CHAPTER I

INTRODUCTION

1.1 Background of the study

Nepal is a small land lock country of Asia located between two economically giant countries - China and India. It is roughly rectangular shape with three distinct geographical regions- Mountain, Hill and Terai. Nepal is the second richest country of the world and first richest country in Asia in the context of water resources. Where, more than 6,000 small and largest rivers, which originated form Himalaya to Tarai region. The total hydropower potentialities of these rivers are estimated about 83,000 MW among them 43,000 MW is technically and economically feasible. Nepal's Theoretical occupies 2.77 percent of the world potentiality of hydropower (MOF, 2009/10). There is great possibility to product micro hydro electricity and it can be success to contribution on economic prosperity and raise the living standard of the rural people.

Hydropower is the indigenous and renewable energy source for Nepal. There are classified Micro hydropower in Nepal are - Above 300 MW Large Hydro Power, Above 10 MW to 300 MW Medium Hydro Power, Above 1 MW to 10 MW Small Hydro Power, Above 100 KW to 1 MW Mini Hydro Power and Up to 100 KW Micro Hydro Power.

Micro hydro refers to hydropower systems with a power rating of 100 KW or less. A 100 KW system will produce 100 standard units of electricity in one hour. Hydro refers the energy of falling water to generate electricity. A turbine converts the energy of falling water into mechanical energy. Energy can be generated from falling water through the use of turbine, which can be used as mechanical power. This is known as hydropower. This can be used directly to run various equipments or can be converted into electricity by using generator. This generated electricity can be used for lighting, heating, and operating machines. In Nepal, hydro project that produce up to 100 KW is called micro- hydropower (AEPC, Booklet, 2000:3)

Micro hydropower is a renewable source of energy. It is renewable, pollution free, reliable source of energy, cost effective energy solution, power of developing countries etc that is easily available in mountain and hilly region of Nepal. It is an important for rural development. Without energy, people will be back from their achieving a better lifestyle. People need the energy to fulfil their basic needs as well as save the time. Energy help to save the time of task of demands work within a time as well as more productive result. Therefore, in the hilly region of the world, Micro hydropower is one of the major sources of energy.

Nepal is richest country on the contest of water resources but still is facing on load shedding problem. Lack of energy power Nepal could not develop smoothly in economic sector. Nepal is a country-based country where more than 80% people live in rural area and the 20 % people live in urban area. A large proportion of households lived in their own dwelling units and majority (68.4%) household used the wood as fuel of for cooking. (Household Labour Force Survey,(2008). Therefore, the electricity through micro hydro is suitable in Nepal. There are more than 6000 rivers so; Micro hydropower has a great potentiality for fulfilling the energy requirement of rural Nepal to great extent. However lack of clearly defined policy, system oriented approach, unstable government and debate on the size of project and led to slow development of hydropower in the past. In Nepal, still 85% area is rural area and two- third of its land mass are hilly and mountain region. Therefore, the special rural electrification scheme needs to be adopted to electrify such region. Extending the grid isolated rural communities scattered in the hills across the nation is slow and exceedingly expensive today, only 15 percent of the total population have accessibility to electricity through guide connection. Due to the consciousness about the negative environmental and socio-economic impact of large scale hydropower development, electrification through small scale decentralization micro hydropower emerge as available alternative for rural electrification in Nepal (NPC, 2002)

By the end of the fiscal year 2008/9 various projects generates 655 MW power is connected in the national grid, while rest of the energy generated from small hydropower stations are not connected to the national grid is provided at local levels.

The total electricity generated has reached 714 MW including 53.41 MW from thermal power station and 100 KW from solar plants. On the other hand, the no of electricity consumers is growing annually. By the end of fiscal year 2008/9 total number of electricity customers is estimated to be 1879000 with 12% growth (Economic Survey 2009/10). Micro hydropower electricity energy is considered as value added energy product having great demand in a domestic and foreign energy market. This clean energy is and vehicle for modernization, commercialization and urbanization in the economic development of agriculture, industry, education, health and tourism etc. Therefore, it is determinant factor of each and every economic activity. Its higher development leads to sufficiency of energy, which indicates right development of sector and area towards national development.

Because of the low-cost versatility and longevity of micro hydro, developing countries can manufacture and implement the technology to help supply much needed electricity to small communities and villages Energy is one of the foundations of modern civilizations and economies. Electricity is prerequisite for increasing economic activity. Nepal Micro Hydropower Development Association was established in 1992, by eight privately run micro hydropower development firms/companies to set as an umbrella organisation of those dedicated to serve the nation with micro hydropower technology, skill and expertise. The Association is also to support formulating policies, plans and programmes to concerned agencies. Likewise, professional welfare is one of its objectives**.**

1.2 Statement of the Problem

Nepal is one of the Developing Countries in the world. About more than 80 percent, people are lived in rural area and rely on agriculture as their main source of income. They depend on traditional resources of energy such as fuel-wood, agriculture residue and animal dung for their daily energy supply. Fuel-wood is the most important sources of energy in Nepal until the present scenario. It accountants for 76 percent of the total energy consumption in rural area (REDP, 1998)

Nepal has one of the low per capita incomes in the world at around US $742 (Statistical Bulletin 2011/12) and the new poverty line; the poverty incidence (headcount) for Nepal in 2010-11 is 15.16 percent. The poverty rate is much lower in urban areas 15.46% then rural areas 27.43 percent (Nepal living standard Survey 2066/67). Only about 15 percent of rural households have access to electricity during the dry season in Nepal. In the present context of Nepal, micro hydropower energy is most feasible and alternative energy source for electricity as well as infrastructure development of sound economy. Nepal is a development country, there have been around more than 85% people lived in rural far from urban area. Therefore, they less available national grids electricity are not sufficient for the Nepalese people so, the rural area's people deprive by the electricity. On the other hand the national grid electricity is not suitable due to its high cost and rough topography (CBS, 2002) In Nepal, It is not appropriate to construct large hydro power project due to expensive cost of construction, lack of technology, lack of skill man power etc. Therefore, the hydro projects are running at low efficiency and some have completely failed during the recent random sample survey conducted on about ten percent sample of the total plants installed in Nepal. Around 30% of the total hydro projects have completely failed in Nepal (Earth Consult, 1995).

The consumption patron of energy in Nepal is based on traditional sources specially, firewood, dung, fuel etc. Now a day, the deforestation is great challenge of our country. So, the increasing level of deforestation due to the heavy dependency of fuel on forest. But our country is second richest in water resource among the world after the Brazil. There are more than 6000 rivers with highly forces blowing mountain to Tarai but there has been success to product 556.400 KW electricity until the fiscal year 2062/63. It is not sufficient availability electricity for the 2,66,20,809 population of Nepal. Moreover, the rapid deforestation has created the environment change not only that now a day creating many kinds of disease and problem due to deforestation and hydrological change. Therefore, the micro-hydropower will be better remedies to solve this kind of problem like developing countries like Nepal because it has cost effective project. Though the petroleum product may be alternative use instead of fire-wood for people but it is not useful and much expensive than the electricity and the petroleum

product can't creates the employment and it will not be sustainable product but micro-hydropower project can arise the employment on Nepalese's context because there are more than 6000 rivers are for the resources for hydro project. On the other hand, the use of petroleum product creates the environmental problems & large amount of foreign currency is needed to import the petroleum products. Nepal has limited economic resources and unlimited needs; as a result, Nepal has been facing dept trap & also deficit Balance of Payment (BOP).

In recent years, there has been a growing realisation of the importance of electricity in bringing social and economic development to rural communities in the less developed countries of the third world, and in the rural areas of the developed countries with relative isolation from the national distribution system. The need for standard urban quality electricity supply at not much greater cost revert the idea back to the old approach of using very small scale hydro power schemes.

Therefore, the Micro hydropower & mini hydropower are appropriable alternative option for electrification. It is viable option for small communities in the rural areas of hilly regions. It can be established by the small investment, exports & equipments. The high possibility of micro hydro project in Nepal with the limited capital investment & resources, it can be reduces the environmental pollution by the help of micro hydro project in rural Nepal. Therefore, this topic has been selected for thesis study.

The focusing points of the study will be finding following challenging:

I. What are the impacts of MHP on income and employment in rural area?

II. What are the impact of MHP on education of the people specially reference to study area? And

III. What are the problems & possibilities of micro-hydro project in Nepal in the present context?

1.3 Objectives of the study

1. To analyze the comparative impact on income and employment before and after instalment of MHP in the study area.
2. To analyze the impact of MHP in education sector on the study area.
3. To analyze the benefits and problems of MHP on the study area especially reference to electricity demand point of view.

1.4 Significant of the study

Micro-hydropower is the most effective and sustainable source of energy in Nepal. It plays a vital role in the overall development of country. In Nepal, there are a lot of water resources. However, due to lack of capital, technical work force and political crisis the mega hydro projects are still not easy and feasible source of energy. In Nepal more than 80% population resident in rural area but the mega electricity is focused in only urban area so, more than 80% of rural population are behind form mega project electricity on the present situation. On this context micro-hydro project will be the remarkable significance to uplift the rural economic by directly and indirectly contributing for employment and income generation.

This study will be analyzed on the pivot impact of micro-hydropower project on the income, employment and education of the study area. This study will be helpful for the policy maker to formulate appropriate polices for the development of micro-hydropower project in the rural area. The result will be also helpful for other institute and implementation of program effectively as well as it will be helpful to analyze the socio-economic impacts of MHPs in rural area of Nepal.

1.5 Limitations of the study

This study will properly base on primary data but it will be hire secondary data as well on the requirement of the study and as such, reliability will base on accuracy regarding the informants' also secondary data. This study will be concerned on the fact-findings impacts of MHP on income, employment, education also economic development during the establishment of Tanting MHP.

1.6 Organization of the Study

This study has been organized in six chapters. The first chapter is an introduction, which deals with background, statement of problem, objectives of study, significant and limitation of the study. The second chapter is review of literature. The third chapter deal with the methodology of the study. The chapter four is introducing the study area and the chapter five analyze the data, interpretation data and finding the results about impact of MHP on education, employment and income. The sixth chapter deals with findings, conclusions and recommendations of this study.

