

**SOCIO-ECONOMIC IMPACT OF SMALL HYDROPOWER PROJECT:**

**A Case Study of Ridikhola Hydropower Project on Ruru VCD,  
RidiGulmi District**

**A Thesis**

**Submitted to Department of Rural Development  
in Partial Fulfilment of the Requirements for the Degree of  
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in  
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**Submitted By**

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### RECOMMENDATION LETTER

This is thesis entitled **Socio-Economic Impact of Small-Hydro Power Project: A case Study of Ridikhola Hydropower Project on Ruru VCD, Ridi Gulmi District** has been prepared by Tek Bahadur Budha under my supervision and guidance. He has conducted the research in May 2016 to April 2017. To the best of my knowledge the study is original and carries useful information regarding Socio-economic Impact of Small Hydro Power Project in Ruru VDC of Gulmi district. Therefore, I recommend this thesis to the evaluation committee for its final approval.

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**APPROVAL LETTER**

This is to certify that TekBahadurBudha has prepared this thesis entitled **Socio-Economic Impact of Small-Hydro Power Project: A Case Study of Ridikhola Hydropower Project on Ruru VCD, RidiGulmi District** under our guidance and supervision. This report is prepared as partial fulfillment of the requirement of the Degree of Master in Rural Development from Tribhuvan University. This thesis has been accepted and recommended for final approval.

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## **DECLARATION**

I hereby declare that the thesis is my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different source in the course of preparing this thesis. The results of this thesis have not been presented or submitted anywhere else for the award of any degree or for any other proposes. I assure that no part of the content of this thesis has been published in any from before.

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TekBahadurBudha

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April 2017

## ABSTRACT

This study entitled "Socio-Economic Impact of Small-Hydro Power Project: A Case Study of RidiKhola Hydropower Project on Ruru VDC Gulmi District" has been conducted. The role of hydropower either it is developed or developing country is essential. Hydropower is renewable energy which can be taken as a backbone of the nation in economic development in the context of least developed country like Nepal. The electricity generated from the hydropower plant is not only essential for industrial growth but is equally inevitable for rural development too. The main objective of the study is to evaluate the impact of the small hydropower projects in rural development on socio-economic aspects through income and employment generation, health and sanitation, education and information technology and suggest solution for sustainable development of small hydropower. Descriptive and exploratory research design was applied for this study to understand the impact of RidiKhola Hydropower Project on the lives of the people. To fulfill the main objective close-ended and open ended questions were used.

As this study was based on exploratory designs it deals with the different spectrum of the respondents life. As found in the study area there were involved 45.65 percent respondent with their age 26-40. It was taken consideration that the people from 26 to 40 are physically and mentally active and they can give proper ups and downs in their lives due to Ridi Hydro Power project. This reserch incorporates and deals with the opinions of 46 respondents including 58.70 percent male and 41.30 percent female. As Nepal is dominated country of Hindus, in the study area 86.96 percent respondents were follower of Hinduism followed by 8.70 percent Buddhist and 4.35 percent Christians. Majority of the respondents were dependent on foreign job whereas after the installation of RidiHyrodo power more than fifty percent job holders are from local people. It was found that Kerosone was totally eliminated after the installation of this hydro power. Traceable improvement was also in their children's study and diretly and indirectly there is positive impact of Ridi Hydropower in Ruru VDC of Gulmi district.

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## ACRONYMS

ADB	:	Asian Development Bank
AEPC	:	Alternative Energy Promotion Centre
CBS	:	Central Bureau of Statistics
FY	:	Fiscal Year
KW	:	Kilowatt
SHP	:	Small Hydro-Power
MW	:	Megawatt
MWE	:	Megawatt Energy
NGO	:	Non-Governmental Organization
NEA	:	Nepal Electricity Authority
PRA	:	Participatory Rural Appraisal
UNDP	:	United Nations Development Program
VDC	:	Village Development Committee
WTO	:	World Trade Organization

## CHAPTER-1

### INTRODUCTION

#### 1.1 Background Study

Nepal is a land located mountainous country, which is situated between India and China; it is 1,127 km. far from the nearest point of the sea. It occupies 0.3 percent and 0.03 percent of Asia and the world respectively. Nepal is located between the latitude 26°22'N to 30°27'N and longitude of 80°4'E to 88°12'E. The country is approximately rectangular in shape and its average length from east to west is 885 km and the breath from North to South is 193km.

Nepal is divided on the various bases such as ecologically(Mountain, Hill and Terai),river's basis(Koshi, Gandaki and Karmali), administratively five development regions,fourteen zones and seventyfive districts,3615 VDCs and 58 municipalities. Out of total populations 86.06 percent people lives in rural areas and 80.77 percentage peoples are dependent upon agriculture. More than two third(67.26 percent)of the total household's main source of lighting is electricity. Kerosene is used by 18.28 percent of the total households for lighting while solar and bio-gas is source of light for 7.44 and 0.28 percent of the total households respectively(CBS, 2011).

The landlocked position,rugged topography with limited arable land(17percentage of total land). Poor source base and high extent of poverty are major economic vulnerabilities Nepali are facing economic problems these days. This makes it susceptible to increasing imports and foreign developments. Nepal has immense stoke of endowed natural resource, unfortunately we are still poor and the last developed nations because of underutilization of the available resources. On the one hand, Nepal's economic growth rate is low. On the other hand, Nepal's economics development is its initial stage. However more or less, all sectors such as agriculture, industry,

trade, commerce and commutation are in their growing stage along with social services and tourism and they are the backbone of rural development.

Nepal has a huge hydropower potential. In fact the perennial nature of Nepali rivers and the steep gradient of the country's topography provide ideal conditions for the development of some of the world's largest hydroelectric projects in Nepal. There is the potentiality of 40,000 MW electricity as anticipated by experts. However, the present situation is that Nepal has developed only approximately 780 MW of the hydropower. Therefore, bulk of the economically feasible generation has not been realized yet. Besides, the multipurpose, secondary and tertiary benefits have not been realized from the development of its rivers. Although bestowed with tremendous hydropower resource, only about 44 percent of Nepal's population has access to electricity. Most of the power plants in Nepal is Run-of River (RoR) type with energy available in excess in the country demand during the monsoon season and deficit during the dry season.

Nepal's electricity generation is dominated by hydropower, though in the entire scenario of energy use of the country, the electricity is a tiny fraction, only few percent of energy need is fulfilled by electricity. The bulk of the energy need is dominated by fire wood (68%), agriculture waste (15%), animal dung (8%) and imported fossil fuel (8%). The other fact is that only about 44 % of Nepal's population has access to electricity. With this scenario and having immense potential of hydropower development, it is important for Nepal to increase its energy dependency on electricity with hydropower development. This contributes to deforestation, soil erosion, depletion and increased flooding downstream in the Ganges plain. Shortage of the wood also pushes farmers to burn animal dung, which is needed for agriculture. Not only this, the development of hydropower will help to achieve the millennium development goals along with the protection of environment, increase of literacy rate and improvement of health of children and women with better energy. Growing environment degradation adds a sense of urgency.

