CHAPTER: ONE
INTRODUCTION

1.1 Background

Nepal is a mountainous country holding more than 80 percent of total population in rural areas. More than 90 percent of total energy use comes from biomass which is used for domestic sector and the commercial and other sectors utilize remaining 10 percent. Biomass is primarily used as fuel for cooking, space heating and cooking animal feeds as well as animal fodder.

Rural energy is one of the priority sectors of government as well as NGOs. The promotion of renewable energy in rural areas has been widely recognized as the pre condition for sustainable economic growth in rural areas. Rural energy services bear direct link with livelihood health and environment. Though government has been subsidizing various policies for alternative energy, slow pace has not been able to meet the demand of rural communities. In fact, rural energy could not keep pace due to excessive population growth. In result, majority of the rural population is dependent on biomass energy source

The share of fuel wood, agricultural residues and animal dung accounts respectively 79 percent, 4 percent and 7 percent. The forestry sector master plan has revealed that there is a gradual increase in fuel wood consumption. There was 11.3 million tons of fuel wood consumed in 1985/86 and this figure has been increased to 14.1 million tons in 1995/96. The agricultural residues (paddy, maize and wheat residues and jute stick) estimates approximately 11.2 million tons per annum, however no data are available on quantity of its uses. Most of the agricultural residues are used in very crude form and burnt in ineffective stoves. The animal dung, a third major source of biomass energy after fuel wood and agriculture residue, has been estimated to be 11 million tons dry weight from 3 million cattle. Nepal has huge hydropower (HP) potential, 83000 MW from 6000 rivers and rivulets flowing from north to south. Although, the hydropower development has begun from early nineties, the development could not be made as required. The electricity contributes to only 1 percent of the total energy consumption and only 3 percent has been used for domestic sector of rural part. The share of petroleum fuel and coal used for domestic and commercial sector is minimal and has been estimated to be 8.6 and 1.4 percent respectively .Nepal has zero production of petroleum. This scenario of slow development of hydropower and zero existing

situations of imported petroleum fuels compel the situation for biomass consumption increment to meet the growing need of energy. (REDP 2001)

The present scenario of energy uses in Nepal depicts an unsustainable picture. Heavy dependence on Fuel wood coupled with the high population growth rate is exerting a continuous pressure on forests, which has caused the rate of forestation is less than the rate of felling. The existing annual rate of deforestation accounts to be 1.7 percent posing a great threat to the environment. The dwindling of forest has direct impacts on fragile mountain ecosystem, which has created landslide, erosion, loss of biodiversity and climate change led to enhance poverty. Further, uncontrolled burning of agricultural residues and animal dung has brought about indoor air pollution and deficiency on manure, which has impact on the agricultural productivity as well as soil quality. In addition to the biophysical impacts, more than 78 percent of the rural women and children are caused drudgery and extra work in rural part in Nepal. Further, dung burning has reduced the organic manure input to the fields, which is very vital to agricultural productivity in the economically poor farmers to supplement the nutrients by fertilizer. (CRTN 2005)

Women in Nepal are confronted with heavy work load. They not only carry out almost of domestic work, but also the major part of the work related with agricultural production. The work load of women is increased due to deforestation. More time has to be spent on collection of fuel wood and fodder collection. Biogas is the promising energy technology in Nepal. It is a renewable, relatively cheap and decentralized energy source which can help to meet energy demands in rural areas while lessening reliance on other source for cooking – especially wood and animal dung. Since women are responsible for collecting fuel wood in some extents, the installation of biogas can have positive impact on reducing women work load, (Britt and Kapoor 1994)

Biogas program is claimed as one of the successful rural energy program in Nepal. Current interim 3 years plan of Nepal has planned to install 100000 additional biogas plants in 70 districts during its 3 years period taking the alternative energy as a program for poverty reduction. (NPC 2007)

Women and men could be equally addressed in extension and promotion of biogas program. Nowadays mainly the information is supplied through male member of the family. If the

women were involved in extension and promotion of this program, they would be able to watch over the consequences well. And they would be better informed about the advantages and disadvantages of biogas. Lack of information should be avoided and women should equally take part in decision making process. Along with, the installation of bio gas will certainly reduce women's work load.

Nirmal Pokhari VDC is one of the largest VDC of Kaski district for biogas installation. The concept of biogas installation in this VDC was started in 2050 B.S. The people of this VDC were totally dependent on fire wood as the source of house hold energy. Since the forests were cleared randomly, they had to spend more time for firewood collection. In another hand, due to the lack of hygienic toilets, their health and environment was affected. After the installation of bio gas, they have constructed toilets attached in biogas plants. So the installation of biogas has saved the time of women which is utilized by them for various activities.

1.2 Statement of the problem

Women are mainly responsible for the household energy management in rural areas of the country. Rural women in Nepal are confronted with a high workload. They do most of the household domestic and agricultural work. Depletion of natural resources like forest will even worsen their situation. It has impact on women inclusion in other development activities and their socio economic status development. Biogas is considered as a promising renewable energy source probably able to reduce the workload of women.

Since the women are contorted with heavy work load, it is essential for them to reduce their work load to participate them in various aspects of developmental activities. It is possible to reduce women's workload and address their productive and economic needs through innovative technologies and support mechanism. For this there is a need to focus on women's needs and role in water and energy management. But not only to meet their practical need but also to address their productive and strategic needs which can make significant changes in meeting development challenges.

Biogas is one of the popular renewable energy in rural areas of the country. In Nirmal Pokhari VDC of Kaski district also there have been already installed 423 household type biogas plants out of 1069 households. Due to difficulties in fire wood collection and since

they are domesticating animals for practicing agriculture they are attracted towards biogas plant installation. Provision of community forest, easy access to transport facility for supplying raw materials, availability of raw materials like sand stone etc., government subsidies , reducing indoor air pollution, etc are other additional factors to motivate the people for biogas installation in this area. Dissemination of biogas technology is affected by various factors like physiographic, socio economic, technological etc. To meet the target of interim plan, both men and women should be equally addressed in the extension of biogas program. The women are the real manager of rural household energy. If the women were involved in this program, it would get success in great pace. Until women's practical and strategic needs are addressed by policies and gender based program, the rural biogas program may remain ineffective and unsustainable. It is essential to involve women in extension program. Women must be aware of the real benefits of biogas installation for the extension of biogas program. But there are difficulties in finding out the qualitative study about advantages and disadvantages of biogas installation. The study focuses on gender perspectives and highlights the impacts of biogas installation on women empowerment.

The following issues are raised for the statement of problem in this study.

1. Why are the people of Nirmal Pokhari VDC motivated to install the biogas plants?
2. What is the impact of biogas in daily lives of rural women?
3. How does the use biogas influence rural women in decision making process?
4. How has the installation of biogas helped in women empowerment process?

1.3 Objectives

General objective of the study is to assess the effects of biogas installation on women's work load. Specific objectives of the study are as follows:

- To analyze the socio economic condition of the study area
- To find out the causes of biogas installation.
- To analyze the effects of biogas installation on various dimension of women status in household level and women empowerment process.

1.4 Limitation of the study

It is difficult to find out the biogas study on gender perspectives. Study about the gender effect of the biogas installation at household level might be helpful to its development program by recognizing the real stakeholder. The study was concerned on studying the socio economic effects of biogas installation on rural mountainous areas. Because of budgetary and time constrains the study only focuses on the selected households of Nirmal Pokhari VDC. Due to which the study cannot include the study about biogas slurry, technical and financial aspects. Since the study concern only one VDC of the country, the result finding can be generalized only those areas of same socioeconomic and geographic back grounds.

1.5 Conceptual framework

Figure 1.5: Conceptual framework

The above conceptual frame work makes it clear that the lack of easy access to domestic energy had been a problem for women in the study area. They faced heavy work load as they had to allocate more time for collecting fuel wood and they had little attention in social activities. But their collective awareness and participation of women along with other member in the family ensured the installation of biogas plants. Their continuous involvement in biogas plant construction and management has increased their decision making process, express ability of women and involvement of women in social activities and save their time subsequently which help them getting more empowered in the welfare of self, family and the society. After the installation of biogas plants, time is saved in morning and evening. In the saved time, the women can be involved in various activities such as; adult literacy program, social organizations, income generating activities, trainings and empowering activities as well. In this way, the women empowerment can be promoted by the installation of biogas plants.

1.6 Significance and Justification of the study

Biogas is a good technology in alternative energy sector of Nepal. This simple technology contributes a lot in lessening the burden on forest resource. It helps greatly in preventing deforestation. It is well realized that biogas technology is very much suitable for Nepalese context. Installation of biogas helps in saving firewood, time for collecting firewood, cooking as well as for cleaning utensils. Mainly the women are responsible for collecting fire wood, cooking and cleaning activities. So the women are benefitted from the installation of biogas.
The interaction with the female member of biogas installed households on various aspects of biogas and observation of biogas plants would help in getting real picture of the biogas technology in the study area. This will provide an understanding of various pertinent questions which will undoubtly help in addressing problems formulating realistic policies and programs there by bringing poverty reduction, social justice and women empowerment by providing appropriate feedback to the concerned agencies.

As a result of the above important considerations, the researcher initiated the study to acquire usefulness, as well as its effects on reducing workload of women and women empowerment process in Nirmal Pokhari VDC. Thus the findings and recommendations of the study are likely to contribute for the installation of biogas in rural community of Nepal

1.7 Organization of the Thesis

The entire thesis has been divided in to 7 chapters. The first chapter gives introduction to the study. It contains background of the study, statement of the problem, objectives, conceptual framework, limitation of the study, significance and justification of the study and organization of the thesis.

The second chapter consists of the study of review of previous studies on biogas technology and impact of biogas on reducing women's workload and women empowerment.

The third chapter describes the research methodology of the study

The fourth chapter consists of the socio-economic status of the respondents.

The fifth chapter consists of the description of biogas installation in the study area.

The sixth chapter consists of the effects of easy energy access on various dimensions of women empowerment.

The seventh chapter consists of the summary, conclusion and recommendations.

