

# CHAPTER I

*"If you give a man a fish, you will feed him a day  
If you teach him how to fish, you will feed him ever"*  
"Human Development if not engendered is endangered"

(HDR 1995)

## 1. INTRODUCTION

Nepal is predominantly a rural country with 85.8 percent rural area and the rest 14.2 percent urban area, of which 90 percent live from agriculture (Sustainability: 2003). Due to the rugged topography there is the constraint in the development of infrastructure that has restricted most of the area from being developed.

Women comprise more than 50 percent of the total population where the female literacy rate (over 6 years) is 42.5 percent as compared to the male literacy rate of 65.1 percent and the women's life expectancy at birth is 60.7 years where the male's life expectancy at birth is 60.1 years. The economically active (15yr +) rate for male is 81.7, whereas, this rate is only 60.4 for the females.<sup>1</sup>

In most castes and ethnic groups, Nepalese women have both lower status and heavier workloads than men. Women are mostly vulnerable to health hazards with relation to traditional energy, since they are the primary producers, users and managers of fuelwood. Modern energy technologies however may provide some relief to them.

### 1.1 Background of the Study

Need of DES: Energy is the indispensable requirement for providing economic and social benefits to the people for the comprehensive development of any region (Kumar, 2003)<sup>2</sup>. Nepal being a country with rugged mountainous topography, many parts are accessible on foot only. Laying grid lines to the remote hills is extremely expensive compared to the

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<sup>1</sup> CBS. 2003, *Population Monograph*, vol. II, Kathmandu, Nepal.

<sup>2</sup> CES/ IOE, 2003, *Renewable Energy Technology for Rural Development*, p. 107, Pulchowk, Lalitpur.

development of *decentralized energy system*<sup>3</sup>. National grid provides electricity for only 15 percent of the total population. Nepal with a per capita energy consumption of about 15 G. Js energy is one of the five least energy consuming countries in the world despite the fact that it has 2.27 percent of the total Water Power potential in the world (Shrestha, 2003, pp. 1)<sup>4</sup>. But, Nepal is facing energy crisis despite its own huge Hydro Power potentials.

In rural areas, the major energy source used for heating and cooking application are fuelwood, agricultural residues and animal dung; and for mechanical application muscle power, traditional water mills, *dhiki*, *janto* etc. are used. Thus renewable energy can be a catalytic agent for the development of the rural areas that makes any work simple and less time consuming. The development of such renewable energy system needs active participation of the actual beneficiaries. The direct benefits go to the women who are the active users of the technologies. Thus their preferred technologies should be identified that would increase their productivity and reduce their drudgery.

Nepal relies on traditional energy resources to a greater extent as there is no fossil fuel available in its territory. Renewable energy sources are indigenous that can contribute towards reduction in dependency on fossil fuels. These energy resources can fulfill the demands when there is scarcity of fossil fuels in the world. Various studies have proved that there is a definite correlation between access to energy on one hand and education attainment and literacy on the other.<sup>5</sup>

Gender equity in development : Nepalese women are still found to be suppressed, exploited, neglected and forced to live insecure life because of illiteracy, ill health, poverty, orthodox tradition and discriminatory legal system. Taking into consideration these facts, women in development has been accepted since the Sixth Plan as a national policy; and several sectoral women development programmes were implemented and institutional

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<sup>3</sup> chapter II, operational definition, pp. 10

<sup>4</sup> CES/ IOE, 2003, *Renewable Energy Technology for Rural Development*, p. 1, Pulchowk, Lalitpur.

<sup>5</sup> Ibid.

development efforts were carried out.<sup>6</sup> It is now widely realized that without women's involvement, no programme can be successful.

To empower women, *gender equity*<sup>7</sup> needs to be integrated into all development activities of local governments with regular follow up and monitoring by providing education and trainings to make them able for any kind of employment opportunities. Support services such as social mobilization, awareness building and gender sensitization have to be promoted at all levels.

Reports of various organizations have shown that they have learned lessons from different development programmes that "sustainable operation of any renewable energy device is not possible till the community and stakeholders are fully involved right from the development stage to the post installation modalities and mechanisms are fully taken care of."

## **1.2 Statement of the Problem**

Social views on gender: Gender discrimination and inequalities continue to erode the better opportunities and advancement of women in every sector of development. As the saying goes, "Ignorance is bliss". Many people take it very easily for the unequal power relation granted between the men and women is a natural way of life and go through life without any questioning. The realization of the human rights, the unequal and unjust position of women is not natural but that it is formed by discriminatory traditional and customary beliefs from the social system based on patriarchy. Thus, their status and position in society is to be negotiated for the creation of gender friendly society.

It should thus be unthinkable that women have hardly anything to do for their betterment. In most of the countries even in developed countries women remain absent, invisible and unheard in decision making body of the country because of discriminatory traditions. With this situation of the society, how can country be developed if home makers have negligible participation in the development process. We can find many examples of old saying in the

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<sup>6</sup> 9th plan (1998-2002), NPC, see also Sustainability, 2003.

<sup>7</sup> chapter II, operational definition, p. 9

culture that downgrade women, one of such example is “sons are the light of the family where daughters lighten the kitchen only”.

The household chores are the responsibility of the female members in every family in our country whether it be in the rural areas or in the urban areas. No matter how bulky the burden of work is, the male members pay no heed to it, and they are busy roaming round the villages, gossiping, gambling and so on. However there is some exception, some men are really very supportive to their family.

South Asia is the classical belt of patriarchy where the discrimination against girls and women has continuously constrained them from advancing their lives and Nepal is the only South Asian country without criminal law provisions to deal with domestic violence. The situation is exacerbated by their illiteracy, lack of assets, their absence in decision making and also due to lack of income generating opportunity.<sup>8</sup>

Laws and the real life: The law of equal opportunity and wage has been ventured; however, women spend in addition more time than men on unpaid subsistence activities and domestic work. In addition, the gender discrimination in any manifestation is prohibited by the international instruments and the constitution; still numbers of social values & tradition, culture, superstitions are contributing to discrimination against women. Women are socially, economically, politically and culturally marginalized and subject to violence. As a result, women have to live a suppressed life that puts them at the disadvantage right from birth, which is a non-ending story.

This discrimination impinges on access and control over resources- physical, intellectual, human, financial as well as intangible resources such as knowledge, information and power. Hence, gender equity is to be considered during the implementation of any programme. In other words, we can say that policy makers should consider the capability of both the men and women and make them participate on equity basis from the beginning of the plan.

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<sup>8</sup> FSD, 2003, *Sustainability*, p.78

It is often witnessed that women aren't given equal opportunities in decision making and holding managerial post though they are capable of that post. This is against the Article 11(2) "*no discrimination shall be made against any citizen on the ground of religion, race, sex, caste, tribe or ideological conviction, or any of these*"<sup>9</sup>. We can hear the bitter experiences of the women involved in different sectors who have often been discouraged by the ignorance of their presence and their views on a particular matter. They have often been snubbed, not other than being women even in the valley.<sup>10</sup>

Women in development: The women have indigenous knowledge of using energy efficiently. Thus the implementation of any energy system must be done with the equal participation of both the genders on their need basis so that it would sustain longer. However, male and female differ in their roles, needs and perception regarding these technologies. The policy makers usually don't care about the need of women's involvement in decision making. It is often found that women's participation is not taken as compulsion if the male member of the family is present in the meeting.

We can see that often decisions are made on certain issues by the men alone and made the women sign on the participants' list to show their participation. The women were not even told what the meeting was about and what decisions were made. In most of the domestic applications, the end-users and the managers of the energy are found to be women. However, their roles are not explored and they are also excluded from decision making process. Thus, this study tries to assess the gender roles in the DES implemented in the selected VDC.

### **1.3 Objectives of the Study**

#### **1.3.i General Objective:**

The study aims at the assessment on the socio-economic changes brought by the installation of DES in Nayagaun VDC of Kavrepalanchowk district through gender equity.

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<sup>9</sup> 2047 B.S. *Nepal Adhirajyako Sambhidhan 2047*, Singha Durbar, Ktm; also see *Sustainability* 2003.

<sup>10</sup> Experienced shared by some of the well known female members of our country and the researcher's own experience faced in her life.

It tries to excavate the impediment during its implementation while providing equity and opportunity to both male and female.

### **1.3. ii. Specific Objectives:**

- ❖ To excavate the dissatisfaction of the beneficiaries of DES especially focused on biogas and ICS users.
- ❖ To assess the socio-economic impact on the users of biogas and ICS specially focused on the change in the role of women and girls.
- ❖ To compare the gender roles before and after the DES in different ethnic groups and user groups.
- ❖ To study the constraints overcome while providing equity to the target group in the process of the identification, implementation, monitoring and evaluation of the programme.

### **1.4 Rationale of the Study**

The implementation of decentralized Renewable Energy Technology (RET) in any rural area is synonymous of the reduction of women vulnerability. The women are the actual beneficiary of these RETs; for instance, the use of Improved Cooking Stoves (ICS) and installation of Biogas plant reduce time for cooking food and reduce indoor air pollution as well. This means women and children are less exposed to smoke who spend more time on cooking in the poor ventilated kitchen. Thus it helps in reducing health hazard regarding visual and respiratory. Similarly, less smoke makes the dishes less dirty thus helps in fast and easy cleaning of the dishes and the rooms also become less messy. Hence the time saved from these household chores can be spent in income generating activities.

Women have been consistently excluded from decision making across history and societies. Therefore, creating greater gender equity will contribute to building peaceful democratic and prosperous societies (NARC, 2003). The study being conducted is one of the VDC where REDP has already launched and finished the programme in the development of decentralized energy system (biogas, ICS, solar and Micro Hydro) initiated with the six basic principles of community mobilization.

The study focus not only on the impact of DES (especially focused on Biogas and ICS), but also the constraints encountered while providing equal opportunity to both females and males. The study also tried to excavate the discontents of the women about the energy installed in their houses. Hence, it would response to the silent question, "Has DES really benefited the women and has it been successful in achieving its target?"

The lesson has been learned from various development programmes that women participation is a must for the success of any programmes, for which women empowerment has been prioritized.

The outcomes of the study will help the concerned organizations to realize their shortcomings and also act as a guideline in the future for the replication of such programmes in remote areas with wider potentiality of such energy, with no connection of national grid within the next five years or more.

