ More than 3 times ☐ Not at all	c) What type of problems are you facing in using ICS? (you can check more than one question) ☐ Problem of smoke outlet ☐ Direction of chimney against wind direction ☐ Does not burn wood properly ☐ Consumes more firewood ☐ Cooks food slower than tradition stoves ☐ None of the above ☐ Other (Specify if any).....
d) What other types of stoves are you using beside ICS? ☐ Bio gas ☐ LPG ☐ Kerosene stove ☐ 3 stones ☐ Tripod ☐ Traditional mud stoves	e) Are there any houses who have constructed ICS but not using them? ☐ Yes ☐ No If yes, what might be the reason?	

4. Effectiveness of ICS

a) How much fuel wood was used in Traditional Stove in a day? …….. kg	b) How much fuel wood is required now in a day? …….. kg
c) What types of bio fuel do you use at your home? ☐ Fire wood ☐ Cow dung cake ☐ Hay/straw ☐ Twigs and agricultural residue ☐ Other (Specify if any).....	d) Where do you collect firewood from? ☐ Community forest ☐ Government forest ☐ Private forest ☐ From own farmland ☐ Buy ☐ Other (Specify if any).....
e) Who goes to collect fuelwood in your family ☐ Self	f) How much time do you spend to collect fuel wood ? ……. Mins/hour

☐ Father-in-law ☐ Husband ☐ Wife ☐ Mother-in-law ☐ Son ☐ Daughter ☐ Daughter-in-law ☐ All the family members ☐ Buy ☐ None of the above Other (Specify if any).....	
g) How much time did you require to prepare food in Traditional stoves? …… mins/hour	h) How long it takes to prepare food in Improved cooking stoves? …… mins/hour
i) How long did you used to spend to collect a bhari of fuel wood while using traditional stove? ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 hours ☐ 4 hours ☐ more than 4 hours	j) How long does it take now to collect a bhari of fuel wood after ICS intsallation ? ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 hours ☐ 4 hours ☐ more than 4 hours

5. Impacts of ICS on Health

a) What kind of health problems did you use to face while using traditional stove? ☐ Respiratory ☐ Cough and cold ☐ Chest pain ☐ Asthma ☐ Eye problem ☐ Headache Other (Specify if any).....	b) Do you still have those problems? ☐ Yes, same as before. ☐ Yes, but not serious as before ☐ No
c) How much money do you used to spend on health check-up while using traditional stove in a year? ☐ less than thousand ☐ 1000-3000 ☐ 3000-6000 ☐ 6000-9000 ☐ 9000 and above ☐ No idea	d) How much money is spent now on health check-up after using traditional stove in a year ? ☐ less than thousand ☐ 1000-3000 ☐ 3000-6000 ☐ 6000-9000 ☐ 9000 and above ☐ No idea

6. Impacts of ICS on Environment

a) What impacts are seen in forest conservation after the use of ICS (you can check more than one responses) ☐ Reduce in fire wood collection ☐ Illegal tree felling has been minimized ☐ Minimized fire wood sale ☐ Compared to 5 years back, forest looks dense Other (Specify if any).....	b) What other improvements are seen in environment conservation after using ICS? …… …… ……
c) What impacts are seen in sanitation after use of ICS? …… …… ……	

7. Other Benefits from use of ICS

a) Have you been able to save your cooking and cleaning time after use of ICS? ☐ Yes ☐ No If yes, how much time? ..... mins/hour	b) What do you do to utilize your time? …… …… ……
c) How many people in your area are engaged in promoting/constructing ICS? …… people	d) How much does it cost to construct an ICS? Rs.……to Rs. ……

8. Other Information Regarding use of ICS

a) Do you want to continue using ICS? ☐ Yes ☐ No Why? ..... …… ……..	b) What do you think has to be done to make ICS program more effective? Please give your suggestions. …… …… ……

Notes: Please give your opinion if you have any regarding ICS which are not covered in the questions above.

……..
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……
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Thank You!

Annex III

PHOTOGRAPHS

Two pot holes Improved Cooking Stoves (ICS)

Traditional Cooking Stoves (TCS) being used to cook animal food

Interviewing respondents about ICS

Children enjoying their food cooked in ICS