CHAPTER: TWO
LITERATURE REVIEW

Before proceeding the research, a brief review on the impact of biogas on rural women and the role of biogas installation on women empowerment was made to have good knowledge about the subject. This chapter contains the review of previous studies regarding the biogas and role of biogas installation on women empowerment.

2.1 Energy consumption in Nepal

Nepal's major source of energy falls in the traditional biomass category. As fuel wood is dominant type of energy used. Being a least developed and non-industrial country, the energy can be termed as biomass based subsistence energy. Industrial and transport sectors consume little commercial energy, leaving the bulk of energy demand is met by traditional energy which are consumed for domestic use.

The research on energy using pattern done by Koirala (1998) shows that the share of fuel wood, agricultural residues and animal dung account respectively 79percent, 4 percent and 7 percent. The forestry sector master plan has revealed that there is a gradual increase in fuel wood consumption. There was 11.3 million tons of fuel wood consumed in 1985/86 and this figure has been increased to 14.1 million tons in 1995/96. The agricultural residues (paddy, maize and wheat residues and jute stick) estimates approximately 11.2 million tons per annum, however no data are available on quantity of its uses. Most of the agricultural residues are used in very crude form and burnt in ineffective stoves. The animal dung, a third major source of biomass energy after fuel wood and agriculture residue, has been estimated to be 11 million tons dry weight from 3 million cattle. Nepal has huge hydropower (HP) potential, 83000 MW from 6000 rivers and rivulets flowing from north to south. Although, the hydropower development has begun from early nineties, the development could not be made as required. The electricity contributes to only 1 percent of the total energy consumption and only 3 percent has been used for domestic sector of rural part. The share of petroleum fuel and coal used for domestic and commercial sector is minimal and has been estimated to be 8.6 and 1.4 percent respectively .Nepal has zero production of petroleum fuel. This scenario of laggard development of hydropower and zero existing situations of imported

petroleum fuels compel the situation for biomass consumption increment to meet the growing need of energy. (REDP 2001)

2.2 Renewable energy: Biogas

Biogas is a mixture of different gases such as; methane (50-65%), carbon dioxide (30-40%), hydrogen sulphide (about 1%) and other gases such as nitrogen, hydrogen carbon mono oxide and also consist of water vapors. The water vapor need to be removed through a device known as water drain. The methane is flammable gas used mainly for cooking and lightening.

Biogas was introduced in Nepal for the first time in 1955 by a school teacher, late father B. R. Saubole at St. Xavier School, Godavari in Kathmandu.

During the agricultural year in 1975/76, biogas was included as a special program for its effectiveness in controlling the deforestation and preventing burning the animal dung which could be used as fertilizer in agriculture. The interest free loans were provided to the people to install the biogas plant. Agriculture development bank of Nepal involved since 1974/75 for its promotion (Karki et.al 2005) with the establishment of Biogas Support Program in1992, the financial support from Netherlands Development organization was started .(SNV/Nepal) the pace of installing biogas plants has been increasing rapidly since then. The principal objective of the biogas support program is to promote the wide scale use of biogas as the alternative of fuel wood, agricultural residues, and kerosene. The rising demand for fuel wood for increased population has caused excessive deforestation, soil degradation and decline in the densely populated areas. In addition, the use of fuel wood and kerosene has impacted the health especially of women who have to work with fire and fuel wood.

Now, 62 biogas companies have been established for the development of biogas and more than 140 micro finance institutions are supporting for this program. Besides these various NGOs like UNICEF, SCF/USA, Nepal Biogas Promotion Group etc. have made significant contribution in institutional growth of biogas promotion in Nepal.
(Bajgain and C. Kellener 2005)

2.3 Policy and programs on Renewable energy technology

The current interim 3 year plan has the following objective on renewable energy.

- Alternative energy promotion contributing to rural development, enhancing rural economy and quality of rural life, increasing the employment opportunities and contributing to the sustainability of environment.
- Reducing the dependence on the external sources of energy with the development and promotion of alternative energy technologies, their commercialization, potential and promotion as means of mainstream energy supply.
- Reducing the dependence on the conventional energy sources due to far reaching environmental consequences and progressively replacing them with the modern energy alternatives that are affordable.
- Promotion of alternative energy as integral program of Clean Development Mechanism (CDM) due to its established potential in reducing greenhouse gas emission in the atmosphere and therefore its promotion as mean for generating financial resources in long terms through carbon trading.
- Contributing to the broader national goal of achieving social inclusion and gender mainstreaming through increased participation of population of all class, caste and gender in the development, promotion and utilization of alternative energy sources.

The result oriented target regarding biogas in interim 3 year of 2007 is to install 100000 units of biogas plants in 70 Districts. (NPC 2007)

The 20 years perspective plan (2000-2020) focuses on the promotion and diffusion of the biogas plants in Nepal through institutional strength, diffusion training socioeconomic studies, monitoring and evaluation, information dissemination and publicity, research and development etc.

2.4 Theoretical Review

Sociologists have proposed lots of theoretical frameworks to analyze the socio cultural changes in rural community. To analyze the changing pattern on women role this study is carried out under gender perspective. Due to the installation of biogas especially the women's

role has been changed. So this study was carried on under the comparative study of changing women role.

2.4.1 Women in Development (WID)

Lots of efforts were forwarded to enhance women's conditions since the decade of 60s. The whole issues of women in development (WID) first came in to the agenda in the early 1970s. The term women in development is associated with the various activities concerning women in development process in which governments, local NGOs and the multilateral and bilateral agencies are involved since 1970s. Studies showed that women's economic contribution was neglected by the planners and the development projects had adverse effect on women, research on women during the decades of 70s brought various issues on women that required special concerns and efforts. To address the issue the first world conference on women was organized at Mexico City in 1975 and declared as United Nations decade for women's decade which gave importance to the issues concerning women. The focus was paid on the progress/improvement of women in the areas of educational and employment opportunities, equality in political and social participation and increase the health and welfare services. The WID movement during the initial period demanded social equality and justice for women (Tinker 1987)

WID was coined by a Washington DC based female development, professionals, the women's committee, chapter of the society for international development. Easter Boserup's work presented that modern development strategy has neglected women and left them behind. As a result integration of women into development concept was introduced into the development. The WID approach emphasized on improving women's conditions and did not take concern on the production and distribution of resources among individuals inside the households and the capitalist mode of production in the state as a whole. WID gave more emphasis on equal participation of women in all areas- education, employment and other opportunities and integration, WID focused on economy participation in market, economy training, property holding. Major focus was given on productive aspects of women's work ignoring the reproductive role, income generations and welfare approaches such as health, hygiene child care in literacy.

2.4.2 Women and Development (WAD)

The women and development (WAD) approach emerged during the mid half of 75-80s. Rather than integration it focused on women and development processes. Emphasis was given to count for women's contribution to economy both at home and outside. They challenged the trickle down model of development and pointed out that trickle down model of development caused negative impact on men and women instead of improving their status and political rights. The issue of triple burden of women was raised and emphasis on introducing women friendly technology to integrate women in the main stream development was stressed. (Luitel 2008)

WAD focused on the approach of development that had treated women as beneficiaries rather than participate and thus were ignored from the main stream development process. It claimed that women's contribution to the total economy was ignored due to its policy to treat women as a separate entity. It demanded for equal distribution on resources as well as equal participation of women at all levels. The focused women as equal partners of development process, reduction of women's workload and involve them in development process. It focused to involve the women in the program as decision makers rather as beneficiaries. WAD also focused more on income generation activities without considering women's burden at home and farm, over burdening women rather benefiting them or releasing from their hazards.

2.4.3 Gender and Development (GAD)

Gender and development emerged during the early 1980s however it is the outcome of the continuous efforts of women who devoted their time and energy for the enhancement of women. The feminist movement that started in the west spread all over the world during the 1970s. The decade of 80s brought a new vision in the liberal feminist thought as well as a new approach in the development arena. The post modernist and post structural feminist argued on the issue of universal feminism which the liberal and Marxist feminists were carrying over so far. GAD emerged in 1980s and emphasized on the position of women in the total social structure rather to address in isolation. The GAD is concerned with the social construction of gender which confines women in the role of production and reproduction that acts as the basis of women's oppression. (Moser 1993)

One of the key areas of GAD concern is that it involves on analysis of women's contribution inside and outside the household. It emphasizes on the analysis of women's household work before bringing her in development work e.g. Income generation, adult literacy etc. such analysis were useful to understand women's contribution both as producers and reproducers. It emphasizes to consider women as agents of change rather as passive recipients of development.

GAD was concerned more on women's holistic development. GAD looks at the total social system, social, political, economic, educational sub ordination and oppression of women and called its caused both psychological and social. GAD approach views as active agents of development rather passive recipients and yet holds development rather passive recipients and yet holds that women lack knowledge or understanding of their social situation- the understanding of the structural roots of discrimination and subordinations. It is the combination of all the approaches welfare, antipoverty and equality. It holds that the welfare and anti-poverty approaches are the prerequisites condition for equality.

The concept of gender makes it possible to distinguish between the biologically founded sexual differences between men and women and culturally determined differences between the roles given to them. The first one is unchangeable like destiny. The latter one is dynamic or changeable that may be changed by political and opinion shaping influences. The concept of women in development is concrete and may lead to marginalizing women as a particular species with inherited handicaps. The concept of gender and development is abstract band opens up for the realization of women's perspective potentials in development (Moser cited in Luitel 2008)

The term gender relation refers to the relations of power between women and men who are revealed in a range of practices, ideas, representation including the provision of labor, roles and resources between men and women. Gender role means the set of cultural expectation that defined the ways in which the member of each sex should behave. (Lawman 2004) gender analysis begins from a consideration of the ways in which men and women participate differently in the household economy and society. Secondly it seeks to identify the structure and processes, legislation, social and political institution, socialization practices, employment policies and practices that can act to perpetuate of women's disadvantages. Every society is characterized by gender based social relationship. Their roles are determined in the childhood

consequently their growth leads them in the different psychological pattern. It reflects the oppression and discrimination by the differences in division of labor creates differences in status in family, marriage community and society. Gender relation is the term used to describe the relation between men and women based on biological differences that are socially and culturally created. For example, although the biological fact of having a child does not make it impossible for women to have a job, she may be prevented by a numbers of factors determined by gender. Among them cultural norms are restricting women to the home stereotypes about suitable job for women or the lack of care and family services are the few. In spite of the degree and forms of gender inequality, the system is universal. Women have no common the multiple activities they are expected to carry out while their official sphere is the home and the family .The relation on the women man relationship as old system of relationship breaks down version are called for the historical roots of the male female relationship are thousands of years old and are embedded in a patriarchal system which has shaped our institutions, our thinking and the patterning our relationships. As we work towards change, we must recognize the weight and depth of the society.

