Chapter - One

INTRODUCTION

This chaper deals with the introduction of the research base. It consistts of the general background of the study, statement of the problem, significancy of the study, the objectives of the study and limitation of the study.

1.1 Background

Nepal is rectangular in shape and lies between $80^o4'$ and $88^o12'$ East longitude and $26^o22'$ and $30^o27'$ North latitude. It has an area of 147181 KM^2. It is 885 KM long and 145 to 241 KM wide. From three sides east, west and south, Nepal is surrounded by India. From northern side, it has been bordered with China.

Nepal is endowed by water resources and got second position in the world. There are more than 6000 rivers in Nepal. The catchments area of these rivers is 194471 KM^2 (Malla, 2003). So it is identified as the potential country for hydroelectricity. In fact, water resource is considered as the wealth of the nation (DDPN, 2007). The water from these rivers has been used for the following three purposes: (a) irrigation (b) drinking water (c) hydroelectricity generation

The surface water is also used in the industrial sector but the use of the water in this sector is very low. In the irrigation sector, only 42 per cent of total irrigable land has got the irrigation facility in the present situation. In the sector of drinking water, the resource is not efficiently utilized because, around 66 per cent of the total population is getting safe drinking water (MOWR, 2002).

In the sector of hydroelectricity generation, there is a good potentiality. The topographical setting is also highly favorable in Nepal for the hydroelectricity generation. The theoretical estimation of the potentiality of hydroelectricity generation from all rivers is about 83280 MW (Gyawali, 1989). In this estimation, about 43000 MW is currently considered economically viable. Although Nepal possesses huge hydroelectricity potential, only around 580 MW has been harvested now. From this situation, it is clear that the potentiality of water resource has not been utilized as accordance of its carrying capacity in Nepal. Similarly, hydro electricity is very important form of renewable energy, which has no environmental pollution.

Electricity is considered as one of the important aspect of the infrastructure of the national development. Similarly, rural development can not be imagined without electrifying the rural areas. Thus electrification in rural areas is the prerequisite of the rural development. In the present situation, only 38 per cent population is using the electricity in Nepal. But around 21 per cent of the total electricity users are rural areas in Nepal.

Providing electricity facility in rural areas is considered as the rural electrification. But the meaning of the rural electrification has also the contextual importance. Generally, the extension of electricity to the rural areas is called as rural electrification. The electrification may be from the national grid or from the local grid or say decentralized energy system. According to Elizabeth Cacelski and Sandra Glatt, rural electrification means "the provision of electricity to the areas of low demand and highly dispersed potential consumers." Since 1911, when the electricity was first generated Nepal, it was generated for the urban purpose. But later on, it was realized that electricity not only useful for the urban areas but it is also useful for the rural areas. Then the concept of the rural electrification came in the policies of the nation. Currently, the private sectors are working in the field of rural electrification for example, the installation of the microhydro from the private sector in a remote village. In this context, the microhydro is highly supporting to the rural electrification scheme. But in the Tarai belt, the Nepal Electricity Authority (NEA) has also extended its 33 KV line to the rural areas of Tarai. (Malla, 2003)

According to the Report of WEC, 1988, the main uses of rural electrification in rural areas are:

1. To increase the agricultural and industrial productivity,
2. To promote the tourism in the remote areas,
3. To conserve fuelwoods and petroleum fuels,
4. To provide regional government services by electrifying remote district headquarters,
5. To increase the productivity of rural households,
6. To promote the use of social and other services in the remote communities such as street lighting, electric water pumps, etc.

But we cannot limit the uses of rural electrification. We should also see the context and the potentialities end uses of the electricity of the different rural areas. In general,

we can say that the rural electrification and fulfill the energy requirement of rural areas of Nepal if it is managed efficiently.

The scattered settlement pattern and small size of settlements in the rural area makes the rural electrification process uneconomical to supply the electricity from the national grid system. In such kind of situation in process of extension of rural electrification, the rural electrification scheme will be economically more viable. Thus the extension of national grid for the rural electrification is quite expensive in this area.

In Khaira study area Jhimruk Hydro Project has extended transmission line from the power station which lies in Ramdi VDC of Pyuthan district. The hydro project was completed about 13 years ago. Before this extension of the 11 KV line, people used to use the kerosene for the lighting purpose but in the present situation, most of the people use the electricity in stead of kerosene. This study was conducted to evaluate the impact of rural electrification in this rural VDC.

1.2 Statement of the Problem

Rural electrification is quite beneficial for the development process of the rural areas of the country. But we cannot say that this gives benefits to all people of all classes and levels without conducting any research and study.

In some sector, the rural electrification can give very good support but on the other sector, it may create resistance to develop. Thus, to find the impact of rural electrification on the social, economic, environmental and service delivery mechanism, we need to focus on the following issues.

a. What type of impact is the rural electrification leaving on the irrigation and industrial sector?
b. Is the rural electrification generating favourable impact upon the public health and education?
c. Whether or not the rural electrification is supporting to the environmental conservation by saving the fuelwood and the petroleum in the selected area?
d. Whether or not the service delivery mechanism is suitable according to the needs of the people?

Thus, the problem of this study was to find out whether the rural electrification is providing favourable impact upon the social, economic, environmental sectors in the selected area.

1.3 Significance of the Study

Generally, when the conversation of rural electrification takes place, it will be said that it is really beneficial for the rural people. But in reality, it may not be true. When we visit to rural areas and study about the rural electrification and conduct impact assessment, after that understand the reality about the benefits of rural electrification to the rural people. Study attempts to find out the real impact of the rural electrification upon the irrigation, rural industries, rural environment, rural public health and education in the Khaira area.

This impact study is also beneficial for the Nepal Electricity Authority and the policy makers of the rural electrification because this is the first impact evaluation study of the rural electrification of the Khaira area. Nepal Electricity Authority has started this scheme five years ago but till now not even a single study has been conducted to evaluate the impact of this scheme on the rural people. This study will help the Authority to understand the impact of this extension of the electricity on the rural areas of Nepal. Similarly, this study has also given certain vision about the impact of the rural electrification in the hilly region of Nepal.

In the case of rural electrification, we will find many impact study of the microhydro. But microhydro only is not the main source of rural electrification; the Nepal Electricity Authority is also working in this sector. But very little studies have been conducted on the rural electrification scheme of the Nepal Electricity Authority. This study is related with the rural electrification scheme of the Nepal Electricity Authority. Thus, this study has significance in this field.

This study is also beneficial for the institutions, which are working in the field of environment conservation. It gives them certain understanding about the impact of rural electrification on the environmental conservation in the context of fuelwood and kerosene consumption in the selected area.

This impact study also shows how the rural electrification is associated with the public health and the education. This achievement of the study shows the real scenario of the rural electrification on public health and education to the governmental and non-governmental institutions, which are working in the public health and the education sector in the rural areas.

The outcome of this study also shows us whether the service delivery mechanism of

the related authority is satisfactory to the rural people or not. This study is benefited to the related authority as it contains measures relating to how the authorities could create the effective and suitable service mechanism for the benefits of rural people.

This study is also benefited for the future researcher on this topic because it contains not only fact and figure but also analysis and issues about the impact of the rural electrification in the hilly region of Nepal.

1.4 Objectives of the Study

The main objective of this study was to evaluate the impact of electrification in the context of economic, social, environmental and service delivery system at Khaira area in Pyuthan district. This major objective was further divided into the following specific objectives.

1 To evaluate the impact of rural electrification on the industrial sector and the irrigation systems of the study area;
2 To assess the impact of rural electrification on public health and education;
3 To examine the impact of rural electrification on the consumption of firewood and petroleum products as fuels;
4 To measure the impact of service delivery system of rural electrification on the selected area.

1.5 Limitations of the Study

1. The study is concentrated in the Khaira area of the Pyuthan district; therefore, the findings of this study may or may not applicable to other parts of Nepal.
2. The study may require different complex type of computer programmes but it is only limited on the Microsoft Word and Microsoft Excel while processing the data.
3. The rural electrification may affect different variables of the selected rural area but this study has taken impact of rural electrification on certain variables viz. irrigation, small and cottage industries, public health, rural education, fuelwood consumption, the petroleum consumption and the service delivery mechanism.
4. The all family members may have different perception and ideas about the impact of rural electrification but the interview is limited with only one member of the household.

Chapter - Two
LITERATURE REVIEW

This study is mainly associated with the impact evaluation of rural electrification in Nepal. There are many publications, articles, books, journals and studies published on the socio-economic impact of the rural electrification. But most of these publications are only focused on the socio-economic impact of the micro hydropower plants which are playing key role on the rural electrification in the various parts of Nepal. But it does not mean that the national grid has not played any role on the rural electrification. The grid extension of Nepal Electricity Authority has also played key role on the process of rural electrification. This study is mainly related with the socio-economic impact of the rural electrification of the national grid.

There are magnificent literatures published on rural electrification. This literature review contains some of those literatures which are quite relevant for this study

This literature review has been divided in to four different sectors according to concern and the subject matter of the literatures as follows:

2.1 Conceptual Review

Different writers and different publications have tried to define the rural electrification through their own way. According to the McGraw-Hills Encyclopedia of Science and Technology, "Rural Electrification is the generation, distribution and utilization of electricity in non-urban areas, beyond the confines if incorporated cities, villages and towns". This definition of rural electrification is quite reliable. This encyclopedia has also given the technical concerns for the rural electrification. It says about it as "the homes found in rural areas, both farm and non-farm are as modern and upto date as those found in towns and cities." This definition of rural electrification has included the use of rural electrification in the hinterland and the far rural areas both. This encyclopedia has also shown the rural utility systems, the load density, distribution system and the future prospects of rural electrification.

According to World Bank in its journal, "Rural Energy Development Improving Energy Supplies for Two Billion People" says, "Rural electrification is generally thought of as grid electrification and this is indeed the most common and most desired means of supply where load densities are low, however, diesel generators, renewable

energy (solar energy, micro hydro, wind and small biomass fired generators) and 'hybrid' of such options are more cost effective." It is also quite reliable definition of rural electrification in which rural electrification has been characterized as most common and desired means of supply of electricity with low load densities. Similarly, this journal has also presented the existing scenario of rural electrification during 1970 to 1990. All developing countries of the world have electrified 33 per cent of total rural areas during this time in which 820 millions of rural population has got the electricity facility in these countries. This journal has also shown the pricing and financial policies, cost effectiveness, the choice of alternatives and the approaches of the rural electrification.

Similarly, the "World Millennium 2000" of "The World Book Encyclopedia" has presented the institutional development of the rural electrification in USA. According to this publication, the rural electrification was started in USA after the establishment of Rural Electrification Administration (REA) under the United States Department of Agriculture. It had worked for the rural electrification from 1935 to 1994. This institution mainly support to the rural electrification and the telephone extension in the rural areas by providing loans to the rural cooperatives and the companies to do these works. During the establishment of this REA, 10 per cent of the total farms had electricity facility in rural areas but in 1990, the 99 per cent of total rural farms had the electricity facility. This shows the efficiency of the service delivery of the REA but this has not defined the rural electrification separately and it has also not shown the socio-economic impact of the rural electrification.