CHAPTER II

LITERATURE REVIEW

Micro-hydro is a term used to describe electricity-producing installations of up to100 kW. This technology falls into one of three categories: Patrice, Non-Peptic, or Improve Ghattas. Patrice sets are small, vertically mounted units with impulse-type turbines and induction-type generators and usually produce less than 5 kW. Non-Patrice sets use Pelt on or cross-flow turbines and typically produce more than 5 kW. Improved Ghattas use a traditional water wheel but instead of wood, the wheel is steel. This difference offers significant increases in productivity. Improved Ghattas are used exclusively for grinding and de-husking and do not produce electricity (Alternative Energy, 2005).

Micro-hydro power projects typically include a water intake, a weir or dam, penstock pipes, a turbine and a powerhouse. Water flowing from a source, typically a river, is directed into the intake, which screens fish or other debris from entering the turbine. After passing through the intake, water flows to the penstock pipe, which carries the water to the turbines inside the powerhouse. The water rotates the turbines, which drives the generators that produce electricity. This electricity is then transmitted to houses through transformers and transmission lines (Alternative Energy, 2005).

There are currently 1,956 micro-hydro schemes in Nepal, of which 810 are Patrice, and 347 are Non-Patrice. The installations of these systems are installed and overseen by local entrepreneurs, Non-Governmental Organizations (NGOs), local manufacturers, International Non-Governmental Organizations (INGOs) and the United Nations Development Program-Global Environment Facility (UNDP-GEF) (Rijal, 2000). The Nepalese government has taken a number of initiatives that they hope will foster the development of these projects. A license is not required to install a micro-hydro project as long as it produces 1000 kW or less. In addition, the government established the AEPC to promote renewable energy within the country. In addition, to help foster the development of micro-hydro projects, Nepal joined the United Nations Development Program-Rural Energy Development Program (UNDP-

REDP). This relationship has encouraged INGOs to support these installations through providing capital subsidies and building greater capacity. Nepal administers its subsidy program through the national Agricultural Development Bank (ADB) (Alternative Energy, 2005).

Nepal is a nation rich in water, with copious precipitation flowing from the Himalayas at an elevation of 3500 m or higher (Panthi & Nilsen, 2007). According to estimates from Rural Energy (2007), Nepal has the potential to generate 40,000 MW from large-scale hydropower and 50 MW from micro-hydro plants, but to date, facilities producing only about 533 MW (527 MW from large-scale and 6 MW from small-scale hydro projects) have been developed. While Nepal designates electricity shortages, a national emergency, according to the NEA, 80% of the Nepalese population remains without electricity. According to the Nepal News (2009), power outages are in effect 15 to 18 hours per day. In 2007, the Nepal Electricity Authority (NEA) was unable to meet the total energy demand of 23% during the day and 41% at night. At present, the evening electricity demand in Nepal is 720 MW, of which the NEA is able to provide a paltry 360 MW. The excess demand is met by India, which exports 60 MW to Nepal. Load shedding brings in the remaining 300 MW. The NEA cites lack of additional power development as the main reason for this energy crisis (NEA, 2008). The NEA is unable to expand its grid-based electricity system because of technical, environmental, and most importantly, financial constraints (Billinton & Pandey, 1999). The country's mountainous terrain and complex geology alone make the extension of grid-based electricity nearly impossible (Panthi & Nilsen, 2007). The cost of grid extension averages $10,000-$30,000 (Tanwar, 2007) in such terrain, is far too costly for the NEA. A NEA-proposed solution to the energy crisis concerns the construction of micro-hydro projects. Used for power generation up to 100 kW, micro-hydro projects have gained enormous popularity in developing countries during the last four decades (Khennas & Barnett, 2000). Micro-hydro generation is a cost-effective and low-impact technique for power generation that offers a potential solution for rural electrification in Nepal (Paish, 2002). According to a 2005 report by the Alternative Energy Promotion Centre (AEPC), 1,956 micro-hydro schemes with an overall capacity of 13,064 kW have been installed since 1962. There is much scholarly documentation of

the technical success of community based micro-hydro projects in the literature (Mallandu Development Society, 1999; Edwards, 1986; Holland, 1983; Osti, 2002; Khennas and Barnett, 2000; Rural Energy, 2007). Unfortunately, there are few, if any, related studies that provide a detailed evaluation of the role that public participation play in these micro-hydro projects. This study aims to perform such an examination, concentrating on micro-hydro power impact in the Nepalese village of Tanting.

Bajracharya (1991), has analyzed the problem and prospects of development of micro hydropower system in Nepal. He has traced out the historical development of HMP in Nepal. The promotion of these micro-hydro systems emerged essentially from the attempts to improve on the function of the traditional ghattas. The first initiative appeared in early 1960s when eight propeller turbines were installed for agro-processing in Kathmandu valley. Almost concurrently, a more powerful from of the traditional ghatta that uses metal components and is popularly known as the Multipurpose Power Unit (MPU) was developed by Akkal Man Nakarmi at Kathmandu Metal Industries and was popularized. Another important development of locally manufactured induction generators in 1984 contributed to the rapid growth of rural electrification. This has no doubt, played a very important role in the popularity and dissemination of micro-hydro system in Nepal. The national expertise is currently recognized in the international circle, as is evident from the export request and other enquires addressed to Nepalese manufactures of other countries.

Brodman (1981) in his study "Socio-Economic Impacts of Rural Electrification: Lessons from Central Java" has examined the socio- economic impacts of Klaten Rural Hydropower Project in Indonesia. This study is mainly based on primary data collected with structured questionnaire. The study has found that 88% if the businesses in the study area had installed electricity of the project, 71% of the electricity adopters with school children reported that electricity had caused an increase in their children's study time, more than 80% of the respondents said that electricity had made the village safer due to lightening of the village paths, more than 70% of both electricity adopters and non- adopters opined that electricity had benefited them by stimulating night- time activity. Business work hours had increased, 11% of the interviewed

households increased their income by using electricity in their home industries 33% of the business respondents reported that electricity use had developed their business, 50% of the business respondents and 43% of household respondents said that employment opportunities had increased due to electrification.

Aitken (1991) was conducted by ICIMOD to analyze the environmental social and economical impacts of mini and micro hydro power plants. This paper mainly concentrated on hydro electricity. This study found on the principle issues in the development of hydropower resources. In Nepal, the cost of hydropower, government subsidies, development of domestic resources, energy efficiency, coordination and control, impacts and benefits Electrification from hydropower in Nepal. This paper included that the private installations plats are more profitable than that of public installations. Reason for the profitability of the private sector installations include the fact that many started by providing agro-processing services and electricity generation was only added on later. By contrast, the government installations produce electricity only and have been expected to cover their running costs at least from the beginning. It also concluded that the lack of disposable incomes in remote areas and lack of the other infrastructural inputs required for industrialization is the causes of little demand for electricity. This report has made some recommendations. This paper suggested that the plans for grid extension must be made available because investors are deterred by the fear that the grid may be extended to their area, putting their plant out of business by providing electricity at subsidised prices. It also recommended that the technical training is needed in both public and private sectors. Particularly at the operative level to improve present standards. This paper suggested that the mini and micro hydro industry has the potential to become a national export industry as well as local supplies.

Korkeakoski, Mika (2009), in his study “impact of Micro-Hydropower Based Electrification on Rural Livelihoods: case study Nam Mong MHP, Lao PDR” has examine the long term impacts of renewable energy from Micro-Hydropower on poverty reduction. The main objectives of the study area;

- To examine the short-run and long run impact of electrification on rural livelihood and
- To find out the villagers experiences from electricity and impacts related to electrification.

The study has found that people have felt better and wanted to develop themselves and their surroundings, social status has increased with the introduction of electrical devices, electricity has enabled access to information and learning made communication easier within and outside the community. Women and children have less workload, more productive time and choices when to work, improved status and more safety after the electrification. Children have more choices when to study, studying is easier and they have become smarter as well as actives. Electricity has created choices when to work and given people more productive time especially in the evenings and mornings. Electricity has enabled increase in income through new livelihood activities and by making old livelihood activities carried out easier and quicker, workload and working time have decreased for all, life has becomes more convenient, healthy and safety. People have been spending more time on watching TV, interaction among the community members has lessened and cultural ways of dressing, signing and living have changed especially amongst teenagers. Community life has benefited from electrical devices such as Karaoke sets, TVs, CDs etc.

Further, the micro-hydropower dam has not any negative impacts but the introduction of electricity has encouraged more people to move into the village, thereby causing less forest resources (animals and plants) and fish available and reduction in water quality. Electrification has not improved access to health and education facilities; it has not improved access markets and banking facilities, but has been helpful preparing products for market. Access to information and knowledge has improved.

K.C. ,N.R. (2007), explained that Nepal has got long experience in hydro generation and its utilization. But even after completion of 10^{th} plan development of power in Nepal is still in infancy stage. A single scale large hydro plant has not been installed in the country. So, crisis of hydro energy occurs time to time uncertainly and consumer

are facing load-setting problem. Its contribution in over all energy consumption is only 1.5 percentages. On the other hand, pattern of little consumption is dominated by traditional resources firewood, which has created a serious environmental problem, deforestation and land erosion. Nation does not have sufficient hydro energy supply system in rural remote areas. There is not developed any alternative way of energy supply, rather based on traditional resources. Some alternative energy technologies are operates in these areas but they are not available everywhere in country. Except certain urban centres life standard and development place has not been achieved according to 21th century. Urban areas are facing great energy crisis. So only the way to cope with this problem is development of hydro energy and its balanced distribution in rural areas as well as remote areas of the country. The today's national interest should be in investment in hydro energy development using mostly internal resources and reducing foreign aid and loan in energy sectors. If we could mobilize the internal resources, it could accelerate the speed of hydro energy development. This helps to create the indigenous technologies in hydropower development sector. Alternative resources like micro-hydro and IPP production should be highly encouraged for increase INPS capacity. This is the only way, which uses the local resources and sustainable development of the hydro energy sector in Nepal. Lastly, we can conclude that, macro indicators are affected by agro-based activities in the Nepalese economy. Nepal could not achieve modern agro-based industrialization without harnessing available water resource in the form of hydro energy. Present agro-based economy could not give any sign of rise up beyond this development path. The stagnancy of agro-based economy could not be restructured without use of modern energy form.