### **1.5 Limitation of the Study**

The study was limited only in Nayagaun VDC of Kavrepalanchowk district to assess their socio-economic status after the installation of DES. The study also tried to assess the changes that have brought in the role of the family members in conducting household chores and social activities. Thus the outcomes of the study can't be generalized to the households outside the sample areas. Due to the time and financial shortages, the study was done in the selected households with the adoption of biogas and ICS only, as it has major contribution in reducing women drudgery.

### **1.6 Organization of the Report**

The report is presented in seven chapters, which could be divided into three main parts. The first part (Chapter I and II) introduces the background of the study and the literature review. The second part (Chapter III and IV) presents the methodology and description of the study site. Finally the third part (Chapter V to VII) deals with data analysis, interpretation, conclusion and recommendation.

# CHAPTER II

## 2. LITERATURE REVIEW

For the study, various articles related to WID & GAD issues, energy and the need of women participation were collected from different books, journals, magazines, newspapers, and progress & annual reports of the concerned agencies working in the field of energy interventions.

### 2.1 Conceptual Framework

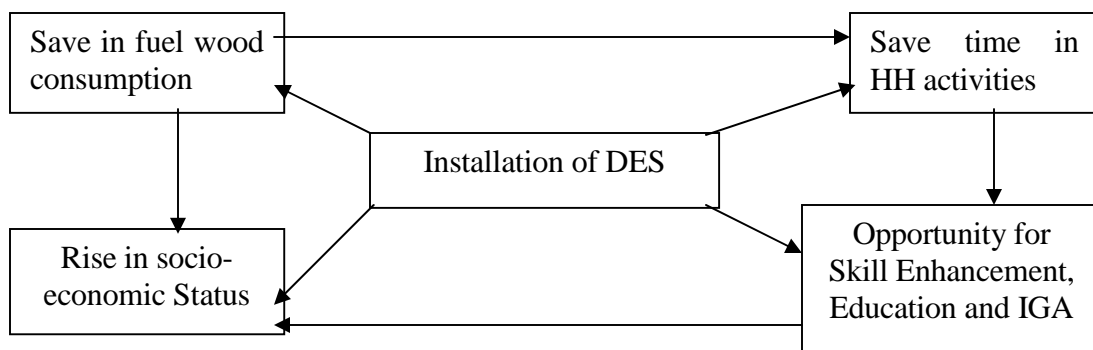


Figure 2.1 Conceptual Framework

It is assumed that installation of biogas plant and ICS not only save in fuel wood consumption but also save time in household activities. The time saved thus can be spent for skill development, income generating activities and education attainment which in turn will help in raising socio-economic status.

### 2.2 Operational Definition

#### Gender:

Gender is a shorthand term, which encodes the basic social identities classified by society to exaggerate the difference between females and males to maintain sex inequality, rather than based on fixed biological characteristics. Hence, gender is changeable, for example- women can do traditionally male jobs and vis-à-vis. **“Gender refers to the socio-cultural**



**definition of man and woman, the way societies distinguish men and women and assign them social roles” (Bhasin, 2003).**

Gender issues are not the same as women's issues. Understanding gender means understanding relationship, opportunities, constraints and the relationships impacts of changes as they affect both men and women. The HDR 1995 precisely explained " *human development if not engendered is endangered*".

The concept of *gender* emerged as a way of distinguishing biological differences and socially constructed inequality, while the concept of *gender relations* sought to look at the social relationships through which they were mutually constituted as unequal social categories (Chhetri, 2001).

#### **Sex :**

Sex refers to the biological distinction between males and females which can't be changed. It “**refers to visible differences in genitalia and related differences in procreative function**” (Bhasin, 2003).

#### **Gender Equity:**

Gender equity refers to "**fairness in women's and men's access to socio-economic resources and also it is a condition in which women and men participate as equals and equal access to socio-economic resources**” (Khanal, 2003)<sup>11</sup>.

#### **Gender Equality:**

Gender equality “**refers to norms and values, attitudes and perception required to attain equal status between women and men without neutralizing biological differences between being men and women**”.<sup>12</sup> Thus it can be said that equality is the goal and equity is supplement to achieve the goal.

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<sup>11</sup> See Sustainability, 2003, p. 91

<sup>12</sup> Ibid.

**Opportunity:** Opportunity refers to the *favorable chance given to an individual for performing or doing anything.*

**Decentralized Energy System:**

Decentralized energy system refers to the *energy system which can be consumed with the locally available resources for meeting ever expanding and diversified energy needs independently by the people themselves in which they have full self-control over its installation, use and maintenance.* Thus the complete handover of the system to the local people after training them to install the power along with its maintenance when needed can be known as decentralized energy system.<sup>13</sup> It will be more useful for fulfilling the basic energy needs of the rural poor who lacks access to basic conventional energy like kerosene, which is used for lighting purpose.

**2.3 WID & GAD Issues**

In "*Contribution to Nepalese Studies, Jan. 2001*" published by CNAS, Chhetri has written about the concept, emergent and importance of WID and GAD, in a topic entitled "A Social and Cultural Perspective of Women and Community Forestry in Nepal."(pp. 96-100). She focused on the views of the feminists, "*the WID approach came in 1970, that tends to focus on women in isolation rather than social, cultural and political relations of which they are a part*". Thus it tended to concentrate on women and their domestic role. She further tried to emphasis on its changing policy by mid 1980s which increasingly stressed on women employment, income generation, capacity and so on rather than the provision of welfare service to them.

As feminist anthropologists have frequently pointed out, it is gender and not sex which is at issue. This has led to a shift towards GAD in 1980 which turns away from women as an isolated category to the wider relation of which they are a part. "*GAD focus shifted from women to gender, and from welfare, basic needs and efficiency approached to a women's empowerment approach which seeks to address the patriarchal system at the root cause*

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<sup>13</sup> Annual Report, 2002 REDP, Pulchowk, Lalitpur. See also *Renewable Energy Technology for Rural Development*, p. 107, FSD, Lalitpur.

*of women's subordination*". It was argued that looking only at women is neither problem free nor adequate.

Thus the concept of gender emphasized that the problem was not with women but with the socio-cultural definition given to women and men which determine their work and space and so on. *Looking at gender thus require looking at men as well because women cannot be understood in isolation.*

Thus, it is now widely recognized that women must be equal partners in decision making in all institutions and at all levels and must be subjects not objects, or just beneficiaries of the development policies and programmes.

#### **2.4 Women in Development**

In the same journal, published by CNAS, Chhetri has stressed on the reality that women have been taking part in development activities in Nepal long before international concerns were voiced for including women in development and increasing their participation. In Nepal socio-economic context, women's workload is believed to be heavier in the rural areas compare to that of their men. However, their contribution to development activities at community level and work and household level is never recognized and their status remained unimproved in spite of global efforts in increasing women's participation.

It is said that necessity is the mother of invention, *women's needs and problems could only motivate them for participation in any development interventions.* Thus their needs and interests should be identified before beginning anything. The work burden of women in Nepal is reported to be much higher than the global average for women without salary or tips or holiday or overtime payment or any reward. (NESAC 1998)

Chhetri further quoted one of her experiences which portrays the work burden of most of the women that can be cited during June –August when their work schedule is hectic due to plantation activity. The women get up soon after midnight and prepare meal and khaja (snacks) before dawn. They not only work all the day, but also carry corn back home finding their way to home in twinkling star light. Yet, feeding the animals and the

family remain waiting for them. After such a long exhausting day, they have much little rest and have to wake up early in order to begin another hectic day.<sup>14</sup>

Even during the slack season from farm activities, women collect firewood and engage in some of income generating activities as – namlo weaving in between domestic chores and also while talking to the visitors.<sup>15</sup>

The establishment of DES in such rural areas with impossibility of national grid would reduce not only women's drudgery but also help in their skill as well as economic enhancement. For instance, rice and flour mills, road construction, pressure cooker, ICS, Biogas have not only simplified their work, but also reduce their working time, which they would either use in income generating activities or have rest or entertainment.

Thus mainstreaming gender equity in DES will lead to sustainability. In other words we can say that involvement of both the female and male in the programme and decentralization of the system operation is really a sustainable development that they don't need to wait for the outsider for the maintenance of the equipment.

## **2.5 Energy Consumption Pattern In Nepal**

The energy consumption pattern in Nepal can broadly be classified into 3 major types; Traditional, Commercial and Renewable. Out of the total, traditional source including fuelwood, agricultural residue and animal dung fulfill about 85.87 percent of the energy demand. The commercial sources like gasoline (petroleum), coal, electricity fulfill 13.65 percent, while the rest 0.48 percent by renewable energy.<sup>16</sup>

Almost 80 percent of the population still uses fuelwood as their primary source supplemented by crop residue and animal manure of which about 90 percent is consumed by residential sector. These smoke inducing fuel in rural sector and the commercial source in urban sector bring health hazard and environment degradation. Thus the environment friendly renewable energy like solar, wind, water, biogas and also ICS needed to be

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<sup>14</sup> Ibid, pp. 96- 100

<sup>15</sup> Ibid. See also, Chhetri & Rana 1994

<sup>16</sup> See WECS, 2003.

promoted with the people's active participation on the equity basis. This not only reduces health hazards, but also save the expense on the imported commercial energy and the expense on the medical treatment of the disease brought by them.