Rural communities need energy for many different activities like households use, school education, medical services, microenterprises development, rural tourism development and agriculture processing. Micro-hydro in rural area which is far from grid electricity would be the best substitute of the energy source. Traditionally development agencies funded big power projects, mainly in power generation. These undoubtedly made a contribution to economic growth, but many big power projects were seen largely to fail in delivering the expected development benefits for poor people. This was due inter alia to lack of participatory planning to deliver what was appropriate to meet local demand, lack of institutional infrastructure to regulate and deliver services and lack of local capacity to install, operate and maintain systems (DFID, 2002, Energy for Poor Page-21).

Nepal's economic and social development is being hampered by its inadequate energy supply. The country does not have its own reserves of Gas, Coal or Oil. Although it's most significant energy resource is water, less than 1% of the potential 83,000 MW of hydropower is currently harnessed. Firewood is the predominant energy carrier, constituting more than 70% of consumption. However, its use is inefficient and poses a threat to the country's forests. Electricity is generally only available in urban areas and few rural areas are connected in grid electricity.

<b>Energy Sources of Nepal</b>	
Total Installed Electricity Capacity (2011):	709 MW
Hydro-electric:	92%
Thermal/Imports/IPPs:	8%
Total Primary Energy Supply (2008):	9,799 ktoe
Comb. Renew. And Waste:	86.4%
Petroleum Products:	8.0%
Coal:	2.8%
Hydro-electric:	2.7%
Electricity:	0.1%

*(An Energy Sources Survey: Internet Search; Nepal's Energy Situation)*

Biomass is the major source of energy, particularly in rural Nepal. Biomass fuels consist of both woody and non-woody biomass. The former come from trees and shrubs, the latter from crop residues and other vegetation. Fuel wood from forest and tree resources, charcoal mainly from woody biomass, residues from different agricultural crops and animal and human dung are the major biomass-based energy resources. Coal, petroleum products and electricity are the commercial sources of energy that are utilized in Nepal. However, the country spends a huge amount of its foreign exchange reserves for the importation of fossil fuel. In addition, transportation problems arising from the geographical structure of the country tend to bar people living in remote areas from using petroleum products.

The Nepal Electricity Authority (NEA), the government-linked monopoly electricity supplier, serves only 15% of the country's total population. For this small fraction of customers, reliable electricity access is less than 8 hour per day, with rotational blackouts accounting for the remaining 16 hour. In December 2008 the Nepal Government declared a "National Energy Crisis" and one year later the World Bank argued that "Nepal is experiencing an energy crisis of unprecedented severity, caused by years of under-investment and sharp growth in electricity demand". Nepal ranks among the lowest in the world in terms of net electricity generated per capita and energy intensity; and two-thirds of households live at least a 5-18 days walk from the nearest village connected to the electricity grid.

Small Hydropower is an indigenous and source of energy for which the potential exists in the almost the whole Hindu-Kush Himalayan Region, which includes Afghanistan, Bhutan, China, India, Nepal and Pakistan. Micro Hydro is generally defined as medium scale industries less than 1MW. For the power generation, upto 10MW, Small Hydropower have gained enormous popularity in developing countries during the last four decades. Small scale hydropower can provide electricity services. Small Hydropower generation is a cost- effective



and low-impact technique for the power generation that offers a potential solution for rural electrification in Nepal.

## **1.2 Statement of the Problem**

Unavailability of commercial source of energy is one of the major obstacles in the development of rural areas in Nepal. This has not only slowed down the rate of development of new technologies for increasing the agricultural productivity but also created excessive dependency on traditional sources of energy including fire wood, agricultural residuals and animal dung. Owing the lack of commercial energy sources, the productivity of rural population remains modest. The excessive and unsuitable use of traditional resources has resulted in low agricultural productivity, deforestation and soil erosion, which creates imbalance in eco-system. The use of fire wood, agriculture residue and animal dung in cooking causes respiratory disease. With the use of traditional source of energy, considerable labour hours of human resource are spent in production activities, which could have done with much less manpower if modern technologies were used. People especially women; are spending much of their working hours in collecting fire wood. Students study hours is being affected by the lack of lighting in the houses. They may suffer from the eye infection and so on due to the smoke of fire wood.

Nepalese rural economy is based on traditional agriculture system. In addition to agriculture other sectors of economy such as industry, trade and commerce transportation, communication and tourism are developed yet due to their inadequate electric power and financial resources. On the other in the absence of infrastructures like road and transmission line; Hydropower development cannot be achieved more over infrastructures are required for proper exploitation of other available resources in the country. Economic development has not got proper acceleration due to insufficiency of electricity in rural area of Nepal.

There is a high potential of hydropower in Nepal and considering that rural communities are isolated and scattered, small-hydro system is positive impact on social welfare through improvement in education, health and communication. Some research questions are as follows:

- ) What is the impact of Small-hydro Electrification(SHE) on the Education in the study area?
- ) What are the impact of SHE on the information technology and entrepreneurships in study area?
- ) What are the impact of SHE on Health and sanitation in study area?
- ) What are the impacts of SHE on income and employment generation in Ruru VDC of Gulmi District?

### **1.3 Objectives of Study**

The main objectives of the study is to evaluate the impact of the small hydropower projects (SHPs) in rural developments on socio economic aspects through income, saving and employment generation and specific objectives of the study is as follows:

- ) To examine the impact of Ridi Hydropower Project on income and employment generation in Ruru VDC Gulmi District.
- ) To evaluate the socio-economic impacts hydropower projects in rural areas.
- ) To explore the problems associated with the small hydropower and suggest solutions for the sustainable development.

### **1.4 Significance of Study**

In the views of growing of fire wood the others non-renewable energy source the search for alternative energy source is prominent. In this context, many projects have been operated, but how far the projects are succeeding in terms of end-use-efficiency, how far it effects for the up liftmen in the livelihood for the

rural people, how far the projects is succeeding in terms of overall socio-economic enlistment of the rural people in their perception are leading issues. Moreover there are many studies adopted in small hydropower sectors but there is still lack of proper information and documentation, which will be analyzed and explore the ground reality of socio-economic aspects of small hydropower i.e. Ridi Hydropower. Hence, this study will put positively and impacts of small hydropower projects on socio-economic aspect of the rural people. Outcome of this study will help to access the impact of the Small Hydropower on education, health, information and technology of the people RuruVDC, Gulmi District.

### **1.5 Limitations of Study**

This research will be conducted to analysis the impact of small hydropower projects on education, health, income, information technology and entrepreneurship of the people live remote area of Nepal. This study of will mainly be conducted for an academic purpose. Some limitations are as follow:

- ) It is the case study of Ridikhola small hydropower projects on Ruru VDC, which may not be applicable to the other VDC of the country.
- ) The Data will be depending on social survey which may not provide the exact picture of society.
- ) The Study narrowed only some limited variables and ignores many variables which may affect on study area.
- ) The study focused only limited area so the generalization of the study may not reliable to other area.

## **1.6 Organization of the Study**

Altogether, this study is divided into five chapters. The first chapter deals with general background, statements of the problems, objective significance, limitations and organizations of the study. The second chapter is about literature review. The third chapter is about introduction of the study site, nature of data, sample selection, Questionnaire design, methods of data collection and data processing. Forth chapter deals about analysis and interpretation of data and fifth chapter includes summary, conclusion and recommendation.

