

# CHAPTER-I

## INTRODUCTION

### 1.1 Background

Nepal is a landlocked mountainous country situated in the middle of belt of the mighty Himalayas. The country is rectangular in shape and is enclosed between 26<sup>0</sup>22' N to 30<sup>0</sup>27' N latitude and 80<sup>0</sup>4' E to 88<sup>0</sup>12' E longitude. The east-west average length is 88km and north south average width is 193 kms. The total area is around 147181 sq km with a population with a population of about 23.2 millions.

Agriculture is the source of livelihood of Nepalese people. Agriculture contributes more than 35.68 percent of total gross domestic production and gives employment to large percentages of the population (Pant and Joshi, 2060). Nepal is predominately an agriculture country where 74 percent of its total economically active population is engaged in agriculture (Rajbhandari, 2071). The volume of the national income is generated from agricultural sector. The agricultural production account neat about 70 percent of the total exported value of the country.

Nepal has uneven distribution of land and population. The hill is mountainous together account for 43.01 percent of total population of Nepal supported by 43 percent of cultivated land. The terai constitutes 57 percent of cultivated land inhabited by only 50.27 percent of the total population (CBS, 2011). So agriculture can be considered as the pole of Nepal in its all round development. Agriculture development is an essential part of the socio-economic development.

The total cultivated land of the country is 18 percent, where rice, maize, wheat, jute, tobacco, sugarcane, millet, oilseeds are the main crops (Rajbhandari,

2071) and 33 percent of land area of Nepal could be potentially cultivated of irrigation and soil fertility management facilities were available (Karan & Ishi, 1997). The main crops are mainly produced in summer season when rainfall is generally adequate. Most of the rainfall is concerned with in a few month of the year. About 80 percent of the total annual rainfall occurs within the period from the June to September (Lamichhane, 2000). So, the crop production can't give amount of profit without irrigation facility.

Irrigation project plays vital role an agriculture for the food grain, vegetable and fruits production. The surface irrigation is the main system in various parts of the country. By tradition method of irrigation are Pynes, terraces, well and canal irrigation in Nepal (Shrestha, 1986). Now a day in the hills and valleys various project have been implemented for the development of canal irrigation in the Nepalese context.

The yields of particularly all crops are increased by a rational and specific application of water. The quantity of water to give best result for the certain crop in a specific area can be determined experimentally. Any quantity less than or in excess of optimum gives smaller yields (Singh, 1975).

In the Western development region of Nepal many hill irrigation projects have completed many canals. Among them Fewa Tal irrigation project, Bijayapur irrigation project, Seti irrigation project, Ratikhola irrigation project, Chapachour irrigation project, Phalebas irrigation project, Pakuwa irrigation project etc. are prominent.

Tilahaar VDC is situated at the North eastern part of Kusma Bazar in Parbat district. It covered 1020 hector land of the district (District Profile 2013). The command area lies Tilahaar VDC Ward no. 1, 2, 3 and 6 and the canal has about 4km length. The net irrigated land has 123 hector in the dry season; where rice, maize, wheat, oilseeds, vegetable are the main crops. Agriculture production can be insured by irrigation land during the time of famine.

Tilahaar VDC has 4614 populations with 1168 households (District Profile, 2013). About 250 households and 1456 populations are lived in the Ratikhola irrigation catchments area. The causes of population growth and economic status is heavily based on agriculture sector and it can be improved by developing agriculture system. By the development of irrigation facilities particular community, society or locality can be uplift through agriculture development.

## **1.2 Statement of the Problem**

Nepal is an agricultural country depending on the uneven and uncertain monsoon rain. It is said that Nepalese agriculture is the gamble of the monsoon. Water is essential for the plant growth. But the monsoon in Nepal is irregular and uncertain and varies from year to year and place to place. Due to the uncertainty of monsoon sometimes heavy flood destroys all of the crops and human life. Sometimes great famine occurs and directly affects the un-irrigated land. Therefore the irrigation is most essential thing to solve these problems to increase the agricultural production and productivity on un-irrigated land.