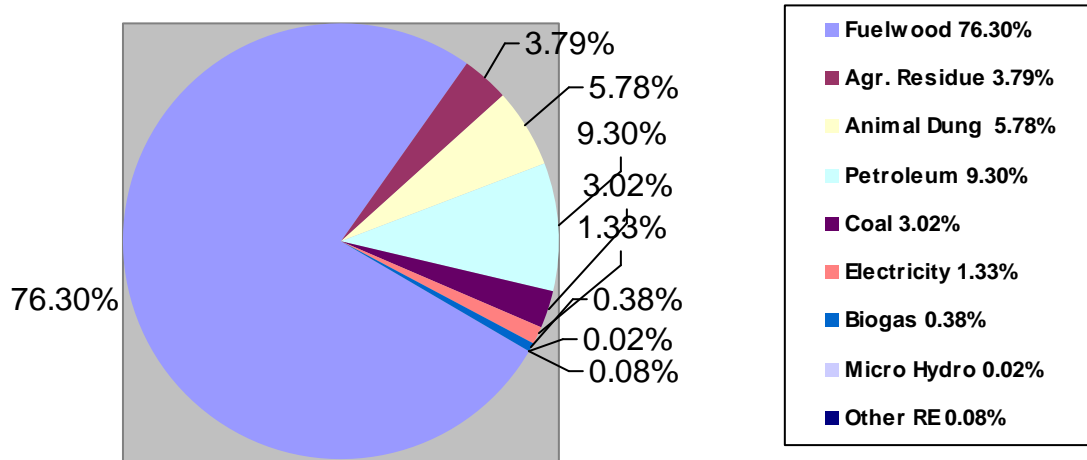


Figure 2.2 **Energy consumption by fuel type**

Source: MOPE 2003, *State Of The Environment*<sup>17</sup>

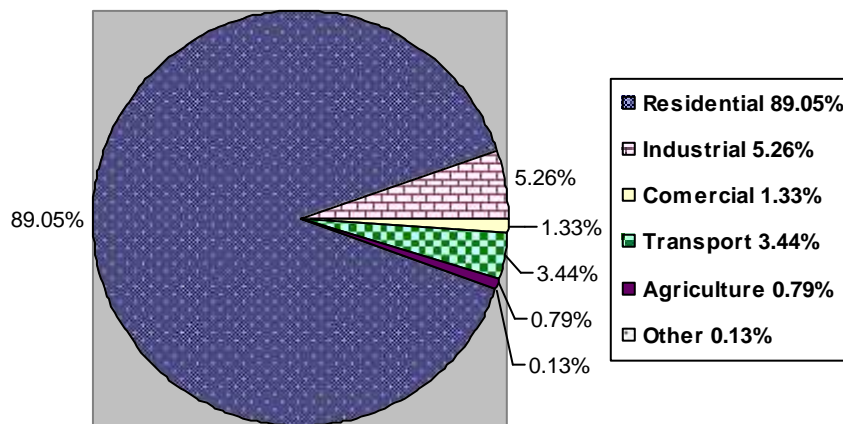


Figure 2.3 **Energy consumption by sector**

Source : CES 2003, *Renewable Energy Technology for Rural Development*.

<sup>17</sup> State of environment, 2003, MOPE, sees RETRUD, 2003 and Sustainability, 2003.

Table 2.1 : A review on the renewable energy generated in Nepal

<b>Source of Energy</b>	<b>Capacity of Energy</b>
Biogas	1,30,000
Improved Cooking Stove	1,50,000
Micro Hydro	14 MW
Solar Water Heater	4 MW
Solar Home System	3 MW
Wind	2 KW

Source: *Science and Future*, Vol. 1. No. 9 May/June 2005

Many donor agencies are providing financial support in DES establishment in the rural areas viz. DANIDA, NORAD, WB, GTZ, SNV, EU, UNDP etc. The HMG has also been providing subsidy since 2057 BS through ADBN for the installation of all the energy system except ICS. The subsidy varies according to the size and types of energy and also on the road accessibility with the loan repayment period of 20 years. With the support from REDP with its six principles of community mobilization, four types of energy technologies have been in operation in the selected study site with the view of DES, viz. Micro Hydro, Biogas, Solar Home System and Improved Cooking Stove.

## **2.6 Gender Issue in Rural Technology**

Gender analysis involves looking at the sexual division of labor, the access and control men and women have over inputs required for their labor and benefit. It refers to systematic way of looking at different impacts of development in women and men. Different roles, needs, access to and benefits from technologies and decision making power with respect to technologies are assigned to men and women within household, community and society.

The integration of women into development has not solved women's survival problems. It only increased women's workload and didn't give them more income and assets. It is believed that part of the problem in the past may have been a misconception among the planners and policy makers as to what constitutes women's participation. It is found that

without support and motivation from the male members of the community, increasing women's participation in development activities is not only difficult but also almost impossible.

## **2.7 Development Stages of Decentralized Energy System (DES)**

Biomass resources have been used as the major source of energy in Nepal particularly in rural areas even in these days. This trend of traditional energy consumption is neither sustainable, nor suitable from environment point of view. We have reached alarming situation that we need to replace these traditional energy consumption method with the modern form of energy in terms of resources and technologies.

For this, DES has been the best natural alternate in those areas where people depend on imported fossil fuels for lighting due to high cost of grid connection and low and dispersed settlement. Decentralized and renewable energy systems like Micro Hydro, Solar PV, Biogas, ICS , etc. provides feasible and environmentally friendly energy supply options in rural areas, as it is infinitely available in nature.

The most important renewable energy technologies (RETs) in Nepal are Pico-Hydro Power, Micro Hydro Power, ICS, Biomass energy like Biogas, Briquettes, Gasifies, etc., Solar energy like solar water heaters, solar dryers, solar cookers, etc. and wind energy like wind generated water mill, etc.

### **Improved Cooking Stove (ICS)**

Improved cook stoves (ICS) are one of the most simple, inexpensive and widely used technologies designed to improve the combustion efficiency of fuel wood and reduce exposure to indoor air pollution. ICS was introduced in Nepal in 1950s and continues to be relevant in the present context. Several government and non-government organizations are involved in promoting ICS and His Majesty's Government of Nepal plans to install 2,50,000 ICS in 45 districts during Tenth Five Year Plan period (2002-2007).

### **Historical development of Improved Cooking Stove**

Development and promotion of ICS in Nepal can be divided into four phases.

The *first* phase started in 1950 with the introduction of Hyderabad and Magan model stoves aimed to reduce exposure to smoke (SEECON, 2000).

The *second* in the early 1970s with large mud stoves with a number of rings known as Lorena Stove developed in Guatemala. In the late 1970s, RECAST improved these stoves and renamed them "Nepali Chulo".

The *third* phase began in the early 1980s, with research and development activities and large scale dissemination. The National Planning Commission (NPC) included ICS promotion in the Sixth Plan and RECAST was involved in assessing various types of cook stoves' performance and designing stoves with higher performance and efficiency. Initially Ceramic Insert and Double Wall Stoves replaced the Lorena and other mud stoves. These stoves were widely distributed by Community forestry Development Project Small Farmers Development project and Women Development Division. About 44,000 ceramic insert type stoves were freely distributed, but of these only 35 percent are believed to be in operation.

ICS promotion entered in the *fourth* phase in the 1990s with the replacement of ceramic stoves with the mud and brick/stone stoves which were built on-site with locally available materials. The ceramic design was abandoned mainly because their transportation was difficult as they were cumbersome and fragile and it was not possible to make the inserts locally. Since 1990s mud and stone stoves built locally have been promoted. Tamang Chulos with hollow brick chimneys are now quite popular.

### **Biogas**

Biogas is one of the most successful bio-energy technologies in Nepal in terms of its wide application and successful operation. The technology was first introduced in Nepal in 1955 by Fr. Subole in St. Xavier's School, Godavari by using a 200 litre oil drum. However, it wasn't until about two decades later that the biogas programme started to gain some momentum. 1975/76 was declared "Agriculture year" when 250 floating drum type biogas plants were built using interest-free loans. Till 1974, Nepal had only four biogas plants which were in households in Kathmandu (Karki et. al, 1998).



In 1977, the Gobar Gas and Agricultural Equipment Development Company (Pvt.) Ltd. (GGC) was established and a number of plants began to grow slowly. In the Seventh Five-Year Plan (1985-90), the government's target to construct 4,000 plants was met mainly due to the efforts of GGC. Then, in the Eighth Five Year Plan (1992-97), the target was increased to 30,000 plants.

In 1992, the Biogas Support Programme (BSP) was set up with the support from the government of the Netherlands, aiming the goal of developing and disseminating biogas technology as a commercially viable and market oriented industry. The project was successful in standardizing the technology and proper monitoring and promoting private companies in this sector. Today, there are more than 1,30,000 plants in Nepal and about 97 percent of them are in operation. Similarly, to support this sector, there are about 50 biogas companies that are providing their service throughout the country, 13 appliance manufacturers and more than 5,000 trained biogas technicians. Besides, more than 60 micro finance institutions and 3 banks are involved in biogas lending. Thus biogas has become a thriving industry with a capacity to construct about 30,000 plants per year.

## **2.8 Biogas and Improved Cooking Stove: An Overview Energy Situation**

Regarding the impact of these decentralized energy systems, many individuals and organizations have made overviews based on different researches. However, we can hardly find any report showing their negative consequences in the nature as it does by fossil fuels or the petroleum products.

The most difficult task found in the development and dissemination of ICS is designing an efficient model that incorporates all essential parameters, technical as well as socio-economic factors; including local cooking habits, seasonal variations, agro-processing requirements, fuel type, cultural and religious restrictions and others. A common misperception about ICS is that any stove that consumes less fuel to cook a fixed amount of meal is an efficient stove and should automatically contribute to reducing PIC emission which is not true though.

Karki (2001) study shows that the application of bio slurry on maize and cabbage in Lalitpur found the best result as compared to the use of inorganic manure.

The New Era (1995) study has revealed that the main attraction towards biogas plant is the easy availability of gas for cooking and general hygienic condition.

As of 28 Feb, 2006, the total number of biogas installed by Biogas Support Programme (BSP) is 1,35,193.

## **2.9 Government Policies and Program for Decentralized Energy System (DES)**

The Tenth Plan (2002-2007) continues to stress the importance of making renewable energy available for rural Nepal by setting target to cover about 1,000 new VDCs within the plan period. This provides a tremendous opportunity for the promotion of modern renewable energy forms. Some of the major result oriented targets in the Tenth Plan are:-

- ) Producing 44 MW energy by installing 2, 00,000 biogas plants in 65 districts.
- ) Producing 3.5 MW electricity energy by distributing 52,000 domestic and institutionalized solar electricity system in 52 districts.
- ) Installing 2,700 solar dryers/ cooker in 20 districts.
- ) Installing 4,000 improved water mills.
- ) Constructing 2,50,000 improved ovens in the rural areas.( NPC 2003)

To achieve this target, there is need for a major policy for renewable energy development through decentralized governance. In this context, the role of local government remained critical in building partnership with the communities, private sectors, NGOs and other actors involved in the dissemination of renewable energy technologies at local level.

## **2.10 Potential Consequences of Improved Cooking Stove / Biogas**

The environment conscious persons are very eager about the expansion of biogas and ICS in a wider scale. There are many organizations working in the promotion of the renewable energy system to conserve the energy for our future generation.

### **Improved Cooking Stove**

- ) The use of ICS reduces in the consumption of fuelwood by about 25 to 45 % than in the traditional cooking stoves, hence it reduces deforestation rate.