The book of Arjun Shrestha, "Hydropower in Nepal: Issues and Concept of Development", has said that the small hydro projects are only suitable for the rural electrification in the present context in Nepal and it has also presented the causes behind the difficulty on the extension of the national grid for the rural electrification. But the writer has also commented the weaknesses of the present small hydel projects and micro hydropower plants for the rural electrification as they cannot meet the future needs because they have low voltage. Similarly, the writer has also said that the electricity will be ineffective in the productive works of the rural areas because the villagers will be unable to pay the electricity bills, thus only use the electricity on the lighting purpose only. The writer has also said that the rural electrification in Nepal is overdue because of the lack of the well-designed schemes. But the writer has said in

totality that the small hydropower projects are only feasible for the rural electrification because the transmission line extension will be quite costly for the rural electrification. But unless there is development of integrated approach for along with the small-scale industry, irrigation and labour intensive programme to raise the purchasing capability of the rural people; the rural electrification programme will be uneconomical. In this book, the writer has mainly focused on the feasibility, problems and prospects as well as the economic impact of the rural electrification but it has not tell about the social impact of the rural electrification.

The article of Mohan Dhoj Karki, "Small Hydropower and the Development of Agricultural Sector", has shown the importance of rural electrification on the agriculture, such as the development of agro based industries, irrigation by pumping water from river. But it has also presented the shortcomings of the micro hydro in the process of rural electrification but it has said that the rural electrification can play important role in the agriculture sector and boost up the agricultural production. The author has criticized the traditional irrigation technique. But the writer has not said anything about the rural electrification of the national grid.

Indu Shamsher Thapa, in his article, "Development of Small Hydroelectric Power and its Impact on the Small and Rural Industries", has shown the benefits of the electricity in the rural areas. It has mainly focused on the use of electricity in the industrial sector in rural areas from the national grid. It has also said that most of the rural industries are using the electricity from the small hydropower projects. This article has also said that the extension of rural electrification will reduce the oil consumption and the deforestation in the rural areas.

The article of Shanker Krishna Malla, "Jal Bidhut Bikash Ma Samashya Ra Sambhabana", published in the "Gorkhapatra", has said that there is high possibility of the rural electrification in the high land than the lowland through the micro hydro . But we cannot get the impact of rural electrification upon the agricultural sectors, rural industrial sectors and on the other socio-economic sectors of the rural areas.

The article of Prayag Lal Shrestha, "Bidhyut Shakti: Ek Jankari", published in the "Vijulee" bulletin, has mainly focused on the urgent need of rural electrification in the rural areas for the drastic change in the rural areas. But it has said that the rural electrification is only possible through the development of micro hydropower. It has

not talked about the impact of rural electrification on the rural people.

The article of Tek Bahadur Chhetri, "In Favour of Micro-Hydro Scheme", published on the "The Rising Nepal" on 18th November 1979, has presented the feasibility of micro hydro for the source of energy in the rural areas. It has said that the commercial fuels are not reliable as the source of energy in the rural areas but they are not available in rural areas easily but the micro hydro will provide many benefits to the people. But there is not any mention of the role of rural electrification from the national grid.

The news of Bikash Thapa, "Bangladeshi Gramin Bidhutikaran Model Arthik Star Ukashna Saphal", has shown the successful story of the rural electrification in the Bangladesh. According to this collection, this successful model of rural electrification will make the people the master of the rural electricity which will control the leakages and boost up the economic growth of the rural areas. He has also presented the expression of Prof. Dr. Abul Bakarat of Dhaka University as the economic growth has been reached to the 16 per cent because of the rural electrification in the Bangladesh and the rural industries has also flourished which are creating high employment in the rural areas. The writer has also said that this model of rural electrification is also implemented in Nepal from the fiscal year 2060 BS.

The article of Bikash Thapa, "Prasaran Line Ma Niji Schhetra", has said that the production, extension and distribution are the major three phases of electrification and in the absence of any one, the electrification will be incomplete. The community electrification approach is being followed in Nepal in the distribution process of the electricity which is quite effective for the rural electrification. This article has said that the role of private sector is quite necessary for the extension of electricity because the Nepal Electricity Authority is not capable to do it. Similarly, this article has also said that the extension of Nepal Electricity Authority will be quite expensive for the people but the extension work of the private sector will be quite cheap for the people but it has said that the Nepal Electricity Authority has not made any plan for the participation of private sector in the extension process of electricity.

Similarly, the another article of Bikash Thapa, "Data Ka Sarta, Sarkari Niti Ra Mahango Bijuli", has said that the price of the electricity is one of the highest rate in the world because of the different bonds and the contracts made by the donors and the

donor oriented policy of the government. Such type of bonds and contracts also exist in the 8th Rural Electrification Programme of Nepal Electricity Authority, which is mainly supported by the Asian Development Bank. This article has also said that because of the high price of the electricity, people of the rural areas are using the diesel engines for the pumping of water in the place of electricity. This article has mainly shown the service mechanisms of the electricity, the weaknesses of the electricity distribution and the causes behind the high cost of the electricity in Nepal.

The article of Douglas Barnes and Gerald Foley, "Rural Electrification in the Developing World: Lessons from Successful Programs", published in "http://wblm008.worldbank.org", has different lessons for the successful rural electrification by presenting different successful examples from different countries of the world. It has pointed out while managing the rural electrification, there are many factors and variables which should be kept in attention such as political dimension, institutional set up for electrification, other services to rural areas, cost recovery and the initial charge of electrification, community participation, operating cost, etc. This article has presented successful examples of rural electrification from different countries of the world such as Bangladesh, Laos, Costa Rica, etc.

2.2 Historical Review

According to "http://www/personal.psu.edu", the electricity was first generated as early back as 100 B.C. in Greece and Rome. But in Asia and Europe, it has been started to be generated in 4th A.D. It has said that the first turbine with curving blades has been created by the James Francis in 19th century which is still called as Francis turbine. The Dams are also started to be created for the electricity generation from the 19th century. This publication has said that the first electricity plant was built in Wisconsin in 1882 which produced 12.5 KW power.

The seminar paper of Bashant Kumar Shrestha, "A Seminar Paper on Histroical Development of Hydroelectricity and Its Problems", has presented the history of electricity of the world as well as Nepal. He has given the definition of Hydro electricity as "Hydro electric power means, electricity produced from generators that are driven by hydraulic turbines". It has been presented in this paper that the first hydroelectricity was generated in Tothernbury in Netherland on 1879. This presentation paper has also said that the first hydroelectricity plant in Europe for the supply of electricity to the public was built at Zurich, Switzerland in 1882. It has also

presented the history of hydropower in Nepal from the very beginning. It has said that the first hydropower station in Nepal is Pharping with capacity of 500 KW established in 1911 AD. Similarly, this paper has presented the hydroelectricity development in Nepal through the plan wise manner. During the first five-year plan, about 9 per cent of the total expenditure was allocated to the hydroelectricity generation and different rivers were surveyed for the electricity generation in this plan period. According to this presentation paper, the surveyed plants of the first plan period were constructed in the second and third plan period. The electricity generation has got the second position in the plan during the fourth plan period. This presentation paper has given the different figures of electricity development up to eighth plan period. It has said that the concept of rural electrification is started in Nepal from the decade of sixties was contributing for the rural electrification. This paper has said that GON has started to gear up the rural electrification process by establishing new small hydel project in hill area of Nepal.

The article of Chelsea Heller, "Hydropower History and Technology", published in "http://physics.Pomona.edu", has given the history of hydroelectricity and the technical side of the electricity development. But this article has been mainly focused on the history of hydroelectricity development in the USA. This article has also claimed that the mechanical energy from water was used before the 2000 years in Greece and Rome. The first hydropower in USA was the Wisconsin in Appleton established on 1882. It has said that the hydroelectricity was highly developed in USA after the First World War only because it was felt that the hydropower could provide water, power and revenue to the nation. The big dams were started to build in USA after the drought of 1930s. This article has also presented the Tennessee Valley Authority Act, passed in 1930s which was related with the first formal rural electrification in USA. This article has also given the idea of technical side of hydroelectricity such as the typology of dams, classifications of hydropower plants, types of turbines for hydroelectricity generation and transmission lines.

According to the McGraw Hill Encyclopedia of Science and Technology, the first central station service for rural electrification was provided by the Pearl Street Station in New York. Similarly, this encyclopedia has also said that the first electricity used in the farm was in 1898 by using the electric motor for the irrigation in the northern California. It is supposed as the beginning of the rural electrification in the world.

This encyclopedia has also said that the Rural Electrification Administration (REA) was the first administration which was targeted for the rural electrification.

2.3 Institutional Publications, Studies, Public Documents' Review

Electricity Act of 1992 has also given certain vision about the rural electrification. It has defined electricity as "Electric power generated from water, mineral oil, coal, gas, solar energy, wind energy, atomic energy or any other means". Similarly, it has defined hydroelectricity as "electric power generated from water. This act has said that different types of concession will be got these plants of electrification which has less than 1000 KW capacity. In Clause 12(1), it has been said, "No income tax to be levied to a person or a corporate body who is generating transmitting and distributing hydro electricity up to 1000 KW." This clause has been mainly targeted to increase the number of micro hydro for the rural electrification. Similarly, the Clause 18(1) is equally important for the rural electrification. It has been said in Clause 18(1) as, "One who distributes electricity in isolation of the national grid, shall be entitled to fix the electricity tariff and other charges for the electricity so distributed". This Clause is also targeted to facilitate the rural electrification process of Nepal. In the same way, the provision of Clause 29(1) is equally for the rural electrification of the nation because it guarantees against the nationalization of the land, line and plants of the electricity generation.

In the same way, the Hydropower Development Policy of 1992 is equally important for the rural electrification. The first objective of this policy is, "To supply electricity as per the demand of the people in urban and rural areas through the development of the high potentiality of the water resources that exits in the country". It has underlying concept of extension of rural electrification. The second policy has given high emphasis for the extension of the rural electrification as, "To give emphasis to the programme of rural electrification in order to render assistance in the development of agricultural production and cottage and small industries in the hill and Tarai region". The sixth policy is equally important for the rural electrification for the substitution of the fuel wood consumption in the rural areas by electricity. There are many policies which promote the micro hydropower plants for the rural electrification such as permission of the operation of plants in the isolation form and no necessary for the license to establish plant but the plant should have capacity up to 1000 MW. This micro hydropower has also liberty to fix the price rate of the electricity. These all

policies are related with the promotion of rural electrification in Nepal.

The report of Water Energy Commission under Ministry of Water Resources, "Report of the Task Force on Rural Electrification Impacts in Nepal (Vol. 1)", has mainly focused on the impact and the effectiveness of rural electrification projects in Nepal. This report was mainly targeted to facilitate the database building in the rural electrification for the future forecasting and the future direction of the rural electrification. It has focused on the impact of national grid as well as other small hydro and micro hydro for the rural electrification. This report has tried to define the rural electrification through two perspectives as demand side and supply side. But the semi urban and small urban centers are also included in the rural areas in this report. It has also reviewed the 5th, 6th and 7th five-year plan in order to find the provisions for the rural electrification. According to this revision, fifth plan has focused on the extension of national grid and the development of small hydro for the contribution on agriculture, commerce and small industry. In the seventh plan also, the rural electrification was mainly focused on the irrigation for agriculture development and the development of small and cottage industries. This report has presented the goals of rural electrification through the following way:

a. To increase the agricultural output through tube well pumps and small scale industrial production in rural areas,
b. To promote tourism be providing different services to the rural areas,
c. To conserve scarce resources as fuel wood and petroleum in rural areas by substituting these resources with electricity,
d. To assist in the development of a strong decentralized government by electrifying district head quarters,
e. To electrify the rural households to increase the productive activities in the rural areas,
f. To increase social services in the rural in setting up of hospitals and other equipments related with health.