WECS (1994) is a final report on the improvement of economic viability of MHP plants funded by UNDP and executed by WECS. This study is the first of its kind to analyze the wide-ranging issues related to MHP development. This study has raised more issues for further consideration than it has resolved which is natural due to the initial stage of MHP development. This report also studies on the identified and unresolved issues will be crucial to the successful promotion of the MHP. The main objective of the study is to prepare a set of guidelines to increase the economic viability of the MHP plants. This study is based on the information collected from 4

case studies namely Barpak, Gandruk, Angaha and Bhadure MHP plants. From these 4 case studies the report has identified some important conclusions and recommendations. The result of the study indicates that MHP Plants is the only major source of energy capable of supporting the efforts towards breaking the socio-economic changes in the rural hills. The results of the study also indicated that the introduction of subsides for MHP in 1985 played a vital role for MHP promotion. This study concluded that the development of a MHP promotion has been able to mobilize considerable resources from the people of hills. This report suggested that for successful promotion of end users the reliability and quality of electricity need to be improved. This study recommended that the government agency by given the responsibility for micro hydropower development. It also recommended that the outing subsidy for MHP should be continued on a long basis and appropriate legal framework to support MHP development be formulated. It suggested that 50% of the electrical component cost be financed through the resolving fund for non-remote areas. In addition, for a remote area 25% of the electrical component cost and 50% of the mechanical cost be financed through the resolving fund. The study also suggested that as currently individual ownership is dominant in MHP and the individual village entrepreneurs are not likely to be able to mobilize enough resources for large MHP, the effort should be made for promotion of company type MHP ownership as well. The study also recommended that the lift irrigation be developed as major end used of MHP.

Berend, v. B. (1991), analysis the social, economic and environmental impacts of micro hydropower technology in remote rural areas in Nepal case study of journal is taken and information is collected from 22 evaluated sites, this study discusses about the economic assessment, social impacts, technical assessment, environmental impacts and future hydropower development. The different issues of micro hydropower technology are also identified and the current situation in jumla is analyzed and found that this technology is not going to transform of micro hydropower has only limited opportunities to change the underdeveloped communities.

According to this study, the government led public electricity supply plants have run into many managerial and technical problems and failed to encourage industrialization in rural areas where as the private enterprises have been more successful and concluded that the government has done the right thing in privatizing the installations of micro hydro unites. This research concluded that the agro processing to more profitable than electricity generation. Profit from the agro processing is dependent on the quality of management of the owners skill of the operation and agricultural production of the corresponding area, further to develop the micro-hydro project in rural areas the income of rural people must be increased without creating significant income of rural people the micro hydro power will play only a marginal role in the liyes of the rural people. The study makes some important recommendations. It suggested that, the government has to develop a long-term policy of energy supply for a country to enable hesitation businesspersons to make up their mind whether to go ahead with their plants or not and the manufacturers should provide maintenance services in the main area where the customers are located. It also suggests that the development of micro hydro project has to be taken from village level upwards. It also pointed out that the real development has only a chance of success, if the persons involved are prepared to claim down to village level and work among the people instead of pretending to work for them.

Neston et. al. (1999) in their study "Community Micro-hydropower in LDCs: Adoption, Management and Poverty Project 7110" have examined the socio-economic effects of Micro-hydropower in Nepal, Srilanka, Ethiopia and Uganda. They have concluded that micro-hydropower has proved very successful as a tool to help rural people develop their economic position and improve their lifestyle. It provides extra energy in the rural area to reduce the drudgery of food processing and it can offer a means of generation electric power in an area away from the grid.

The study has recommended that subsidy should be given to micro-hydropower (MHP) plant in rural Nepal area rather than subsidizing other energy supplies such as kerosene and grid electricity. Since MNP has a very low running cost, loan finance should be available to the rural people. Trainings about their maintenance and

operation should be given to the rural people themselves for the sustainability of the project. Since the demand for power during the daytime in the rural area is very low, trainings should be provide to the rural so that people can start new businesses such as food processing mills.

WECS (1999) in the report analysis the wide ranging issues related to MHP development. This study has raised more issue for further consideration than it has resolved before due to the initial stage of MHP development. This report also study on the identified and unresolved issues crucial to the successful promotion of MHP. The main objective of the study is to prepare the set of guidelines to increase the economic viability of the MHP. It realizes the necessity that information and ideas should be shared to facilities and foster integrated resources planning. It has suggested that the promotion of MHP in high scale private sector should be encouraged and activated as what is in Thailand but in the context of Nepal, This sector is still at its infancy. They have yet to prove their cost effectiveness. Reason for installation of MHP in private sector for sometimes is better that decision making process in long and commonly underdetermined in community own MHP.

Aitken (1991) was conducted by ICIMOD to analyze the environmental social and economical impacts of mini and micro hydropower plants. This paper mainly concentrated on hydro electricity. This study found on the principle issues in the development of hydropower resources. In Nepal, the cost of hydropower, government subsidies, development of domestic resources, energy efficiency, coordination and control, impacts and benefits Electrification from hydropower in Nepal. This paper concluded that the private installations plants are more profitable than that of public installations. Reason for the profitability of the private sector installations include the fact that many started by providing agro-processing services and electricity generation was only added on later. By contrast, the government installations produce electricity only and have been expected to cover their running costs at least from the beginning. It also concluded that the lack of disposable incomes in remote areas and the lack of the other infrastructural inputs required for industrialization is the causes of little demand for electricity. This report has been made some recommendations. This paper

suggested that the plans for grid extension must be made available because investors are deterred by the fare that the grid may be extended to their area, putting their plant out of business by providing electricity at subsidised prices. It also recommended that the technical training is needed in public and private sectors. Particularly at the operative level to improve present standards. This paper suggested that the mini and micro hydro industry has the potential to become a national export industry as well as local supplies.

MIT series no 10, ICIMOD 1991 was prepared for and presented at the seminar on "Rural Energy and Related Technologies" held in Kathmandu from 26 to 28 March 1991 in collaboration with the ADB/N and WECS of His Majestry's Government of Nepal. This paper assesses the development of the micro hydro system for the last sixteen years, identifies factors that contributed to the success of this technology and also the factor affecting in its development and also indicates the priority areas for future development and promotional efforts. This paper is based on the information collected from 6 case studies. From these different 6 case studies, the paper presents some recommendations and suggestions.

It recommends that the success in MHP development is the relicensing of installations below 100KW capacity. The study also identifies from the owner's points of view the MHP units constitute a paying proposition except in cases of very bad management, the mill and electric generator (specially with 50% subsidy) bring sufficient revenue to enable other to repay the loan instalments in time and make a profit over and above the amount. People are willing to contribute towards the capital cost out of their own pockets. They are ready to pay from Rs 12 to 16 per 40-Watt bulb per month, which is several times higher than the standard NEA rate. This paper suggests that due to the lack of operating knowledge the plants have been facing many difficulties like load shedding. This paper concludes that the government is right in privatizing the installations of Micro Hydro units and it has to develop a comprehensive and integrated policy to promote micro hydro development. This has to be complemented by realistic planes of action in which people can participate with effectiveness and derive tangible benefits. This paper suggests that a diverse has to be adopted given the

physical, cultural and economic conditions in the country. The range of activities can be expanded from the provision of inexpensive constructions kits for improving the facilities to the larger schemes that integrate electrification with various rural industrialization ativities.

Dhungel (2002) in this article examine the trends and patterns of energy consumption in Nepal. He has mentioned main source of energy in Nepal are traditional sources. This consists of fuel wood, agriculture waste, animal dung etc. In addition, commercial sources which constitute coal, petroleum product, hydropower etc. Energy consumption in Nepal is dominated by biomass, which accounted for 90 percent in FY 1984/85, 94.9 percent in FY 1989/90. 91.4 percent in FY 1995/96, 86.4 percent in FY 2000/01.

Adhikari (2005) has examined the component of energy sector assistance programme in Nepal. He stated that the institutional development of the sector stated date bake to 1960s when Swiss assisted to the establishment of a manufacturing company named Balaju Yantra Shala in Kathmandu. The electrification from the micro- hydro started after 1985 when the government announced a provision for the subsidy primarily on adding generator to existing turbine mills. A large number of generators were added in the existing turbine mills and also some new schemes were built for the stand alone electrification purpose. A quick progress was witnessed in a short period of time. More than 400 micro- hydro plants were locally manufacture and installed in Nepal. Paltry sets were installed at the rate of two units per week. Research and development took a place especially for the electric load controller and some other electrical components. Intermediate Technology development group (ITDG) brought electric load controller technology to Nepal, eliminating the need for the turbine governors that were prohibitively costly for micro-hydro plants. Turbines manufactured in Nepal were exported to India and other countries. Manufactures came together to form association and established Nepal micro-hydropower development association.

Karki (2004) in his study on the Dajungkhola MHP in Myagdi has examined the MHP in rural electrification and analyzed the people participation for development and

promotion of MHP in Okharbot VDC. He has found that more than 30% of the households are directly benefitted by project. The literacy rate has increased, study hours have increased, consumption of kerosene has decreased by 3-5 litters per month and income level has increased. He also found that 21.74% of household are involving in productive works by using MHP system and their income level has increased on the average by Rs. 2500 per month after the installation of the project. Further the health condition has improved. The BCR of the plant has been found to be greater than one NPV positive. So the project is economically feasible and it playing a vital role in the improvement of educational status, health condition, resource mobilization, information sharing, co- ordination and capacity building. As a method for data collection, he has used structured interview, questionnaire and focused interview.

This study has recommended that a integrated approach for promoting MHP in Nepal needs to be adopted, the participation of women in planning and implementation of MHP should be ensured, technology promotion and entrepreneurial development programs should be organized, technical training should be given to private and public sectors particularly at the operation level to present standards. Capability should be built at village level for operation, maintenance and repairing, community- owned, and managed micro- hydropower plants should be promoted.

Winkrock International Nepal (2006) has examined the role of energy in poverty and its links to people's living conditions in terms of education, health, sustainable environment and women's empowerment. While REDP and other rural energy services have been in place for almost a decade, the quantitative measurement of their efforts towards the national poverty reduction strategy (PRS) and MDGs have not been documented and reviewed in detail. This study is designed to analysis the REDP's impacts on energy linkages in achieving PRS as well as MDG targets. The two primary objectives of this study were to undertake comparative analysis of changes before and after REDP intervention and analyze the overall approach of program that contributed to MDGs.