- ) It improves in the indoor pollution by reducing the smoke that also helps in reducing environment related health hazards.

#### Biogas

- ) One of the most potential consequences of biogas is the *carbon credit* we can get from carbon trading to the industrial countries that produce more pollutants in the environment. According to the experts, one biogas plant can save 5 tons of carbon in the environment and each biogas can get 7 USD in turns.
- ) Beside that the digested slurry can be used as manure which is good for crop production which not only increase the production but also maintain soil quality.
- ) The use of toilet attached biogas plants makes the surrounding as well as indoor environment healthier that reduced environment related health hazards.
- ) For the small family its use reduces about 80% of fuelwood consumption, reducing deforestation rate.

# CHAPTER III

## 3. METHODOLOGY

Various social science research methods were applied to conduct the study on the gender equity for successful implementation of Decentralized Energy System in the selected VDC especially focused on biogas and ICS.

### 3.1 Research Design

In order to produce experiential facts to fulfill the set objectives, data collection is necessary. The research was conducted on the basis of both the exploratory and descriptive methods. The exploratory method is the collection of quantitative data from the biogas and ICS benefited households, while the descriptive method is the collection of qualitative information, which is the comparison of gender role, their socio-economic status before and after the implementation of DES.

### 3.2 Selection of the Study Site

To assess the gender equity, only one VDC of Kavrepalanchowk district was selected. For this, Nayagaun VDC with the four types of energy installed with the support from REDP run under UNDP, HMG and WB was selected. The site being composed of heterogeneous society, the study on gender equity was possible on different ethnic groups in a short period. The study was conducted on the beneficiaries' households with the comparison of their socio- economic status and gender roles before and after the DES implemented in their village. Thus the outcomes of the study will be fruitful for the concern agencies for formulating policies and programs of such energy for replicating them in new sites where connection of national grid is impossible within next five or more years.

### 3.3 Study Site Description

Nayagaun VDC was selected for the study area with the total population of 5141 of which 2,571 are the female. The VDC is located at north-west part of the district at an altitude ranges from 900-1500m that falls under subtropical climatic zone. It is bordered with

Mahadevsthan and Anikot VDC in the east, Garibisauni, Deupur and Baluwapati VDC in the north, while in the south, it joins with Devitar, Nala and Tukucha VDC of Kavre. The site is accessible after 3 hours walk from the nearest road head. Majority of people belong to Tamang and Brahmin followed by Chhetri, Gurung, Kami, Sarki and other ethnic groups.

### **3.4 Nature and Source of Data**

The data was both exploratory and descriptive which are either secondary, or primary. The secondary data were collected from documents, reports, journals etc., and the primary data were collected from interview with key persons, individual household survey and informal discussion with the people in that VDC.

### **3.5 Data Collection Techniques/ Instruments**

#### **3.5. i. Secondary Data:**

For the study, the documents, articles, reports, and literatures related to gender issue, the energy situation, their use pattern and their impact on the users or the beneficiaries was collected that was very useful in the preparation of the report. The laws and policies related to gender were also considered along with the socio-economic structures of the rural Nepalese.

#### **3.5. ii. Primary Data:**

Primary data was collected through the application of various techniques to find out the data related to various aspects.

- ) Detail household survey was conducted through structured-questionnaire and observation.
- ) Focus group discussion was done for generating detail information about the village; checklist was made along with observation.
- ) Consultation with the key people, community organizations, NGOs, user groups was done to study the constraints overcome while providing equity and opportunity to the target group.

### 3.6 Variables and Their Operationalization

#### Independent Variables

##### 1. *Socio- cultural factors*

- Age
- Sex
- Occupation
- Caste/Ethnicity
- Family Size
- Education (in / formal)

##### 2. *Economic Factors*

- HH income
- No. of cattle
- Economically active population
- Type of stove used
- Fuelwood consumption amount

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#### Dependent variables

##### 1. *Social Awareness*

- Empowerment for decision making
- Community Mobilization
- Social Participation

##### 2. *Economic Impact*

- Engage in income generating activities
- Habit of saving money
- Save fuelwood consumption
- Save expenses for health treatment

### 3.7 Sampling Procedure

Sample population for the study was 50 from biogas benefited households whereas it is only 25 from ICS benefited household, which is comprises only 10% of the total beneficiaries of each energy system for the quantitative data. The sample household was selected on the basis of simple random sampling method, with probability sampling in which any one has equal chance of being selected. For the qualitative data, observation was done while filling up the questionnaires and interviewing with the key persons.

### 3.8 Method of Data Analysis

Data was processed and analyzed both electronically and manually. The household survey was processed in MS Access. Other data were processed manually. The data are presented in a descriptive way with the help of table, chart, percentage and ratio.

# CHAPTER IV

## 4. GENERAL FEATURES OF THE STUDY SITE

### 4.1 Physiological Characteristics

Nayagaun VDC is located at north-west part of the district at an altitude ranges from 900-1500m that falls under subtropical climatic zone. It is bordered with Mahadevsthan and Anikot VDC in the east, Garibisauni, Deupur and Baluwapati VDC in the north, while in the south, it joins with Devitar, Nala and Tukucha VDC of Kavre. The site is accessible after 3 hours walk from the nearest road head.

### 4.2 Demographical Characteristics

According to CBS 2001, the total population of the VDC is 5141, of which 2,571 are the female.

### 4.3 Socio-Cultural Characteristics

Majority of people belong to Tamang and Brahmin followed by Chhetri, Gurung, Kami, Sarki and other ethnic groups. Due to current conflicting situation, almost all the youth have migrated to the city and other places for security. Most of the houses have only old persons to live in, while some are empty.

### 4.4 Economic Characteristics

The livelihood of almost all the population is sustained through the agricultural activities. People have been migrated to the city for opportunity for earning their livelihood. And few are engaged in some other income generating activities, like mason, small shop etc. Almost all the houses have kept one or other types of livestock and fowl. They also take their livestock to the city for selling.

# CHAPTER V

## 5. DATA ANALYSIS AND INTERPRETATION

This chapter deals with the analysis of data collected from the respondents of the selected site, Nayagaun VDC, Kavrepalanchowk district. This chapter will explore different aspects of the selected respondents.

### 5.1 Socio-economic Profile of the Respondents

Out of the total (50) respondents of biogas benefited households, 68 percent were female, whereas only 20 percent from the ICS benefited households (i.e. 25). Agriculture is the main occupation of all the respondents. The installation of the ICS and Biogas has benefited a lot in saving their time and keeping their surrounding environment healthier.

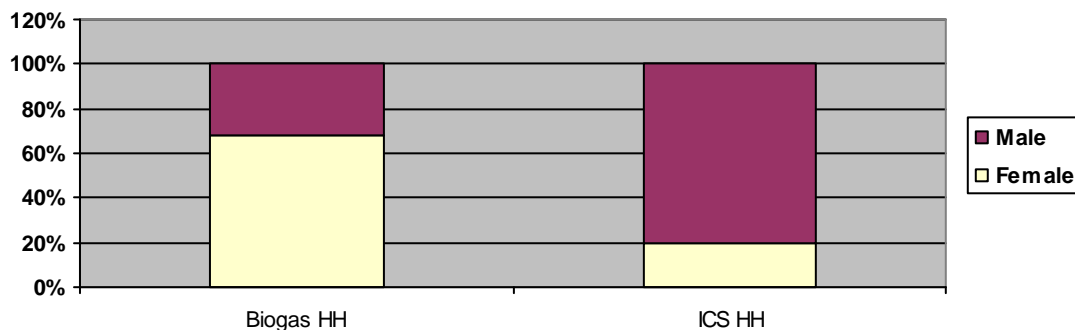


Figure 5.1 Gender-wise distribution of the respondents

Source: Field Survey 2006

#### 5.1.1 Ethnic/Caste composition

Nepal being multi-ethnic country, no place can be found to be composed of only one ethnic group. The site selected is no more an exception; it is composed of Mongols and Brahmins. The majority of the respondents are Tamang followed by other castes like Bajgain, Dhungana, Ghorsane and other minority castes.



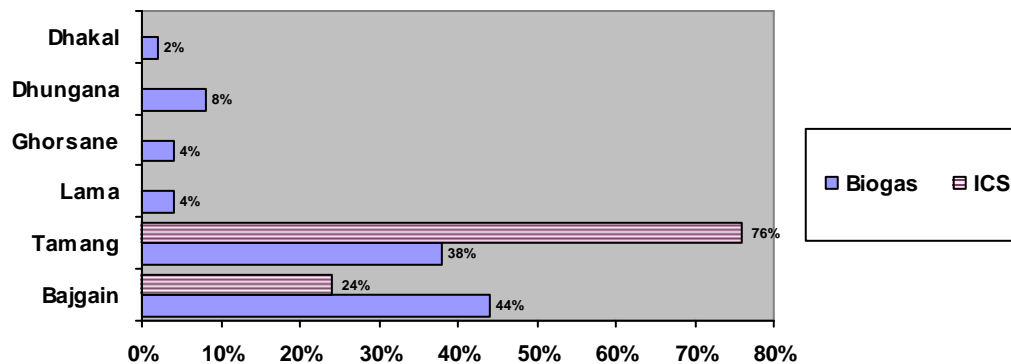


Figure 5.2: Caste Composition in Biogas and ICS Benefited Respondents

Source: Field Survey 2006

The above figure shows that ICS is installed in only two types of castes while biogas is installed in all the six castes. The figure also shows that 76 percent of the ICS benefited is group are from Tamang caste; while the percent is only 24 in Bajgain. Similarly, in biogas benefited group the percent is 44 from Bajgain, 38 from Tamang, 4 from Lama, 4 from Ghorsane, 8 from Dhungana, and only 2 from Dhakal respectively.

### 5.1.2 Family Size

According to CBS 2001, the total population of the VDC is 5141, of which 2,571 are the female. The study found that in the majority of the family, the size ranges from six to ten. The percentage of extended family is rare.

Table 5.1: Family size of the Respondents

Family size	Biogas HH	ICS HH
	Frequency	Frequency
1-5	14(28)	9(36)
6-10	33(66)	16(64)
11-15	3(6)	
Total	50(100)	25(100)

\* The numbers in the parenthesis indicate percentage.