2.5. Review of previous studies

BSP studied the workload of rural women and founded that a large number to children, mostly girls have to allocate 20 percent of time on fuel wood collection. (WECS 1995) comprehensive studies on women's workload in different part of Nepal concluded that a woman's one day work consists of 9 to 11 hours. A study by BSP conducted in 1992 estimated that almost 75% of households spent more time in collecting firewood in 1988 than on 1983. Van Vliet and Van Nes (1993) studied the effects of biogas on the workload of women in Rupendehi district of Nepal. They concluded that the reduction in work load of women as a result of installing biogas plants accounts to a minimum of two hours and maximum of seven hours per day.

Effect of biogas on the workload of women in the village of Madan Pokhara in Palpa district studied by Marieke Van Vliet (1993) highlights on rural women in Nepal confronted with a high work load. They do most of the house hold domestic and agricultural works. Depletion of natural forests has worsened their situation. Biogas is considered as a promising renewable energy source probably to reduce the work load of women. Biogas influenced positively to all

the families with regards to the time spent on collection of fuel wood. In general, due to the utilization of biogas, women saved minimum one hour and maximum 2.5 hours a day.

"The effects of biogas on women's work load in Nepal" an overview of studies conducted for the BSP by C. Britt in 1994 concluded distinct view in biogas. He concluded that cooking, the collection of firewood and cleaning of utensils are dramatically affected by the installation of biogas. Particularly in areas where wood is in short supply and household members are forced to spent substantial periods of time collecting fuel wood, the time saving aspects of biogas are emphasized. The water sources at a great distance from the plant, the time saving impact of biogas is less noticeable. In most of the cases quicker food cooking, collecting fire wood and cleaning utensils still allow for a saving of labor for women in the majority of the households.

Rural energy development program 1998 concluded that women are active participants in community mobilization schemes like savings and credit, and other community activities such as contributing labor for the construction of canals, and community buildings. This indicates women's potential to play more powerful roles in the planning and management of alternative energy technologies as well as energy based small enterprises. However, there are few opportunities for women to start small productive enterprises that could lead to their empowerment.

Agricultural development Bank had conducted a study entitled Impact of biogas installation in Nepal in 1986.The study was carried out in Kavre, Kaski, Rupandehi and Jhapa. The report provides a complete literature on almost all aspects of biogas installation and further every field that receives the impacts of installation is covered. The use of biogas had saved 0.8 hrs in Terai and 0.6 hrs in hilly region. The gained time was utilized in productive activities. (ADB/N 1986)

A study was carried out on impact assessment of biogas technology in rural Nepal in Sundar Bazar VDC of Lamjung district. They study concluded that biogs installayion has been proved very useful for female members in the family. The workload has been reduced by about 50 percent after biogas installation. The women had utilized their gained time in agricultural activities, house hold activities and income generating activities. The

participation of women in social organization was increased significantly after biogas installation. (Gauli 2004)

The study carried out in Bhanu VDC of Tanahun district (2008) by Adhikari concluded that the installation of biogas has brought positive effects on the overall status of women. The overall impacts of biogas had helped to empower the women and enhance their involvement in household level to community level. (Adhikari 2008)

The research on the impact of biogas on women has shown that biogas has reduced the women workload. Women have demonstrated good skills in mobilizing the community, which was a good strategy to motivate them in the adoption of alternative energy technologies. By their involvement in saving and credit groups initiated by rural energy development programs, women were able to motivate others in the group to be involved in construction of micro-hydro canals, for installing biogas plants and ICS and so on. In a group of women, one individual is able to convince others to install plants for their convenience. Women would then talk to their husbands about the need for such plants and in some cases they were able to convince them to support this ideas rather than seeking the approval of the female members of the household. The acceptance of technology by women is taken for granted. (Skutsch cited in Sharma and Banskota 2005 **)**

Women play a key role in collection, management and use of domestic energy and technologies. The multi roles and responsibilities force them to face a numbers of problems. The growing scarcity of fuel wood and other biomass resources has caused the women to spend other more time to collect the energy sources. (WECS 1995)

The smokeless biogas has greatly benefitted the plant owners by contributing to a significant reduction in eye-related troubles/problems and respiratory diseases. Women feel better in terms of the removal of eye-irritation, eye-pain, eye-sore, headache, coughing etc. Another benefit realized by the plant owners was remarkable reduction in physical stress in term of more leisure made possible from time saved in firewood collection, cooking and cleaning utensil. (BSP 1996)

There are renewable energy technologies that offer significant potential in terms of reducing women' workload and improving health condition. For example, the improved cooking stove,

an improved version of traditional cooking stove has a positive impact on addressing the gender concerns. The impacts of renewable energy technologies such as biogas, micro hydro power and solar energy is found to have a positive impact on women's work load, their living condition and economic empowerment. (East Consult 1994)

Reducing the drudgery and workload especially in energy task is a strong entry point for enabling the women to participate in new livelihood and opportunity and improve their standing in the society. It gives more option to women to meet their productive and gender needs in a suitable way. The need and role of women should be integral to the decision making process of a decentralized and efficient system. This is a technical and political process. It will require a shift in organizational culture and way of thinking the promotion of gender goal. (Sharma 2010)

It seems that the role of women in energy related sectors have to be understood by policy makers and the policies seem to be formulated in gender-neutral process. The participation of men and women in development should be made equal. Then only the men and women can be benefitted equally from developmental works. This assumption is a distortion of the real situation that women are lagging behind in socio economic, legal and political aspects. The women's role, concerns, needs, and problems are different from that of men. Until the women's practical and strategic needs are addressed and internalized by policies, and gender based program planned and implemented, the rural energy program are likely to be remain inefficient and unsustainable.

The government of Nepal energy sector agencies should provide credit facilities and subside for time and energy saving technologies. With these facilities and provisions, women will have access to technology that will give them the time needed for their skill development and income generating activities. If the women are able to generate income, they can contribute for the families and the community as well. A major obstacle to meet the basic needs on poor rural families is the lack of productive resources and the compulsion of women to be involved in triple roles, as producers, manager and users of energy. Development efforts without the participation of women is sure to be failed until the development activities are women oriented because the women have an intimate relationship with energy, environment, economy and natural resource management.

CHAPTER: THREE
RESEARCH METHODOLOGY

This study was designed to obtain the changing socio economic condition of women and gender role after the installation of biogas. For this study a descriptive research design was followed. The descriptive research was applied for qualitative data obtained and derived during the study. The data which were not quantifiable was explained literally. The analysis of data was made by generating the table of average and percentages. This chapter discusses the research methods employed to accomplish the study objectives.

3.1 Rationale for the selection of study site

Kaski district holds significant position in biogas installation. In this district, Nirmal Pokhari VDC is one of the important VDC from the point of view of biogas installation. So this VDC was sellected for the impact study of biogas installation and use. Due to time and resources constraints, in-depth study could not be carried out in all the wards. The other reason behind the selection of this VDC is that the researcher was born in the same place. So it was expected easier to observe and interact with the people to collect the data for the study. For detail and in-depth study, ward no 8 of the VDC was chosen. In this ward, there was significant change in the overall life of women before and after the installation of biogas plant. To meet the objectives, social mapping of the wards was conducted and ward no 8 was selected for the study. For social mapping, some resource person of VDC were requested to rank each wards of the VDC based on the impact of the biogas on the overall life style of the women. They gave high rank to this ward. That means there was significant change in the lives of rural women in this ward in comparison to other wards after the installation of biogas.

3.2 Research Design

The study was basically designed as a descriptive field study research. The research was concentrated on the effects of the biogas installation on the women role. It had an objective to assess the socio economic condition of the women of the study area, to know the effect of biogas installation on women's work load, and to assess the role of biogas installation on women empowerment. To meet the objectives of the study, exploratory and descriptive

research design were employed. The impact of biogas installation on women was analyzed through the study of the status of women before and after the installation of biogas.

3.3 Nature and sources of data

The study was mainly based on primary data and in some extent secondary data were used. So the sources data were primary as well as secondary. To collect the primary data, various tools such as house hold survey, focus group discussion key informant interview were employed. The first hand information was collected contacting and interviewing to the respondents from the study area.

The publications of governmental and non-governmental organizations, books, journals, booklets, dissertations of the former students, reports were major sources of secondary data. The sources of secondary data were Biogas Support Program (BSP), District Development Committee (DDC), village profile etc.

3.4 Sampling

Nirmal Pokhari VDC located in the southern part of the Kaski district is one of the largest VDC in biogas installation in the district and was taken as a site where 423 biogas plants have been already installed out of 1069 total household. There are 60 households with biogas plants in ward no. 8. So, census survey was carried out in those households. Table 3.4 shows the ward numbers, their relative house HH numbers and No. of biogas installed households.

Table 3.4: Installation of biogas in the VDC

S.N	Ward no	Total HH	Biogas installed HH
1	1	246	80
2	2	79	18
3	3	138	30
4	4	67	41
5	5	135	61
6	6	120	69
7	7	51	33
8	8	141	60
9	9	130	31
Total		1069	423

Source: Village Profile, 2067

3.5 Pre-testing

To ensure that the tools were properly designed, they were pre-tested in the area of the non sampled households of the VDC. After pre testing, necessary changes were made and interview schedule were finalized for administration to the local women.