This report found out several improvements in REDP supported communities is some MDGs indicators, indicators such as women's empowerment (MDG3) is found to be

directly influenced by REDP's initiatives, with 48% of the total women interviewed holding higher positions in various community based organizations. This was also confirmed with positive response for community elders. Recall questions also established the significant role of REDP in achieving greener and sustainable environment (MDG7) and that REDP's holistic approach plays a key role in hitting a number of MDGs targets simultaneously. However, this study also suggests that linkages between energy and some development outcome are too complex, and that a better understanding of these linkages is still needed. Overall, positive changes in many indicators confirmed the vital role of energy in the development process of the rural communities studied. Considering that REDP is providing in a integrated manner, including skill development, enterprise development, information services, institution and capacity building, fuel supply, technology manufacturing operations and maintenance etc with encouraging output it can be considered as a best practice model operating so far in Nepal.

Nepal (2008) in his study "Hydropower Development in Nepal" has analyzed the consumption pattern and trend of energy in Nepal. He has analyzed the development of hydroelectricity in Nepal and examined the prospectus and constraints. This study has concluded that Nepal is currently facing a power shortage and it is feared that it will get worse it we do not work to enhance our capacity for energy generation. The major constraints of hydropower development of Nepal are not only the financial constraints, but also policy inconsistency, planning deficiency, licensing anomaly, PPA related constraints and environmental constraints. The main challenge for the country now is to harness the hydropower potentiality. Policy deficiencies and the slow decision making process in electricity sector gas resulted in the increased project costs and has reduced the investment of private sectors and entrepreneurs.

This study is descriptive as well as analytical using primary as well as secondary data. Key informant interview has been use as a tool to generate primary information.

Upadhaya (2009) has evaluated the effectiveness of micro-hydro in Nepal. This study investigates the efficacy of community- based hydro projects in tow remote villages. Luwang Ghalel and Chandruk, as well as the role of public participation in these project. This report employs a case study methodology, with data collection taking the form of interviews, Survery, and document reviews. The results of this study show that micro-

hydro projects are a temporary solution at best. Base on internationally accepted criteria, both the technical performance and the level of public participation at both projects were found to be very low. Gender, caste, ethnic group and socio- economic stratification have also seen an unequal distribution of the project benefits. According to her, Nepalese national power grid would be expensive and problematic, micro hydro project have proven to be an economical and efficient alternative in the effort to power remote villages deep in the mountains. Her findings indicate that both the Nepalese government and associated nongovernmental organizations must make significant policy changes if they hope to achieve success in future development work with community-base micro- hydro project.

Awasti (2010) in his study 'Socioeconomic Impact of Chameliya Hydropower Project in the Adjoining Area' has examined the socio- economic impacts in Chameliya Hydropower plant in the adjoining area. This study has concluded that the socio-economic impacts of the project are moderate in absolute term and satisfactory in relative term. The project has provided sufficient drinking water and employment opportunities to the local people and electricity supply has extended the social and recreational activities like increase in educational standard, purchase of radios, TV, Tape recorders etc.

This study is a descriptive one based upon qualitative data. It has used primary as well as secondary data. The primary data has been generated from field survey, interview, observation and questionnaire.

Gurung (2011), in his article 'The potential of a renewable energy technology for rural electrification in Nepal' has analyzed that energy is undoubtedly a fundamental means for securing basic needs of life support system and development efforts. However, despite having enormous potential for hydro-electricity generation in Nepal, the share of the electricity in national energy consumption is 2% Nepal has a low electrification rate, in which nearly 50% of the total population has access to electricity, mainly to those living in urban areas. Because of the lack of other commercial energy sources, the country heavily relies on traditional energy sources, especially firewood. Use of the traditional energy sources is detrimental to health, hygiene and environment. Due to lack of technical capability and poor economy, many mountainous villages are likely to be without the

national gridline electricity in the foreseeable future. However, the electricity demand is increasing countrywide.

Sharma, G. (2007), explained that the involvement of private sector in the development on hydropower in Nepal is a most and there is a lot of enthusiasm on the part of private sector too. However, very few realize that there is a lot of risk associated with hydropower development. This is particularly true for local developers who are mainly capable of developing small size projects (up to MW). Such small projects are very often not well studied and the developers cannot afford to spend more on detailed study. Often they do not realize the value of such study and try to jump to power purchase agreement and project construction. This usually to cost overturn, time delays and unavailability of predicted energy. On the other hand, the success of few earlier developers can no more be an example for recent developers. The most of project is increasing every year due to inflation on work force, materials and equipment cost but there is no price escalation on the power to be sold. In contrast, facilities like tax holiday for fifteen years is no more available and Nepal Electricity Authority is tightening the power purchase agreement more and more in its favour making life for the independent power developers.

MHP scheme, one of the most successful modal of RETs in Nepal, has proved to be successful in improving the socio- economic status of its consumers through the multiple benefits it provides at a household, community, and the country. Generation of direct as well as indirect benefits to individual and the society is the reason behind the success of MHP system in Nepal. Improvement in health, sanitation, education, environment and income are some of the pronounced local benefits from MHP projects in rural households. Owing access to electricity reduced drudgery for women in sample household in Tanting allowing them to have enough time to be involved in other household related activities including income generation and social and community developmental activities similarly, electric lights in households extend the day providing additional hours for evening reading and also reduced drudgery for children. Thus, the development of MHP scheme would be a milestone clean, affordable and sustainable energy, which is must for the overall development of rural areas in Nepal.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research design

The main attempt of this study will to analyze the impacts of micro-hydropower in income, employment, education and its effectiveness on economics development of Nepal. Therefore, this study will be analytical as well as descriptive in nature. The whole study will be carried out on the basis of mainly primary as well as secondary data. Reliable and relevant study will be made only by applying scientific method. Mostly it will be used both the quantitative and qualitative techniques depending the nature and source of data and information.

3.2 Nature & source of data

This research study will base on primary and secondary as well as quantitative and qualitative data from questionnaire through the household survey. The primary information will be collected from field survey through questionnaire. In addition, additionally, secondary data will be used for this research study from different sources such as economic survey; CBS reports relevant bulletins, internet, unpublished thesis etc.

3.3 Method of data collection

For the research study, data about the effectiveness of the electrification will be collect through direct personal with the help of structured questionnaires among directly projects affected families in the society since the installation of micro hydropower in Tanting. The structure of questionnaires will be used to as a tool to collection both of qualitative and quantitative data in the research study.

3.4 Data processing

The data are carefully edited, processed and tabulated by traditional method like tally bars, table, diagram by using computer software like MS-Excel, average etc. The field questionnaires have been checked for possible errors and the collected data will be classified according to its nature & characteristics to make the analysis more reliable and easier, different data sheet have been prepared for different variables. The data or worksheet will be analyzed of the impact of MHP on income, employment, education sectors before and after instalment of MHP in the study area.

3.5 Analysis and Interpretation of Data

The study will be attempts to show the impact of MHP on peoples of Tanting. The various qualitative and quantitative data will be present in various units and forms depending its nature to conduct through analysis on its objectives fulfilment. A number of mathematical tools such as tabulation, percentage, pie-chart, bar-diagram and other graphical charts are used as required in analysis. And also used to some electronic MS-excel etc.

CHAPTER IV

ANALYSIS OF DATA

This chapter presents the analysis of data and their interpretation with the help of different diagrams, figures and bar-diagrams by the help of qualitative analysis. Section 4.1 presents the socio-economic condition of the village, caste and religious distribution of the population of the study area; section 4.2 presents the results from the analysis of data.

4.1 Socio-Economic condition of the village

Socio-economic feature depicts the status of the particular village, area and the whole a nation. Sociological and economical characteristics such as religion, education, employment, health, environmental situation have a significant influencing in the economy of the nation and standard of living of the people. Unless the economy of the household improves, the development and prosperity cannot be achieved.

4.1.1 Caste and religion

Nepal is the multi dimensional country as various castes, religion and cultures. As Nepalese society is characterized by heterogeneity and multiplicity, the catchment area of the research study also includes various castes like Gurung, Kami (Dalit), chhetri their different language specially, Gurung's have own language and Nepalese language for others castes. Specially Gurung is dominant castes among the whole population of the study area, while Dalit are the second position and the chhetri are the third and others castes respectively.

Religion is the deeply rooted belief among people that binds them together. It is the determinant of cultures, beliefs, customs and values. The majority of the

people in the research catchment area are Buddhist and little bit Hindu. The table 4.1 shows the distribution of castes respondent.

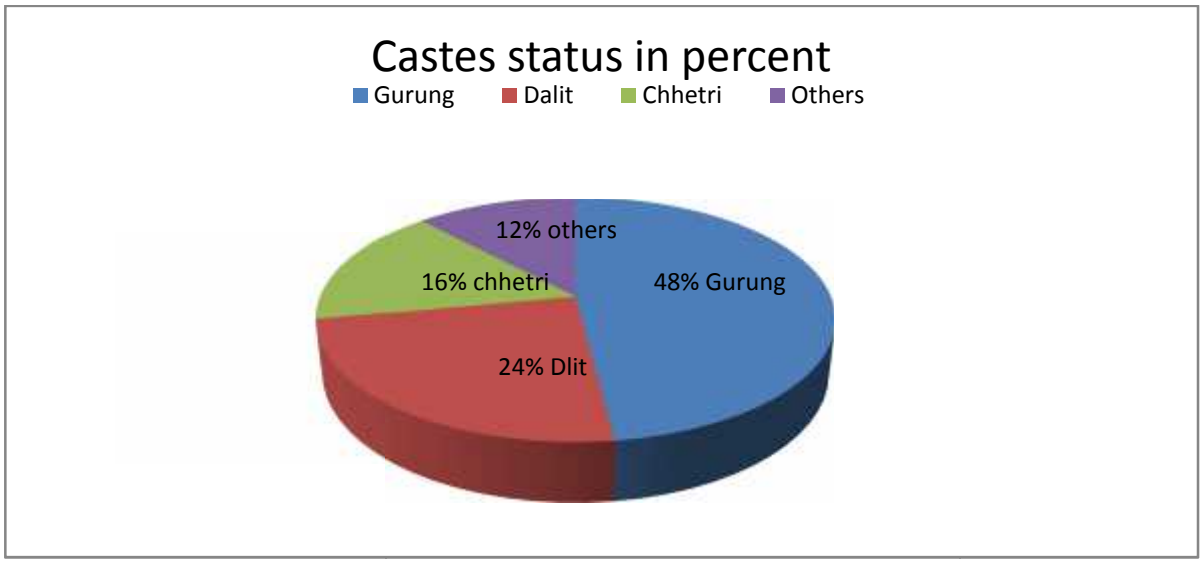
Table 4.1: Distribution of castes respondent

Castes	No of Respondent	Percent
Gurung	24	48
Dalit	12	24
Chhetri	8	16
Others	6	12
Total	50	100

Sources: Field survey, 2014.