## **CHAPTER-II**

### **LITERATURE REVIEW**

In Nepal, there are limited researches have been conducted on socio-economic impacts of small hydropower projects. However there are many studies in other sector of hydropower project. Generally, the studies on medium and large scale hydropower project have been conducted to identify various types of impacts created by the development of hydropower project. Many publications, reports, theses, dissertations, articles in journals and newspapers which are related to the hydropower are reviewed. Those pieces of literature which are closely related to this research have been reviewed:

#### **2.1 Reviews of Studies at International Level**

Brodman(1981) in his study "socio-economic impact of rural electrification: Lesson from central java" has depicted the socio-economic impact of Klaten rural hydropower project in Indonesia. This study is mainly based on primary data. This study has found 88 percent of the business in the study area has installed electricity of project, 77 percent of the electricity adopters with school children reported that electricity had caused in increase in their study time, more than 80 percent of respondents said that electricity has made the village safer due to lightning of the village path, more than 70 percent of electricity adopters and non-adopters opined that electricity had benefited them by stimulating night time activity. Business work hours had increased 11 percent of the interviewed household increases their income by using electricity in their home industries, 33 percent of the business respondent reported that electricity use had developed their business,50 percent of the business respondents and 43 percent of households respondents said that employment opportunities had increased due to electrification.

Nattakul, Boonrod and Roongrojana(2010) have made a study on "Socio-economic Assessment of Pico Hydropower Installations in the Northern Region

of Thailand." This work assesses social impacts of the Pico Hydropower applications in the Northern region of Thailand. Six existing Pico hydropower projects were selected based on different characteristics including system capacity, size of user. Normally, Pico hydropower systems are found in rural or hilly areas. Based on the guidebook, most projects should utilize hilly and mountainous locations to site suitable projects. From a reports on electrification technologies by the World Bank Energy Unit, of the options currently available for off-grid generation, Pico-hydro is likely to have the lowest cost. For mini-grid power, it is likely that only bio-gas plant provides more cost-effective electricity than micro-hydro. Northern Thailand is filled with mountains and high level. In areas with high rainfall, there is plenty of water. In terms of economic the result is clear because most of the people have the tea gardens and coffee gardens, so they can use electricity at night time to boil tea leaves and pack it for sale. The production cost for each voltage in the system In addition, they have home stay service to tourist, which increase incomes. Socially, second range is high percentage of users have satisfaction in the hydropower. According to the light at night time the village can take time for exchanging ideas with each other, the children read books for longer time and old people understand more Thai language as they can remain watching TV in the night.

Dahal and Mund (1996) have conducted another valuable and marvelous publication in this regard. This publication includes five major areas of social economy and national development in the context of Nepal. These are: Outward oriented economical nationalism, Local Development, People's Participation, Self-help Organization and Cottage and Small-Scale Industries. In this article, "Outward Oriented Economic Nationalism", Madan Kumar Dahal has discussed about water resources. He says that Nepal's economic future lies in her water resources, which flow pricelessly from Nepal to India. The present estimated commercial potential of water resources in Nepal, if

harnessed properly through bilateral, regional and international cooperation, not only Nepal but also the whole SAARC region will be benefited.

## **2.2 Reviews on National Level**

Bhattarai(2012) has published in Bidhyut(2012). He has analyzed that establishment of hydropower projects opens up immense opportunities for social and economic upliftment of the rural communities, If other crucial aspects like- basic road infrastructure for transportation, promotion in income generation, tourism development rural electrification and small industrial activities base on local resource available in the local area etc. develop the rural and remote area of Nepal. This helps to reduce the migration of skilled and non-skilled manpower. Therefore there is no doubt that the hydro electricity is the key of economic development. If there is the sufficient development of hydro electricity it brings the positive change in all sectors of the economy. He concluded that hydro electricity contributes to sustainable development, rural electrification, industrializations and tourism development etc.

Tiwari(1995)has analyzed the role of SHP in rural electrification and also examined the impact SHP after construction within the influenced area. He has compared the benefits and costs of BhorletarSHP. Field survey has been used to collect the primary information and the secondary data sources are ICIMOD, East Consult, Ministry of Finance an Nepal Electricity Authority. This study has concluded that micro hydropower is the most feasible and the most efficient alternative source of energy in rural areas.

Awasthi(2010) has examined the socio-economic impacts of the Chameliya Hydropower Plant in the adjoining area. This study concluded that the socio-economic impacts of the projects are moderate in absolute terms and satisfactory in relative term. The Project has provided sufficient drinking water and employment opportunity to the local people and electricity supply has extent the social and recreational activities like increasing educational standard, purpose of ratio, television and tape recorder etc.

Dhungel(2002) has mentioned that main source of energies are Bio-mass(traditional), which constitutes fire wood, agriculture waste, animal dung etc and commercial sources which constitute coal, petroleum products and hydro0-electricity etc. Energy consumption in Nepal is dominated by bio-mass, which accounted for 95%, 94.9%, 91.7%, 86.4% and remained shares of commercial energy in total energy consumption in FY 1984/85, FY 1989/90, FY 1995/96, FY 2000/01 respectively. Average growth of Bio-mass and commercial energy consumption during the FY 1984/85 and FY 2000/01 were 2.4% and 10% respectively. Combining both in average growth rate was more than 3% per annum during this period. The trends of energy consumption in Nepal during the FY 1984/85 –FY 1995/96 also shows that bio-mass was growing by 2.2% per annum. Similarly, commercial energy consumption was growing by more than 5% per annum. Annual growth rate of fuel wood, coal, petroleum products and electricity during the FY 1984/85 to FY 2000/01 were 2.7%, 27.2%, 12.7% and 10 % respectively. Income elasticity of electro-products consumption and electricity were 1.75 and 1.14% respectively. He found that elasticity coefficients are greater than one, which reveals that an increase in per capita real GDP will increase to the amount of per capita energy consumption. By assuming 2.24% population growth rate and 4% economic growth annually, he predicts that energy consumption increase by 4.2% per annum during the FY 1994/95- Fy 2004/05.

Another report published by WECS (February 1998) entitled Report of the Taskforce on Rural Electrification: Impact in Nepal, this is the final report of the task force on rural electrification and impact in Nepal states: rural areas across Nepal served from a various generation sources were studied in this report. These included Nepal Electricity Authority grid sites and these are remote from the grid served by diesel, the Indian grid NEA. Investigations were made of small hydro and private micro-hydro. The study gathered and analyzed demand data from NEA. Major finding of this report is that the impacts of rural electrification have been minimal. But this does not meant that



there is no future for rural electrification. Rather it means that development of rural grid must be undertaken in a planned and reasonable way so that its systematic development is possible in rural areas.

Dangol(1979) explained that power is the most important thing for making country industrialization and in modern era, industrialization plays an important role in economic development of Nepal. Exploitation and utilization of energy resources have contributed so much to the development of industry, agriculture, transportation etc. Per capita energy consumption is the basic factor not only for comparison of living standard of the Nepalese people but also for the measurement of economic growth of the country.

Jha(1995) said that one of the major reasons for poverty and backwardness of the Nepalese economy is power deficit. Shortage of power creates a problem in the development of agricultural industrial, trade and other sectors of economy. With a view of meet the power shortage, there is need to generate power from not only the medium and mega projects but also small scale hydropower projects. The small hydropower projects might contribute significantly by providing electricity in isolated pocket area as well as to the grid since the electrification is relative to productivity. Small hydropower might help to increasing working efficiency of the rural families. For the sustainable development of small hydropower, he has emphasized the implementation of small and micro hydropower projects by adopting is required to provide supporting services such as agriculture extension input supply. Marketing services credit facility etc and development of capacity of the farmers.