3.6 Tools and techniques for data collection

Household survey was conducted altogether in 60 biogas installed households of ward No.8 to address the objectives of research, the following tools and techniques of data collection were employed.

3.6.1 Household survey

Household survey (observation) might be the useful tool for data collection. House hold survey was carried out in BIHH. The study area was familiar with the researcher. Changes could be seen in women status and socio economic condition of that place. A set of questionnaire was scheduled. Since the study is focused on women, the questionnaire was concerned only with women who are playing responsible role in the family and in case of her absence other responsible female member of the family responded the questionnaire.

3.6.2 Focus Group Discussion

Organized discussions were held with women from among the biogas installed houses. Second focus group included the VDC chair person, social workers, leaders of political parties, teachers, members of mother groups etc. The purpose of such exercise was to find out if biogas plant operation reduces the work load of women, empower them to involve in decision making, involvement in income generation, social activities and political activities.

3.6.3 Key Informant Interview

Discussions with the key informants consisting of local community and political leaders, school teachers, representatives of local self help organizations, health workers and other knowledgeable persons are found to be useful to acquire community perceptions on biogas

plant operation in relation to its effects on reducing workload of women, empower them to involve in decision making, involvement in income generation, social activities and political activities. And the persons who installed biogas plant on first stage were the major source of key information. A semi structured interview checklist was administered with the key informants.

3.7 Validity and reliability

The validity of the instruments was maintained by the consulting advisor. Efforts have been made to maintain the objectivity of the data and avoid data error by comparing them with different data collected from different sources. Likewise the reliability of the data was assured by taking larger sample of the respondents.

3.8 Analysis of data

The research or study cannot give the fact till the data is analyzed. After the field survey there must be the analysis and interpretation of the gathered data and information. Both statistical comparison and qualitative assessment are adopted to analyze the gathered information. After analyzing the data and information only, various conclusions and recommendations are drawn. For the analysis of collected data tabulation, proportion, percentage etc were used.

CHAPTER: FOUR
SOCIO-ECONOMIC CONDITION OF THE RESPONDENTS

The study was particularly concerned with the status of rural women. It was focused to analyze the change in the status of the women after the change in the pattern of the source of energy required for domestic consumption. So to achieve the objective of the study, primarily the data were collected from the housewives. Most of the respondents were between 40-60 years. Only few respondents were above 60 years. However there were variations in the socio-economic condition of the respondents in other aspects. Here is the detail description of the literacy, sources of income, occupational status, land holdings, land ownership pattern, ownership of the livestock population of the respondents.

4.1 Population and household size:

The total population of the 60 households was 268 with an average household size 4.46, which is less than the national average 5.44 which was recorded in 2001 census. Among the total population male were 130 (48.50%) and female were 138 (51.50%). Households with maximum number of family was 8 where as minimum number was 3 respectively. Table 4.1.1 shows the family size of the respondents households.

Table 4.1.1: No. of respondents with family size group

SN	Family size Group	No. of house holds	Percentage
1	Small (up to 4 person)	22	36.67
2	Medium (5-7 person)	36	60.00
3	Large (8 and above)	2	3.33
Total		60	100.00

Source: Field survey, 2068

Table 4.1.1 shows that 60 percent of the households have 5-7 member family size, 36.67 percent households have up to 4 member family size and only 3.33 percent of the households have 8 and above member family size. Majority of the households have medium family size.

The population of the study area is composed of various age groups. The composition of population in the study area on the base of sex and age is shown in table 4.1.2.

Table 4.1.2: Population Pattern of the study area

SN	Age group	No. of individuals		Total	Percentage
		Male	Female		
1	0-5 years	8	12	20	7.46
2	6-14 years	18	27	45	16.79
3	15-59 years	91	83	174	64.92
4	60 and above	13	16	29	10.83
		130	**138**	**268**	**100.00**

Source: Field survey, 2068

Table 4.1.2 shows that 64.92 percent of the population of the study area is of 15-59 years age group which is considered as economically active group. 16.79 percent of the population is of 6-14 years group, 10.83 percent of the population is of 60 and above age group and 7.46 percent population is of 0-5 years age group.

4.2 Caste and Ethnic composition of the study area

Since Nepalese society is the heterogeneous society, various caste and ethnic group of people live in the study area also. The table 4.2 shows the caste and ethnic composition of the study area.

Table 4.2: Caste and Ethnic composition

SN	Caste	No of house holds	Percentage
1	Brahmins	55	91.68
2	Giri	3	5.00
3	Magar	1	1.66
4	Kami	1	1.66
Total		60	100.00

Source: Field survey, 2068

Table 4.2 shows that 91.68 percent of the respondents were Brahmins, 5 percent of the respondents were Giri, 1.66 percent of the respondents were Magar and 1.66 percent of the respondents were Kami. It shows that the Brahmins are ahead in installing biogas plants in the study area.

4.3 Literacy status of the respondents

Among the total of 60 respondents, 53 respondents were literate. Among the respondents, some of them had joined formal education, some got informal education and some had attended adult literacy classes. Only 4 respondents had passed SLC exam but none of them have joined for higher education. The table 4.3 shows the detail of the literacy status of the respondents.

Table 4.3: Literacy status of the respondents

SN	Literacy level	No. of respondents	Percent
1	SLC	4	6.67
2	Class 6-10	5	8.33
3	Class 1-5	7	11.67
4	Just Literate(read & write)	37	61.66
5	Illiterate	7	11.67
Total		60	100.00

Source: Field Survey 2068

Table 4.3 shows that 6.67 percent respondents have passed SLC but none of them have joined higher education. 8.33 percent respondents have studied 6-10 class, 11.67 percent respondents have studied 1-5 class. 61.66 percent respondents were simply literate who can only read and write. Only 11.67 percent of the respondents were illiterate.

4.4 Sources of income and Occupational status

The source of income and occupational status of the respondents including the household members is one of the important factors of the socioeconomic status. The study shows that all the families are directly and indirectly involved and dependent on agriculture. Besides agriculture, the people are involved in service, foreign employment, pension, business and small scale industries. Being a Brahmin community, some people are involved in Jajmani (performing the rituals). The table 4.4 shows the source of income and occupational status of the respondent households.

Table 4.4: Source of Income and Occupational Status

SN	Source of income	No. of HH	Percent
1	Agriculture only	8	13.33
2	Agriculture & service	20	33.33
3	Agriculture & pension	8	13.34
4	Agriculture, service & pension	4	6.67
5	Agriculture & foreign employment	6	10.00
6	Agriculture, foreign emp. & service	4	6.67
7	Agriculture, service &industry	2	3.33
8	Agriculture & Business	3	5.0
9	Agriculture, business & service	3	5.0
10	Agriculture & jajmani	2	3.33
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 4.4 shows that all the respondent households are directly and indirectly involved and dependent on agriculture. Only 13.33 percent respondent households are dependent only on agriculture. 33.33 percent respondent households are involved in services along with agriculture. 13.33 percent respondents have their pension along with agriculture.10 percent are involved in agriculture, service and foreign employment. 6.67 percent are involved in agriculture and foreign employment. 6.67 percent are involved in agriculture, service and foreign employment.5 percent are involved in agriculture and business.5 percent are involved in agriculture business and service.3.33 percent are involved in Agriculture, service and industry. 3.33 percent are involved in agriculture and jajmani.

4.5 Land holding size

Being an agricultural country, the land has great importance in Nepalese society. It is not only important activities but it is an important asset in Nepal which determine the socio economic status in the society. The land ownership pattern differs from one person to another person. Field survey shows that all the respondents have their more or less own agricultural land. They grow maize, rice, wheat, mustard as the major crops. The table 4.5 shows land holding size of the study area.

Table 4.5: Land holding size of the respondents

SN	Land size in ropani	Households	Percent
1	Below 5 ropani	10	16.67
2	5-10 ropani	32	53.34
3	10-15 ropani	14	23.33
4	Above 15 ropani	4	6.68
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 4.5 shows that majority of the respondent households (53.34) percent have 5-10 ropani land. 23.33 percent respondent households have 10-15 ropani land, 16.67 percent have less than 5 ropani land and only 6.68 percent have more than 15 ropani land. The table shows that majority of the respondents have medium land size. They could not grow more crops in large amount to sell because they have limited area of land. To meet the households' needs from the limited area the farmers intensively cultivate the land.

4.6 Land Ownership

Nepalese society is the patriarchal society. Man is the head of all the power and property in households. Man represents the households and he is the head of the family. Land is the major property of household economy and also cherished by the man. The land from one generation to another generation also passes from man to man. It is found that the women have less access over land ownership. The power relation between men and women is not balanced. Woman is supportive to man. So to enhance land ownership to woman government has subsidized land registration free to women. However, the pattern of land holding is changing. Generally the women are getting land ownership due to different socio economic change and legal incentives. The table below shows the land ownership pattern according to the respondents and their family members.

Table 4.6: Land ownership in the respondent households

SN	Land owners	Households	Percent
1	Self	10	16.66
2	Husband	26	43.34
3	Self & husband	13	21.67
4	others	11	18.33
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 4.6 shows that in 43.34 percent households, the husband is the owner of the land. In 21.67 percent households, both husband and wife are the owner of land. In 16.66 percent households, the wife is the owner of the land and in 18.33 percent households, other member of the family are the ownership of the land.

4.7 Livestock status

Animal husbandry is the major component of agriculture of the study area. The Farmers have buffaloes, oxen, and cows. They use oxen to plough the land. They produce milk and dung from the buffaloes and cows. Those animals supplied required manure for biogas plants. The table 4.7.1 shows the detail of livestock status of the study area.

Table 4.7.1: Number of livestock in the study area

SN	Live stock type	No. of livestock
1	Buffaloes	102
2	oxen	46
3	cows	6
Total		**154**

Source: Field Survey, 2068

Table 4.7.1 shows that, most of the respondents have kept buffaloes. It produces high quantity of milk and compare to cow. So it is highly popular. The farmers of the study area use oxen for cultivating the land. There were 102 buffaloes, 46 oxen and 6 cows. Besides

these live stocks, the farmers of the study area have kept goat, chicken which help to generate income among the women. The number of livestock house wise is shown below.