Source: Field Survey 2006

### 5.1.3 Education Status

Education is the main factor that determines the socio-economic condition of any family. The study found not much high literacy rate in the village. Of the total respondents benefited by biogas, 44 percent are literate, 24 percent are illiterate and 30 percent have

attained formal education, of which, 2 percent have attained higher secondary level. Similarly, of the total benefited by ICS, 54 percent are literate, 8 percent are illiterate and 36 percent have attained secondary level education, of which, 2 percent have attained higher secondary level.

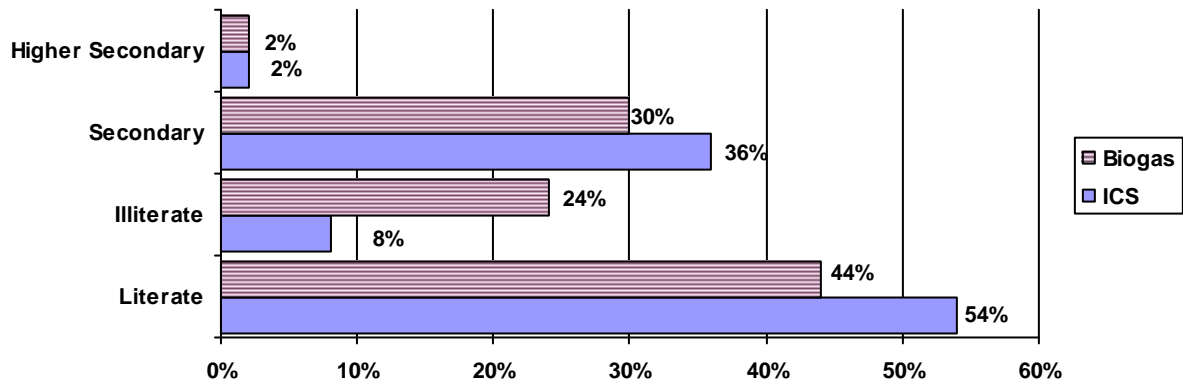


Figure 5.3: Education Status of the Respondents

Source: Field Survey 2006

### 5.1.4 Occupation

Agriculture being the main occupation of the rural sector of the country, the occupation of the majority of the respondents is not other than agriculture. Out of the total respondents benefited from biogas, 84 percent are engaged in agriculture, 10 percent are student and 6 percent are housewife. Similarly, of the total respondents from ICS, 92 percent are engaged in agriculture whereas, 8 percent of them are students. Though people have different occupation, they also help in the household chores including agriculture.

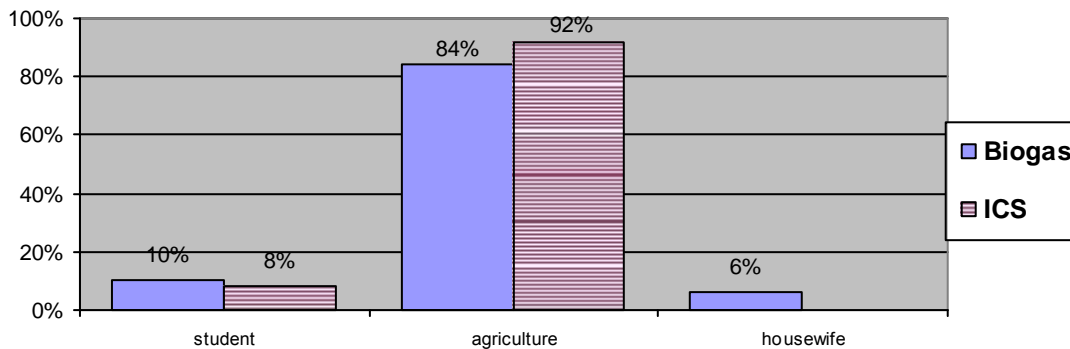


Figure 5.4: Occupation of the Respondents

Source: Field Survey 2006

### 5.1.5 Land ownership pattern

Land is another factor that determines the socio-economic status of a family. Of the total, all the respondents of the study have their own land. The ownership ranges from 1 to 40 ropanies in biogas benefited household. This range is 1 to 20 in ICS benefited household which is comparably lower than the biogas owner. The detail of land holding size is presented in the table below (Table 5.2)

Table 5.2: Agricultural Land Holding Pattern

Land size in ropani	Biogas HH	ICS HH
	Frequency	Frequency
1- 5	8 (16)	1 (4)
6-10	13 (26)	7 (28)
11-15	12 (24)	8 (32)
16-20	9 (18)	9 (36)
21-25	6 (12)	-
26-30	1 (2)	-
31-40	1 (2)	-
Total	50(100)	25(100)

\* The numbers in the parenthesis indicate percentage.

Source: Field Survey 2006

Table 5.2 shows that the average land holding size for the biogas benefited household ranges between 1 to 40 ropanies, while ICS benefited household is between 1 to 20 ropanies. Despite of large landholding size, the production is insufficient for all the households to meet their family needs due to low productive sloppy and terraced land.

### 5.1.6 Area of resident

Similarly the area of residential land hold by the respondents is presented in the table 5.3 below.

Table 5.3: Residential Land Holding Size

Land size in ana /ropani	Biogas HH	ICS HH
	Frequency	Frequency
0.1 - 2 ana	12 (24)	6 (24)
2.1 - 4 ana	32 (64)	17 (68)
4.1 - 6ana	5 (10)	2 (8)
6.1 ana - 2 ropani	1 (2)	-
Total	50 (100)	25 (100)

\* The numbers in the parenthesis indicate percentage.

Source: Field Survey 2006

The table above shows that the average land the respondents hold is between 2 to 4 ahas. It includes the compound of the house which is used to dry their agricultural product, performing household chores and as a play ground for the children.

### 5.1.7 Households with livestock and fowl

Most of the rural households hold some or other kind of livestock and fowl, so is the case in this village. Every household holds livestock and fowl. The details are presented in the table 5.4 below.

Table 5.4: Households with livestock and fowl

a) Biogas

Livestock/ fowl	No. of HH.	Percentage (%)
Cows only	22	44
Ox only	10	20
Both	5	10
Buffaloes	45	90
Goats	46	92
Fowl	21	42

b) ICS

Livestock/ fowl	No. of HH.	Percentage (%)
Cows only	10	40
Ox only	4	20
Both	2	8
Buffaloes	22	88
Goats	21	82
Fowl	15	60

Source: Field Survey 2006

The above table shows that the number of cows and buffaloes kept by the total respondents is comparatively high in biogas benefited households, whereas the number of fowl kept is higher in the ICS benefited household households.

### 5.1.8 Kerosene consumption per year

In rural areas, kerosene is one of the main fuel consumed either for illumination and for cooking. The kerosene consumption by the majority of the selected household of both the groups ranges from 31 to 60 litres per year. Despite the fact that, there is electric light available generated from local Micro Hydro Power, during the study duration, there were no electric light due to some technical as well as political problems. Thus the consumption amount is high due to its use for lighting purpose in addition. The hike in the price of this fuel has greatly affected in their lives. However, the consumption amount has decreased after the energy system is used in every household.

The table below shows that a biogas stove saves more kerosene than an ICS stove does.

Table 5.5: Kerosene Consumption per Year

Litres per year	Biogas HH		ICS HH	
	Frequency		Frequency	
	Before	After	Before	After
8-30	6(12)	18 (36)	3(12)	9 (36)
31-60	14(28)	26 (52)	7(28)	14 (56)
61- 100	23(46)	4 (8)	11(44)	2 (8)
Above 100	7(14)	2 (4)	4(16)	0
Total	50(100)	50 (100)	25(100)	25 (100)

\* The numbers in the parenthesis indicate percentage.

Source: Field Survey 2006

## 5.2 Gender Role in DES Installation

For the installation of any energy the first and the foremost essential thing is the feeling of its necessity. Being a male dominant society, this village is no more different from other. Thus for the installation of both the energy systems, the male members of the household still have significant role in decision making though REDS mobilized and trained them on equity basis, the rate is higher in biogas installation due to the high cost of installation. The involvement of both the male and the female members are presented in both the energy systems separately in the figures below (see Table 5.6 and 5.7).

### a) ICS

The involvement of male in *decision making* for the installation of ICS is found to be 52 percent while the female is 36 percent where the involvement of both the male and female is 12 percent out of the total households included in the study. Being male dominant society, no household is found where there is the major role of the male members in household work, especially in cooking and cleaning. Thus the *daily operation* of ICS is found to be done by female in 60 percent of the respondents' household, whereas 40 percent by both the members. Similarly, in the *construction*, the major role is played by the technicians in 68 percent, the male by 28 percent, while only 4 percent by the female. In contrast, in the *maintenance*, female involvement is high, that is 44 percent while 28 percent by the male alone and both the members. (See Fig. 5.5)

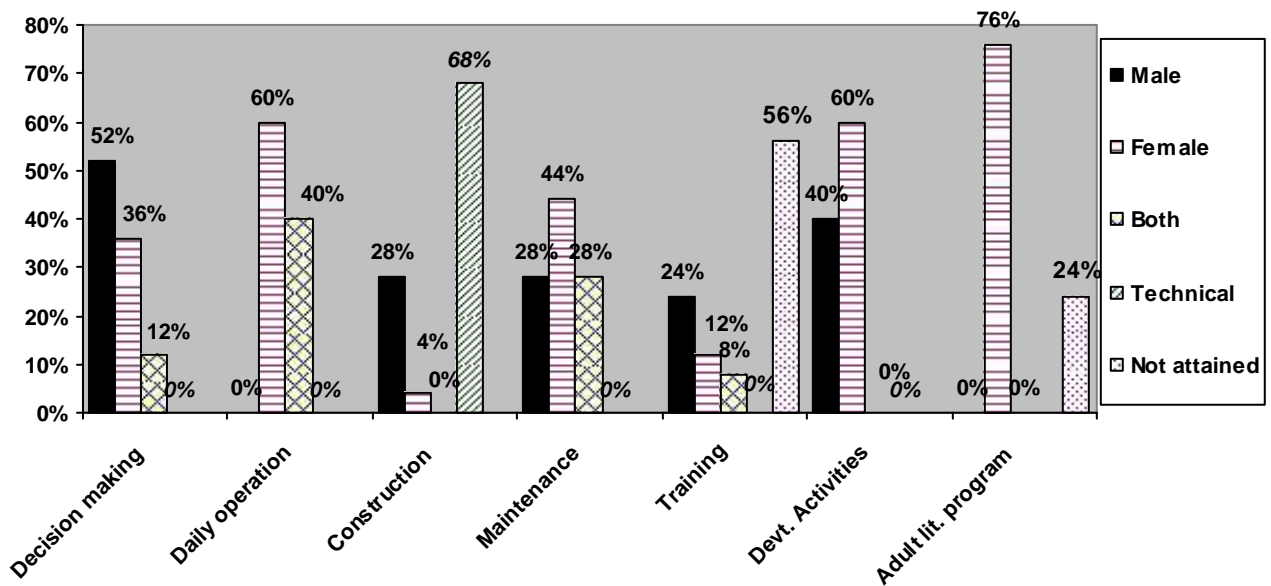


Figure 5.5: Involvement in Different Activities (ICS)

Source: Field Survey 2006

In the *trainings* provided by REDS, the involvement of male is 24 percent, female is 12 percent while both the members is 8 percent, while the rest 56 percent have not attained the training. In the *development activities* initiated in the village by REDS, the involvement of female is found to be higher than those of male; their participation is 60 percent and 40 percent respectively. Similarly in the *adult literacy program*, female involvement is 76 percent, while 24 percent is found not involved. This shows that the community mobilization has significant effect on the female participation in different activities.