This report has shown two types of services for the rural electrification in Nepal as public and private. It has also said that the Nepal Electricity Authority (NEA) grid has supplied more than 30 sites of remote areas and nearly 16 MW of total installed capacity was available through these sites. This report has presented 13 hydropower stations for the rural electrification but it has also included the solar photovoltaic for the rural electrification. It has also presented the electricity using pattern in the rural

areas as domestic sector, industrial sector, irrigation sector, etc. but it has said that the agriculture sector and the industrial sector have lowest use of the electricity. In the domestic purpose also, only the 10 per cent of total rural households are using electricity for the cooking purpose. It has said that the small and cottage industries of the rural Tarai belt are using electricity comparatively more than the industries of the hills and mountains. This report has also illustrated the service delivery mechanism for the rural electrification by the Nepal Electricity Authority (NEA). In conclusion, this report has said that the rural electrification is giving positive impact on the agriculture industrial sector and fuel wood consumption although it is minimum.

2.4 Individual and Team Outputs or Publications' Review

There are different dissertations, impact studies as well as other impact evaluations of different electricity programmes and projects of Nepal. But there are few studies and the impact evaluation reports on the rural electrification.

The dissertation of Rabindra Man Bajracharya, "Mini Hydro Project: A solution to Rural Energy Needs", has mainly related with the impact of rural electrification in the process of rural development. It has also says that the rural electrification process can stop the deforestation in the rural areas. This study is mainly focused on the role of mini hydel projects on the rural electrification but it has also signified that the national grid can also play crucial role in the process of rural electrification. It has also said that the rural electrification can play crucial role in the boost up of the small and cottage industries of rural areas. In totality, it says that the rural development will not possible without the rural electrification. But this dissertation has not talked about the negative impact of the rural electrification through the mini hydel project which are related wit the service delivery mechanism of the rural electrification.

The dissertation of Rekha Rajbhandary, 'Power Development in Nepal, A Strategy for Rural Electrification", has shown the importance of the small hydel plants in the rural electrification. It has been said that the electricity can be used in the agricultural sector and the industrial sector in the rural areas. But it has been also pointed out that the people of rural areas cannot pay the price of electricity of the national grid because the cost of extension will be quite high in the rural areas, thus the small hydel project can play key role in the rural electrification. The methodology is descriptive and explorative based on the secondary information in this dissertation.

Similarly, the dissertation of Kabita Acharya, "Hydro Electricity Development in Nepal and Its Contribution of Nepalese Economy", has been shown the impact of the electricity on the rural population. It has mainly focused on the suitability of the micro hydel projects for the agriculture and industrial sector in the rural area. In the agriculture, the electricity can be used in the irrigation sector and the agro based industries. It has said that the extension of electricity can reduce the oil consumption and the deforestation in the rural areas. This dissertation has also pointed out the mechanism for the integration of the small hydro project with the irrigation sector of agriculture. It says that the use of electricity in the irrigation sector will lead to the boost up of the agricultural development. The agricultural development will lead to the progress in the agro based industries and the agricultural development and the development of the agro based industries will lead to the gear up the rural development process of the nation. It has also presented the service delivery mechanism by presenting the project descriptions for the rural electrification in the Tarai of Nepal. This study is mainly based on the secondary information and the methodology is mainly descriptive and exploratory. It has been concluded that electricity is most necessary for agricultural, industrial, rural as well as urban development.

The dissertation of Prabina Hora, "Role of Micro Hydro Power in the Rural Electrification of Nepal", is equally important in the study of rural electrification in Nepal. This study is mainly focused on the micro hydropower which is totally targeted towards the rural electrification. It has general objective as "to identify the role of micro hydro power in rural electrification". This dissertation has said that the national grid cannot play role in the process of rural electrification because they operates quite far from the rural villages and the expansion of the national grid will not be feasible economically also. The methodology has used only the secondary information in this research which has adopted data from different offices as NGOs, INGOs and other governmental offices. It has been said that the rural electrification can increase the production of agriculture through the irrigation in the hill areas and the Agriculture Development Bank is playing key role in the establishment of micro hydro for the rural electrification to use in the agriculture sector. It has also presented the impact of rural electrification on the educational sector, quality of life, environment as well as the life of rural women.

The dissertation of B. K. Shrestha, Hydro Electricity in Nepal, has be mainly focused on the development process as well as the problems of the hydro electricity development in Nepal. This study says that the raising demand of the fuelwood in the developing countries can only be reduced by the extension of electricity in the rural areas. It has also illustrated the impact of the electricity on the agriculture and the industrial sectors by showing the relationship between the agriculture and the electricity and the industrial sector and the electricity. This dissertation has also shown that the small and micro hydro power plants are suitable for the rural electrification by presenting the examples from different districts of Nepal. But it has also emphasized that the national grid can also play important role in the process of rural electrification although the rural electrification process is quite hard in the context of Nepal. This study is mainly based on the secondary information and the nature of research is descriptive and exploratory. This study has concluded that hydro electricity can play key role in the process of national development. It has recommended that the small and micro hydropower should be developed for the rural electrification by using local raw materials and the local expertise.

The dissertation of B. M. Upadhayay, Prospect pf Harnessing Renewable Energy Resources in Mid-Western Development Region of Nepal, has mainly focused on the source and status of energy as well as prospects of energy development in the mid western development region of Nepal. This study has also shown that the electricity can also be important source of energy in the rural areas which can be used in the agro processing, irrigation, cottage industries, rural lighting, cooking, etc. that can be generated from the small and micro hydropower projects. It has also pointed out the suitability of the improvement of the traditional Ghattas for the rural electrification. This study is mainly based on the secondary information but it has also used the primary information also.

In the same way, the dissertation of S. B. Shtestha, Financing Power Development in Nepal, A Case Study of Nepal Electricity Authority, has mainly focused on the activities of the Nepal Electricity Authority in the process of electricity generation. It has said that the electricity generation can be best source of energy for the fulfillment of the national demand. The electricity generation in the rural areas can stop the deforestation and it will increase the irrigation and the cottage industries which lead to the poverty alleviation, sustainable economic development and upliftment of the

standard of living of people. This dissertation has concluded that very little rural population is getting the benefit of electricity although the topographical setting of Nepal is quite favourable for the electricity generation. It has been recommended that the electricity extension is necessary in rural areas in order to reduce the increasing deforestation in Nepal.

Chapter - Three
RESEARCH METHODOLOGY

This chapter describes the metholodies which were applied to conduct this research. It consists of description of variables, universe and the sample size, research design, sources of data, data collection techniques and tools, and analysis of the data and presentation.

3.1 Description of Variables

The main variables and conceptual frameworks, which are used in this study, are household, irrigation, industrial productivity, public health, firewood consumption, petroleum consumption and service delivery.

3.1.1 Household

Here, household is considered as an economic unit mostly private and non-institutional of the Khaira area. It may consist of two or more members living together.

3.1.2 Education

Education is considered as the education level of the people of the Study area It includes the school level education and the college level education.

3.1.3 Irrigation

In this study, irrigation is considered as the irrigation on the agricultural land of the study area. It includes all the techniques of irrigation and it also includes the irrigation on the cereal crops and cash crops.

3.1.4 Industrial Sector

Industrial sector is considered as the all types of industries of the selected area after the starting of this electrification in this study area. It also includes the newly established industries after the electrification. Industries include the cottage and small industries, which are directly dependent upon the locally available resources.

3.1.5 Public Health

Public health means the health condition of people of the study area. It includes the health condition of people before and after the electrification.

3.1.6 Fuelwood and Petroleum Consumption

In this study, the fuelwood and petroleum consumption refer as the consumption pattern of the fuelwood and the kerosene before and after the starting of the electricity in this rural area.

3.1.7 Service Delivery Mechanism

Here, the service delivery mechanism is considered as the regularity of the service delivery and the effectiveness of the service delivery mechanism of the related authority.

3.1.8 Rural Electrification

The rural electrification means the rural electrification of Butwal Powar Compani/ Jhimruk Hydro Electricity and Rural Electrification Center (BPC/JHEREC) in the Khaira area in this research.

3.2 The Universe and Sample

The total number of households of Khaira area is universe of this research and about 10% are selected as sample from these households by using simple random sampling technique. The size of the universe is 829 households and the sample size is 85 households.

3.3 Research Design

This study is based on the micro study of impact of rural electrification on the selected area. The study is designed in an explorative, descriptive and analytical framework to evaluate the impact of rural electrification.

3.4 Source of Data

The study is mainly based on the primary data. Secondary were also used for the purpose of analysis and comparison. Primary data were mainly collected through the structured questionnaire by taking personal interview with the member of the household. Each sampling unit have been selected by taking simple random sampling without replacement. This was done to obtain an unbiased and fair study. The interview was conducted with the head of the household. The secondary data were taken from publications of Nepal Electricity Authority, National Planning Commission, Central Bureau of Statistics different I/NGOs and various other research organizations. The secondary data are obtained in order to make comparison with the primary data of this research.

3.5 Data Collection Techniques and Tools

To generate the primary data, the structured questionnaire, semi or unstructured interviews, and observation methods were applied.

3.5.1 Households Survey Questionnaire

Household survey questionnaire was prepared to generate the realistic and accurate data from the sample household. While preparing the questionnaire, the special attention was given to the simplicity of the questions and the possibility of getting appropriate answers. The respondents were requested to fill up the questionnaire. In case the respondents were unable to read and write the questions were asked to them and answers were filled up to collect data (The households survey questionnaire is given in Appendix).

3.5.2 Key Informant Interview

The primary data were collected from key informants such as teachers, electricity officer, government officer, local leader using the semi or unstructured interview method. The interview was taken for cross checking the information obtained from different key informants in order to make high degree of accuracy in the study.

3.5.3 Observation

The method of observation was also applied to get the relevant information for the study. The researcher was visited the study area and observed the people, their activities, electricity situation, other surrounding and so on because it is also an integral part of the study.

3.6 Data Analysis and Presentation

The systematic analyses have been done by using qualitative as well as quantitative tools and techniques. The quantitative data obtained from structured questionnaire was first processed through validation, editing and coding. Secondly this processed data were presented in tabular form. Finally, the data interpreted with additional information. Simple statistical tools such as per cent and ratios were used to present the findings. Besides this, cartographic techniques such as graphs, diagrams, maps and pie-chart were used to supplement the presentation of the findings of the study.

Chapter - Four

MAJOR FINDINGS AND INTERPRETATION

This chaper deals with the discription of the selected area for the research. It reveals the location, land holding pattern, occupational status, literacy status of the population in the study area and also this chaperter deals with the data, their analysis and presentation in the basis of the findings. It has covered electricity use, its impact in commercial and industrial sectors, in irrigation sector, in consumption of other sources of fuels, in health and education, and in service delevery system

4.1 Location

The study area of this study is Khaira area of Pyuthan district. It lies nearly at the center of the district. The study area is boardered by Dakhakwadi, Bijuwar and Khalanga to the North, Dharmpaniand and Raspurkot to the east, Dhuwang and Ramdi to the south, and Ramdi and Dakhakwadi to the west. According to the population census of 2001 the total population of the study area is 4628, which is 2.18 per cent of the total population of the district. Out of the total population of the study area male has covered 47.15 per cent (2182) and female has covered 52.85 per cent (2446). The following table shows the population distribution of the study area by sex in each ward.