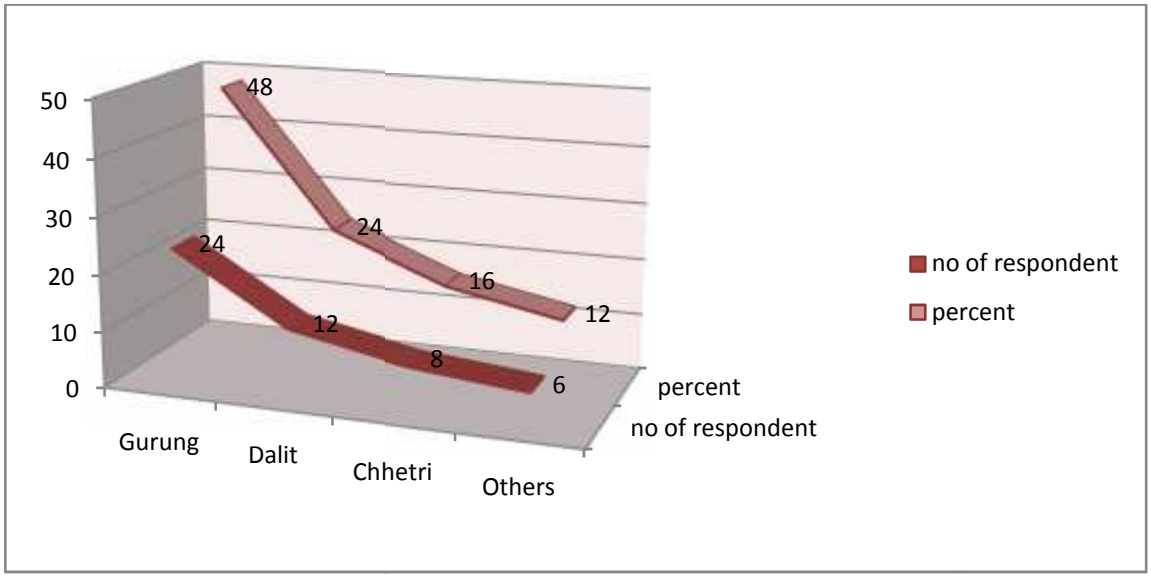
Gurung is the dominant castes in this research catchment area representing nearly 48 percent followed by Dalit 24 percent, Chhetri 16 percent and the others castes representing 12 percent by the below pie-chart. By this above tabulated expression, the research area is mostly Gurung dominant and most of the peoples affected by Gurubg culture (Table 4.1).

Figure 4.1: Distribution of castes respondents



Above diagram 4.1 shows that this study area is Gurung dominates area where there are major three castes and some are others the 48 percent people are Gurung, the second position dominates castes 24 percent are Dalit, 16 percent are Chhetri and 12 percent are others of the sample households in the study area over the 50 respondents.

Figure 4.2: Distribution of castes respondent and percent



The above figures 4.2 represent the distribution of castes in this study area in percent as well as number. Both lines show the Gurung castes are highly than Dalit and chhetri, others respectively. So this study area is manly Gurung dominant area.

4.2 Socio-economic impact of MHP

This section covers the socio-economic of MHP plant in this study area. This study is focused on specially What change bring occurred in social as well as economics, health, education and income aspects of the people in the area covered by the Micro Hydro Plant project. The different impacts of the MHP are as below by the help of different figures and tables through the comparative study of the field survey data.

4.2.1 Annual income Level of Sample Population

Income level determines the resource mobilization, living standard, education level and health also. Generally, it is believe that high level of income increases the quality of life. In the study area, there are many sources of income such as agriculture, government job (service), foreign job, business, labouring and others. It is generally difficult to figure out the individual household income because the numbers of households do not like to respond to question about their income because of the fear of publicity of their economic status. Specially, it is difficult in a society like our where material wealth is used as a tool to place a family or an individual in the hierarchy of society. As a result, respondent answers this question with caution. To estimate the household income, the probable source of a household income has to be considered, such as sales of agricultural products, animal products, salary, labour wage. The annual income level of the sample households is shown in table below.

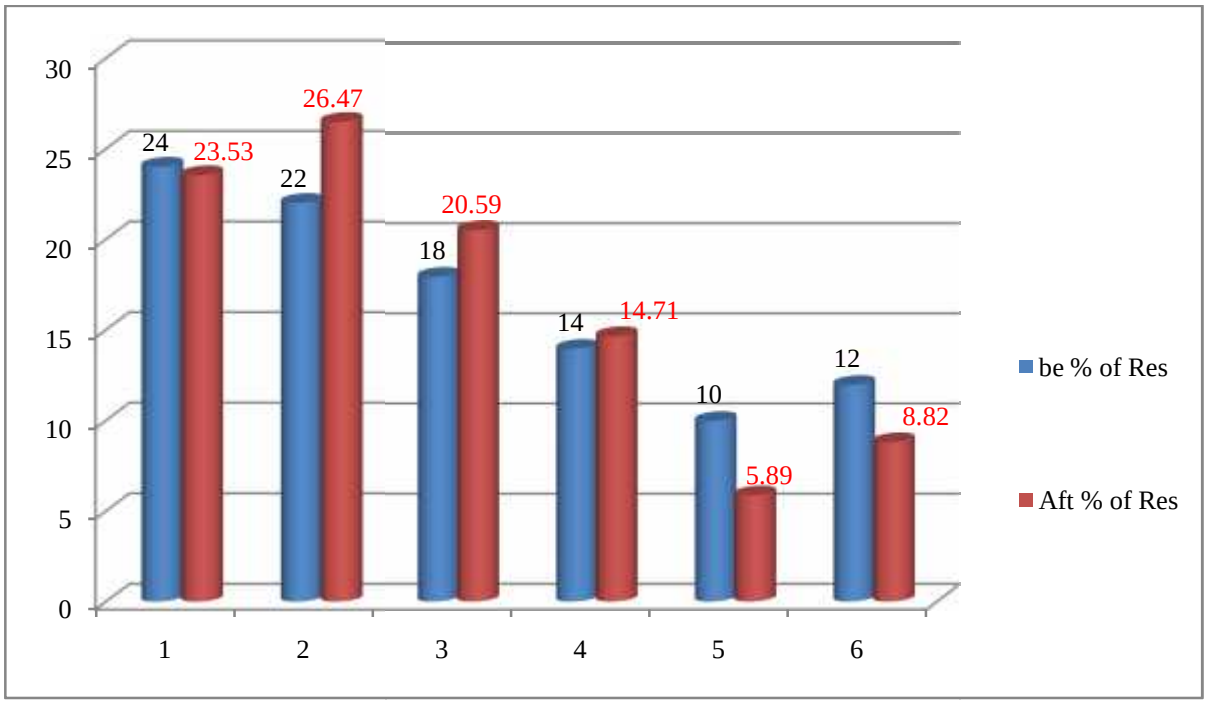
Table No. 4.2: Respondents by Annual Income Before and After MHP

Annual Income of HH	No. of Respondents Before MHP Installation	No. of Respondents After MHP Installation	Before % of Respondents	After % of Respondents
Less than 20	12	8	24	23.53
20 - 40	11	9	22	26.47
40 - 60	9	7	18	20.59
60 - 80	7	5	14	14.71
80 - 100	5	2	10	5.89
More than 100	6	3	12	8.82
	50	34	100	100

Source: Field Survey, 2014

Table 4.2 states that, the installation of MHP has changed the sources of income, output, education, health etc. in the project-covered area. Above table, the income level of the household in special six different groups. Before MHP installation, the group of less than twenty thousand income received by 24 percent respondents whereas after installation of MHP 23 percent respondents only get less than twenty thousand annual income it means the near about one percent respondents have improve their income level. Similarly, the group of more than one lakh income level group of respondents have been improved their income level reducing percent of previous receiving level by near about 3.18 percent.

Figure 4.3: Income of HH Before and After Installation of MHP.



Source: field survey 2014

The figure 4.3 shows that the improved income level of the respondents over the total 50 respondents. They improved their income level to reducing respondent's number over the 34 respondents in different income groups. In above the figure the compare study of the income level of the sample household as respondents answer. There are six different groups of income level household in the study area. After installation of MHP plant, they improved their income level to reducing the every group's respondents.

4.2.2 Occupational Status of the Study Area

In this study area, the comparative study of occupational status before MHP installation and after installation of MHP. It has changed the occupational status in the project-covered areas. Meanly the traditional occupations have significantly improved after installation of MHP in the study areas. After MHP installation, most of the peoples are attracted business, foreign employment,

government services and daily wages. After MHP plant installation, there have been creates various types of new businesses such as electrical shops, home-stay for the tourists, sawmill, agro-processing-mill etc. have been expanding in the focused area. This project has provided employment opportunities to daily wages especially in tourist guides and home-stay servicer. Now a day the study areas has totally changed into tourist sports day to day increase in number of tourist and by home-stay servicing.