#### b) Biogas

The involvement of male in *decision making* for the installation of biogas is found to be 74 percent while the female is 18 percent, where the involvement of both the male and female is 8 percent out of the total households included in the study. The *daily operation* of biogas i.e. feeding biogas plant is found to be done by 62 percent of the male, while 10 percent by female, whereas 28 percent by both the members. Similarly, in the *construction* and *maintenance* of the system, the major role is played by the technicians in 84 percent and 70 percent, while 16 percent and 26 percent by the male members respectively in each activity. (See Fig. 5.6)

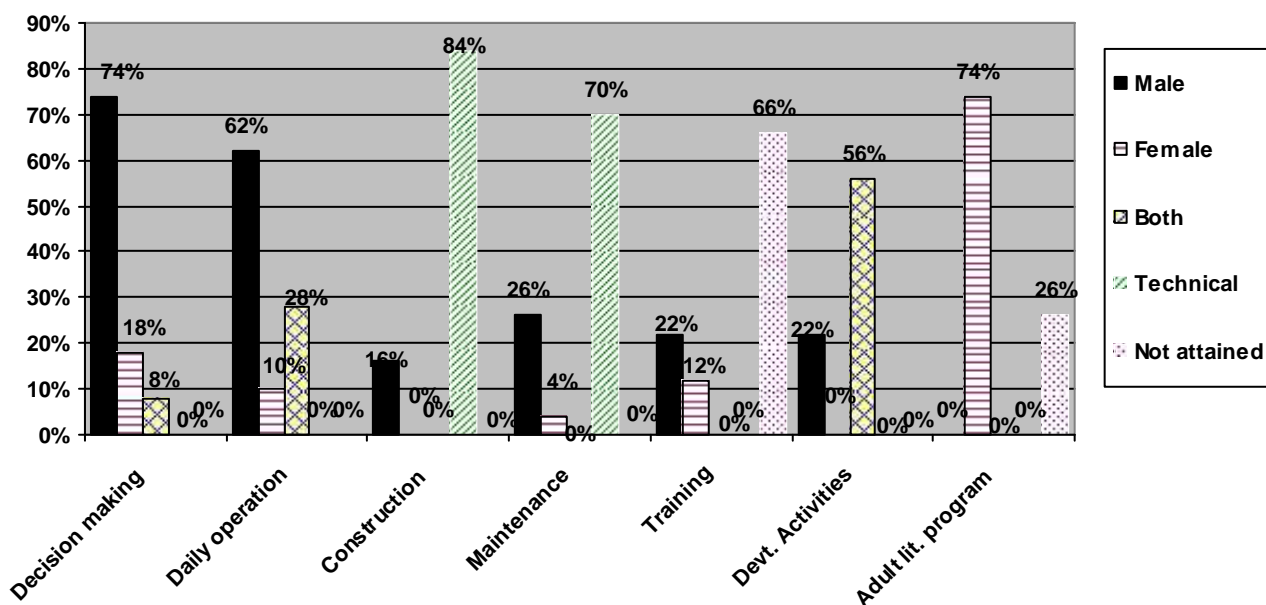


Figure 5.6: Involvement in Different Activities (Biogas)

Source: Field Survey 2006

In the *trainings* provided by REDS, the involvement of male is 22 percent, female is 12 percent while both the members is 66 percent. In the *development activities*, the involvement is found to be 22 percent by male alone while 56 percent by both the members. While in the *adult literacy program*, female is found to be attained by 74 percent, while 26 percent is found not attained.

### 5.3 Changes brought by DES

The study aims at studying the impact of the energy installed. Thus figures showing the work division among the male and female members of the selected households are presented below for each energy system separately.

#### 5.3.1 Household activities

Nepal being male dominant country, the majority of the household burden is put on women's back. But the development programmes launched by REDS with the mobilization of community on gender equity basis has helped to change the role in different activities. The detail is presented separately in the tables below (see Table 5.6 and 5.7).

i) ICS

From the study in the ICS benefited households, it is found that the major role in *cooking* is of the female members in 64 percent households, the male in 28 percent whereas the both in 8 percent. Similarly, for *fuelwood collection*, the major role is played by both the members in 80 percent of the households, by the male members only in 4 percent, whereas in 16 percent, it is the female members' responsibility. *Household decision* in 56 percent of the households is done by both the members whereas, in 32 percent, it is done by the male and in 12 percent it is done by the female.(see Table 5.6)

Table 5.6: Work Division among the Family Members (ICS)

Activities → Role	Cooking		Fuelwood collection		HH. decision		Child rearing		IGA		Kitchen gardening		Washing Dishes		Feeding biogas	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Female	16	64	4	16	3	12	19	76	---	---	2	8	22	88	---	---
Male	7	28	1	4	8	32	---	---	6	24	1	4	---	---	---	---
Both	2	8	20	80	14	56	6	24	11	44	22	88	3	12	---	---
None									8	32						
Total	25	100	25	100	25	100	25	100	25	100	25	100	25	100	---	---

Source: Field Survey 2006

As has been practiced from the very past, the major role in *child rearing* is of the female members (76%), and only 24 percent by both the members. Similarly, male are engaged in *IGA* in 24 percent of the households, both the members in 44 percent of the households whereas, none of them are involved by 32 percent of the households. Similarly in *kitchen gardening*, in majority i.e. 88 percent of the households, the involvement of both the members is found, where the rate is 8 percent by female and 4 percent by male. Similarly, in *washing dishes* the major role of female is in 88 percent household where this rate is only 12 where both the members equally participate.

ii) Biogas:

From the study in the biogas benefited households, it is found that the major role in *cooking* is of the female members in 84 percent households, the male in 6 percent, whereas the both in 10 percent of the households. Similarly, for *fuelwood collection*, the major role is played by both the members in 76 percent of the households, by male members only in 10 percent,



whereas in 14 percent, it is the female members' responsibility. *Household decision* in 20 percent of the households is done by both the members whereas, in 68 percent, it is done by male and in 12 percent it is done by female. (See Table 5.7)

Table 5.7: Work Division among the Family Members (biogas)

Activities Role →	Cooking		Fuelwood collection		HH. decision		Child rearing		IGA		Kitchen gardening		Washing Dishes		Feeding biogas	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Female	42	84	7	14	6	12	42	84	3	6	13	26	46	92	35	70
Male	3	6	5	10	34	68	1	2	14	28	6	12	1	2	5	10
Both	5	10	38	76	10	20	7	14	17	34	31	62	3	6	10	20
None									16	32						
Total	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100

Source: Field Survey 2006

As has been practiced from the very past, the major role in *child rearing* is of the female members (84%), only 2 percent by male members and 14 percent by both the members. Similarly, male are engaged in *IGA* in 28 percent of the households, both the members in 34 percent of the households, female in 6 percent of the households, whereas none of them are involved in 32 percent of the households.

Similarly in *kitchen gardening*, in majority i.e. 62 percent of the households, the involvement of both the members is found, where the rate is 26 percent by female and 12 percent by male. Similarly, in *washing dishes* the major role of female is in 84 percent households where this rate is 10 where both the members equally participate and 6 percent in male participation. Likewise, for biogas feeding, female involvement was seen in 70 percent of households, whereas this rate is 10 percent for male participation and 20 for the participation of both the members.

### 5.3.2 Particular activities

The Rural Energy Development Sector (REDS) programmes have also brought positive changes on other aspects of the villagers' lives. The Decentralized Energy System installed in the village has brought momentous change in the role of male and female in most of the households.

i) ICS

With the installation of ICS in household level, it has brought many significant impacts on the lives of the family. The study found that ICS installation has decreased the rate of *fuel wood consumption* in 92 percent of the selected households; whereas, *improvement in health* is found in 88 percent of them. The increase in *women decision making* in 56 percent of the households can be considered as a positive change as compared to increase in *male involvement in cooking* in only 28 percent of the households. (See figure 5.7)