Table: 4.1: Gender wise Population Distribution in the Study Area.

Gender	Wards									Total	Per cent
	1	2	3	4	5	6	7	8	9		
Male	188	338	155	261	302	258	164	203	313	2182	47.15
Female	222	383	202	289	297	259	178	281	299	2446	52.85
Total	410	721	357	550	599	553	342	484	612	4628	100.00
Per cent	8.86	15.58	7.71	11.88	12.94	11.95	7.40	10.46	13.22	100.00	

Source: CBS, 2001

Table 4.1 shows the overall distribution pattern of the population in the study area It shows that there is higher number of female than male in the study area. In the same way, this number is higher in the each wards of the study area. This distribution of population, the average household size is 5.58 which is slightly more than the overall household size of the country. Similarly, the land distribution pattern of the study area can be shown through the following table.

Table 4.2: Land Holding Pattern in the Study Area

Land holding size (in Ropani)	Households	
	Number	Percent
Landless	2	2.35
Below 5	10	11.76
5 - 10	26	30.59
11 – 15	26	30.59
16 – 20	13	15. 29
21 and above	8	9.41
Total	85	100

Source: Field Survey, 2008. * Note: 1 Ropani = 0.05 hectar

Table 4.2 illustrates the land holding pattern in the Khaira area. The highest per cent (30.59) of population of the study area who, holds 5 to 10 ropani and 11 to 20 ropani respectively. Similarly, the second highest portion of (15.29%) the population holds 16 to 20 Ropani in the study area. In this way, 11.76 per cent of the total population holds below 5 ropani and 9.41 per cent holds 21 and above Ropani land. Very few portion of the population (2.35%) belongs to land less in the study area. From this land holding pattern in the study area, we can say that there is not uniformity in the land holding pattern which creates high barrier to uplift the economic status of this study area. However, most of the population of this study area is dependent upon the agriculture.

Table 4.3: Occupational Status of the Study Area

Occupations	Households	
	Number	Percent
Agriculture	50	58.82
Industry	3	3.53
Service	7	8.24
Labour	15	17.65
Business	10	11.76
Total	85	100.00

Source: Field Survey, 2008.

The table 4.3 shows the occupational status of the study area. In this study area, 58.82 per cent of total sample population is engaged in the agriculture as their major profession. Similarly, 11.76 per cent population is following business as their major occupation. In the same way, very least population is following industry as their major profession. 8.24 and 17.65 per cent of the total population is engaged in the service and labour respectively. This shows that the agriculture sector is the leading sector of the economy of this study area. But the business sector is also contributing in the economy of this study area. From this data we can conclude that the use of electricity in the agricultural sector will highly support to boost up the development process of this study area.

Table 4.4: Literacy Status of People in the Study Area

Educational Level	Population	
	Number	Per cent
Illiterate	182	38.32
Primary	101	21.26
Lower-secondary	91	19.16
Secondary	62	13.05
Campus	39	8.21
Total	475	100.00

Source: Field Survey, 2008.

The educational status of people in this study area is moderate. There are about 39 per cent illiterates in the total sampled population. Similarly, the 21.26 per cent of total population has studied upto primary level only. The 19.16 per cent of the total population studies upto lower secondary level. In the campus and secondary level, there is lower proportion of population than the primary and lower secondary level. This trend shows that there is high flow of population in the lower classes and the flow of population decreases in the higher classes. In the campus level, there is only 8.21 per cent population but in the primary level, it is 21.26 per cent. The cause of this, when some individual is child, he/she cannot contribute in the works of the households but when he/she crosses 10 years he/she is able to contribute in works of households. Then he/she is stopped to go school from the household.

4.2 Electricity Use in the Area by Sector

After the electrification The study area consumes around 18518 units per month. The electricity has been used in different sectors such as industrial, commercial, transportation, agricultural and residential sectors. The following table 5.1 shows the percent of the electricity consumption in different sectors of the study area.

Table 4.5: Electricity Consumption in the Area by Sector

Sectors	Units/month	Percent
Industrial	3704	20.00
Commercial	926	5.00
Transportation	0	0.00
Agricultural	370	2.00
Residential	13518	73.00
Total	18518	100.00

Source: Field Survey, 2008.

The above table 5.1 represents the electricity consumption in the study area. As showing in the table the residential sector consumes 73 per cent and the industrial sector consumes 20 per cent of the total electricity consumption in the study area. Similarly, the commercial and agricultural sectors consume 5 and 2 percent of the total electricity consumption in the study area respectively. But the transportation sector has not used the electricity in the study area.

4.3 Impact of Electrification on the Commercial Sector

After the electrification the commercial sector of the study area has been benefited. The sector has no any knowledge on the use of the computers and other information technology before the electrification. When the study area was electrified every service sectors of this group has purchased computers and other equipments in their offices. The following table 5.2 shows the types of the commercial sectors in the study area.

Table 4.6: Types of the Commercial Sectors in the study area

Types of commercial sector	No
Schools	6
NGOs	2
Sub Health Posts	1
Cooperatives	2
Hotel/ Restaurants	7
Retail Shops	15
Total	33

Source: Field Survey, 2008.

According to the above table 5.2 there are 6 schools including Primary, Lower Secondary and High Schools, 2 NGOs, 1 Sub Health Post, 2 Cooperatives, 7 Hotels and Restaurants and 15 Retail Shops in the study area.

4.3.1 Commercial Sectors before Electrification

Before the electrification in the study area the commercial sector was deprived from the information technology because there was no any computers, telephone, fax. And photocopy machines in the study area. Similarly, there were very few numbers of the retail shops and hotels/restaurants which used to use kerosene for lighting and schools did not have computers. Now the study area has been equipped with different information technology appliances. It is due to the electrification in the study area.

4.3.2 Commercial Sector after Electrification

Rural electrification has brought changes in the study area. Many services sectors have been working in the study area and schools are being upgrading now. This change has been brought by the electricity in the study area. The schools use electricity for lighting in the off school times to teach the students on their subject matters. These activities helped to improve the educational status of the students in the study area. Similarly, some of the schools are providing computer courses to the students in the study area. Like wise, other service sectors have been providing servicing of photocopy, computer desk to work, telephone and fax to the villagers in the study area. In this way the use of the electricity is different in every service sectors in the study area. The following table 5.3 shows the end use of the electricity in the commercial sectors of the study area.

Table 4.7: End Use of the Electricity in Commercial Sectors

Types of end uses	No	Percent
Lighting only	8	24.24
Lighting and Radio/TV/Cassette Players	22	66.67
Lighting, Computer/Photocopy/Fax/telephone machine Operating	3	9.09
Total	33	100.00

Source: Field Survey, 2008.

The above table 5.3 represents the end use of the electricity in the commercial sectors of the study area. According to the table the electricity is used for lighting and operating radio/cassette/TV in the study area. This type of use covers more than 66 per cent of the total commercial sectors in the study area. Similarly, 24.24 percent and 9.09 per cent of the commercial sectors use electricity for lighting only and Computer, Photocopy, Fax, telephone machine operating with lighting respectively in the study area. This provides us the information that there every sectors used to purchase

4.4 Impact of Rural Electrification in the Industrial Sectors

In this study area, more than 3 per cent of total population are following industrial sector as their major occupation. However, more than 18 per cent of the population is labour in this study area. These labours are also associated with the industrial sector in some wages. Thus industrial sector is also quite important sector for the livelihood of people in this study area. In the present position, all the industries of the study area are using electricity. The impact of electrification can be analyzed through the evaluation of condition of industrial sector before and after the electrification.

4.4.1 Types of Industries in the Study Area

There are about 12 different industries in the study area. There are running three types of the industries in the study area. Out of the rice, flour and oil mill about 3 numbers were established before electrification and 2 numbers of them were established after the electrification in the study area. Similarly, the poultry farming and TV cable distribution industries were established after the rural electrification in the study area.

Table 4.8 : Types of Industries in the Study Area

Types of Industries	No
Poultry Farming	7
Rice, Flour and Oil Mill	5
TV Cable Distribution	1
Total	13

Source: Field Survey, 2008.

The above table 5.4 shows that there are about 7 numbers of poultry farming industries and about 5 numbers of rice hulling, oil expelling and grinding mills running in the study area. One of the rice hulling, oil expelling and grinding mills is improved water mill.

4.4.2 Industrial Sector before Electrification

Before the electrification, the industries of these areas used to use the petroleum products as their fuel for operating the machines. Industrialist said that the expenditure used to be higher on the fuel for the production before the electrification. Similarly, it is also approved by the villagers that they used to pay about Rs. 12 for rice hulling for 40 KG before the electrification. In the same way, villagers said that there were very few numbers of industries especially the rice mills before the electrification in this study area. The cost of fuel can be shown through the following table before the electrification in this study area.

Table 4.9 : Expenditure on Industries before the Electrification /month

Expenditure (Rs.)	No. of industries	Per cent	Mid value	Total expenditure (Rs.)
<500	2	16.67	250	500
500-1,000	1	8.33	750	750
1,000-1,500	1	8.33	1250	1,250
1,500-2,000	1	8.33	1750	1,750
>2,000	7	58.34	2250	15,750
Total	12	100.00		20,000

Source: Field Survey, 2008.

The above table shows that 16.67 per cent of total industries used to spend less than Rs. 500 for the purchasing of fuel for the industry before the electrification. Similarly, some industries used to spend around Rs 750, 1250, and 1750 per month for fuel

purchase respectively. In the same way, the 58.34 per cent of industries used to spend more than Rs. 2000 for the purchasing of the fuel. In total, all industries of the study area used to spend around Rs. 20000 before the electrification in this study area.

4.4.3 Industrial Sector after the Electrification

Almost all industries of the study area are using electricity for different purposes. The following table 5.6 represents the end uses of the electricity in different industries.

Table 4.10 : End Use of electricity in the Industries

End Use	Number	Percent
Lighting	3	23.07
Heating and lighting	7	53.86
Mechanical and lighting	3	23.07
Total	13	100.00

Source: Field Survey, 2008.

In the above table 5.6, 23.07 per cent of total industries are using electricity both in the mechanical and the lighting purposes. Similarly, around 53.86 per cent of the industries use the electricity for heating and lighting purposes. But the 23.07 per cent of industries are using the electricity for lighting purpose only. There are many causes behind the use of electricity for the lighting purpose only.

There are very few industries which say that the cost of production is higher by using electricity than by using petroleum and firewood. Most of the industries are using the electricity because it reduces the cost of production. The consumption pattern and the cost pattern of the industries are shown from the table 5.7 as follows.

Table 4.11 : Consumption and Cost Patterns of Electricity by Industries per Month

Amount of Electricity	No. of industries	Percent	Mid value	Price of per Unit	Total expenditure (Rs.)
50-100 Units	6	46.16	75	5.45	2,452.5
100-200 Units	2	15.38	150	5.45	1,635.00
200-300 Units	2	15.38	250	5.45	2,725.00
300-400 Units	1	7.7	350	5.45	1,907.5
>400 Units	2	15.38	450	5.45	4,905.00
Total	13	100.00			13,625.00

Source: Field Survey, 2008.