Table 4.7.2: No. of cattle and households

SN	No. of cattle holding	households	Percent
1	1 cattle	4	6.66
2	2 cattle	28	46.67
3	3 cattle	18	30.00
4	4 cattle	8	13.33
5	5 cattle	2	3.34
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 4.7.2 shows that majority of the households 46.67 percent had kept 2 cattle. 30 percent households had kept 3 cattle. 13.33 percent households had kept 4 cattle. 6.66 percent households had kept 1 cattle and 3.34 percent households had kept 5 cattle

CHAPTER: FIVE
DESCRIPTION ABOUT BIOGAS INSTALLATION

5.1 Installation of Biogas plants in the study area

The trend of Biogas installation in this ward started in 2053 BS. The year of biogas plants installation in the study area is given in table 5.1.

Table 5.1: Year of biogas plants installation in study area

SN	Year of installation	Households	Percent
1	Before 2055 BS.	8	13.33
2	From 2055-2060 BS	46	76.67
3	From 2060 onwards	6	10.00
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 5.1 shows that though the trend of biogas installation was started in this ward since 2053 BS, it got popularity in the period between 2055-2060 BS.76.67 percent of the biogas plants were installed in this period. Before 2055 B.S 13.33 percent respondents have installed biogas plant and only 10 percent respondent installed biogas 2060 B.S. onwards.

5.2 Description about domestic energy consumption

Nepal has most of its land in rural areas. Firewood is the chief source of domestic energy for cooking purpose. Community forest and private forests are the major sources which supply the required quantity of the firewood to the people. In the study area the respondents are the key person to prepare food. Most of the respondents use firewood and biogas for preparing food. Some respondents use electricity and LP gas along with firewood and biogas. The detail of domestic energy consumption in the study area is shown in table 5.2.

Table 5.2: Sources of domestic energy in the study area

SN	Sources of energy	Households	Percent
1	Biogas and firewood	42	70.00
2	Biogas and electricity	2	3.33
3	Biogas, firewood and LP gas	6	10.00
4	Biogas firewood and electricity	4	6.67
5	Biogas, firewood, LP gas & electricity	6	10.00
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 5.2 shows that 70 percent of the respondents use biogas and firewood for as domestic energy. 10 percent respondents use biogas, firewood and LP gas. 10 percent respondents use biogas, firewood, LP gas and electricity. 6.67 percent respondents use biogas, firewood and electricity and only 3.33 percent respondents use biogas and electricity as domestic energy.

5.3 Reasons for installing biogas plants

Before the installation of the biogas, firewood was the chief source of domestic energy. Various factors inspire the people to install the biogas plants. Mainly the respondents are inspired to install the biogas plants because of two reason; easy and smokeless cooking and time saving in collecting firewood, cooking and cleaning utensils. The detail of the inspiring factors for the installation in the study area is shown below.

Table 5.3: Reasons for the installation of biogas plants

SN	Factors to install biogas	House holds	Percent
1	Easy and smokeless cooking	20	33.33
2	Time saving in collecting firewood, cooking and cleaning utensils	18	30.00
3	Both of the above factors	22	36.67

Source: Field Survey, 2068

Table 5.3 shows the about 33.33 percent of the respondents installed biogas plant for easy and smokeless cooking. 30 percent of the respondents installed biogas plants for time saving in collecting firewood, cooking and cleaning utensils. 36.67 percent respondents installed the biogas plants for both of the above reasons.

5.4 Motivating factors for the installation of Biogas

The trend of installing biogas plants was popular among the villagers in between 2055-2060 BS. Most of the plants in the study area were constructed in that period. The motivating factors for the installation of biogas are shown in table 5.4.

Table 5.4: Motivating Factors for installing Biogas plants

SN	Motivating Factors	No. of HH	Percentage
1	Self initiatives	28	46.67
2	Initiatives from biogas company	12	20.00
3	Initiatives from biogas installed households	20	33.33
Total		60	100.00

Source: Field Survey, 2068

Table 5.4 shows that 28 respondents (46.67) percent were self motivated for installing biogas in their house. 12 respondents (20.00) percent of the respondents were motivated by the biogas companies and 20 respondents (33.33) percent were motivated by the biogas installed households of nearby.

5.5 Impact of biogas installation on household workload

Installation of biogas plant in the study area had various impacts in the lives of the rural women. Mainly the study was focused to analyze the impacts of biogas installation on the workload of women and the women empowerment process. The respondents reported that household work load has been decreased significantly. Only few respondents reported that no change has occurred in household workload. The details of the impact on household hold work load is shown below

Table 5.5: Impact of biogas plants in household workload

SN	Description	No. of respondents	Percent
1	Work load increased	00	00.00
2	Work load decreased	58	96.66
3	No change	2	3.34
Total		60	100.00

Source: Field Survey, 2068

Table 5.5 shows that no respondent has found increment on household workload after the installation of biogas plant. 96.66 percent respondents have found that work load has been decreased and only 3.34 percent respondents have found that no change has occurred in household work load.

5.6 Disadvantages of the installation of biogas

Though the installation of biogas has lots of advantages and positive impacts, the respondents opined that it has some bad aspects and negative impacts. The negative impacts of the biogas plants among the respondents are shown below.

Table 5.6: Disadvantages of biogas installation

SN	**Disadvantages**	**No. of respondents**	**Percentage**
1	Bad smell	28	46.67
2	Mosquitoes increased	46	76.66
3	Less tasty food	28	46.67
4	Rusting on metal utensils	8	13.33
5	Less warmth inside the kitchen	10	16.66

Source: Field Survey, 2068

Table 5.6 shows that majority of the respondents (76.66) percent reported that population of mosquitoes has been increased after the installation of biogas plants. Besides it, 46.66 percent respondents reported that bad smell has been caused due to biogas, 46.67 percent respondents reported that food cooked on biogas is less tasty than the food cooked on firewood, 16.66 percent respondents reported that there is less warmth inside the kitchen after the installation

of biogas. Similarly 13.33 percent respondents reported that cooking on biogas caused rusting on metal utensils.

5.7 Time taken for feeding the Biogas plant

Most of the households in the study area have good supply of drinking water. All the households have attached toilet in the plant. The respondents reported that they need not to feed the plant with huge amount of animal dung. The respondents reported that it takes average 20 minutes (0.33 hrs) to feed the plant daily.

CHAPTER: SIX
EFFECTS OF EASY ENERGY ACCESS ON VARIOUS DIMENSION OF WOMEN EMPOWERMENT

Empowerment is the process which changes existing power relation by addressing itself to three dimension; material, human and intellectual resources. It is a process which must change ideology, set of ideas, attitudes, beliefs and practices in which gender bias or social bias like caste, class, regionalism and communalism are embedded. The process of empowerment has to occur at several levels. The transformation has to give changes in the ideological system, in access to resources and in institutions and structure at several levels such as the family and the households, the village and the community and the state and market. (Sharma 2003)

In this chapter the impact of biogas installation on various dimensions of women empowerment are discussed under various topics.

6.1 Time saving

6.1.1 Fire wood required before biogas installation

Fire wood was the main source of domestic energy in the study area before the installation of Biogas plants. They had to prepare food on fire wood. So, they need a huge amount of firewood throughout the year. The details of firewood required for a year in the respondent households is shown in table 6.1.1.

Table 6.1.1 Firewood required in respondent households

SN	Quantity of required firewood in Bhari	No. of Households	Percentage
1	Up to 100	12	20.00
2	101 to 140	11	18.33
3	141 to 180	13	21.67
4	181 to 220	15	25.00
5	Above 220	9	15.00
Total		60	100.00

Source: Field Survey, 2068

Table 6.1.1 shows that 25 percent respondents needed 180 to 220 bhari firewood for a year. Similarly 21.67 percent respondents needed 141 to 180 Bhari, 20 percent needed up to 100 bhari firewood, 18.33 percent needed 101 to 140 Bhari and 15 percent needed above 220 Bhari fire wood. The respondents reported that they needed maximum 270 Bhari and minimum to 100 Bhari fire wood before the installation of biogas.

6.1.2 Fire wood required after biogas installation

Fire wood was the main source of domestic energy in the study area before the installation of Biogas plants. They had to prepare food on fire wood. So, they need a huge amount of firewood throughout the year. After the installation of biogas the amount of firewood has been tremendously reduced. The details of firewood required for a year in the respondent households is shown below.

Table 6.1.2 Firewood required in respondent households

SN	Quantity of required firewood in Bhari	No. of Households	Percentage
1	Up to 30	7	11.67
2	31 to 40	12	20.00
3	41 to 50	10	16.66
4	51 to 60	17	28.34
5	Above 60	14	23.33
	Total	60	100.00

Source: Field Survey, 2068

Table 6.1.2 shows that 11.67 percent respondents needed up to30 bhari firewood for a year. Similarly 20 percent respondents needed 31to 40 Bhari, 16.66 percent needed 41 to 50 bhari firewood, 28.34 percent needed 51 to 60 Bhari and 23.33 percent needed above 60 Bhari fire wood. The respondents reported that they needed maximum 100 Bhari and minimum to 30 Bhari fire wood for a year after the installation of biogas.

6.1.3 Time taken for collecting fire wood

The study area is located at diversified geographical location. So the distance to the forest varies from settlement to settlement. The details of the time required for collecting each unit of firewood is given below.

Table 6.1.3 Time required for collecting each unit of firewood

SN	Time Required (in hours)	Households	Percentage
1	Up to 4	8	13.33
2	4 to 5	32	53.34
3	5 to 6	20	33.33
	Total	60	100.00

Source: Field survey, 2068

Table 6.1.3 shows that, the respondents have to allocate maximum 6 hours and minimum 4 hours to collect a bhari of firewood. Majority of the respondents (53.34%) had to allocate 4 to 5 hours to collect each bhari of firewood. 33.33 percent respondents had to allocate 5 to 6 hours and 13.33 percent respondents had to allocate up to 4 hours to collect each bhari of firewood. They had to allocate maximum 6 hrs and minimum 4 hours to collect a bhari of firewood. In average they had to allocate average 2.53 hours to collect fire wood per day.