Nepal is one of the richest countries for water resources in the world. But the crop production almost entirely depends on monsoon. The economic conditions of the Nepalese farmers are measurable. Lack of capital, skill manpower, Ruggy topography, transportation problem is responsible for the development of irrigation project. Due to those problems, proper irrigation facility cannot be developed in Nepal. So, these key factors are responsible for economic growth. Recent years the government of Nepal has been lunching various large and small scale irrigation projects in different parts of the country. Ratikhola irrigation projects also one of them.

Tilahaar VDC has only one irrigation projects with 123 hector land irrigated. It has about 40 percent population is under the poverty line. This command area has 250 households with 1456 population. The crops production as well as economic status of this command area has been changing rapidly than before.

This study therefore tries to find out the socio-economic status of farmers, living standards, production on crops, cropping intensity before and after irrigation facility.

In this study attempts to answer the following questions:

- ) What is the socio-economic condition of Ratikhola irrigation command area?
- ) How many farmers are achieved by the irrigation facility?
- ) How many farmers are changed their food grain, vegetables production and livelihood?
- ) How many farmers are changed their commercial farming and food habit?
- ) How many farmers are changed their living standard and culture?

### **1.3 Objective of the Study**

The specify objectives of the study area are as follows:

- a. To study an economic impact of Ratikhola irrigation project.
- b. To examine the existing crop production before and after irrigation project.
- c. To access the changes in the cropping pattern after the irrigation project.

### **1.4 Significance of the Study**

Ratikhola irrigation project is the medium scale project of Nepal. This project has not tried to study anyone. So this study will be helpful for any researcher, who is interested to know about the impact of this project on the people and society. It explore the problems related both to agriculture and project sectors which is helpful for management of the project in order to meet the desired objectives and goals. This study is highly important for formulating and implementing plans and projects pertaining to accelerate growth of agriculture.

## **1.5 Limitation of the Study**

Tilahar VDC has only one irrigation project and 1367 households with 5306 population and 123 hector land irrigated. Lack of financial assistance, lack of time, lack of manpower, Ratikhola irrigation project has been selected for the study. It covers 123 hector land irrigated. There will be 250 household and 1456 population involved in the study area.

## **1.6 Organization of the Study**

The study of an impact of Ratikhola irrigation project is on Tilahar, Parbat district, Nepal. With the help of such bases the present report is divided into six chapters. The first chapter presents with the introduction. It consists of the statement of the problems, objectives, significance of the study area, limitation and organization of the study. The second chapter is associated with the literature review, which is related to impact study of the irrigation project. The third chapter presents the research methodology used on the study. The fourth chapter deals with the socio-economic climate of the study area. The fifth chapter deals about an impact study of Ratikhola irrigation on Tilahar, Parbat. In the end summary, findings, conclusion and recommendations have been given.

## **CHAPTER-II**

### **LITERATURE REVIEW**

#### **2.1 Historical Review**

Agriculture is the oldest occupation of the world. The historical background of this occupation may be traced back as old as the human civilization (Upreti, 1980). It is supposed that the irrigation & agriculture may have developed simultaneously probably irrigation started when prehistoric man planted crops in low area. Mediterranean Agriculture has long tradition after four million at proto agriculture experimentation, agriculture emerged in the eastern Mediterranean basis seventy five hundred years ago (Bufzer et. Al. 1985). The Egyptians used water from the Nile to irrigate adjacent field as early as 5000 B.C. Historical records show that king Menes (who live around 350 BC) had a large masonry dam build to control the Nile river and provided water for irrigation (Encyclopedia, 1973). Babylonian records that irrigation works were in use before the reveal that irrigation works were in use before the time of king Hammurabi about 2200 B.C. (Encyclopedia, 1975). The practices of irrigation spread to China from Babylonia. The Chinese Pilglain Sunghan has mentioned that the Pamir region used the water of the river of irrigation. The history of irrigation in Nepal at least Kathmandu Valley is as old as its adjacent land (Mallick, 1982). Mallick adds that rice was cultivated in Nepal since the Vedis period which provides that Nepal has a long history of irrigation practices.