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. 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 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. Micro-hydro generation is a cost-effective and low-impact technique for power generation that offers a potential solution for rural electrification in Nepal). 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.

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 form 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.

ICIMOD (2016) has constructed that the condition of hydropower in Nepal. According to it, there are many problems in construction as well as distribution too. Mountains offer ideal conditions for the development of hydropower, but the uneven distribution of benefits from project development often create friction and development disputes between communities and project developers. How can hydropower projects be designed and implemented in such a way that affected communities derive benefits beyond mere compensation and mitigation? Is there any evidence that benefits can be shared fairly and equitably with mountain communities? These questions are particularly important for Nepal, which has an estimated technically and economically-feasible hydropower potential of over 40,000 MW, of which only a fraction has been developed so far. The purpose of this report is to document the various facets of benefit-sharing practices in Nepal. In doing so, this report develops a comprehensive typology of the benefit-sharing mechanisms that have evolved in Nepal over the last four decades and critically analyses each of these mechanisms in terms of what works and what doesn't and what can be done to fine tune these mechanisms to better suit mountain communities.

GoN, Ministry of Population and Environment in May 2016 has conducted a research on "Renewable Energy subsidy Policy, 2017". The paper especially concentrated about the major issues and sources of renewable energy. Nepalese rural area keeps the potentialities of such energy. In case of small hydropower,

physical setting i.e. geographical setting is the main obstacle to make it possible. Due to the high cost of material, equipment and transport for project construction in very remote areas are seems to be the main obstacles of small scale hydropower production.

## **2.2 Research Gap**

The literatures above show hydro energy and hydropower project able to uplift the socio-economic condition of a rural people and able to change the social welfare condition of a society in a real sense. The review to available literatures at the Nepalese context as well as the International context shows that studies about the socio-economic impact of hydropower project in the mountainous and backward rural regions is still facing problems. Therefore, the present study aims to examine the socio-economic impact of RidiKholahydropower project on Ridi VDC Gulmi District as well as measures to develop their potentialities in the project area.

## CHAPTER - III

### RESEARCH METHODOLOGY

#### 3.1 Introduction of Study Site

RidiKhola Small Hydroelectric Project lies in the Ruru VDC of Gulmi District. The site is located in Yeklepipal 1 km far west from Ridi Bazar of Ruru VDC. The installed capacity of this project is 2.4MW with design discharge 3.2m<sup>2</sup>/sec.

RidiKhola is one of the tributary from Arghakhaanchi District which ultimately contributes to the flow of Kaligandaki river at Ridi. The Ridi catchment area is 591km<sup>2</sup> elongated east-west direction draining towards the east. It is a rain-fed river originating from the Arkhakhanchi District. The catchment area of the project is 591km<sup>2</sup>. In this catchment the lowest flow occurs in the month of May, while the highest flow occurs in the month of September. The predicted flow shows that more than two fourth of flow occurs during the four monsoon months (Shrawan, Bhadra, Aswin and Kartik/July, Aug., Spt., Nov.), while the remaining eight non-monsoon months have only less than one third of annual flow.

First feasibility of RidiKhola small Hydropower Project was completed in the year of 1999. and registration in 2057 BS in Industries Minister. The Power Purchase Agreement (PPA) with an installed capacity 2400KW with Nepal Electricity Authority was completed 2006. The Detail Project study in carried out and report is prepared and sign with NEA in 2006.

The Project site is connected with Kathmandu capital city by motorable road access via Butwal, Palpa and RidiGulmi, and 1km west way from Butwal-Tamghas Road. However the existing Powerhouse site only access from gravel road from Ridi Bazar. It was very convenient to transport all kinds of heavy tools and machinery being already road access to the power house site.

## **3.2 Research Design**

This study was mainly based upon qualitative data because it was a fact finding investigation with adequate interpretation in the context of social research. In this sense of researcher was adopt descriptive type research design as it was in corporate and identified the various socio-economic characteristics of the community.

## **3.3 Nature and Source of Data**

The nature of the study is descriptive as well as analytical.

### **3.3.1 Primary Data Collection**

Original data sources collected specifically for this study to find out the objective of the research were the primary data source. Primary data were original data gathered by the researcher for the research project at hand. Thus, these data were collected from different published and unpublished documents by government of Nepal, nation and international organizations and so on.

### **3.3.2 Secondary Data Collection**

A secondary source refers to those for already gathered by different scholars in different time and venue. The sources of secondary data were books, published reports by different organizations. In this study, secondary data were collected from different published and unpublished documents by Government of Nepal, nation and international organizations and so on.

## **3.4 Universe and Sampling**

The universe of the study was conducted in Ruru VDC Gulmi District, Although, RidiKholra Small Hydropower Project with connected national grid transmission line, it is distributed among the people of mainly RuruVDC of Gulmi District were benefitted from this hydro-electric projects directly and indirectly. It is not possible to conduct the research among all the VDCs,

though the researcher was conducted research on Ruru VDC of Gulmi district which was directly affected area of that project. Satmure and Eklepipalare purposively selected.

In Satmure and Yeklepipal of Ruru VDC, there are 25 and 19 house households respectively, though the researcher will be selected one person from each households. By using the census sampling method, the researcher will selected 44 persons from 44 households(VDC profile of Ruru VDC 2072).

### **3.5 Methods of Data Collection**

#### **3.5.1 Households survey**

A household survey questionnaire were developed to collect the quantitative data. For that, semi-structure questionnaire were prepared which were included different types of informative questions and interviewed to the targeted population from whom the data collected.

#### **3.5.2 Key Information Interview**

The researcher was developed a structure key information schedule for collection the information about socio-economic impact of hydropower project. Present status of people residing in Satmure and Eklepipal of Ruru VDC was incorporated including their educational, social, technological change and economical dynamics. Key information review were taken with social leaders, teachers, elders and political leaders regarding socio-economic impact of Ridikhola small Hydropower project.

### **3.6 Data Processing**

Field questionnaire was carefully checked for possible errors. The data were carefully edited and processed. Diagrams and table also be generated by using computer software program.

### **3.7 Data Analysis**

Primary as well as Secondary data were used in this study. This study were primary depended on primary data. Collected data will be presented through in the table, pie chart, simple bar diagram and multiple bar diagram were used to analyze the primary data as well as secondary data. Explanation and interpretation were made according to the nature of data to fulfill the objectives demarcation.



## **CHAPTER IV**

### **ANALYSIS OF DATA**

This chapter includes the findings of the study in terms of the objectives then the findings are analyzed by using different descriptive tools. The detailed findings and analysis in terms of socio-economic condition of the village, caste and religious distribution of the population of the study area in detail.

#### **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 Age Group of Respondents**

Age and sex structure is primary basis of demographic classification of vital statistics. The researcher was also considered the age factor as a basic and fundamental components as a demographic parameter which rather plays a vital role in the development of rural development. The respondents are divided into four groups. The questionnaires were asked to the respondents who were above 15 years in their age. The response collected from the questionnaire were transform into tables according to their age group. People are divided into four age groups i.e. 15-25, 26-40, 41-60 and 60 above. Regarding the issue, the following table explains the age group in this way:

**Table 4.1: Age Group of Respondents**

<b>Age Class</b>	<b>Respondents</b>	<b>Percentage</b>
15-25	9	19.57
26-40	21	45.65
41-60	11	23.91
Above 60	5	10.87
Total	46	100.00

Source: Field Survey, 2017.