In the above mentioned table 5.7, 46.16 per cent of total industries of the Khaira area are using 50 to 100 unit electricity. Similarly, 16.67 per cent of total industries are using 100-200, 200-300 and more than 400 units of electricity respectively. In the same way, the 8.33 per cent of total industries are using more than 300-400 unit electricity per month. Similarly, table 5.8 has also shown the expenditure pattern of the industries. It has shown that these 12 industries are spending Rs. 13625.00 per month.

4.4.4 Evaluation of the Impact of Electricity on the Industrial Sector

From the above mentioned information about the condition of industrial development in this study area, it is included that there is highly positive impact of electrification up on the industrial sector of this study area. This logic is supported from the following table which represents the expenditure patterns of the industries on the energy before the after the electrification.

Table 4.12 : Electrification Comparison of Expenditure on Energy in Industries Before and After

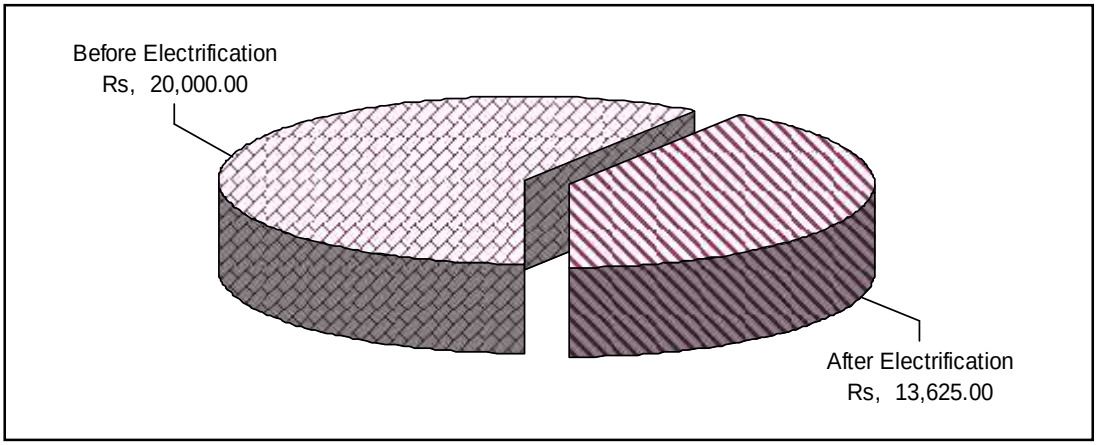
Before electrification		After electrification	
Number of industries	Total expenditure (Rs.)	Number of industries	Total expenditure (Rs.)
2	500	6	2452.5
1	750	2	1635.00
1	1250	2	2725.00
1	1750	1	1907.5
7	15750	2	4905.00
12	20000	13	13625.00
Average	1666.67	Average	1048.00
Difference in total		Rs. 20000-Rs. 13625= Rs. 6375	
Average saving per month		Rs. 6375.00	

Source: Field Survey, 2008.

In the above mentioned table 5.8, we get the expenditure pattern of industries on the energy before and after the electrification. Before the electrification, the most of the industries were using the petroleum products for their energy. For that purpose, the industries used to pay aggregate amount Rs. 20000.00 per month. But after the electrification, most of these industries have started to use the electricity as their

source of energy and pay only Rs. 13625.00 per month. Before the electrification, the average expenditure of industries was Rs. 1666.67 on energy but after the electrification, the average expenditure of the industries is Rs. 1048.00. From this energy purchasing trends of industries, the average saving of industries after the electrification is Rs. 6375.00 per month. It shows that the industrial sector is highly benefited after the electrification in this area. Similarly, the expression of people also support that the rural electrification has reduced the rate of grindings of grains in the grinding mills. The expenditure pattern of the industries before and after the electrification can be shown through the following figure also.

Figure 1: Expenditure Pattern before and after the Electrification



Source: Field Survey, 2008.

In the same way, the numbers of industries is also increasing in this study area after the electrification. Specially, the TV Cable distribution industry and the Grinding Mills are increased in this study area because of the decrement of the large amount of initial cost of establishment.

4.4.5 Findings from Industrial Sector Data Analysis

From the above analysis of data of the industrial sector of the Khaira area, we can summarize that the impact of electrification is positive to the industrial sector of this study area. This is possible because of the following supports to the industrial sector by the electricity:

- The number of industries has increased because the electric motors are cheaper than the petroleum engines for the establishment of small and cottage industries.
- The cost of production has also reduced, because the electricity is cheaper than the petroleum fuels which was used in the small and cottage industries before the

electrification.

- Some industries are in the exceptional case because their cost of production will increase while using the electricity in the production. Thus they are not using electricity for the production.
- The industrial sector is more beneficial to the low income group of people also because of the low price of the local industrial products.
- The industrial sector has also support to preserve the local environment by using the non-pollutant energy.

4.5 Impact of Rural Electrification on the Irrigation Sector

Rural electrification can play very important role in the sector of irrigation in order to increase the agricultural production. There are many techniques of irrigation in the Khaira area such as Kulo System, Pump set system, Electric Motor System, etc. The data of irrigated land and non irrigated land is presented through the following table.

Table 4.13 : Data of Irrigated and Non-irrigated Land

Land holdings (in Ropani)	No. of households	Irrigated land		Non irrigated land	
		Households	Percent	Households	Percent
<5	10	7	23.33	3	5.66
5-10	26	11	36.66	15	28.30
11-15	26	8	26.67	18	33.97
16-20	13	2	6.67	11	20.75
21and above	8	2	6.67	6	11.32
Total	83	30	100.00	53	100.00

Source: Field Survey, 2008.

In the table 5.9, the total irrigated land is low than the total non irrigated land. There are 7 households which have less than 5 Ropani irrigated land. On the other hand, there are 3 households which have less than 5 Ropani non irrigated land. There are 11, 8, 2 and 2 households which have 5-10 Ropani, 11-15 Ropani, 16-20 Ropani and 21 and above Ropani irrigated land respectively. However, there are 3, 15, 18, 11 and 6 households which have below 5 Ropani, 5-10 Ropani, 11-15 Ropani, 16-20 Ropani, and 21 and above Ropani non irrigated land respectively. The total number of households with the non irrigated land is higher than the total number of households

with irrigated land.

There are different techniques of irrigation in this study area. Some people are following the cannel (Kulo) system, some are following the pump set system for the irrigation. There are very few people who are following the electric motor system of irrigation. The following table shows the irrigation pattern of the study area.

Table 4.14 : Irrigation Pattern of study area

Techniques	No. of households	Per cent
Cannel (*Kulo*) system	28	93.33
Electricity (lift irrigation)	2	6.67
Total	30	100

Source: Field Survey, 2008.

In the table 5.10, the irrigation techniques of the study area have been shown. There are 93.33 per cent are using the Kulo system for the irrigation and remaining 6.67 per cent are using electricity (lift irrigation) for the irrigation. The lift irrigation mostly used during the winter and summer seasons only. On the other hand, more than 60 per cent of total population is not using any irrigation in the present position also.

4.5.1 Condition of Irrigation Sector Before the Electrification

Before the electrification in this study area, most of the people were following rainfall irrigation system. According to the group discussion about the irrigation technique, we have got some information that they were not able to pay for expensive irrigation before the electrification. According to Bhim Bahadur Thapa one of the respondents, they have been dependent upon the rainfall for the irrigation till present position also. It shows that the people of Khaira area had only one option of irrigation before the electrification in this study area i.e. rainfall.

4.5.2 Condition of Irrigation Sector after the Electrification

After the electrification, there are two options of irrigation in this study area viz. cannel (Kulo) system and Electrical Motor System. From the table 5.10, we have got that cannel (Kulo) system of irrigation is still widely being used in this study area i.e. 93.33 per cent. About 7 per cent households are using the Electrical Motor System for the irrigation.

4.5.3 Impact Evaluation of the Impact of Electricity on the Irrigation Sector

There will be high positive impact of the electricity on the irrigation sector, if it is used for the irrigation. But the condition of this study area is quite different because there is very minimum use of the electricity in the irrigation sector. The main cause of this the electricity is only available nearby the settlement but not available near by of the farm. More than 93 per cent of the respondents are saying that the electricity is not available near by their land thus they are not using electricity for the irrigation to their land. That's why, only 6.67 per cent of the total respondents are using electricity for the irrigation. The cost of electricity is also lower than the general cost. According to the Jhimruk Hydro Electricity and Rural Electrification Center (JHEREC), per unit charge of the electricity for the irrigation is Rs. 3.65 it is completely 50 percent less than the general cost (7.30) of electricity. It is also quite supportive for the extension of electricity in the irrigation sector.

4.5.4 Findings from Irrigation Sector Analysis

From the above analysis of the irrigation sector, there has not seen positive impact of electrification on the irrigation sector in the Khaira area although the situation is also favourable. On the other hand, people want to use the electric motor for irrigation but they are not getting the electricity nearby their farm land and high land irrigation would be difficult. Thus, people are not able to use the electricity for the irrigation in this study area. From the above data analysis, we get the following findings:

- There was single irrigation technique in the past in the Khaira area that was rainfall.
- In the present position, there are two types of irrigation system in the study area these are cannel (*Kulo*) system and Electric Motor system.
- There are only 6.67 per cent households are using the electric motor irrigation system. It shows that the electrification can not contribute on the irrigation sector properly.
- The main causes of not using electricity in the irrigation sector are, the slope land, high land and lack of availability of the electricity nearby of the farms.

4.6 Consumption of Firewood and Petroleum Products

Firewood and kerosene are major sources of energy in the study area. Some areas of the study area have not been electrified completely till date. Thus, the people of these areas are still highly dependent upon these traditional sources of energy. But now the electricity has been able to substitute the kerosene. Basically, all wards are using electricity in the present position. The data of electricity users and not users is shown by the following table.

Table 4.15 : Electricity Users and Non Users Households

Users/Non Users	Number	Percent
Users	77	90.59
Not users	8	9.41
Total	85	100.00

Source: Field Survey, 2008.

The above table 5.11 has shown the electricity using and electricity not using households. Only 90.59 per cent of total households are using electricity in the present position but remain 9.41 per cent are not taking the facility of electricity till now. This situation shows us that the 9.41 per cent population is still depending on the firewood and kerosene for the energy sources in their households.

4.6.1 Firewood and Petroleum Consumption before the Electrification

Before the electrification, the population of whole study area was dependent upon the firewood and kerosene as their major source of energy. Table 5.11 has shown that there is not electricity in some areas of the study area till now. It means, there prevails condition of the before electrification till now in some wards. But the consumption of these energy sources have been reduced to some extent. Before the electrification, the sources of energy in this study area are shown by the following table.

Table 4.16 : Source of Energy before the Electrification

Sources	Number of households	Percent
Kerosene and firewood	82	96.47
Biogas, firewood and kerosene	3	3.53
Total	85	100.00

Source: Field Survey, 2008.

In above table 5.12, the 96.47 per cent of total population was dependent up on the kerosene and firewood as their major source of energy before the electrification. In the same way, kerosene and biogas, firewood and kerosene were used by 3.53 per cent. From this table, we get that there was high dependency on kerosene and firewood before the electrification. They could no have access to alternatives to substitute these sources of energy in that time though, the biogas was introduces in the study area.