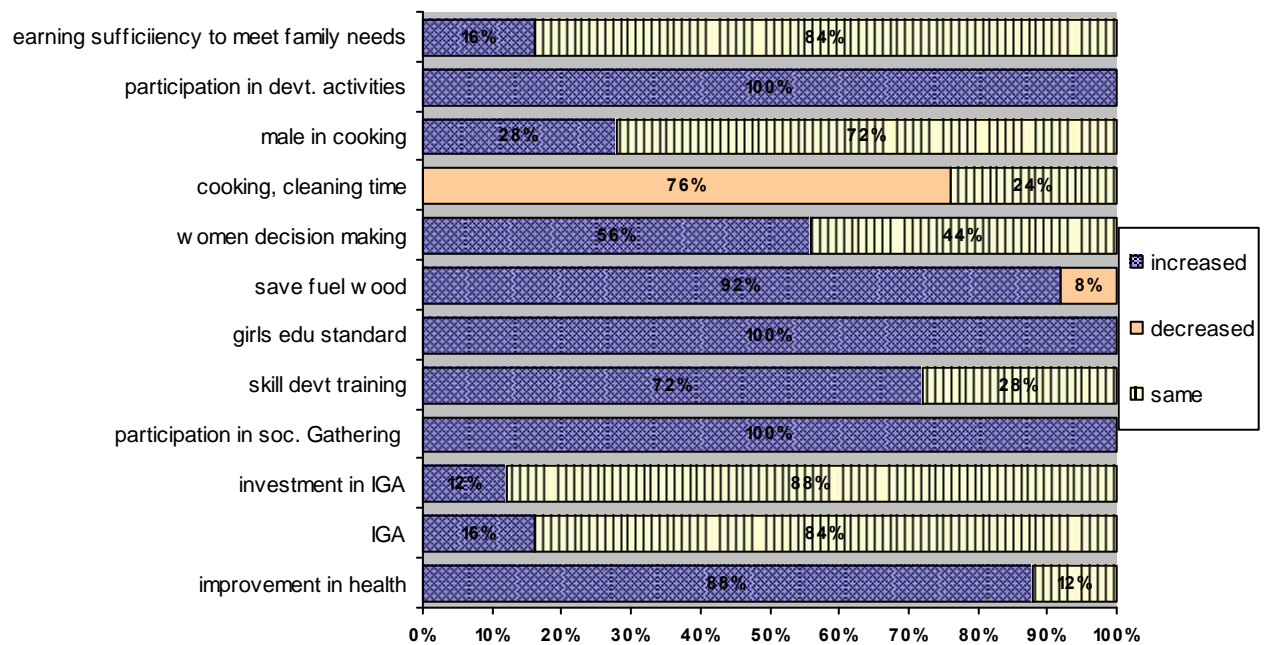


Figure 5.7: Changes brought by DES (ICS installation)

Source: Field Survey 2006

Likewise, the increase in the save in *cooking and cleaning time* in 76 percent of the respondents' house also shows significant impact in the female to have a free time which could be spent for personal hygiene and some sort of social or economic activities. The increase in the *girls' education standard*, *participation in development activities*, and *social gathering* are found in 100 percent of the selected households, which is a very significant impact on the socio-economic status of the family. The involvement in *skill development training*, by 72 percent of households proves to be less worthy as compared to the *investment in IGA* done by only 12 percent of the households. However the *earning sufficiency* and *involvement in IGA* are found in only, 16 percent of the households.

## ii) Biogas

Similarly, the installation of biogas has also brought many significant impacts on the lives of the family. The study found that biogas installation has decreased the rate of *fuel wood consumption* in 96 percent of the selected households; whereas, *improvement in health* is found in 94 percent of them. The increase in *women decision making* in 34 percent of the households can be considered as a positive change as compared to increase in *male involvement in cooking* in only 8 percent of the households. (See figure 5.8)

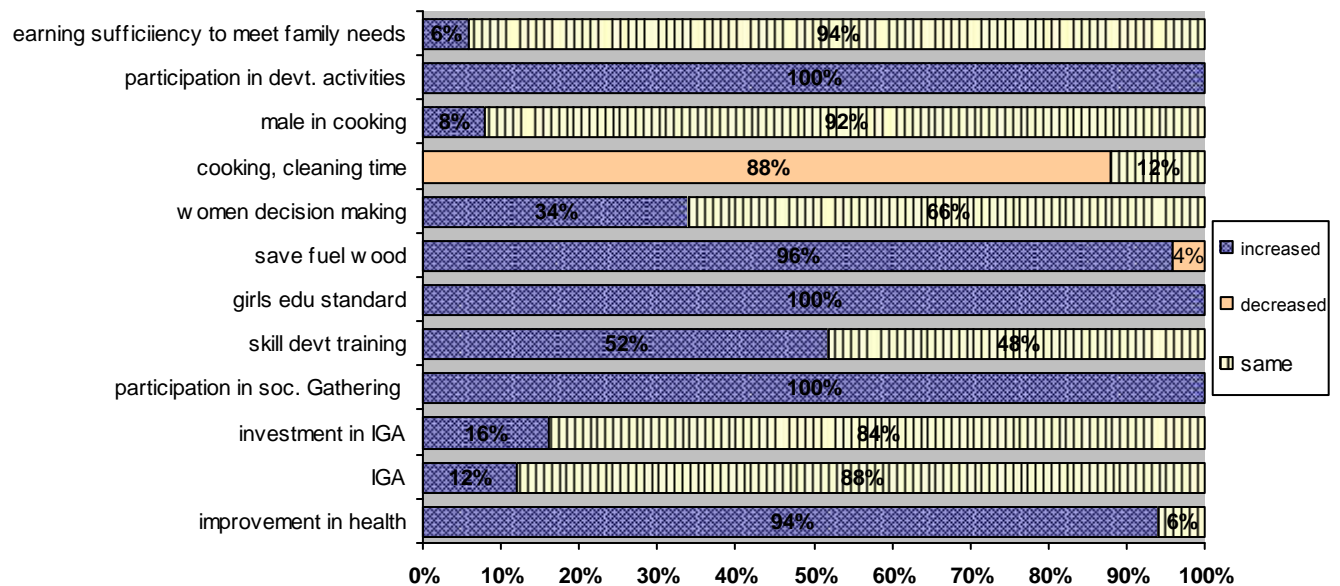


Figure 5.8: Changes brought by DES (biogas installation)

Source: Field Survey 2006

Likewise, the increase in the save in *cooking and cleaning time* in 88 percent of the respondents' house also shows significant impact in the female to have a free time which could be spent for personal hygiene and some sort of social or economic activities. The increase in the *girls' education standard*, *participation in development activities*, and *social gathering* are found in 100 percent of the selected households, which is a very significant impact on the socio-economic status of the family as in the biogas benefited household. The involvement in *skill development training*, by 52 percent of households proved to be less worthy as compared to the *investment in IGA* done by only 16 percent of the households. However the *earning sufficiency* and *involvement in IGA* are found in only, 6 percent and 12 percent of the households respectively.

While comparing the above two figures, they clearly show that the save in the *consumption of fuelwood* is high by 4 percent; *cooking and cleaning time* is high by 12 percent among the biogas beneficiaries. Similarly, *improvement in health status* is also high by 6 percent. The increase in the *girls' education standard, participation in development activities, and social gathering* are found in 100 percent, in both the groups, which is a very significant impact on the socio-economic status of the benefited households. Their participation *in skill development training* is found to be 72 percent in ICS whereas, this rate is only 52 in biogas benefited households.

The following case studies shows that despite the skill the people have they are being underutilized due to lack of favorable condition like access to market, improvement in the quality of the product and favorable socio-political situation etc.<sup>18</sup>

## **Case Studies**

### **1. Ms. Bajgain**

She is one of the participants of incense making training. With the social mobilization programme she can now talk to anyone boldly.

"I had to use my fingerprint for signature. I used to hesitate to talk to the outsiders, but now I can talk to anyone without any hesitancy." She further said, "With the community mobilization programme we can now read and write and are able to write our name. Besides that the compulsion made by the programme for the participation of a male and a female member from each household have trained the male members to help us in our household chores. The programme has phased out but the personnel of REDP promised us that they would help us to produce more qualitative product and get access to the market, but there is no sign of fulfilling the promise."

### **2. Ms. Ghorsane**

She has a different story as compared to Ms. Bajgain. After the programme installed DES in the village, she is not only benefited from biogas plant and ICS but also invested in agro-processing mill in partnership. She has better income than other women that she herself

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<sup>18</sup> The numbers in the parenthesis indicate the percentage.

owns the mill. But during the study, it is not in operation due to some technical problem in the generation of electricity created by political clash. She hopes for problem solving sooner and make the lives of villagers easier.

#### 5.4 Fuelwood Consumption Per Year (before and after the energy installation in Bhari)

The installation of decentralized energy system in this village has contributed a lot in reducing the fuel wood consumption for cooking purpose. The details are presented in the figures below.

##### i) ICS

The table below shows that before the installation of ICS, the consumption of fuelwood ranges from 31 to 150 bhari<sup>19</sup> per year depending upon the number of family members and the livestock they have kept, whereas this amount ranges from 11 to 90 bhari for the same period after the installation of ICS. This shows the decrease in some 60 bhari of fuelwood per year. (See Table 5.8)

Table 5.8: Fuelwood Consumption per Year (in Bhari)

Fuelwood consumption per year before energy installation			Fuelwood consumption per year after energy installation		
Amount of fuel wood (in Bhari)	Biogas HH	ICS HH	Amount of fuel wood (in Bhari)	Biogas HH	ICS HH
11-30	4 (8)	---	11-30	21 (42)	11 (44)
31-50	12 (24)	9 (36)	31-50	14 (28)	7 (28)
51-70	7 (14)	3 (12)	51-70	7 (14)	1 (4)
71-90	4 (8)	5 (20)	71-90	3 (6)	6 (24)
91-110	5 (10)	3 (12)	91-110	3 (6)	-
111-130	5 (10)	4 (16)	111-130		
131-150	3 (6)	1 (4)			
151and above	2 (4)	-			
Total	84 <sup>20</sup>	100	Total	96 <sup>21</sup>	100

\* The numbers in the parenthesis indicate percentage.

Source: Field Survey 2006

<sup>19</sup> 1 Bhari equivalent to 50kg. of fuelwood.

<sup>20</sup> The rest 16% respondents could not estimate the amount of fuelwood they use, again 4% out of them responded that the consumption amount reduced by 1/2 and 1/3 after the energy installation.

<sup>21</sup> The rest 4% respondents could not estimate the amount of fuelwood but stated that the consumption amount reduced by 1/2 and 1/3 after the energy installation.

### i) Biogas

The table above shows that before the installation of biogas, the consumption of fuelwood ranges from 11 to above 151 bhari per year depending upon the number of family members and the livestock they have kept, whereas this amount ranges from 11 to 110 bhari for the same period. This shows there is decrease in fuelwood by more than 40 bhari per year.