Above table presents the age group of the respondents. According the table it seems that Majority of the people in this study were involved age group 26-40 years age group. While collecting the data, special focus was made to select 26-40 years respondents because the researcher assumption is that this age is very important to deal with the social issue including old people to dig out the difference of society with electricity and without electricity. In this way in the study 19.57 percent respondents were from 15-25 years old, 23.91 percent were 41-60 years and 10.87 percent respondents were above than 60 years.

#### **4.1.2 Gender of Respondents**

Society is a combined form of male and female. Each and every society consists of male and female. In order to find out the gender specification in this research and to dig out their opinion women were also taken into consideration. The following specification clearly tells the gender combination of the study area included in this research as:

**Table 4.2: Participation Percentage of Respondents by Gender**

<b>Gender</b>	<b>Respondents</b>	<b>Percentage</b>
Male	27	58.70
Female	19	41.30
Total	46	100.00

Source: Field Survey, 2017.

According to the above table it clearly posits that in this study there was male's majority. In this way, 41.30 percent women were taken into this research where as 58.70 percent male were participated. The study area is still male oriented are female is follower of male. In the social work male have played vital role. Due to the less activeness of female and their shyness in each and every activities of their life respondents were less in numbers than male respondents.

#### 4.1.3 Caste

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 Brahman, Magar, Gurung and Kumal their different language. Specially, Magars and Gurung's have their own language. Nepalese language is mainly followed by Brahmins. Kumals have their own Botes language and in the study Kumals are known as Bote. Specially Brahmin is dominant castes among the whole population of the study area, while Magars are the second position and the Gurungs are the third and Kumals castes respectively.

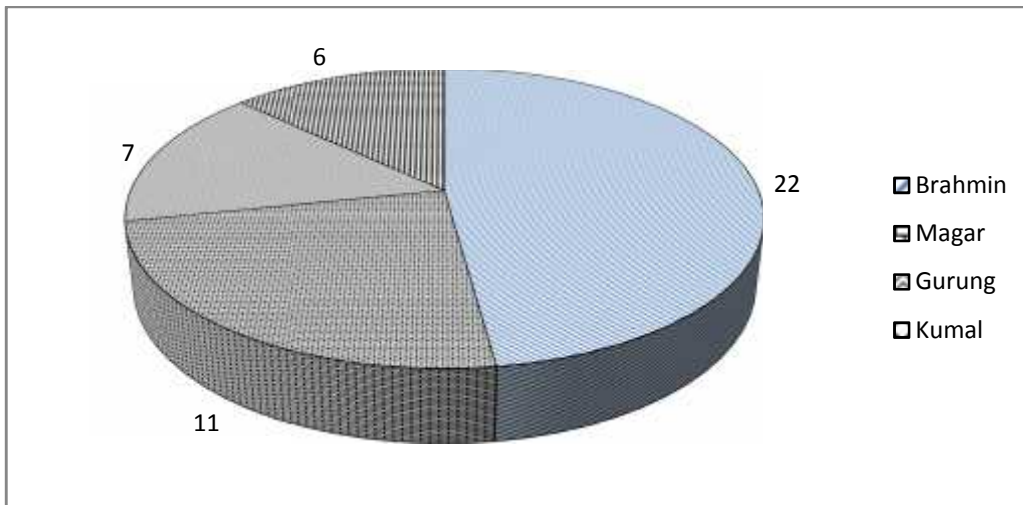
**Table 4.3: Distribution of castes respondent**

<b>Castes</b>	<b>No of Respondent</b>	<b>Percept</b>
Brahmin	22	47.83
Magar	11	23.91
Gurung	7	15.22
Kumal	6	13.04
Total	46	100.00

Sources: Field survey, 2017.

Brahmin is the dominant castes in this research catchment area representing 47.83 percent followed by Magar 23.91 percent, Gurung 15.22 percent and Kumal representing 13.04 percent by the below pie-chart. By this above tabulated expression, the research area is mostly Gurung dominant.

**Figure 4.1: Distribution of Castes Respondent**



#### **4.1.4 Religion Wise Distribution of the Respondents**

Religion is the deeply rooted belief among people that binds them together. It is the determinant of cultures, beliefs, customs and values. Religious composition is the important social characteristics of population. Religion also plays a vital role to unite a society and keep solidarity among its members. It is also a factor that determines the role and responsibilities of the people; because different religious groups have their own traditional values and systems which govern people beliefs. In these days Nepal is facing the problem of religion as its people have started to change their religion in terms changing their economic lifestyle. The combination of religious structure in the study area has been given below:

**Table 4.4: Religion-wise Distribution**

<b>Gender</b>	<b>Respondents</b>	<b>Percentage</b>
Hindu	40	86.96
Buddhist	4	8.70
Christian	2	4.35
<b>Total</b>	<b>46</b>	<b>100.00</b>

Source: Field Survey, 2017.

The majority of the people in the research catchment area are Hindus in majority and Christian in minority. In figure 86.96 percent were follower of Hinduism, 8.70 percent were the follower of Buddhism and 4.35 percent were Christian. In the study no one was by birth Christian rather they were later adopted Christianity. In Nepal according to the CBS, 2011, there were 81.34 percent Hindus, 9.04 Buddhist, 4.39 percent Islam, 3.05 percent Kirat, 1.42 percent Christian and 0.76 percent others. In the same In the study area too Hindus are in majority and others were in their hierarchy according to their presence. Therefore National figure of Religion is matches with study area.

#### **4.1.5 Occupation of Household**

Agriculture is predominant occupation in project area flowed by livestock farming, poultry, alcohol fermentation weaving clothes and sacks from the wild nettle plant, and weaving various bamboo products, such as wooden threshers. Pastoralism is another important source of income for households in the village.

**Table 4.5: Occupational Distribution of Respondents**

<b>Occupation</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Agriculture	9	19.57
Business	9	19.57
Services	7	15.22
Foreign Job	11	23.91
Labour	5	10.87
Others	5	10.87
<b>Total</b>	<b>46</b>	<b>100.00</b>

Source: Field Survey, 2017.

Above table shows that majority of the respondents were adopted foreign job as their livelihood strategy where as 19.57 percent respondents were involved in

agriculture and business. Among the respondents, 15.22 per cent were job holder and 10.87 per cent respondent were labour and other occupation.