6.1.4 Time taken for cooking before biogas installation

Cooking on fire wood takes more time and it needs to watch regularly to burn fire while cooking. Table 6.1.4 shows the time required for cooking food per day.

Table 6.1.4 Time required for cooking

SN	Time required (in hours)	Households	Percentage
1	Up to 2.5	10	16.66
2	2.5 to 3	37	61.67
3	Above 3	13	21.67
Total		60	100.00

Source: Field survey, 2068

Table 6.1.4 shows that majority of the respondents (61.67%) required 2.5 to 3 hours to cook food per day. Similarly 21.67 percent respondents required above 3 hours and 16.66 percent respondents required up to 2.5 hours to cook food. The respondents reported that they had to spend maximum of 3.50 hours and minimum to 2 hours to cook food. The respondents had to spend average 2.75 hours on cooking food per day.

6.1.5 Time taken for cooking after biogas installation

Cooking on fire wood takes more time and it needs to watch regularly to burn fire while cooking. Cooking in biogas is comparatively reduced the time for cooking. The table below shows the time required for cooking food per day.

Table 6.1.5 Time required for cooking

SN	Time required (in hours)	Households	Percentage
1	Up to 1.25	9	15.00
2	1.25 to 1.75	36	60.00
3	Above 1.75	15	25.00
	Total	60	100.00

Source: Field survey, 2068

Table 6.1.5 shows that majority of the respondents (60) percent required 1.25 to 1.75 hours to cook food per day. Similarly 25 percent respondents required above 1.75 hours and 15 percent respondents required up to 1.25 hours to cook food. The respondents reported that they had to spend maximum of 2.25 hours and minimum to 1.25 hours to cook food. The respondents have to spend average 1.75 hours for cooking food per day.

6.1.6 Time taken for cleaning utensils before biogas installation

The utensils used for cooking on fire wood get blackened so they need more time for cleaning. Table 6.1.6 shows the details of time required for cleaning utensils per day.

Table 6.1.6 Time taken for cleaning utensils

SN	Time required (in hours)	Households	Percentage
1	Up to 1.75	18	30.00
2	1.75 to 2.25	26	43.34
3	Above 2.25	16	26.66
Total		60	100.00

Source: Field survey, 2068

Table 6.1.6 shows that 30 percent respondents needed up to 1.75 hours to clean the utensils daily, 43.34 percent respondents needed 1.75 to 2.25 hours to clean the utensils and only 26.66 percent respondents needed above 2.25 hours to clean the utensils. The respondents reported that they had to spend maximum of 2.50 hrs and minimum of 1.50 hours to clean the utensils. They had to spend average 2 hours on cleaning the utensils.

6.1.7 Time taken for cleaning utensils after biogas installation

The utensils used for cooking on fire wood get blackened. So they need more time for cleaning. The utensils used for cooking in biogas use to be less blackened so it takes less time on cleaning the utensils. The table below shows the details of time required for cleaning utensils per day.

Table 6.1.7 Time taken for cleaning utensils

SN	Time required (in hours)	Households	Percentage
1	Up to 1.25	14	23.33
2	1.25 to 1.5	27	45.00
3	Above 1.5	19	31.67
Total		60	100.00

Source: Field survey, 2068

Table 6.1.7 shows that 23.33 percent respondents needed up to 1.25 hours to clean the utensils daily, 45 percent respondents needed 1.25 to 1.5 hours to clean the utensils and 31.67 percent respondents needed above 1.5 hours to clean the utensils. The respondents reported that they had to spend maximum of 1.75 hours and minimum of 1.25 hours to clean the utensils. They have to spend average 1.5 hours on cleaning the utensils.

6.2 Overall saving of time saving after the installation of biogas

The time saving after the installation of biogas in various aspects of house hold works is shown in the table below in comparison before and after the installation of biogas.

Table 6.2: Time saving after the installation of biogas

SN	Category of works	Average time taken hr/day		Time saving hr/day
		Before installation	After installation	
1	Fire wood collection	2.53	0.68	1.85
2	Cooking	2.75	1.75	1.00
3	Cleaning utensils	2.00	1.50	0.50
Total		7.28	3.93	3.35

Source: Field Survey, 2068

Table 6.2 shows that they had to spend 7.28 hrs on collecting fire wood, cooking and cleaning the utensils per day before the installation of biogas plant. After the installation of biogas plants they need to spend 3.93 hrs on collecting firewood, cooking food and cleaning the utensils. And they need to allocate 0.33 hrs on feeding the plants. The above table shows that 3.02 hrs has been saved in the house hold work of the women after the installation of biogas plants. Mainly the time is saved in morning and evening. So the time saved from the above has been utilized by the respondents positively in the various activities.

6.3 Involvement of respondents in adult literacy program

6.3.1 Involvement of respondents in adult literacy programs before biogas installation

The respondents reported that only 16 respondents (20.00%) were formally educated. But none of them have attended higher education. Before the installation of biogas they had to allocate more time on household work. That's why they could hardly attend the adult literacy programs organized by non-formal education programs of various NGOs and government of Nepal. The table below shows the involvement of the respondents in adult literacy programs.

Table 6.3.1: Involvement of the respondents in adult literacy programs

SN	Description	No. of Respondents	Percentage
1	Educated formally	16	26.67
2	Attended adult literacy programs	11	18.33
3	Not attended adult literacy programs	33	55.00
	Total	**60**	**100.00**

Source: Field survey, 2068

Table 6.3.1 shows 63.33 percent respondents attended adult literacy program. 11.67 percent respondents have not attended literacy programs even after the installation of biogas. 26.67 percent of the respondents were formally educated earlier.

6.3.2 Involvement of respondents in adult literacy program after biogas installation

The above tables showed that the decrease on women workload after the installation of biogas plants. Since the women's workload is decreased after the installation of biogas, they are involved in women adult literacy program in the time they saved from their work load. The study in the respondent households showed that majority of the women member started adult literacy program after the installation of biogas plant. The table below shows the detail of involvement of women in adult literacy program.

Table 6.3.2: **Involvement of respondents in adult literacy programs**

SN	Description	No .of respondents	Percent
1	Involvement in adult literacy class	37	61.66
2	Not involvement in adult literacy class	7	11.67
3	Educated formally earlier	16	26.67
	Total	**60**	**100.00**

Source: Field Survey, 2068

Table 6.3.2 shows 63.33 percent respondents attended adult literacy program. 11.67 percent respondents have not attended literacy programs even after the installation of biogas. 26.67 percent of the respondents were formally educated earlier.

After comparing table 6.3.1 and 6.3.2, it is found that the involvement of respondents in adult literacy is increased significantly. Involvement of respondents in adult literacy is increased by 43.33 percent after the installation of biogas.

6.4 Involvement of respondents in Social Organizations

6.4.1 Involvement of respondents in Social Organizations before Biogas installation.

Before the installation of biogas plants the respondents had to spend more time on house hold activities. So there was not significant involvement of the respondents in social organizations. The table below shows the involvement of the respondents in social organizations before the installation of biogas plants. The respondents reported that 15 of them (25%) were involved in various social organizations before the installation of biogas. The table below shows involvement of the respondents in various organizations.

Table 6.4.1: Involvement of the respondents in various organizations

SN	Description	No. of respondents	Percentage
1	Involvement in Mothers Group	15	25.00
2	Involvement in Co-operatives	11	18.34
3	Involvement in Small Saving Groups	14	23.33
4	Involvement in Farmers Group	12	20.00
5	Involvement in Various committees	7	11.67

Source: Field survey, 2068

Table 6.4.1 shows that 15 respondents (25) percent were involved in mothers group, 11 respondents (18.34) percent were involved in Co-operatives, 14 respondents (23.33) percent were involved in Small Saving Group 12 respondents (20.00) percent were involved in Farmers Group and 7 respondents (11.67) percent were involved in various other committees such as drinking water, community forestry, school management committees etc.

6.4.2 Involvement of women in social organizations after biogas installation after biogas installation

The respondents of the study area are involved in various social organizations after the installation of biogas plants. The women are involved in various mothers groups, co-

operatives, small saving programs, commercial vegetable farming groups and various management committees. The table below shows the detail of the involvement of women various social groups. The respondents reported that 70% of the respondents were involved in various social organizations while the 30% of the respondents are not involved in any social organizations among the respondents. The detail of the involvement of the respondents in various social organizations is shown below.

Table 6.4.2: Involvement of respondents in various organizations

SN	Description	No. of respondents	percentage
1	Involvement in mothers group	42	70.00
2	Involvement in co-operatives	36	60.00
3	Involvement in small saving programs	32	53.34
4	Involvement in farmers groups	34	56.66
5	Involvement in various committees	12	20.00

Source: Field Survey, 2068

Table 6.4.2 shows that 70 percent of the respondents are involved in mothers groups. 60 percent of the respondents are involved in co-operatives. 53.34 percent of the respondents are involved in small saving programs. 56.66 percent of the respondents are involved in commercial vegetable farmers groups and 12 percent of the respondents are involved in various management committees. (School management, drinking water, road etc.)

After comparing table 6.4.1 and 6.4.2 it is found that the involvement of respondent in various social organizations has been increased significantly. Involvement of respondents in mothers groups is increased by 45 percent, involvement in co-operatives is increased by 41.66 percent, involvement in small saving programs is increased by 30.01 percent, involvement in farmers group is increased by 36.66 percent and involvement in various committees (school management, drinking water, road construction etc.) is increased by 8.33 percent. The time saving in household activities after the installation of biogas is used by the respondents for their empowerment.

6.5 Involvement of the respondents in income generation

6.5.1 Involvement of the respondents in income generation before biogas installation

The chief economic activity of the study area was agriculture; however the people are involved in other side income generating activities. The respondents were in involved in various income generating activities such as running tea shop, producing milk products and vegetable and selling them in the local market. But there was not a significant involvement of the respondents in those activities. The table below shows the involvement of the respondents in income generating activities before the installation of biogas plants.