The kerosene using pattern has been changed after the electrification in this area. But the firewood using pattern has not been changed in the study area because there are very few households use the electricity for the cooking purpose. The table 5.13 shows the firewood consumption pattern of the study area before the electrification.

Table 4.17: Firewood Consumption Pattern of the VDC before the Electrification

Consumption firewood *(Bhari)**/ month	No. of households	Percent
5	26	30.59
8	48	56.47
11	11	12.94
Total	85	100.00

Source: Field Survey, 2008. *1 Bhari = Average 30 Kg

The table 5.13 has shown that the maximum number around 57 per cent of people of this study area used 8 Bhari firewood per month before electrification. In the same way 12.94 per cent of the total population used 11 Bhari firewood before electrification. Similarly, 30.59 per cent population was using 5 Bhari firewood per month. Here the consumption of firewood was dependent up on the family size of the household.

Table 4.18: Expenditure Pattern on Firewood before the Electrification Per Month

Amount of fuel wood (*Bhari*)	Number	Per Kg. Price (Rs.)	Total amount (Rs.)
5	26	30	39,000
8	48	30	1,15,200
11	11	30	36,300
Total	85		1,90,500

Source: Field Survey, 2008.

In the table 5.14, there is total expenditure of Rs 190500.00 per month by the 85 households for the purchasing of firewood. The average expenditure of individual household is Rs. 2241.00 per month. It was the scenario of firewood consumption before the electrification in this study area.

In the same way, the following table shows the consumption pattern and the expenditure on kerosene before the electrification.

Table 4.19: Consumption and Expenditure on Kerosene Before the Electrification

Amount of kerosene (in liter)	Mid Value	Number	Percent	Price (per liter) Rs.	Total amount (Rs.)
1-3	2	5	5.88	17	170
3-4	3.5	35	41.18	17	2,082.5
4-5	4.5	24	28.24	17	1,836
5-6	5.5	21	24.70	17	1,963.5
Total		85	100.00	-	6,052

Source: Field Survey, 2008.

In the table 5.15, we get the data of kerosene consumption and expenditure pattern on kerosene before the electrification in this study area. There were 5.88 per cent households which were using 1-3 liters kerosene before the electrification. In the same way, the 41.18 per cent of total households were using 3-4 liters kerosene before the electrification. Similarly, there were 28.24 per cent and 24.70 per cent households which were using 4-5 liters and 5-6 liters of kerosene respectively. In totality, all households used to spend Rs. 6052 per month for purchasing of the kerosene. The average expenditure of these households was Rs. 71.20 per month.

4.6.2 Firewood and Petroleum Consumption after the Electrification

The electricity is available in all wards of the study area. The 90.59% households are using electricity and only 9.41% households are not using electricity. It shows that the large number of population is still compelled to use the traditional sources of energy totally. These people, who do not have the access of electricity, are still using the firewood and kerosene. The following table 5.16 shows the electricity using pattern in the households.

Table 4.20 : End use of Electricity in the Study Area

Purposes	Number	Percent
Lighting	58	75.33
Lighting and machines	14	18.18
Lighting and cooking	4	5.19
Lighting and heating	1	1.3
Total	77	100.00

Source: Field Survey, 2008.

In the Table 5.16, 75.33% of total households is using electricity only for the lighting purpose. Similarly, 18.18% households is using electricity for lighting and mechanical purpose in the household. Here, the mechanical purpose means the only use of electric motors to pump water to use in kitchen. In the same way, 5.19% and 1.3% household are using electricity in lighting and cooking and lighting and heating respectively. This situation of the electricity use shows us that the people are using the electricity mainly for the lighting purpose. It means the 90.59% of the sample households has reduced the kerosene consumption remarkably by substituting kerosene to the electricity.

4.6.3 Impact Evaluation of Electricity on the Petroleum and Firewood Consumption

Nearly 91 percent of total sample households are taking the facility in the Khaira area in the present position and more than 9.41% households are not taking facility of electricity. Among these households, electricity has created very good impact in the context of petroleum consumption. The households of all wards are getting the facility of electricity in the present position. Because of this availability of electricity, the most of the households of the study area have given up the kerosene lamp. They have started to use the electric lamp instead of kerosene lamp. Actually, the cost of electric lamp and the cost of kerosene are similar. Before the electrification, each household used to pay Rs.71.20 per month for the kerosene for lighting but with the on going time, the price of kerosene has been increasing and it cross out the equal boarder of electricity unit price. So, after the electrification, they pay just Rs. 80 to NEA, when the consumption is up to 20 units of electricity. But if they consume more than 20 units they should pay Rs.7.30 per unit. But most of the households of this study area consume only minimum units of the electricity. Thus, generally, they pay Rs.80 per month for the electricity. It shows that there are not very much economic benefits to

the households from the electrification. But there are many indirect benefits from this electrification. Such as, they can work at night easily by using the electricity. The most important benefit from the electricity to the users is that it does not produce any smokes. In the context of kerosene lamp, there was high smoke which was quite injurious to health.

4.6.4 Findings from Data Analysis of Firewood and Petroleum Consumption

In totality, we can say that there is positive impact on the petroleum consumption in some extent but there is a bit positive impact upon the firewood consumption by the rural electrification in this study area. From the data analysis and the group discussion with the villagers, we get following outputs:

- More than 90% of total households are only using electricity in this study area.
- About 10% households are still dependent upon the traditional sources of energy.
- Most of the households are using electricity for the lighting purpose only. That's why; the consumption of kerosene has been totally replaced by electricity in the electricity using areas.
- In the firewood consumption, the electricity has made very minimum impact. Thus, the firewood consumption has not been reduced after the electrification also.
- The main cause of not using electricity in the cooking and heating is the higher price of per unit electricity.

4.7 Impact of Rural Electrification on the Health and Education

In the education and health sector, the electricity can play very remarkable role. There are not students in each and very household in this study area. The 90.59% households are getting the electricity facility. It means the students of these households are also getting the facility of electricity in their study. The Table 5.17 shows the number of the with and without electricity facility.

Table 4.21 : The Electricity Users and Not Users Students in the Study Area

Answer	No. of households	Percent
Yes	68	80
No	8	9.41
No students in households	9	10.59
Total	85	100.00

Source: Field Survey, 2008.

In the above Table 5.17, the students of 80% households are getting the electricity facility in their study. Similarly, the students of 9.41% households are not getting the electricity facility. The 10.59% of households do not have students. It shows that most of the students of the study area are getting the electricity facility in their study. Similarly, the 90.59% households have taken electricity facility in total. On the other hand, 9.41% of total households have not taken the electricity facility.

4.7.1 Condition of Education and Health before the Electrification

The condition of education includes the performance level and the study hours of students. The condition of education means the performance of the students before the electrification. It also signifies the experience of the households on the performance of their students before and after the electrification. It does not mean the enrollment of students in the school before the electrification in this study area. In the same way, the health means the level of diseases among people which occur because of the smoke and toxic gases in the absence of electricity. The health condition also includes the awareness level of people on the role of electricity on their health. The following table shows us the study hours of students before the electrification.

Table 4.22 : The Study Hours of Students Before the Electrification

Hours	Number	Percent
2-3 hours	38	55.88
3-4 hours	14	20.59
More than 4 hours	3	4.41
No study	13	19.12
Total	68	100.00

Source: Field Survey, 2008.

In the Table 5.18, the students of 19.12% households were not studying at all. However, the students of 55.88% households used to study 2-3 hours per day before the electrification. Similarly, the students of 20.59% and 4.41% used to study 3-4 hours and more than 4 hours per day respectively. From this table, we get that there were high number of students who used to study 2-3 hours per day. There was very little number of students who used to study more than 4 hours before the electrification.

In the health sector, the possible diseases in the absence of electricity are cough respiratory diseases, headache and eye diseases. The health workers who has been

working in this study area since 10 years, said that the situation of these diseases was quite severe among people before the electrification, he said that the common cold, the Asthma, headache, vomiting, gastric, and fever are the common in the study area and can be occurred on the presence of smokes from traditional stove and from the kerosene lamp in the households. According to him, the situation was quite severe in the study area before the electrification. The situation was quite severe in poor family who were living below the poverty line. He said that the poor families are less aware than the rich families and on the other hand, they are compelled to stay in squatters. Thus, the poor households are more vulnerable than the rich households towards these diseases.

4.7.2 Condition of Education and Health after the Electrification

After the electrification, the students have got the better facility for their study. On the other hand, the households should not use the kerosene for the lighting purposes. It reduces the number of patients of respiratory diseases and the eye diseases. But all the households of the study area are not taking the facility of electricity.

The electricity has increased the study hours of students in this study area but the number of school not going students is remain the same. The pattern of study hours of students is shown in the following table.

Table 4.23 : Study Pattern of Students After the Electrification

Hours	Number	Percent
2-3 hours	30	44.12
3-4 hours	17	25.00
More than 4 hours	16	23.53
No study	5	7.35
Total	68	100.00

Source: Field Survey, 2008.

In the above Table 5.19, the total number of households is 68 which include the households taking electricity facility. The education status of students of the electrified households is only changed because of the electrification. In the above table, the students of 44.12% households start to study 2-3 hours per day. Similarly, after the electrification, the students of 25% households have started to study 3-4 hours per day. In the same way, the students of 23.53% households have started to

study more than 4 hours per day. This table has shown that the study hours of students have been increased because of the availability of the electricity. From this table, we know that the maximum number of students is studying 2-3 hours per day.

In the same way, the guardians have also known about the impact of the electrification upon the education status of their children. The households, which are using electricity, have already felt it also. But the households which have not used the electricity yet, have also some idea about the impact of the electricity upon the study of their children. The following table shows the level of idea of the respondents about the impact of the electricity upon the performance of students.

Table 4.24 : Perception of Respondents about the Impact of Electrification upon the Education

Responses	Number	Percent
It makes better performance	42	55.26
It don't make better performance	10	13.16
I don't know	24	31.58
Total	76	100.00

Source: Field Survey, 2008.

In the Table 5.20, the 55.26% of total households have said that the electricity has made the better performance of their children in their study. The 13.16% of total households have not known about the impact of electrification upon the performance of students in their study. In the same way, the remaining 31.58% has said that the electricity makes no difference in the study of their children. The households which have no electricity or no students have mainly said that they have no idea about the impact of electrification on the education of their children. But some of the electrified households has also expressed the ignorance of the impact of the electrification upon the education of their children. This table shows that the electrified households have already felt the positive impact of the electrification on the education level of their children. On the other hand, some households, which don't have the electricity facility yet, have also knowledge that the electricity will create better performance in the study of their children.

In the health sector, very few households have knowledge that the electricity gives positive impact on the health of people. The following table shows us the idea of people about the impact of electricity on their health.

Table 4.25 : Perception of People about the Impact of Electrification on their Health

Answer	Number	Percent
Positive impact	35	41.27
No impact	36	42.35
We don't know	14	16.47
Total	85	100

Source: Field Survey, 2008.

In table 5.21, the 41.27 percent of the total households have said that the electricity creates positive impact on their health. But 42.53 percent households of the study area have said that the electricity creates no impact on their health condition. Similarly, the 16.47 percent households have no idea about the impact of electrification on their health. It shows that most of the households of the study area have no idea about the impact of the electrification upon the health.