Table 4.3: Occupational status of study areas

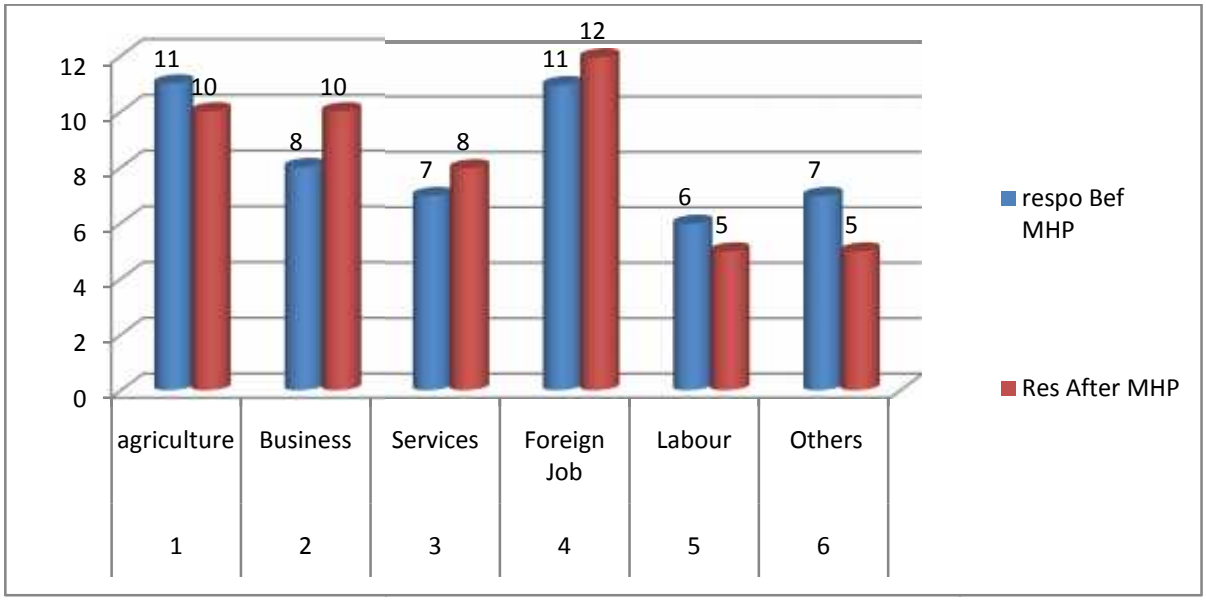
S.N.	Income Sources	No. Of Respondents Before Installation of MHP	No. Of Respondents After Installation of MHP	Percent After Installation of MHP
1	Agriculture	11	10	20
2	Business	8	10	20
3	Services	7	8	16
4	Foreign Job	11	12	24
5	Labour	6	5	10
6	Others	7	5	10
		50	50	100

Source: field survey 2014

The table 4.3 shows that the change in occupational status of the study area before and after the installation of MHP. The previous time, 11 respondents are answered involved in agriculture sector whereas after installation of MHP the number of involvement in agriculture sector's people are shifted into the other different field of occupations like shifted to business, services and other (home stay) from agriculture and labour sector. After installation of MHP, there is create some new opportunities except the agriculture sector like increase in home stay services, tourism, educational status has been improved therefore peoples are shifted to other sectors from the traditional sector like agriculture,

labour services. There have been some mobile house, other types of business so people are shifted this sector after establishment of MHP in this focuses area. According to this table, after established of the MHP in the catchment area, 20 percent youth are involved in foreign job, 16 percent are services sector, 20 percent are agriculture and business and 10 percent are labour and other sectors involvement after installation of MHP in the focused area.

Figure 4.4: Occupational status of study areas



Source: field survey 2014

This figure 4.4 shows that the occupational status before and after installation of MHP plant in this study areas. It shows that the agriculture status has not been as an attracted occupation for the people after the installation of MHP they has been shifted in different new sectors like Home-stay, business, foreign job and service sectors. On the based, figure 4.4 refers to the comparison study before and after established of MHP in the research area, near about 9 percent people are changed their occupation from agriculture, 25 percent are additional involved in business, 14.5 percent are increase in services and other sectors after the established of MHP.

4.2.3 Source of energy

Tanting is one of the remote villages of kaski district. It is one of the village of Nagarjung VDC of Kaski District. In this village, the facility of electricity was not availability in the study area before the establishment of MHP project. People of the focused area used firewood, kerosene as a source of energy before the installation of MHP project in this area. Now all household are installed Hydro Electricity for lighting. Use of kerosene has been significantly replacement by the Hydro Electricity of this focused area.

Table 4.4: Source of energy

Sources	Firewood users HH	kerosene users HH	Electricity users HH
Before MHP	52	52	0
After MHP	50	10	45

Source: field survey, 2014

Table 4.4 shows that after the instalment of Micro Hydro Project, 42 households have completely dropout the use of kerosene and 50 households have installed electricity for the lightening.

4.3 Impact on income and expenditure in different

Before instalment of MHP Project in the study area, the pre month expenditure in different sectors like as Rs Two thousand in firewood per month, Rs180 in Kerosene, Rs 450 in petroleum, Rs 300 in lamps and the cost was not in Electrification due to the lack of electrification availability in the study area. Whereas after installation of MHP the cost in firewood, kerosene, petroleum,

lamp are reducing by high rate that is Rs 600 in firewood, no cost in kerosene, Rs 20 only in lamp but the cost in electrification is Rs 150. Therefore, after installation of MHP Rs 135 increases the cost of electrification. However, except the electrification cost it has reduces the other cost in different sectors by high amount.

Table 4.5: Income and expenditure of households before and after MHP

S. N.	particulars	Unit of Cost	Before MHP		After MHP		change in Qty
			Qty	Cost	Qty	Cost	
1	firewood(Bhari/ Month)	200	10	2000	3	600	7
2	Animal Dung(kg/Month)	10	2	20	0	0	2
3	kerosene(L/Month)	60	3	180	0	0	3
4	Petroleum(L/Month)	90	5	450	0	0	5
5	Lamp(pcs/Month)	10	30	300	2	20	28
6	Electricity(Unit/Month)	2.5	0	0	60	150	0
total				2950		770	

The table 4.5 show the quantity unit of electricity was zero before established of MHP on this area and there is no any cost bearing on electricity whereas after stability of MHP the cost bear in electrification is 150 but except electricity, consumers has cut-off their expenditures on different particulars like as firewood, animal dung, kerosene and petroleum sectors.

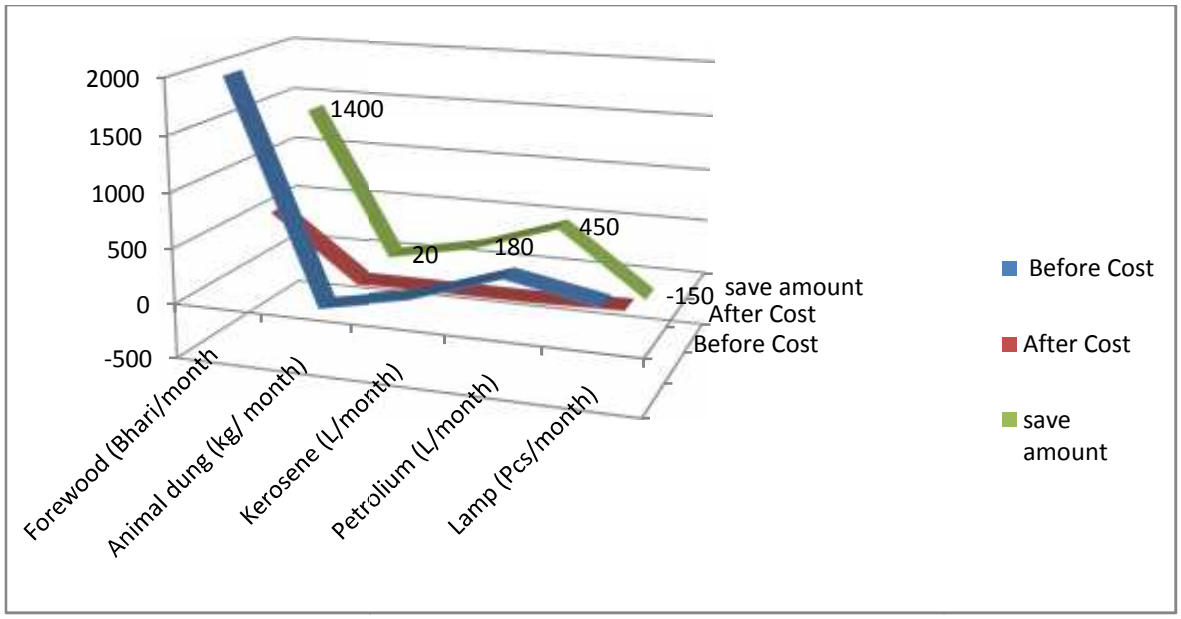
Table 4.6: Cost and saving amount after MHP instalment

Particulars	Before Cost	After Cost	save amount
Firewood (Bhari/month	2000	600	1400
Animal dung (kg/ month)	20	0	20
Kerosene (L/month)	180	0	180
Petroleum (L/month)	450	0	450
Lamp (Pcs/month)	300	20	180

Source: field survey, 2014

Table 4.6 shows that the saving after establishment of MHP in the research area in different particulars likes firewood, animal dung, kerosene, petroleum and lamps per months. Before installation of MHP in the area, per household consume Rs 2000 per month on firewood, Rs 20 on Animal dung, 180 on Kerosene, Rs 450 on Petroleum and Rs 300 on Lamp in rupees per month expenditure whereas they can be saved Rs 2180 (form 4.5) in aggregate in different particulars after established of MHP in this study area.

Figure 4.5: Cost and saving amount after MHP instalment



The figure 4.5 shows cost in different sector before and after installation of MHP plant project in the study area. When the production of electricity the household heavily reduces their expenditure in firewood and saved Rs 1400 per month in firewood. Like wish, the other heading cost has decreased and increased their saving.

4.4 Impact of MHP on Education sector

Nepal is one of the second richest countries among the world in water resource but most of the peoples are depriving by the lighting of electrification and pure drinking water until now. People have been spending high amount in kerosene, fuel, firewood as form of power, foreign made solar etc. In this situation, schooling generation is mostly affected, after the installation of MHP in the study area.

Education is the foundation of human being and the basic need for each people. Most of the rural sector's children are obliged to use kerosene as electricity while they are studying in the evening and morning time. On the one hand, they cannot improve their habitual action in study due to the lack of electricity lightening and on the other hand, it was highly expensive. So their parents can't bear the high cost in kerosene due to the lack of their enough income sources. When installation of MHP, their study time has increases and improves their education pattern. The increment in the study hours of

students after production of electricity in the research area has been given in the table 4.7.

Table 4.7: Impact in study hours per day after producing electricity

S. N.	No. of Respondents	Before Electricity	After Electricity	Increment hrs/day
1	14	2	3	1
2	10	2.5	3.5	1
3	9	1.5	3	1.5
4	10	1	3	2
5	7	3	4	1
total	50	10	16.5	7.5

Source: field survey, 2014

Table 4.7 shows that, out of 50 respondents, 14 replied that the study hours of their children has improved by 1 hour, 10 respondents replied 3 hours, 9 respondents replied 1.5 hours, 10 percent replied 2 hours, and 7 percent are a hour improved their children's study hours per day.