The respondents reported that 8 respondents (13.33) percent were involved in income generating activities along with agriculture and 52 respondents (86.67) percent were not involved in any income generating activities before the installation of biogas plants. The following table shows the involvement of the respondents in various income generating activities before the installation of biogas plants.

Table 6.5.1 Involvement of the respondents in income generation

SN	Description	No of respondents	Percentage
1	Vegetable farming	6	10.00
2	Bee keeping	5	8.34
3	Producing milk & milk products	8	13.33
4	Running shop	1	1.66
5	Keeping chickens	2	3.34

Source: Field survey 2068

Table 6.5.1 shows that only 8 respondents (13.33) percent were involved in income generating activities. Among them, 8 respondents (13.33) percent were involved in producing milk and milk products, 6 respondents (10.00) percent were involved in vegetable farming, 5 respondents (8.33) percent were involved in bee keeping, 2 respondents (3.34) percent were involved in keeping chickens and 1 respondent (1.66%) was involved in running shop before the installation of biogas.

6.5.2 Involvement of the respondents in income generation after the installation of biogas

After the installation of biogas plant, the respondents are involved in income generating activities. The respondents are involved in beekeeping, farming vegetables, producing milk products, running shop etc. The respondents reported that 33.33 percent of the respondents are involved in income generating activities after the installation of biogas. They are involved in various income generating activities after the installation of biogas to uplift their economic status. The table below shows the involvement of the respondents in various income generating activities.

Table 6.5.2: Involvement of the respondents in income generating activities

SN	Activities	No. of respondents	Percentage
1	Vegetable farming	15	25.00
2	Bee Keeping	17	28.33
3	Producing milk & milk products	20	33.33
4	Running shop	3	5.00
5	Keeping chickens	5	8.33
6	Knitting sweater, cap etc	2	3.33
7	Service in various organizations	3	5.00

Source: field survey, 2068

Table 6.5.2 shows that majority of the respondents (33.33) percent of the respondents are involved in producing milk and milk products, 28.33 percent of the respondents are involved in bee keeping, 25.00 percent respondents are involved in vegetable farming, 8.33 percent respondents are involved in chickens keeping, 5 percent of the respondents are involved in various organization as service holders, 5 percent respondents are running shop and 3.33 percent respondents are involved in knitting sweaters, cap etc. respectively.

After comparing table 6.5.1 and 6.5.2, it is found that the involvement of respondents in income generation is increased by 20 percent. Since they were involved in various organizations and received various trainings, they are encouraged for income generating activities. Income generation is obviously a major dimension of empowerment.

6.6 Involvement respondents in decision making process

6.6.1 Involvement respondents in decision making process before biogas installation

Nepali society is the patriarchal society. Most of the families are male dominated. The decisions related to the domestic activities are taken by the male members of the family. Table 6.6.1 shows the role of respondents and other members of the family in decision making process in the domestic activities before the installation of biogas.

Table 6.6.1 Involvement of respondents in decision making process

SN	Role in Decision making process	No. of households	Percentage
1	Husband	36	60.00
2	Self	10	16.66
3	Self and Husband	11	18.34
4	Self and others	3	5.00
	Total	**60**	**100.00**

Source: Field survey, 2068

Table 6.6.1 shows that majority of the decision related with domestic work were made by husband in the family. The respondents reported that in 60.00 percent households, the decisions were made by husband, in 16.66 percent households, the decisions were made by the respondents themselves, in 18.34 percent households, the decision were made by both self and husband and in 5 percent households, the decisions were made by the respondents and other member of the family before the installation of biogas.

6.6.2 Involvement of respondents in decision making process after biogas installation

Mainly the men are the head of the family. The decisions related to domestic activities were taken by the male members of the family. But the change has occurred in decision making process after the installation of biogas. The table below shows the role of respondents and other member of the family in decision making process in the domestic activities.

Table 6.6.2: Role of respondents in domestic decision making process

SN	Role in decision making process	No of HHs	Percent
1	Husband	22	36.66
2	Self	14	23.34
3	Self and husband	19	31.66
4	Self and others	5	8.34
Total		**60**	**100.00**

Source: Field Survey, 2068

Table 6.6.2 shows that in 36.66 percent respondent households, the decisions are made by the husband. In 23.34 percent respondent house holds the decisions are made by the respondents. In 31.66 percent respondent households the decisions are made by both husband and the respondent. In 8.34 percent respondents households the decision are made by the respondents and other member of the family. The respondents are also involved as co-decision makers with their husband and other member of the family.

It seems that women of the study area have been increasing the decision making process in the house hold level. It has different reasons behind it. As the use of biogas has decreased their time required for collecting fire wood, cooking and cleaning the utensils, they had opportunity to get involved in different literacy classes, community meetings, and they have learnt about the importance of their involvement in decision making process of the house hold level.

6.7 Involvement of respondents in training and women empowerment programs

Most of the respondents of the area have attended various training on various topics. The respondents reported that 63.33 percent of the respondents have attended trainings on various topics while 36.67 percent of the respondents have not attended any training. The detail of the attending of the respondents on various trainings is shown below.

Table 6.7: Involvement of the respondents in trainings and empowering activities

SN	Description	No. of respondents	Percentage
1	Training on biogas operation	38	63.33
2	Leadership development training	32	53.33
3	Bee keeping training	30	50.00
4	Training on house hold management	25	41.66
5	Training on knitting sweaters, cap etc	11	18.33

Source: Field Survey, 2068

Table 6.7 shows that 63.33 percent respondents have attended training on biogas operation, 53.33 percent have attended leadership development training, 50 percent have attended bee keeping training, 41.66 percent have attended household management training and 18.33 percent have attended training on knitting sweaters, cap etc. The involvement of women in training and empowering activities is increased significantly.

6.8 Perception about the role of biogas installation to change the decision making process

Nepali society is mostly patriarchal. It reflects male domination in every aspect of social life. A wrong perception about the lack of decision making power of women is deep rooted in tradition, in the community as well as the nation where male governmental officials maintain control over decision making. The scenario is prevalent not only in national level but also in household and community level. The table below shows the perception of respondents about decision making process in household level after the installation of biogas.

Table 6.8: Role of biogas installation to change the decision making process

SN	Perception of the respondents	No. of households	Percentage
1	More change	16	26.66
2	Little change	37	61.67
3	No change	7	11.67
Total		**60**	**100.00**

Source: Field survey, 2068

As mention above, there were different factors to change the decision making process on house hold level and higher level of the respondents compare to the situation before the installation of biogas. The study was made to evaluate the perception of the respondents about the role of biogas to change their involvement in the decision making process in the house hold level. Table 6.8 shows that 61.67 percent respondents found little change in decision making after the installation of biogas. 26.66 percent respondents found more change in decision making after the installation of biogas and 11.67 percent respondents found no change in decision making after the installation of biogas.

As it was observed in perception evaluation, there was a significant change in decision making process of the household level and involvement in other social organizations. They make decision about fuel, types of crops, cattle selling and purchasing. They make decision about their involvement in social activities and community works.

Women of the study area were empowered by the various activities and programs implemented after the installation of biogas. They have also started income generating activities and developmental activities of community level. As their responsibility has increased, they have started sharing their ideas with other members of the family.

CHAPTER: SEVEN
SUMMARY, CONCLUSION AND RECOMMENDATION

7.1 Summary

The study covered a ward (ward no 8) of Nirmal Pokhari VDC of Kaski district. The study area was situated in the southern part of the district. The study was conducted was based on 63 households. 3 households of the study area have migrated to other places. The study area lied at the top of the mountain and on the lap of the mountain. The study area included the fertile agricultural land. The maximum temperature of the study area was 30^0C required for slurry digestion and maximum gas production. In the study area, subsistence agriculture was the chief source of income. Besides agriculture, the people are involved in service, foreign employment, pension, business, small scale industries are other sources of the people. Being a Brahmin society, some families are involved in jajmani system. All the households of study area are provided with transport, drinking water, communication and education facilities. The trend of biogas installation in the study area was started in 2053 BS. Most of the households installed the biogas plants in the year between 2055-2060BS. The villagers used firewood and agricultural residues for cooking before the installation of biogas. But now they use biogas, firewood, electricity and LP gas for cooking purpose. After the installation of biogas the time to collect fire wood from forest was significantly reduced.

Before preceding the study area, a brief review on existing literature was made. The review mainly focused on the impact studies for the reviewers, central library and regional library of TU, BSP office and biogas experts were consulted. The main objective of the study was to assess the socio economic impact and role of biogas installation on women empowerment process. The study also included the reasons for biogas installation and negative impacts of the biogas installation.

Analysis of the data was made simply with tabulation and percentage. Data showed how the biogas plants helped to save firewood, reduce time in collecting firewood, cooking food, cleaning utensils, helped to involve in social organization, helped in income generation, helped to involve in adult literacy programs and helped in decision making process in the domestic activities. The following were some of the major findings of the study.