The 41.27 percent households have said that there is positive impact on the health. They have pointed suffering from different types of diseases in the absence of the electricity in the public health. The following table shows the types of diseases in the absence of electricity that suffers people.

Table 4.26: Perception of People about the Types of Diseases in the Absence of Electrification

Diseases	Number	Percent
Eye diseases	2	5.71
Coughing	1	2.86
Headache	1	2.86
Headache, coughing and eye diseases	3	8.57
Headache, coughing, eye diseases and respiratory diseases	28	80
Total	35	100.00

Source: Field Survey, 2008.

As shown in Table 5.22, 80 percent of the total households, who believe that the electricity creates positive impact on the health, say that headache, cough, eye diseases and respiratory diseases trouble them in the absence of electricity. Similarly, the 8.57 percent of total households says that the headache, coughing and eye diseases suffer from frequently in the absence of electricity. In the same way 5.71 percent

households believe that the eye diseases suffer them in the absence of electricity. The each 2.86 percent in both has said that the coughing and headache suffers them respectively in the absence of electricity. It shows that the most of the households, which believe the positive impact of electrification on their health, think that the electricity has reduced the rate of eye diseases, coughing, headache and respiratory diseases among them.

But the expression of respondent is not totally reliable to believe on the positive impact of the electrification on the public health. The idea of health workers in this study area supports the idea of people about the positive impact of electrification in this study area Samjhana Acharya (H.A. of Jumri Health Post), who is working in the health sector of study area from 10 years, says that the situation of these diseases is severe in these families which are not using the electricity, specially the ultra poor families. She also said that the patients of coughing and headache have been reduced after the electrification. She also believes that the electrification has given positive impact on the public health but this facility should reach to the poorest of the poor also.

4.7.3 Impact Evaluation of Electricity on the Education and Health

The students of 80 percent households are using the electricity but the students of 9.41 percent households are not getting the facility of electricity. In the same way, there are no students in 10.59 percent sample households.

From the sub topics 5.4.1 and 5.4.2, we have got the information about the condition of education before the electrification and after the electrification. From this data analysis it has been known that the average hours of study has also changed before and after the electrification. There is greater number of students who study 2-3 hours per day before the electrification than after the electrification. But the number of students who study 3-4 hours is greater after the electrification than before the electrification. In the same way, the number of students who study more than 4 hours is greater after the electrification than before the electrification. It shows that the study hour of students is increased after the electrification than before the electrification. The average hours of study of students before the electrification is 2.86 but after the electrification, it has been increased to 3.06 hours per day. It means the 0.2 hours is increased after the electrification per day. Meanwhile, the respondents have said that the performance of the students has been better than before the electrification.

In the health sector also, there is positive impact of the electrification. From the Table

22, it is known that the 41.27 percent of total households believe that the electricity has given positive impact on their health. Meanwhile, 16.47 percent of total households have no idea whether the electricity gives positive impact or not impact on their health. At the same time, the health workers of this study area also experienced that the rate of patients of respiratory diseases has been decreased after the electrification as compared to the before the electrification situation. But they say that the problem of theses diseases is severe in those families who are ultra poor in the study area and who are not being able to use the electricity. It shows that the electricity has given positive impact on the public health.

4.7.4 Findings from Analysis of Data on Education and Health

From the data analysis of impact of rural electrification on the education and health, we conclude that the electrification has positive impact on the education and the health sector. But because of the being poor, all households are not being able to utilize the electricity. This situation has compelled to the poor households to remain as they were before the electrification. We can draw following findings from the data analysis of the education and health:

- The number of students with the electricity facility is greater than the number of students without the electricity facility and same condition in the context of households also.
- After the electrification, daily study hours of students have been increased.
- The guardians also believe that the performance of the students is better with electrification than without electrification.
- The situation of eye diseases, respiratory diseases and headache was more severe in before the electrification situation than after the electrification situation.
- The situation of these diseases has been improved in these households which use the electricity but it has been more severe in the poorer households because these households are not able to use electricity.

4.8 Service Delivery System and Its Impact on the study area

The service delivery system means the regularity and effectiveness of the service of electricity to the rural people. Service delivery system is equally important for effective and more reliable rural electrification process. In the case of Khaira area, there are different weaknesses as well as different strong points relating to service delivery system.

4.8.1 General Information about the Service Delivery System

According to the head of Jhimruk Hydro Electricity and Rural Electrification Center (JHEREC), this is run "The Rural Electrification Project". This project is mainly assisted by the NEA and GO/N resources. The targeted area of this project is the rural areas. In the case of Khaira, this project has targeted to provide the electricity facility to whole area of study area. This electrification has been started in the study area from 1995/96.

This project has 11 KV line with 15 KM length. The power station of this project is Madikhola station which is in the Darimchaur. This project has 11 KV for the transmission and 400/220 volt for the diffusion. The bill payment site of the Khaira study areais the Khalanga counter. In the present condition, there are one technician for the meter reading in the study area. But the head of the project says that one technician is enough for the meter reading in this study area. In the same way, for the maintenance of interruption of the electricity, the workers of JHEREC work average 2 hours per day in the interrupted area of the study area.

According to him, there are different types of pricing of JHEREC for different purposes of the electricity use. For the use in households, there are three levels of price. Upto 20 units, the price is Rs.4 per unit. Up to the 250 unit consumption, the price is Rs.7.30 per unit and beyond the 250 unit consumption, the price of per unit Rs.9.90. It shows that more the consumption of electricity increases, the price of per unit electricity also rises. But for the irrigation purpose, the rate of price of electricity is 50 percent low. For the community and personal both type of irrigation, the price is Rs. 3.65 per unit. In the same way, for the small and cottage industries, the rate of electricity is Rs.5.95 per unit.

According to him, the electricity leakage is lower in the rural areas than the urban areas. There is up to 15 percent leakage of electricity in Khaira. In the same way, the electricity leakage is higher in the non-industrial areas than the industrial areas. There is 15 percent electricity leakage in Nepal with the industrial area but without industrial area, it is 35 percent. But in the case of Khaira, the electricity leakage is lower than the average leakage of Nepal.

4.8.2 Impact of Service Delivery System

The electricity has created the both type of impact among the rural population of Khaira area. The households of study area are satisfied with some portions of the

service delivery system of this rural electrification project but in some parts, they are not satisfied. The first and foremost dissatisfaction with the JHEREC from the local people is that all people of this study area are not getting the facility of electricity due to poverty. They also said that the concerned authority should provide the free or nominal chargeable electricity. It is the main dissatisfaction of the population of this study area. They have made frequent requests but the related authority has not taken any step for this purpose.

The electricity using households have also their own type of feeling about the service supply and the bill payment system. The following table shows the remarks of people about the electricity supply in the study area.

Table 4.27 : Response of People about the Electricity Supply

Response	Number	Percent
Regular	39	50.65
Not regular	16	20.78
Occasional interruption	22	28.57
Total	77	100.00

Source: Field Survey, 2008.

In the Table 5.23, the 50.65 percent households have replied that there is regular supply of the electricity in this study area. But 20.78 percent households have said that the electricity supply is not regular in this study area. In the same way, 28.57 percent of respondents have responded that there is occasional interruption in the electricity supply in this study area. It shows that most of the households are satisfied with electricity supply in this study area. But some households are not satisfied with the electricity supply in this study area.

Similarly, all the households which are using electricity in this study area said that there is regular reading of meter in each household. The technicians come to check meter once a month. It shows that there is regular meter reading in the study area. In the same way, all the households pay their bill of electricity in the Khalanga Counter.

The following table shows the comment of households on this bill payment system.

Table 4.28 : Response of Households about the Bill Payment System

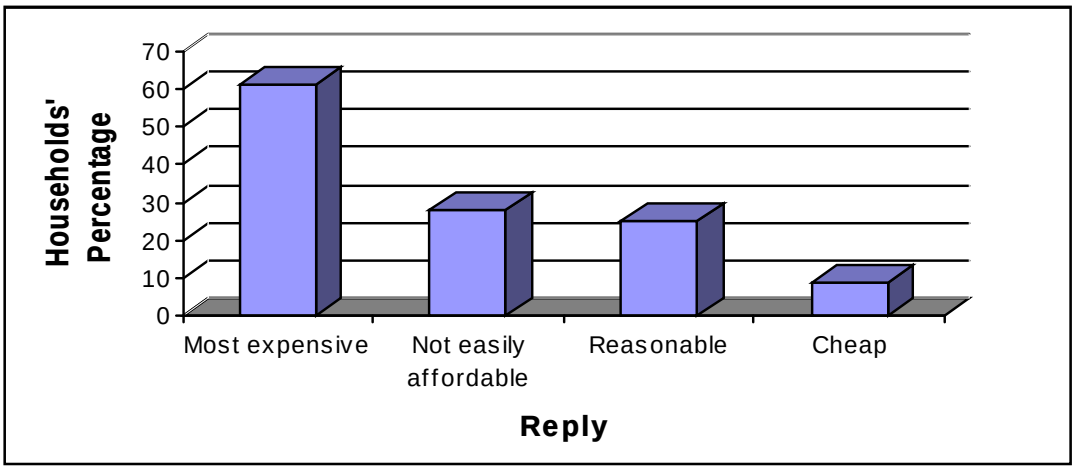
Response	Number	Percent
Comfortable	30	38.96
Not comfortable	47	61.04
Total	77	100.00

Source: Field Survey, 2008.

In the Table 5.24, 61.04 percent households have replied that this bill payment system is not comfortable. However, 38.96 percent of households have replied that this system of bill payment is comfortable for them. It shows that the most of households are not satisfied from this type of bill payment system.

In addition, the response of households about the rate of per unit electricity is shown in the following figure.

Figure 2: Response of Households about the Tariff Rate



Source: Field Survey, 2008.

In the figure 2, the 62 percent households have said that the rate of per unit of electricity is most dear. Similarly, the 18 percent households have said that the existing tariff rate of electricity is not easily affordable. The 13 percent households have said that the rate of per unit electricity is reliable because it is cheaper than the kerosene. The last 7 percent households have said that the existing rate of per unit electricity is cheap. This figure mainly shows that the most of the households have replied that the existing rate of the electricity is quite expensive. But there are also some households which consider the rate of electricity as reliable and some says that it is cheap.

From these all figures and tables of service delivery system of the electrification, we can say that the households which are using the electricity in this study area are not satisfied with the existing service deliver mechanism of the JHEREC in this study area. These households have given different suggestions for the improvement. The 40.5% electricity using households have suggested that the local counter is necessary for the bill payment. In the same way, 22.68% electricity using households have said that the rate should be reduced. The 14% households have said that the electricity supply should be regular in this study area. Similarly, the households have also suggested for extension of service, control leakages, village orientation of service, increment in the number of transformer and phases, etc. These all suggestions have shown that the establishment of local office is main need for local people from the JHEREC and they also want the electricity in lower rate than the existing rate.