Table 4.8: Improvement in school performance

Response	Numbers of respondents	Percentage
yes	37	74
no	13	26
total	50	100

Source: field survey, 2014

Table 4.8 and figure 4.7 show that 74 % respondents out of 100 replied that the performance of their children at school has been improved. Nevertheless, 26 % out of 100 children has not improved at school performance still. They said that, they are illiterate to guide their children and they cannot observe d whether their children study subject matter or other books.

4.5 Impact of MHP on use of Electronic Devices

The case study focused on impact of MHP installation in the research area. It is the comparative study of impact of Micro Hydro Power Project plant in this area. Therefore, before electrification, most of the people in the catchment area used few electrical devices and instruments like Radio, TV communications devices using cell battery and very few solar charges. So they are deprived from the most important news, communication etc. when the electricity has been established in Tanting Village the numbers of electrical devices like mobiles, TVs, Radios etc. all are increased in large amount. After installation of MHP in this village, most of the people are inspire by MHP and they changed their habitual actions like study hour, lightening system. This shows that people have been access to different information and entertainment

facilities due to the installation of MHP. Table 4.9 shows the situation of electrical instruments used before and after electricity production in the study area.

Table 4.9: No. Of electrical instruments before and after Electrification

S. N.	Electrical Instruments	Before MHP	After MHP
1	Radio	35	60
2	Cassette player	10	30
3	Television	0	25
4	Refrigerator	0	2
5	Chargeable battery	0	35
6	Mobile phone	5	200
7	Rice cooker	0	5
8	Heater	0	0
9	Computer	0	15
10	Iron	0	20

Source: field survey, 2014

Figure 4.6: No. Of electrical instruments before and after Electrification

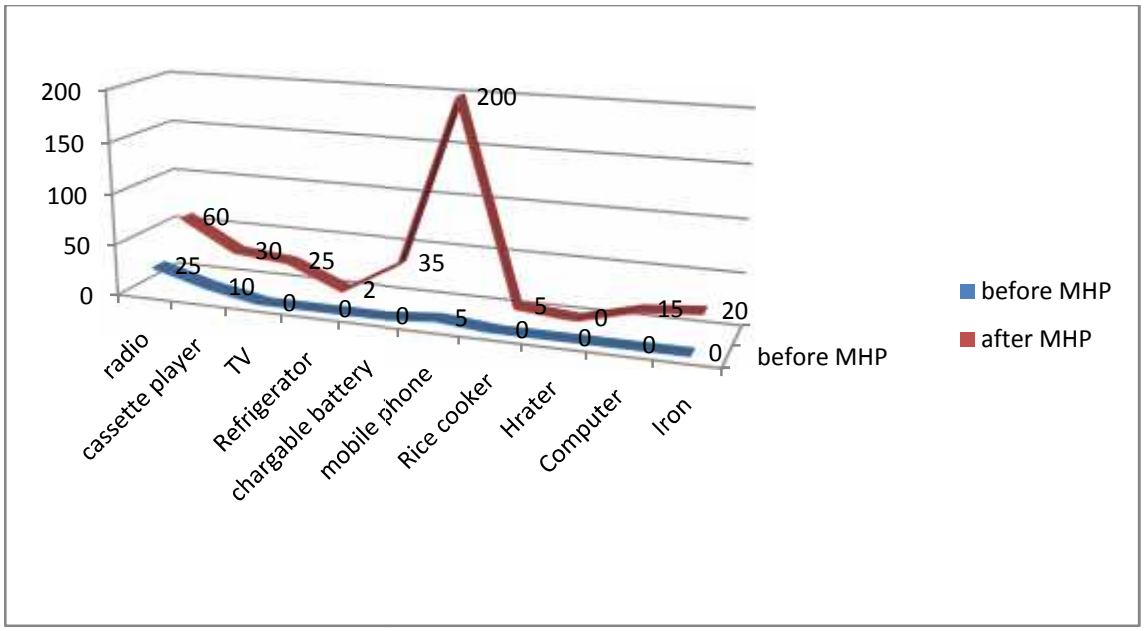


Table 4.9 and figure 4.6 shows that, out of 50 households, 35 household used Radios sates and 10 household used cassette players, 5 households used mobile phones but they cannot used any sets of others devices which mentioned table 4.9 and figure 4.8. But after installation of MHP, this no. Of devices has been increased by large amount and others used of devices has been increased which representation by the above figure and table. Before installation of MHP project in the study area, there was no other electrical instrument like TV, fan, Heater, Refrigerator, Iron and Rice cooker. After installation of MHP project, the number of facilities using those kinds of electrical instruments increased in the study area.

4.6 Impact of MHP on agro processing

Nepal is one of the agricultural developing countries. As an agrarian country, more than 82% people adopted agriculture as the major occupation. In the research, focused area 70 % people adopt the agriculture. The agro product should be processed before consuming. For agro-processing in rural and remote area, traditionally prepared okhal, jato, Ghatta were widely used. Even those it

consume more time, there is no any available alternative to substitute it. The housewife in the hilly area should get up early in the morning to process the agro-product in okhal, Jato, Dhikki and Ghatta, to conduct them, manual power is needed. Therefore, it promotes the drudgery of women. However, after electrification they have used mill and other modern food processing basins.

Table 4.10: Means of agro processing after and before MHP

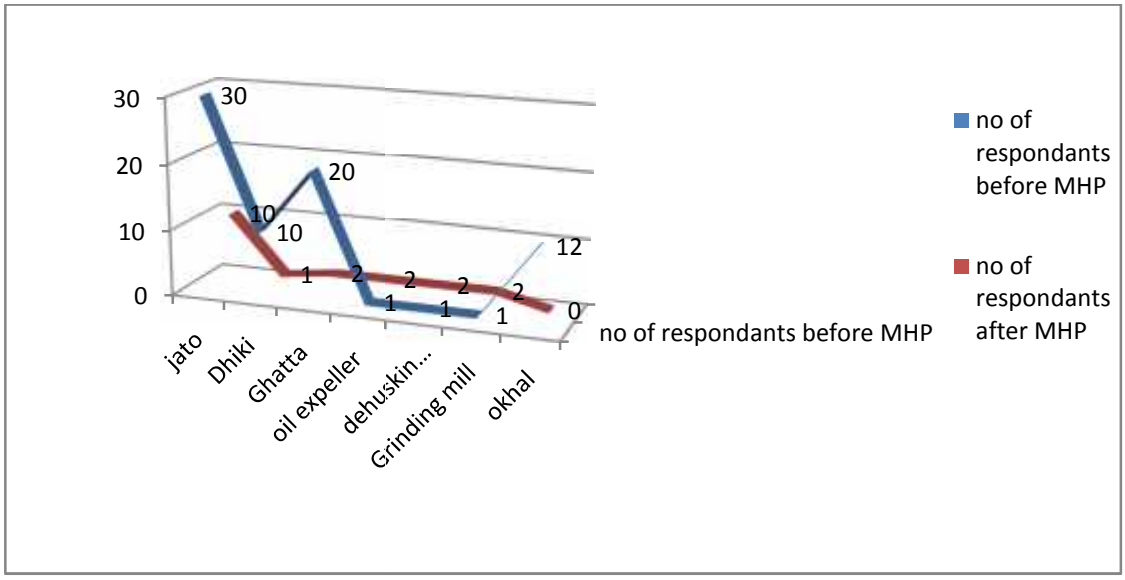
S. N.	Means of agro Processing	No. of Respondents Before MHP	No. of Respondents After MHP
1	Jato	30	10
2	Dhiki	10	5
3	Ghatta	6	2
4	Oil expeller	1	2
5	Dehuskin mill	1	2
6	Grinding mill	1	2
7	Okhal	12	0

Source: field survey, 2014

Table 4.10 shows that, most of the respondent's family uses different types of traditional agro processers before Hydro Electricity Power. They used 30 traditional processer as Jato, 10 Dhiki, 20 Ghatta, 12 Okhal and very few mill.

However, after electrification production, there are stabilised some modern mills for agro processing basin.

Figure 4.7: Means of agro processing after and before MHP



Source: field survey 2014

Figure 4.9 shows that the reducing traditional agro basin processer and increasing in modern electrification agro basin processer after establishment of Micro Hydro Power Plant in the study area. It has saved the time of the user group and reduced the drudgery of women because women had to use the dhiki, Jato to process the agro product before electrification.

4.7 Advantages and Disadvantages of installation of MHP

4.7.1 Affordability of Electricity

The minimum cost of electricity in the village 'Tanting' MHP distribution system is Rs 2.5 per unit per household for up to minimum 30 units. Per unit price above 30 units is Rs 6. Out of 50 respondents, 10 reported that the charge of electricity is expensive, 15 reporters respond not assessable for demand of

electricity. It only for lightening, for some limited TV, Rice Cooker but it is not assessable based on demand.

4.7.2 Regularity of Electricity

As reported by the respondents, the distribution of electricity is not regularity. It's only supported in lightening in the evening and not availability in daytime. In daytime, it should be distribute for the mill and productive sectors. At that time, the electricity is not available for the household sector for lightening, charge, TV and so on. Therefore, it is not assessable based on demand as well as regularity.

4.9.3 Low Power

The Tanting MHP Plant's Electricity has been distributed to 200 household of Tanting village in Kaski District. It is only 30 KW, so the power voltage of the MHP is not especially supports on based Demand view of power voltage. It is not very much effective in operating electrical instruments and is influencing even for lightening during peak hour.

CHAPTER V

CONCLUSION, SUMMARY AND RECOMMENDATIONS

5.1 Summary

Hydropower as a non-polluting, environment friendly, renewable, locally available and reliable source of energy. To meet the national energy targets, small-scale hydropower plants are effective for the electrification of remote areas. Electrification creates various opportunities of environmental activities in rural areas. The use of fossil fuel is also costly and it negatively pressurizes on the balance of payment in the economy. Over pressure on forest creates various problems.

Energy is one of the prime movers in the process of the economic development and its per capita consumption has been regarded some times as one of the indices of economic development. Energy consumption part is the most important indicators of measuring development status of the country. In the Nepalese context, micro-hydropower as an important energy source, especially in the rural sector should never be neglected.