## **4.2 Socio-economic Impact of SHP**

This section covers the socio-economic of SHP 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 Small Hydro Plant project. The different impacts of the SHP 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. 4.6: Respondents by Annual Income Before and After SHP**

<b>Annual Income of HH</b>	<b>No. of Respondents Before SHP Installation</b>	<b>Before % of Respondents</b>	<b>No. of Respondents After SHP Installation</b>	<b>After % of Respondents</b>
Less than 20	17	36.96	8	17.39
20 - 40	10	21.74	13	28.26
40 - 60	8	17.39	9	19.57
60 - 80	6	13.04	7	15.22
80 - 100	3	6.52	5	10.87
More than 100	2	4.35	4	8.70
	46	100.00	46	100.00

Source: Field Survey, 2017

The table 4.6 shows that the improved income level of the respondents over the total 46 respondents. They improved their income level through multiple sectors. In above the figure the compare study of the income level of the sample household as respondents answer. Before SHP in this village most of the respondents income level was less than 20 thousands per year but after the installation, their income level was drastically change as they reduces in 8 respondents. In the similarly way, the respondents income level changed in gradual level. There are six different groups of income level household in the study area. After installation of SHP 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 SHP installation and after installation of SHP. It has changed the occupational status in the project-covered areas. Meanly the traditional occupations have significantly improved after installation of SHP in the study areas. After

SHP installation, most of the peoples are attracted business, foreign employment, government services and daily wages. After SHP 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 4.7: Occupational Status of Study Areas**

<b>Occupational Status</b>	<b>No. of Respondents Before Installation of SHP</b>	<b>Percept Before Installation SHP</b>	<b>No. of Respondents After Installation of SHP</b>	<b>Percept After Installation of SHP</b>
Agriculture	10	21.74	9	19.57
Business	7	15.22	9	19.57
Services	7	15.22	7	15.22
Foreign Job	10	21.74	11	23.91
Labour	6	13.04	5	10.87
Others	6	13.04	5	10.87
Total	46	100.00	46	100.00

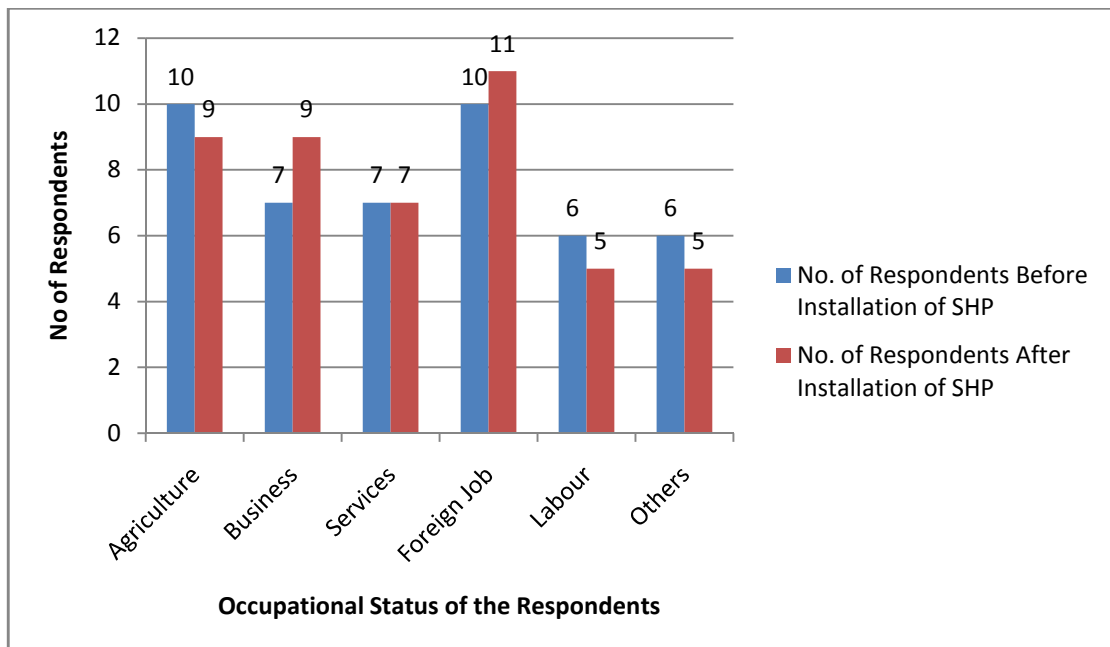
Source: Field Survey 2017

The table 4.7 shows that the change in occupational status of the study area before and after the installation of SHP. The previous time, 10 respondents are answered involved in agriculture sector whereas after installation of SHP 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 SHP, 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 SHP in this focuse area. According to this table, after established of the SHP in the catchment area, 23.91 percent youth are involved in foreign job, 15.22 percent are services sector, 19.57 percent are agriculture and business and 10.87 percent are labour and other sectors involvement after installation of SHP in the focused area.

**Figure 4.2: Occupational status of study areas**



This figure 4.1 shows that the occupational status before and after installation of SHP 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 SHP they has been shifted in different new sectors like Home-stay, business, foreign job and service sectors. On the based, figure 4.1 refers to the comparison study before and after established of SHP in the research area, 1 respondents changed his job occupation from agriculture, in the similarly way after SHP installation

2 respondents were involved in business sector. In this way after installation direct effect of the occupation status has been changed.

### 4.2.3 Sources of Energy

Ridi is one of the remote villages of Gulmi district. It is one of the village of Ruru VDC of Gulmi District. In this village, the facility of electricity was not availability in the study area before the establishment of SHP project. People of the focused area used firewood, kerosene as a source of energy before the installation of SHP 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 4.8: Source of Energy**

Sources	Firewood users HH	kerosene users HH	Electricity users HH
Before SHP	46	46	0
After SHP	43	0	46

Source: Field Survey, 2017

Table 4.8 shows that after the installment of Small Hydro Project, all the households were completely dropout the use of kerosene and all of them have installed electricity for their lighting purpose.

### 4.3 Impact on Income and Expenditure in Different

Before installment of SHP 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 SHP 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 SHPRs 135 increases the cost of electrification. However, except the electrification cost it has reduces the other cost in different sectors by high amount.

**Table 4.9: Income and expenditure of households before and after SHP**

S. N.	particulars	Unit of Cost	Before SHP		After SHP		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	0
3	kerosene(L/Month)	60	3	180	0	0	0
4	Petroleum(L/Month)	90	5	450	0	0	0
5	Lamp(pcs/Month)	10	30	300	2	20	28
6	Electricity(Unit/Month)	2.5	0	0	60	150	0
Total				2950		770	

Source: Field Survey, 2017

The table 4.9 show the quantity unit of electricity was zero before established of SHP on this area and there is no any cost bearing on electricity whereas after stability of SHP 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 4.10: Cost and saving amount after SHP installment**

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, 2017

Table 4.10 shows that the saving after establishment of SHP in the research area in different particulars like firewood, animal dung, kerosene, petroleum and lamps per months. Before installation of SHP 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 in aggregate in different particulars after established of SHP in this study area. Cost in different sector before and after installation of SHP 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 SHP 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 SHP 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 SHP, 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 following table .

**Table 4.11: Impact in Study Hours Per-day after Producing Electricity**

<b>S. N.</b>	<b>No. of Respondents</b>	<b>Before Electricity studying hours</b>	<b>After Electricity studying hours</b>	<b>Increment hrs/day</b>
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	6.5

Source: Field Survey, 2017

Table 4.11 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 4.12: Improvement in School Performance**

<b>Response</b>	<b>Numbers of respondents</b>	<b>Percentage</b>
Yes Improvement	38	82.61
No, I don't think so	8	17.39
total	46	100

Source: Field Survey, 2017

Table 4.12 shows that 82.61% respondents out of 46 respondents replied that the performance of their children at school has been improved. Nevertheless, 17.39 percent out of 46 children has not improved at school performance still. They said that, they are illiterate to guide their children and they cannot observe whether their children study is improved or not.