- Though the population of the study area is heterogeneous, the Brahmins are ahead to install the biogas plants.
- The people installed biogas as a substitute to firewood and to have ease in cooking.
- All the households have attached toilets in biogas plants.
- In the study area, biogas was used only for cooking purpose. No lighting use was reported.
- On an average, 3.02 hours time was saved from collecting firewood, cooking food and cleaning utensils per day. This is used in various activities.
- 88.33 percent respondents were literate but none of the respondents have got higher education.
- 43.34 percent of the land in the study area was owned by the respondent's husband.
- Most of the respondents have kept 2 cattle.
- 53.34 percent respondents have 5-10 ropani land size.
- 70 percent respondents used biogas and firewood as their domestic energy.
- 96.66 percent respondents reported that biogas installation has reduced the workload of women after the installation of biogas.
- Most of the respondents 61.66 percent have attended adult literacy program after the installation of biogas. The attending of the respondents in adult literacy programs has been increased by 43.33 percent than before biogas installation.
- 33.33 percent respondents installed biogas for easy and smokeless cooking, 30 percent respondents installed biogas for time saving time from collecting firewood, cooking and cleaning utensils and 36.67 percent respondents installed biogas for both reasons.
- Majority of the respondents are involved in various social organizations. 70 percent of the respondents are involved in mothers group. 60 percent respondents are involved in co-operatives. 56.66 percent respondents are involved in farmers groups. 53.34 percent respondents are involved in farmers groups and 20 percent of the respondents are involved in various management committees
- The involvement of respondents in social organizations is increased by 45 percent after the installation of biogas. The involvement of women in mothers group is increased by 45 percent, the involvement of women in co-operatives is increased by 41.66 percent, the involvement of women in small saving groups is increased by 30.01 percent, the involvement of women in farmers group is increased by 36.66 percent and the involvement of women in various committees is increased by 8.33 percent

- The involvement of respondents in income generation is increased by 20 percent after the installation of biogas.
- Majority of the respondents 63.33 percent of the respondents have attended various trainings and empowering activities. Among them 63.33 percent have attend the trainings on biogas operation, 53.34 percent of the respondents have attended leadership development training, 50 percent of the respondents have attended bee keeping trainings, 41.66 percent of the respondents have attended house hold management training, 18.33 percent of the respondents have attended sweater knitting trainings.
- 23.34 percent of the respondents are lonely involved in domestic decision making process it is increased by 6.68 percent after the installation of biogas. 31.36 percent of the respondents are involved in decision making process with their husbands it is increased by 13.02 percent before the installation of biogas. In 36.66 percent respondents households, the husbands only take decision it is decreased by 23.34 percent before the installation and 8.34 percent of the respondents are involved in decision making process with other members of the family, it is increased by 3.34 percent after the installation of biogas.
- Most of the respondents 76.67 percent reported that the population of mosquitoes is increased. 46.66 percent of the respondents reported that bad smell coming in kitchen.46.66 percent of the respondents reported that the food cooked in biogas is less tasty than the food cooked in firewood. 16.67 percent of the respondents reported that less warmth inside the kitchen while using biogas and 13.33 percent of the respondents reported that the metal utensils are rusting by cooking in biogas.

7.2 Conclusion

The study was carried out in the rural community of Nepal. The main objective of the study was to analyze the impact of biogas installation on women empowerment process. The following conclusions were drawn from the study;

- Biogas has been proved very useful and beneficial for the female member of the family.
- Though biogas plants were installed in the households people have to use firewood to prepare some food and to prepare kudo for the cattle. So even after the installation of biogas also fire wood is needed.

- The major motivating factors for the installation of biogas are easy and smokeless cooking and to save time on collecting firewood, cooking and cleaning utensils
- Huge amount of firewood has been reduced after the installation. So biogas installation has helped to preserve forest also.
- After the installation of biogas time has been saved significantly on collecting firewood, cooking food and cleaning utensils as well.
- The time saved after the installation of biogas has been utilized in various activities by the women.
- Biogas installation program is found helpful for women empowerment.
- The prevalence of mosquitoes is increased due to the lack of proper management of slurry.

7.3 Recommendation

On the basis of above findings and conclusion of the study, the following recommendations are made to get further desired impacts.

- It is realized from the study that biogas technology is mainly adopted by medium and higher class people at the wide scale level. So government should introduce consistent policy and make possible intervention for promotion. So that the access of biogas technology could reach t rural remote area and penetrate small, marginal and poor people.
- Despite the provision of subsidy, the adoption level is low as expected. Only medium and high class people enjoyed the subsidy. Therefore the government should formulate long term planning and clear policy regarding the subsidies to promote biogas technology in rural area.
- Concerned authority should conduct awareness programs about the positive impacts of biogas technology to maximize adoption of biogas technology in rural areas.
- Installation of biogas should not be provided where water problem is existent. Otherwise it would have it would have negative impact on women.
- Concerned biogas companies should carry out supervision, monitoring and evaluation of installed biogas plants.
- There should be the introduction of such creative programs which would contribute for women empowerment through the use of gained time.

- Great deal of time has been saved after the installation of biogas plant. Therefore women member should have time to work in income generation activities. Concerned authority should pay attention to this.
- Women should be encouraged in construction, operation and maintenance training. This would help towards gender equality issues.
- Although the women are involved in agricultural activities, they have not been able to produce average income. So they should be given trainings for better production.
- Different organizations should work together to give them training not only on agriculture but on various fields which will help them to be economically able.
- Gender sensitive programs and seminars on skill development trainings should be launched and access of women in those programs should be increased.
- The causes of increment of mosquitoes should be studied. It seems that proper compositing of slurry would reduce the chance of breeding of mosquitoes and reduce their prevalence.

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APPENDIX I

Biogas installation and women empowerment process

A case study of Nirmal Pokhari VDC Kaski

Questionnaire Schedule

1. Researcher: **Daya sagar Paudel,** Prithivi Narayan campus , Pokhara

VDC: .....Ward No.....Tole.....Date.....

2. General introduction:

Name of respondent.....Age.....Sex.....

Religion.....Occupation.....Education.....

Marital status.....Date.....

3. Description of the family:

	Name	Relation of the respondent	sex	Age	Marital status	Education	Occupation	Remarks
1								
2								
3								
4								
5								
6								
7								
8								

4. Socio economic aspect of women:

i) what are the sources of income in your family?

a) Agriculture b) Business c) Service d) foreign employment

e) Pension f) Daily wages g) others

ii) Do you have your own agricultural land?

a) Yes b) No

iii) If yes, how much land does your family have?

In ropani .....

iv) Who owns land in your family?

Father in law b)Mother in law c) self d)son e)Daughter in law

f) Others g) Husband

v) Do you have birds and cattle at your home?

a) Yes b) No

vi) If yes, how many do you have?

SN	Name of birds and cattle	Numbers
1	Cow	
2	Buffalo	
3	Sheep	
4	Goat	
5	Ox	
6	Hen	

vii) Who takes care of farm, animals, and birds in your family?

Self b) Husband c) father in law d) Mother in law e) son/ daughter

f) Servants g) others

viii) Who makes economic decision relating to agriculture and domestic animals?

Self b) Husband c) father in law d) Mother in law e) son/ daughter

f) Others

ix) Are you involved in any other works besides farming and rearing of domestic animals?

Yes b) No

x) Besides above work, are you involved in any other social works?

a) Yes b) no

xi) If yes, what are they?

.....

xii) If no, why?

5. Effects of the lack of less energy access to the domestic energy.

i) How much fire wood did you need before the installation of biogas plant?

.....

ii) How much time was required to collect a bhari of fire wood?

.....

iii) How much time did it take to cook food before the installation of biogas plant?

.....

vi) How much time did it take to clean the utensils before the installation of biogas plant?

.....

v) Were you involved in any social organization before the installation of biogas plant?

a) Yes b) No

vi) If yes, what were they?

.....

.....

.....

vii) Were you involved in adult literacy programs before the installation of biogas plant?

a) Yes b) No

viii) Were you involved in any income generating activities before the installation of biogas plant?

a) Yes b) No

6. Description about biogas installation

i) What are the sources of domestic energy used for cooking food?

a) Biogas b) biogas & firewood c) LP gas d) electricity

e) Firewood f) other

ii) What were the sources of domestic energy used for cooking food before the installation of biogas plant?

a) Fire wood b) LP gas c) Kerosene d) Electricity e) other

iii) When did you install the biogas plant?

.....

iv) What are the reasons for the installation of biogas?

....

....

v) What are the motivating factors for the installation of biogas?

....

....

vi) Do you find any changes on household work load after the installation of biogas?

a) No changes b) Work load increased c) work load decreased

vii) Are there any disadvantages of biogas? If yes what are they?

....

....

viii) how much time does it take to feed the plant?

.....

7. Effects of easy access to domestic energy

i)) How much bhari of firewood is needed after the installation of biogas?

.....

ii) How much time is required to collect a bhari of firewood?

.....

iii) how much time does it take to cook food after biogas installation?

.....

iv) How much time does it take to clean the utensils after the installation of biogas?

.....

vi)Are you involved in any adult literacy programs after the installation of biogas?

a) yes b) No

vii) Are you involved in social organization after the installation of biogas?

Yes b) No

viii) If yes, in which organization?

.....

ix) Are you participated in any training or empowering programs after the installation of biogas?

a) Yes b) No

x) if yes, what are they?

.....

xi) Who makes decision in your family regarding agriculture, cattle and land?

Self b) Husband c) father in law d) Mother in law e) son/ daughter

f) Others

xii) Were you involved in any income generating activities before the installation of biogas?

a) Yes b) No

xi) Are you involved in any income generating activities after the installation of biogas?

a) Yes b) No

xii) If yes, what are they?

.....

xiii) Are you involved in any political activities after the installation of biogas?

a) Yes b) No

xiv) What do you think about the role of biogas installation in changing decision making process on house hold level?

a) More change b) Little change c) Nochange

APPENDIX II

Question for the focus group discussion

1 General background of the participants

SN	Name of participants	Age	Sex	Occupation	education	Marital status	Remarks

2 Questions to be discussed

i) Socio economic condition of women of the study area

Social aspect

Economic aspect

Educational aspect

Ownership over property

Occupation and sources of income

ii) Impacts of biogas installation on women's work load

Changes on the work load of women

Positive effects of biogas installation

Negative effects of biogas installation

Involvement of women in social organizations

Involvement of women in trainings and women empowerment programs

Involvement of women in income generation

Involvement of women in decision making process.

APPENDIX III

Question for the Key Informants

General Introduction

Name of the Respondents.....Age.....Sex.....

Occupation.....Education.....Marital status.....

Date.....

What are the sources of income in your village?
Do all the villagers have their own land?
Who owns the land in the family?
Since when and why the installation of biogas started in your village?
How were people inspired to install biogas plants?
Is the difference in using firewood in biogas installed and non installed households?
What are the significant changes on the work load of women in domestic work?
What is your view about women's role in decision making process in house hold level and community level?