### 5.5 Performance of DES

The study found that the majority 76 percent of the biogas beneficiaries are very satisfied, 18 percent are satisfied, whereas only 6 percent are unsatisfied. Similarly, 12 percent of ICS beneficiaries are found to be very satisfied, 84 percent are satisfied whereas, only 4 percent unsatisfied. (See figure 5.9)

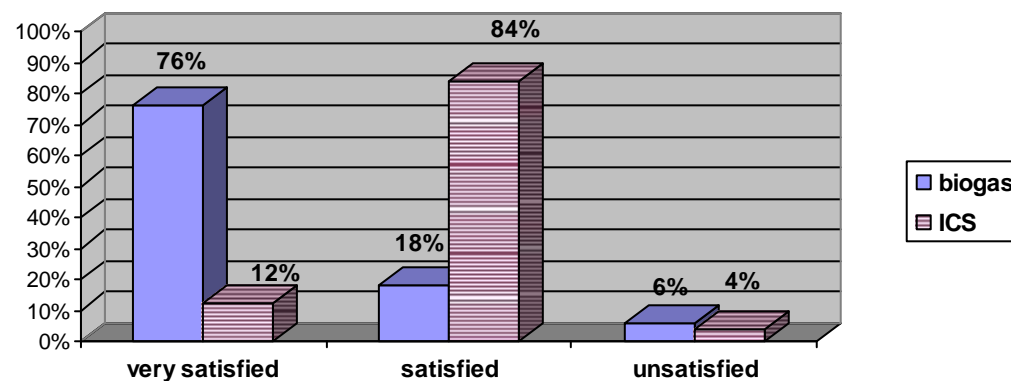


Figure 5.9 : views about the energy installed in the respondents' home

Source: Field Survey 2006

The main dissatisfaction about the ICS is not much reduction in the fuelwood consumption and the time taken for cleaning utensils is as it was while using ordinary stove.

There is much dissatisfaction put forth by biogas beneficiaries. They said that as the gas can not be measured, they can't estimate whether their meal would be properly cooked or not. Thus, they have to get ready their fuel wood stove at the side, if it is not sufficient. This way double fuel is consumed to cook the same amount of food.

# CHAPTER VI

## 6. FINDINGS

During the study, most of the women are found to be limited within household chores and agricultural work, whereas almost all of the men are found to help their female members very often. Almost all the households included in the study are involved in multiple agriculture system. Along with agricultural cultivation, they have kept cows, buffaloes, goats, chicken, and pigeons. Thus, their income is exclusively depended on agricultural productions. Except a very few, all of them have reported that their income is sufficient to meet their needs throughout the year. Despite of few drawbacks, all of them are satisfied with the energy installed in their house.

### 6.1 Dissatisfaction of the DES

The study aims at excavating comments or dissatisfaction of biogas and ICS. During the study, various comments were heard; most of them have the similar comments. The comments will be described separately for each energy.

#### i) ICS

- ) Proper site for plant installation was not done by the experts (technicians)
- ) Can't be used for all kinds of cooking purposes.<sup>22</sup>
- ) Cooking food is slower as compared to traditional stove.
- ) Not so useful for small family, needs more fuelwood than in traditional stoves.
- ) Lack of commitment fulfilled made by the concerned agencies to supervise the progress till 7 years.
- ) Consumption of fuelwood is not reduced as compared to traditional stove.
- ) Release of smoke from the chimney is not regular due to its inappropriate location.
- ) Cleaning chimney from time to time is necessary.
- ) Time for cleaning dishes is not reduced.

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<sup>22</sup> Tamang are not satisfied as they can't produce traditional alcohol in biogas stove.

## **ii) Biogas**

During the study, it is found that biogas plants are not working efficiently and they are solely depended on traditional stoves. It could be because of the inappropriate site of the plant installed as compared to the others that are working properly. While suggesting for hiring technical expert for the maintenance, they commented that they did not come despite they have requested for several times. From the observation, it could be concluded that they are not willing to pay the expert for their skill. They are losing the bio-energy both in terms of both the fuel and fertilizer.

- ) Biogas stoves can't be used for all kinds of cooking purposes.<sup>23</sup>
- ) Gas production is uncertain, especially during winter.
- ) Proper site was not selected by the experts for the installation of the plant.
- ) Problem of gas leakage makes people feel unreliable on it for cooking food properly as they need to prepare fuelwood stove (loss of both the energies) side by.
- ) Stove burns with yellow flame instead with green flame, sometimes unusual sound is heard while burning.
- ) Lack of commitment fulfilled, made by the concerned agencies to supervise the progress till 7 years.
- ) Cooking food is slower as compared to fuelwood stove.
- ) Consume more time for feeding biogas plant <sup>24</sup>

### **6.2 Socio-Economic Impact on the Users**

The programme initiated with the notion of community mobilization with the principle of gender equity through REDP has helped a lot in the development of not only the village but also in the capability development of the villagers with especial focus on the women. The condition of compulsory participation of one male and one female member of each family has played a vital role in making them participate in social gatherings, development activities, forming cooperatives etc and others. The great success is in the hand of the

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<sup>23</sup> Tamang are not satisfied as they can't produce traditional alcohol in biogas stove.

<sup>24</sup> when shed is far from the biogas plant



villagers than the outsiders. The group formation to establish cooperatives have not only developed the feeling of ownness, but also the habit of saving for future. The electricity generated by micro hydro has encouraged establishing rice mill serving the villagers at cheaper price as compared to the mill generated by diesel.

The study shows that significant improvement is found in the health status of female members and the education standard of girls due to save in cooking and cleaning time. Similarly, the great change brought by this programme is full participation of both the gender in social gathering and development activities. However, women's involvement in decision making is satisfactory which was not possible before the programme. Earning sufficiency is not found to be improved despite various skill development trainings were provided. The lack of market facilities, the production cost, the price of the products and their quality is responsible for this. The concern organization is responsible to some extent that they could not fulfill the commitment made to the villagers. Save in fuel wood consumption is significantly high in all household.

### **6.3 Gender Roles Before and After the DES**

There is no doubt that the household chores are limited in the responsibility of the women while they do have to give their supportive hands to the male members of their family in outdoor activities before the programme was launched. The implementation of programmes with the participation of male and female on equity base has contributed in changing their role in performing different activities. It is no doubt that certain responsibilities have been increased for example in feeding biogas.

Among the households benefited by both the energy, however male participation can be seen in household chores, no significant change is found in the responsibility of women in cooking, child rearing and washing dishes. Thus there is a need of gender equity in these activities. However, in ethnic group like Tamang, involvement of both the male and female is found in all these activities. The involvement of both male and female is found in fuelwood collection, income generation activities and kitchen gardening. Likewise activities like cooking, child rearing, washing dishes and biogas feeding in which female

still have a great role. Similarly, in decision making, male have still dominant role however, the participation of both the male and female is found satisfactory.

#### **6.4 Constraints Overcome**

From the study it is found that various constraints had overcome during the launching of the programme. Being male dominant society, they firstly raised voice against the programme being launched with the participation of both male and female on equity basis. Later, they supported it when they were convinced by the chairman of DDC and the community mobilizers for the cost of the development of their village. Hence, we can conclude that chairperson and social mobilizers have vital role in convincing the community. The compulsion made by Rural Energy Development System (REDS) to participate in the social gathering by one male and one female member of a family has brought participation on equity basis which is the only reason behind the success of the programme. The active participation of the villagers was found in the whole process of the programme

# CHAPTER VII

## 7.1 CONCLUSION AND RECOMMENDATION

### Conclusion

It is widely recognized that every development sector gender mainstreaming has been a focal point. But integration of women in development has in most of the time increased their work burden and didn't give them more income and assets.

The study found some significant impact in the involvement of both the gender in certain activities while there remains no change in other despite the expectation of the concern organization. This is due to gender matrix we have been in since the generations.

The significant improvement found with the DES is saving in the fuelwood, cooking and cleaning time and reduction of women health hazards. This ultimately contributes in the education status of girls; however their enrollment in school was always encouraged before the programme was launched. DES further helps in women's participation in different activities including skill generating training, cooperative formation, awareness raising and others that helps them in leadership development to put their view and decision boldly in the society, which was almost impossible in the patriarchal society.

Though the involvement of both the gender is found in different activities, the responsibility of household chores like cooking cleaning and child rearing is still limited to female only. However equal participation of both the gender is found in any activities in small family.

The villagers are happy with the changes brought by DES in their household they resisted the change at the beginning by turning down at the need of participation of female on equity basis in social activities. The DES has however made women's lives easier by saving time besides the supportive hands of the male members of their family. Despite this fact, the need of change is still needed for maintaining gender equity.

## **Suggestions and Compliments**

From the study, many suggestions were heard regarding the energy installed and the concerned agencies involved in such activities.

### **Biogas**

#### **(Suggestions)**

) Formation of group for motivation is needed for the smooth functioning of the programme.

#### **Cultural constraints**

At first they hesitate to cook food in the biogas stove as the plant is attached with toilet. Still a few families still use it for cooking food that is cooked in pressure cooker. Boiling milk, cooking vegetables is still practiced in fuelwood stove.

#### **(Compliments)**

The installation of biogas plants has made the household and the surrounding environment very suitable for health from sanitary point of view with the toilet attached biogas plants. Other work, like fetching water, caring children and livestock, doing homework (for students) can be done side by side while cooking. The smokeless stove has helped to make the home environment clean. The health status of family, especially female members has improved significantly viz. eye irritation, cough, stomach etc. It has saved time for washing dishes and washing clothes.

The consumption amount has decreased after the energy system is used in every household.

### **ICS**

#### **(Suggestions)**

) Introduction of *Bhuse chulho* would reduce much more in fuelwood consumption.

#### **(Compliments)**

The installation ICS has made the household environment very neat and clean. Other work, like fetching water, caring children and livestock, doing homework (for students) can be

done side by side while cooking. The health status of family, especially female members has improved significantly viz. eye irritation, cough, stomach etc. It has saved time for washing dishes and washing clothes. As its installation cost is lower than biogas, it has helped a lot to lower income group.

While filling up the questionnaire, the researcher found many interesting case studies. Two of them have been presented in chapter V.

The programme of Decentralized Energy System launched by REDP has brought drastic changes in the village. The programme did not only help them enjoy the benefit of the energy, but also provide much more benefit from it. The most significant is women literacy and empowerment.

The group discussion during the study found great changes in the attitude of the male members towards the female members of their family. The discussion concluded that the programme of DES has empowered women that those who hesitated to talk about their views are now not only able to put forth their views but are leading their groups in an organized way.

The study found some drawback also. Some of the income generating skills the villagers have learned are underutilized due to lack of market facilities. For example the incense making training has skilled some of the women but due to lack of market, the product remained packed up at the store room. The product is not of a good quality as it was expected due to lack of aroma adding stuff. The weakness of programme is found here to some extend.

### **Recommendation**

The study found the following recommendations given to the concern organization.

- ) Need of proper site selection before installation of any energy system, which was not found to be done by the experts (technicians) in this village.
- ) The concern organization should fulfill the commitment they have made, those which can't be done, should not be promised to do.

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