#### 4.5 Impact of SHP on use of Electronic Devices

The case study focused on impact of SHP 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 Ruru Village the numbers of electrical devices like mobiles, TVs, Radios etc. all are increased in large amount. After installation of SHP in this village, most of the people are inspired by SHP 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 SHP. Table 4.9 shows the situation of electrical instruments used before and after electricity production in the study area.

**Table 4.13: No. Of electrical instruments before and after Electrification**

S. N.	Electrical Instruments	Before SHP	After SHP
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	0	148
7	Rice cooker	0	5
8	Heater	0	0
9	Computer	0	15
10	Iron	0	20

Source: Field Survey, 2017

**Figure 4.3: Number of Electrical Instruments Before and After Electrification**

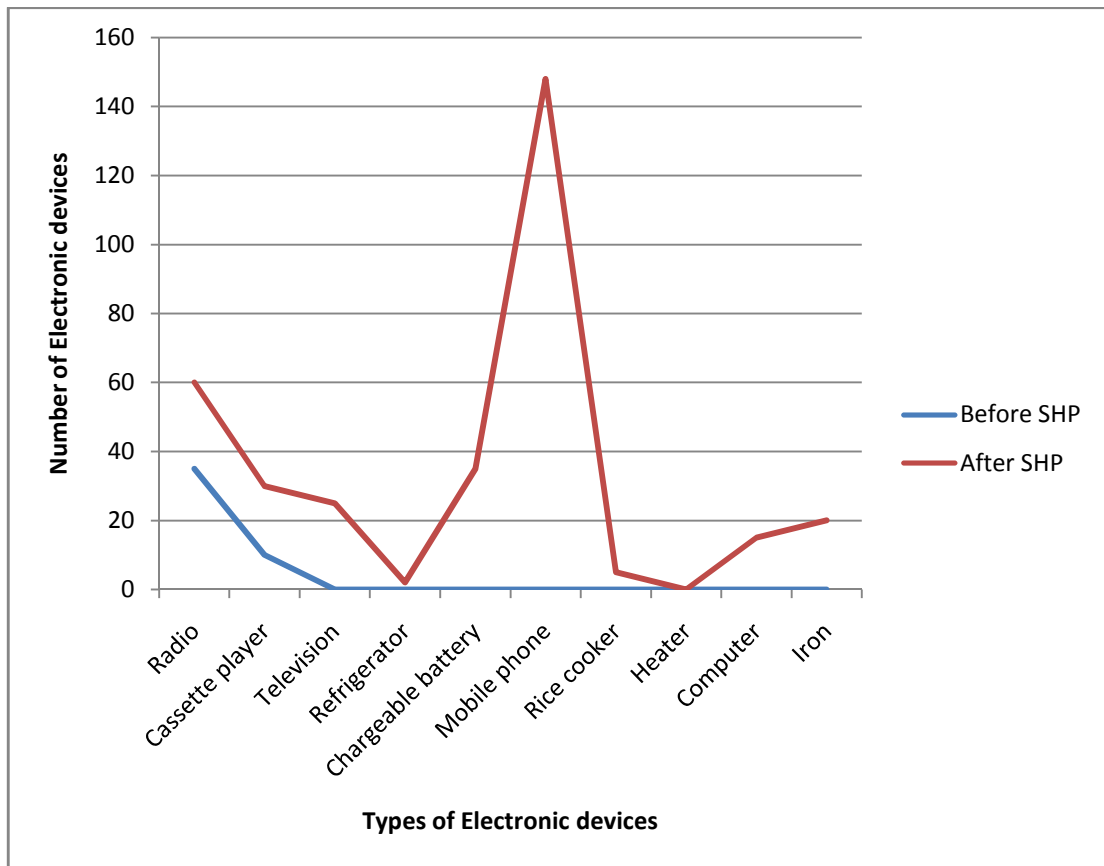


Table 4.13 and figure 4.3 indicate that, out of 46 households, 35 households used Radios, 10 households used cassette players, 5 households used mobile phones but they cannot use any sets of other devices which are mentioned in the table figure above. But after installation of SHP, this number of devices has been increased by a large amount and other used devices have also been increased, which is represented by the above figure and table. Before installation of the SHP project in the study area, there were no other electrical instruments like TV, fan, heater, refrigerator, iron, and rice cooker. After installation of the SHP project, the number of facilities using these kinds of electrical instruments increased in the study area.

#### 4.6 Impact of SHP 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 (CBS, 2011). 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 4.14: Means of Agro Processing after and before SHP**

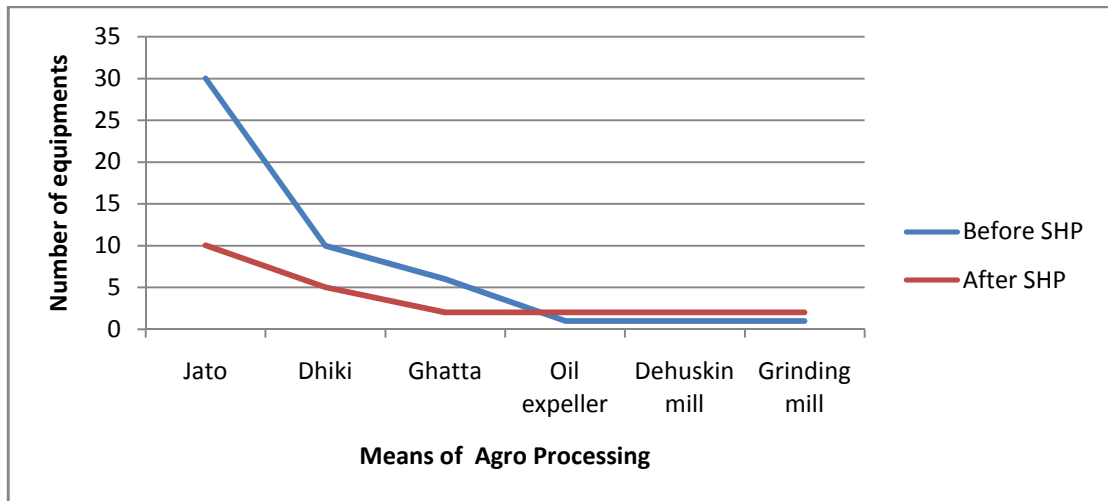
<b>S. N.</b>	<b>Means of agro Processing</b>	<b>No. of Respondents Before SHP</b>	<b>No. of Respondents After SHP</b>
1	Jato	30	10
2	Dhiki	10	5
3	Ghatta	6	2
4	Oil expeller	1	2
5	Dehuskin mill	1	2
6	Grinding mill	1	2

*Source: Field Survey, 2017*

Table 4.14 shows that, most of the respondent's family uses different types of traditional agro processors before Hydro Electricity Power. They used 30 traditional processor as Jato, 10 Dhiki, 20 Ghatta, 12 and very few mill. However, after electrification production, there are established some modern mills for agro processing basin.



**Figure 4.4: Means of Agro Processing after and before SHP**



Source: Field Survey 2017.

Figure 4.3 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 Problems and Prospectus of Small Hydro Power in Ridi**

##### **4.7.1 Impact on Family Activities**

The impact of SHP and rural electrification on family members was quantified during the survey. The impacts assessed included a change in work schedule, income generation, leisure activities, education, health and hygiene etc. The respondents were asked to reveal the changes they had experienced in their lifestyle and various other related aspects. The results obtained are as follows.