4.8.3 Findings from the Analysis of Data Service on Delivery System

The service delivery system is effective in some extent but there are also some weaknesses in it. From the above data analysis and collection of information about the system pattern, we can draw following conclusions:

- The electrification project of Khaira area is "The Rural Electrification Project" of JHEREC.
- There are different electricity tariff according to the purpose of use of electricity.
- There is about 15% electricity leakage in the study area.
- The supply of electricity is generally regular in this study area.
- The electricity using households of the study area pay their bills of electricity in the Khalanga counter of JHEREC which is not comfortable for them.
- Most of the households feel that the existing rate of electricity is most expensive for them, thus most of the households suggest that the rate of per unit electricity should be reduced.
- Most of the households want the local counter for the bill payment.
- The households which are not using the electricity at present are frequently requesting the JHEREC to provide the free or nominal electricity to them.

Chapter - Five

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter deals with the summary of the research findings, conclusion and recommendations.

5.1 Summary

As the study aimed to evalute the impact of the rural electrification in the context of economic, social, environmental and service delivery system at Khaira area in Pyuthan district has found the positive impact on the above mentioned sectors. The study has got the information on electricity use in residential sector which only covered 73 percent of the total consumption. The number of commercial sector has been increased and more than 66 percent of the total population use electricity for the purpose of lighting and operating the radios, TV and cassate players in the area after the electrification. There were numbers of hulling, expelling and grinding mills increased and most of the electricity users use electricity for the purpose of irrigation also. After the electrification more than 90 percent use electricity instead of other petroleum products and it had reduced the fuel wood consumption in the area. Similarly, after tyhe electrification in the area most of the students had increased their study time and majority of the users got relief from different diseases caused by smokes in their households. Therefore, the study concluded that there were many positive impacts of the electrification in the area.

5.2 Conclusions

- All the households of the Khaira area are not getting the facility of the electricity.
- The rural electrification has given positive impact on the industrial sector in this study area by reducing the initial cost and the fuel cost of the industries which has lead to the increase the number of industries and the productivity of industries.
- This rural electrification has been unable to create favorable impact on the irrigation sector in this study area because the electricity is not available nearby land of farmers.
- The rural electrification has given positive impact on the petroleum consumption

pattern by replacing the kerosene in the electricity using households.

- The electricity is not giving any positive impact for the firewood consumption pattern because of the higher price of electricity than the firewood in this study area
- The electrification has given positive impact on the education status of students because the students feel more comfort in their study which leads to increase the average study hours of the students although all the students of the study area are not getting the electricity facility.
- The electrification has given positive impact on the public health because the occurrence rate of eye diseases, coughing and respiratory diseases has been reduced by replacing the consumption of petroleum products by the electricity.
- The service of JHEREC such as electricity supply, meter reading system, etc. are regular in the study area.
- The expensive electricity tariff is the problem for the people who are not using electricity in the present situation.
- There are also phenomena (lack of local counter and high tariff) of the JHEREC which create uncomfortably to the villages.

In general, from the analysis of gathered information and data of electrification in the Khaira area, it is concluded that the rural electrification has created positive impact in the study area.

5.3 Recommendations

There are still certain weaknesses in the rural electrification process in this study area although it gives positive impact in many socio-economic sectors of study area. On the basis of the analysis of the data and information, the following recommendations have been made for the better improvement of rural electrification in this area.

5.3.1 Recommendations for Improvements of Rural Electrification

- Electrification should cover all the area.
- The facility of electricity should reach to farmlands of the farmers which will increase the irrigation by electricity.

- The tariff of electricity for the industry should be reduced which will make all the industries capable to use electricity.
- The tariff of electricity for the households should be reduced which enable the general people to use the electricity for baking and heating. It will also encourage the poor to use the electricity, which will also improve their health.
- The leakage of electricity should be controlled and that electricity should be distributed in rural areas as Khaira.
- The bill payment counter should be established in the study area.
- The supply of electricity should be regular which will lead to the expansion of industrial sector.

5.3.2 Recommendations for Further Studies

- Detailed impact study should be conducted to develop major industries in the area.
- Detailed studies on the different sectors should be conducted to find out the proper utilization of the electrification.
- Detailed study should be conducted on the impact of load shedding of the electricity in the areas.

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Annex -One

Questionnaire for Household Survey

1. General Information:

1.1 Name of Respondent:

Gender: Age: Education: Occupation:

Language: Marital Status Family size:

Address: Ward No. Tole:

1.2 Status of the House

a. Pakki (Made of from cement and concrete) [ ]

b. Kachchi (Made of from hay and straw) [ ]

c. Wooden (Made of fro the wood and zinc) [ ]

1.3 Description of the members of households ?

S. N.	Name	Relation with Respondent	Age	Sex	Education	Occupation	Marital status
1							
2							
3							
4							
5							

2. General information about the electrification in house:

2.1 Do you have electricity in our house?

a. Yes [ ] b. No [ ]

2.2 From how many years you are using electricity?

a. Less than 1 year [ ] b. From 2 year [ ] c. From 3 year [ ]

d. From 4 years [ ] e. From 5 years[ ] f. From more than 5 year [ ]

2.3 For which purpose you use electricity?

a. Lighting [ ] b. Cooking [ ] c. Heating [ ]

d. Machines [ ] e. Others [ ]

2.4 Before this electricity, what did you use in house for energy purposes?

a. Kerosene [ ] b. Fuel wood [ ] c. Other sources (specify)

2.5 How much Kerosene did you use per month?

a. 2 liter [ ] b. 3-4 liter [ ] c. 5 liter [ ] d. More than 5 liter [ ]

2.6 How much fuel wood id you use in your house per month before this electrification?

a. 100 kg [ ] b. 200 kg [ ] ‹g [ ] d. More than 300 kg [ ]

2.7 How much did you used to expend for fuel wood and kerosene?

a. Less than Rs. 500 [ ]b. Rs. 500 to 1000 [ ] c. Rs. 1000 to 1500 [ ]

d. Rs. 1500 to Rs. 2500 [ ] e. More than Rs. 2500 [ ]

2.8 What is the cause of not availability of electricity in your house?

a. Because I cannot afford it [ ]

b. Because the authority is not providing electricity because of our house [ ]

c. Because there is no distribution line in this area [ ]

d. Because we don't want it because it is not regular [ ]

e. Other cause (specify)

3. Information about the role of electrification upon the agriculture:

3.1 Past situation of land:

Total land	Irrigated land	Non-irrigated land

3.2 present situation of land:

Total land	Irrigated land		Non-irrigated land
	Irrigated from electricity	Irrigated from pump set	

3.3 What did you use to use for irrigation before the use of electricity?

a. Pump set [ ] b. Kulo system [ ] c. Others [ ]

3.4 Why are you using pump set?

a. Because it is cheap [ ]

b. Because it is easy to use [ ]

c. Because it is easily available [ ]

d. Because I have no electricity near my head [ ]

e. Because electricity is expensive to use than diesel [ ]

3.5 How much do you expend for the diesel for pump set per year?

a. Less than Rs. 500 [ ] b. Rs. 500 to 100 [ ] c. 1000 to 1500 [ ]

d. Rs. 1500 to Rs. 2500 [ ] e. More than Rs. 2500 [ ]

3.6 Why are you using electricity in irrigation in your land?

a. Because it is cheap [ ] b. Because it is non-pollutant [ ]

c. Because it is easily available to my land [ ] d. Because it is more efficient [ ]

3.7 How much do you expend for electricity for irrigation per year?

a. Less than Rs. 500 [ ] b. Rs. 500 to 100 [ ] c. 1000 to 1500 [ ]

d. Rs. 1500 to Rs. 2500 [ ] e. More than Rs. 2500 [ ]

3.8 How much did you used to expend for irrigation before the availability of electricity per year?

a. Less than Rs. 500 [ ] b. Rs. 500 to 100 [ ] c. 1000 to 1500 [ ]

d. Rs. 1500 to Rs. 2500 [ ] e. More than Rs. 2500 [ ]

4. Information about role of electrification upon the industries:

4.1 What type of industry do you have?

a. Cottage industry [ ] b. Small industry [ ] c. Big industry [ ]

4.2 Do you have use of electricity in your industry?

a. Yes [ ] b. No [ ]

4.3 If yes, for what purpose?

a. For lighting [ ] b. Use in mechanical purposes [ ]

4.4 How much power does our industry use?

a. 50-100 Units [ ] b. 100-200 Units [ ] c. 200-300 Unites [ ]

d. 300-400 Units [ ] e. More than 400 Units [ ]

4.5 How much should you pay per unit?

a. Less than Rs. 4 [ ] b. Rs. 4-6 [ ] c. More than Rs. 6 [ ]

4.6 If no, why are you not using electricity in your industry?

a. Because it is more costly than petroleum products [ ]

b. Because the electricity is not regular [ ]

c. Because the electricity capacity is not sufficient [ ]

d. Because it is not available near to my industry [ ]

e. Because the engine is not suitable for electricity [ ]

f. Others (specify)

4.7 Why are you using electricity in your industry?

a. Because it is more cheap than petroleum [ ]

b. Because it is more efficient than petroleum [ ]

c. Because it is easily available [

d. Because it is non-pollutant [

e. Others (Specify)

4.8 How much did you used to spend for fuel for the industry before the availability of electricity per month?

a. Less than Rs. 500 [ ] b. Rs. 500-100 [ ] c. Rs. 1000-1500 [ ]

d. Rs. 1500 to Rs. 2500 [ ] e. More than Rs. 2500 [ ]

5. Information related with role of electrification on the education status:

5.1 Do your children uses electricity to study or not?

a. Yes [ ] b. No [ ]

5.2 How many hours did they study before the electrification?

a. 2-3 hrs [ ] b. 3-4 hrs [ ] c. more than 4 hrs [ ]

5.3 How many hours do your children study in the man time (in electricity)?

a. 2-3 hours [ ] b. 3-4 hours [ ] c. 4-6 hours [ ]

d. More than 6 hours [ ]

5.4 Do you think that the electricity make the performance of your children better than before?

6. Information about the role of electrification on the health of people:

6.1 do you agree that this electrification has made your health better?

a Yes [ ] b. No (Got to question no. 8) [ ]

6.2 What type of diseases used to suffer to your family from use of other sources of energy members in the absence of electricity?

a. Eye diseases [ ] b. Coughing [ ] c. Headache [ ]

d. Respiratory diseases [ ] e. Other (specify) [ ]

7. Information about the impact of service delivery system of rural electrification:

7.1 Is the electricity supply is regular or not?

a. Regular [ ] b. Not regular [ ] c. Occasional interruption [ ]

7.2 Is there regular meter reading system by the technician or not?

a. Once a month by the technician [ ]

b. Reading of meter once in two echnician [ ]

c. Reading of meter once in thre technician [ ]

d. No reading regularly by the technician [ ]

7.3 Where do you go to pay bill of electricity?

a. Locally (Khaira) [ ] b. Ilaka Office [ ] c. District office [ ]

7.4 Is that place of bill payment comfortable or not?

a. Comfortable [ ] b. Not comfortable [ ]

7.5 If not comfortable, what are the causes?

a. Office time is unreliable [ ] b. Staff behavior is rude [ ]

c. The system is not good [ ] d. Place is far from our settlement [ ]

e. Other (specify)

7.6 What do you think about the change of per unit electricity?

a. Most dear [ ] b. Not easily affordable [ ] c. Reliable [ ]

d. Cheap [ ] e. Don't know [ ]

7.7 What should be done in order to make the service delivery mechanism more efficient? (Not more than three suggestions).

a.

b.

c.

8. Personal attitude:

8.1 If you get one million rupees, how do you utilize that?

Ans.……

……

……

……

Date of interview:

Thank You