Micro-hydro project plant has been able to bring about profound socio-economic changes. The implication of Micro-hydro project plant for the development is an introduction of a modern technology in rural context. This prepares rural community for undertaking rural industrial activities, nurturing of entrepreneurship in rural areas and retention of entrepreneurs in rural areas. This study reflects the over view of Nepalese rural energy sources status and discusses various energy issues through a case study of Tanting VDC, Kaski District in Nepal. The study has discussed various merits of MHP system; it is not only provides energy for lightening but also helps in various sectors like improving health condition, saves time, improvement in education, environment

clean, development of various entrepreneurs like home-stay, handicraft industry, cooking. It makes easy to work at night and is more efficient in income generating as well as additional productive sectors in this study area.

This is descriptive analyze designed to find out the socio-economic impact of micro-hydro power project plant of Tanting VDC, Kaski. This study has been conducted from the direct interview method with 50 household respondents out of 200. Those respondents have been selected by random sampling method with taking certain level interval. The core finding of the study areas pointed as follows;

- There are mainly four different castes in the study area namely Gurung, Dalit, chhetri and others. The Gurung is dominant caste perportion (48%) in this area. In second, position Dalit (24%) than Chhetri (16%) and others (12%) respectively.
- Due to MHP Rs. 370 (000) has increased the monthly average saving income of the different income level of group of people.
- Due to the installation of MHP people have been shifted to the other sectors from the agriculture.
- The installation of MHP has significantly reduced the no. Of families using kerosene as a source of lightening. They used to kerosene for the lightening Rs 180 per household but after installation of MHP they totally cut of their expenditure on kerosene.
- The education performance condition has been positively changed by 65 percent viewpoint of study hours and also positive improve their health.
- Due to MHP, people have started using different electrical instruments like Rice cooker, computer, mobile phones, Radio, Television and others industrials equipment like some mills.

- The MHP has help to established different agro-processing mills. Two Oil expeller mills, two Dehuskin mills and two Griding mills are established in the study areas.
- Due to the establishment of MHP significantly increased in school performance. 87.5 percent despondences replied that their children's school performance have been improved and 12.5 percent respondents replied no changed.
- All of the sample households have been influenced by MHP system because it provided light for them to work at night.
- Most of the respondents are satisfied with electricity affordability.

5.2 CONCLUSION

Energy is undoubtedly fundamental means for basic needs of support and developmental efforts. However, despite having enormous potential for hydro electricity generation in Nepal, the share of electricity in national energy consumption is 2 percent. Nepal has a low rate, in which nearly 50 percent of the total population has access to electricity, mainly to those living in urban areas because of the lack of other commercial energy sources, the country heavily relies on traditional energy sources, especially firewood. Use of traditional energy sources is detrimental to health, hygiene and environment. Due to lack of technical capability and poor economy, many mountainous villages are likely to be without the national gridline electricity in the near future. However, the electricity demand is increasing countrywide.

MHP scheme, one of the most successful models of renewable energy technology in Nepal has proved to be successful in improving the socio-economic status of its consumers through the multiple benefits it provides at a household, community and the as a whole country. Generation of direct as well as indirect benefits to individual and the society is the reason behind the success

of MHP system in Nepal. Improvement in health, environment, education, sanitation and income are some of the mentionable local benefits from MHP project in rural households. Owing assess to electricity reduced drudgery for women in sampled households in Tanting allowing them to have enough time to be involved in other sectors' earning activities which supportable for further income generation and social and community development activities in the study area. Similarly, electric lights in household extend the day providing additional hours for evening reading and also reduces drudgery for children so their children improving their schooling performance. Thus, the development of MHP scheme would be a milestone improving clean, affordable and sustainable energy, which is, must for the development of rural areas in Nepal.

5.2 Recommendations

It is said that, electricity is not only resource of lightening it is the blue money as well as life of living things. The electricity is able to make unification to all nations of the world. Nepal is second richest country among the world with 83000 MHs potentiality in technical point of view and 42000 MHs economically available but it is true that, the people who lives in remote areas they always have been spent their days in darkness. Most of the people are far from modern technology and communication until now. Now a days most of the urban area, which are known as facilitated have compulsions of load shading. This complex issue has been becoming headache of government and common people. Due to this reason, the lower scale MHP is more appropriate in remote and hilly areas. Therefore, the following recommendations can be made with the finding and conclusions of this present research work;

- Nepal is reach in water resources but there is not any especial vision, mission and strategies for achieving the goals. Therefore, the government should

formulate good policies and recently implementation in real fieldwork to producing additional electricity.

- Alternative energy resource should be made available to minimize the pressure on forest.
- Electricity is precious wealth of our nation; we can earn lots of foreign currency sold by electricity. It is the most probable earning sources of our nation so government should be formulate a perfect and sustainable great policy for the electricity production.
- The government should be conduct feasibility survey for MHP in the rural areas of Nepal than starts the production process as much as possible with the help of foreign aid.
- The government should be stop unnecessarily distributes licensing system.

APPENDIX I

Questionnaires

Personal Information:

a) Name of household head/ Respondent: .....

b) Sex : ( ) Male ( ) Female

c) Age: ..... d) Total no of family: .....

e) District: ....., VDC: .....

Village....., Word No: .....

f) Religion: ..... Caste: .....

1. Income & employments:

1.1 Main Income sources of family (In 000)

S.N	Income sources	**Level of Income (Nrs)**				
		less than 5	5 to 10	10 to 15	15 to 20	above 20
1	Agriculture ( )					
2	Business ( )					
3	Service ( )					
4	Foreign Job ( )					
5	Labour ( )					
6	Others.....					

1.2 Was your family member had been employed before MHP installation?

Yes ( ) No ( )

If yes, Please specify

How many family members have been employed: .....

Organizations/ Institution's Name: .....

How long he/she had been worked there? .....

How much salary had been received per month? .....

1.3 Have they employed after MHP installation?

Yes ( ) No ( )

If yes, Please specify

How many family member are working now? .....

Name of employed organization/ institution? .....

How long they have been working there? .....

How much salary they are receiving per a month? .....

1.4 Which is the major source of energy in your family before installation MHP?

a) ( ) Fuel wood
b) ( ) Animal wastes
c) ( ) Biogas
d) ( ) Solar home system
e) ( ) Petroliam products
f) ( ) Electricity
g) ( ) Others .....

If you used kerosene, Please specify the quantity & cost of per month.

Quantity (litre)	Per litre cost (Rs)	Total cost

1.5 Which is the major source of energy in your family after installation MHP?

a) ( ) Fuel wood

b) ( ) Animal wastes

c) ( ) Biogas

d) ( ) Solar home system

e) ( ) Petroliam products

f) ( ) Electricity

g) ( ) Others .....

If you used electricity, Please specify the units & cost of per month.

Units	Per unit cost (Rs)	Total cost

1.6 Which is the major agro machine for food processing before MHP?

A) ( ) Dhikki

B) ( ) Jhatto

C) ( ) Ghatta

D) ( ) Others.....

If you used dhikki for food processing, please specify the quantity and cost of per month

Quantity (kg)	Per kg cost (Rs)	Total cost

1.7 If you used electrical rice mill for food processing, please specify the quantity and cost of per month.

Quantity (kg)	Per kg cost (Rs)	Total cost

1.8 Have you done any productive income generating work by using MHP system?

Yes..... No.....

If yes, Please specify the income & employment of your family member from this work.

Description of works	**Income per month (Nrs)**	**Employment (No)**
Home stay/ Hotel ( )		
Poultry firm ( )		
Saw mill ( )		
Argo- processing mill ( )		
Dairy factory ( )		
Furniture Industry ( )		
Knitting ( )		
Bakery Industry ( )		

1.9 In your view, what are the good impacts of MHP?

a. ( ) Increase income
b. ( ) Increase employment opportunities
c. ( ) Cost effective
d. ( ) Improvement of health
e. ( ) Sufficient energy for lighting
f. ( ) Easy for communication
g. ( ) Easy for reading

1.10 What kinds of problems have been facing by MHP?

a. ( ) Expensive
b. ( ) load shedding
c. ( ) Unemployment
d. ( ) Inefficient light

Education

2.1 Education status of Family member :

Literate	Illiterate	Pri. level	SLC	HSEB	University

2.2 Education status of family after and before MHP?

Before MHP		After MHP	
Educated		Educated	
Uneducated		Uneducated	

2.3 Before electrification, how long time they had been given for studying?

a) Half hour
b) 1 hour
c) 2 hour
d) 3 hour
e) More than 3 hour

2.4 After electrification, do yours children's study hour have been increased?

Yes..... No.....

If yes, how much time has been increased?

Up to 1 hour

f) 1 to 2 hour
g) 2 to 3 hour
h) More than 3 hour

2.5 Have they regular doing homework & activities?

Yes..... No.....

2.6 Have you involved any literacy class at night or evening?

Yes..... No.....

If yes, Please specify.....

2.7 Is your family member are going to community library or community learning centre?

Yes..... No.....

If yes, Please specify

How many times they are going this centre per a week? .....

How long time they have been spending there for reading? .....

2.8 In your view, what are the positive impacts of MHP on education sector?

a. ( ) Cost effective
b. ( ) Increase study hour
c. ( ) Increase reading habit of children
d. ( ) Doing regular homework and extra activates.
e. ( ) Clean & healthy reading
f. ( ) Enough light for reading
g. ( ) Easy to lunch informal education on evening

2.9 What are negative Impacts of MHP on education sectors?

a. ( ) Increase expenditure
b. ( ) Eye problem
c. ( ) Facing load shedding
d. ( ) Decrease literacy rate
e. ( ) Inefficient lighting
f. ( ) Decreased study hour

3. Benefits and Problems

3.1 In your view, what are the most benefits getting from MHP?

a) ( ) Lighting
b) ( ) Easy to study at night
c) ( ) Easy to work at night
d) ( ) Cost effective
e) ( ) Time saving
f) ( ) Improvement on health
g) ( ) Increase on income & employment
h) ( ) Easy on communication

3.2 In your view, what problems are created by MHP?

a) ( ) Over expenditure
b) ( ) Unemployment
c) ( ) On Education
d) ( ) On Agriculture
e) ( ) Eye problem
f) ( ) On business

3.3 Present electricity is affordable for you?

a) Expensive ( )
b) Cheap ( )
c) High expensive ( )
d) Moderate ( )

3.4 In your opinion, MHP system has played vital role for rural electrification?

If yes, please specify

.....

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