##### **a. Impact on Men**

The positive impacts perceived by men were the increase in their work schedule (75%), increase in access to entertainment and leisure activities (65%) increase in access to information and entertainment (40%). Although their daily working hours had increased, only 20% reported that their involvement in new

income generation activities too had increased. Regarding health and hygiene, some 80% of the respondents agreed that the impact of rural electrification on their health was positive.

### **b. Impact on Women**

Among women too, majority (70%) had experienced decrease in their sleeping hours, which somewhat correlated with the increase in daily working hours of most (80%) Women. 25% expressed the view that their access to entertainment and leisure activities had increased but for majority of women (55%), such access had decreased. With regard to new income generation activities, involvement of only 10% of women was seen. Similarly, increase in educational opportunities by reported by only 20% of women. However, some 70% women expressed the view that there have been improvements in their health and hygiene condition.

### **c. Impact on Children**

The positive impacts of electrification as observed in children were the increase in education (90%), health and hygiene (90%), access to information (65%). Almost 85% of respondents said that the sleeping hours of children had decreased, whereas some 60% said that the daily working hours of children too had increased. The increase in entertainment and leisure activities was observed in 30% of children, while for 20% of children, such activities had decreased. There was virtually no change in the income generating activities of children.

Hence, the overall impact of SHP on family members is positive. Due to light they can now stay awake late during night to finish the household chores. This definitely will impact their generation of income during the working seasons. More works in the evening means that their sleeping hours was decreased. They now also enjoy more leisure activities, people had started buying radio, cassette player, television etc. for entertainment. Through these media, they can

now get updated on the current world affairs and happening around the Nepal. More access to information will definitely help strengthen the democratization process in Nepal. Since, women had to do most of the household chores, their access to such media was comparatively lower than men and children.

The replacement of kerosene lamps by electricity means that they no longer faced the pollution caused by smoke and soot from traditional lamp. This in turn had improved their health status. Such impact was strongest on school going children. Now children could stay even late to study.

Meager increment in the new income generating activities may be due to the inadequacy of the users to derive the maximum benefit from electrification. This may also be due to the unavailability of necessary funds among users or due to their ignorance to such opportunities. In future it is hoped that as users increase their productivity and have more saving, more people will exploit such new opportunities. Certainly, giving more of the concessional loans to enthusiastic users help them in this regard. So, in reality, SHP do have the potentiality to involve more people in new income generation activities.

#### **4.7.2 Involvement in SHP**

Since this village is multi caste and ethnic village, its people are mutually dwelling there with harmony. SHP is the backbone of rural development which is available here. Since the villagers themselves were owned SHP, they are taken shareholder of it. The board of director of Ridi SHP is from the respective village, which is vital post, and deeds each and every decisions for the betterment of rural development. The villagers are directly involved 8-10 members permanently as a employee in this institution and indirectly all the village is depend on it in respect to agriculture, trade and livelihood phenomenon.

#### **4.7.3 New Opportunities Brought by SHP**

More than 80% of the respondents felt that SHP has indeed brought them new opportunities. However, the involvement of people in exploiting these new opportunities was quite small. Even significantly lower was the share of women in these new opportunities. Some works they had recently started included, establishment of mill for husking and polishing of rice, poultry farming, fishing, incense-stick making, and irrigating through motor pipe, etc.

#### **4.7.4 Future Plans of the Users of SHP**

Many of the respondents said that they have thought about taking benefit, the new opportunities brought by SHP, and hence to promote their business and work. However, almost 50% said that they had such plan. Their new plants included installation of Grind mill (Grinder), Rural Carpentry, Rice Huller, Video Hall, Dairy, Photo Studio, Lokta, Computer Centre, sawmill, oil-exPELLER, sewing and tailoring, poultry, livestock farming etc. However, they also raised many raised many constraints in this regard. Some of their concerns included, the unavailability of sufficient fund, lack of proper skill of time etc.

#### **4.7.5 Affordability of Electricity**

The minimum cost of electricity in the village RidiSHP 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.

#### **4.7.6 Regularity of Electricity**

As reported by the respondents, the distribution of electricity is regularity, In this area no load shedding problem. Though in this are people are emancipated from the load shedding problem. 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.

#### **4.8 Major Findings**

The major findings of this study are as follows:

- ) Majority of the respondents i.e. 45.65 percent were from 26-40 age group.
- ) In the study area Brahmins were in majority with 47.83 percent where as Magars in second position i.e. 23.91 percent.
- ) In the study area Hindus were in majority i.e. 86.96 percent, Buddhist were 8.370 percent and Christians were in 4.35 percent.
- ) In the study area majority of the respondents were in foreign job i.e. 23.91 percent and 19.57 percent respondents were equally involved in agriculture and business.
- ) After SHP the income level was drastically changed. Before SHP 17 respodnents reported that their annual income was less than 20 thousands but after SHP the number reduced into 8. This fact shows that there is positive symptom of incomelevel after installation SHP.
- ) After SHP many people shift their job. The direct hamper was happened on agriculture, labour and others as the respondents presentation was reduced in this sectors.
- ) Before SHP all the households were using Kerosone for lightening motto but after SHP Kerosone use was totlaly eliminate and after SHP 3 households left to use firewood use. The three persons who left to use firewood were job holder in Ridi hydropower project.
- ) After SHP respondents were able to save lots of amount which was used in firewood and kerosone.

- ) In terms study, it was drastically changed into the study hours of their childrens it was increase by 6.5 hours per day, which can be taken as a positive symptom.
- ) Among the respondents 82.61 percent respondents were replied there came drastic change in their students study.,
- ) After installation SHP most of the respondents were introduced with modern electronic appliances such as Television, refrigerator, mobile, computer and so on.

## CHAPTER V

### SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary of Findings

Hydro-Energy 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.
- ) Small-hydro project plant has been able to bring about profound socio-economic changes. The implication of Small-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 Ruru VDC, Gulmi District in Nepal.
- ) The study has discussed various merits of SHP 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 Ruru VDC, Gulmi. This study has been conducted from the direct interview method with 46 household respondents.
- ) Those respondents have been selected by random sampling method with taking certain level interval. The core finding of the study areas pointed as follows;

## **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. 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.

Small hydro-power 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 SHP system in Nepal. Improvement in health, environment, education, sanitation and income are some of the mentionable local benefits



from SHP project in rural households. Owing access to electricity reduced drudgery for women in sampled households in Ruru 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 SHP 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 SHP 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;

- ) 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.
- ) Alternative energy resource should be made available to minimize the pressure on forest.

- ) Nepal is rich 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.
- ) The government should be stop unnecessarily distributes licensing system.
- ) The government should be conduct feasibility survey for SHP in the rural areas of Nepal than starts the production process as much as possible with the help of foreign aid.

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1.3 Have they employed after SHP 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 SHP?

- 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 SHP?

- 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 SHP?

- 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 SHP 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 SHP?

- 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 SHP?

- 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 SHP?

Before SHP		After SHP	
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?

- f) Up to 1 hour
- g) 1 to 2 hour
- h) 2 to 3 hour
- i) 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 SHP 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 SHP 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 SHP?

- 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 SHP?

- 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, SHP system has played vital role for rural electrification?  
If yes, please specify

.....