Water is normally supplied to the plants by nature through the agency of rain or rainfall, which included nature supply of water and artificial supply of water in a cultivated land. This process is known as irrigation. Irrigation as the nature or artificial application of water to soil, to propose of supplying moisture essential or beneficial to plant growth are essential (Singh, 1975). An artificial device for

the supply of water to the cultivated land is irrigation. Therefore irrigation is mainly device to supply the necessary amount of water required to the plants of cultivated land.

The sources of irrigation are classified as canal's tube-well, Boreholds and Pumping sets, tank, pound & natural flow or combination of two or more of specific sources (CBS, 1986). The process of utilization of water involves the construction of engineering. Works of apprecial magnitude it would be called artificial irrigation (Singh, 1979)

There three irrigation methods are as follows:

- a. Surface irrigation
- b. Sprinkler irrigation
- c. Sub-irrigation

## **2.2 Irrigation in Nepal**

It is difficult to say the actual date of irritation in Nepal. The farmers were irrigating there land by the taping stream water since long, lifting water by human efforts was prevents in the hills.

From the recorded history in the medieval period during of Malla dynasty, irrigation canals (Rajkulo) were constructed by the Government to irrigate the different regions inside the Kathmandu valley. Later on during Shah dynasty irrigation canal appears to be constructed in the Gurkha region of Nepal (Bhimsen Kulo). During Rana Period, farmers started building their own canals in the Terai plains of Nepal. The 16 and 36 villages canals of Rupandehi are classical examples. Likewise canals are found in Babai Karnali rivers, built by local people. Engineering construction of Sarada canal started possibly between 1920 and 1922; likewise the Trijuga canal was constructed in 1928. Catuv on Government involvement started in the construction of irrigation canal. Juddha canal of Bara is another example. Dept. of irrigation was restructured from

earlier canal and Geology department systematic irrigation development started after 1950 (Sharma, 1997).

Master plan for irrigation development in Nepal 1900 has attempted to provide comprehensive information in this regard. The important Government developed projects before 1951 revolution were mostly in the Terai of which 5000 ha. Chandra canal (1928) is best known and serving till today. After fifties construction of medium size Terai irrigation project (Kankai, Manusmara, Sirsa-Dudhaura, and Tilawe etc) was carried out. The 1954 Koshi agriculture with India led to the construction of Sunsari Morang (66000 ha.), while the 1959 Gandaki agreement to Narayani (38000ha.) and west Gandak, command area development in these large projects was initiated in sixth and seventh plan periods and is still continuing presently 50 Government developed surface irrigation systems in Terai (Sharma 1997).

In the history of modern surface irrigation, Fewa Tal irrigation project and Bijayapur Irrigation project are the first in Pokhara and its periphery. These projects were completed during the first five year plan. Bijayapur– Begnas irrigation projects (II), Hyangja Irrigation projects etc. are other irrigation projects in Kaski.

Dedkali was popular lifting in Terai. Some small plots of Terai were traditionally irrigated by the terrace to terrace bars in rotation in the hills. Bhimsen Klulo and Rajkulo in the Kathmandu are example of ancient irrigation system (Sharma 1992) in Nepal. Many irrigation projects were built under the Rana Prime Minister.

An indigenous type of canal was built in Pokhara Miruwa in the early period of Rana rule. Now it out of operation and reduced to ruins which exist even today.

Before the implementation of the periodic development plan in 1956 only three canals Viz Chandra canal (in 1946) (Shrestha 1981) were considered under Rana Regime, several irrigation projects were constructed since 7<sup>th</sup> plan and



since 10<sup>th</sup> plan have been constructed many large irrigation projects in Nepal. Now a day in the hills of Nepal, various irrigation projects have been introduced for the development of canal irrigation.

In Western Development region, various types of hill irrigation project, Bijayapur irrigation project, Ratikhola irrigation project, Begnas irrigation project, Hemja irrigation project, Gaduwa irrigation project, Seti irrigation project (Kaski), Saedikhola irrigation project, Rampur plant irrigation project, Pakuwa irrigation, Phalebas irrigation etc are the important hill irrigation in this region of these projects the impact study of Ratikhola irrigation project is going to be done in this work.

### **2.3 Review of Previous Study**

The massive literature in the field of agriculture shows the resources of this sector. Various institution, research schools, sociologists, economist, geographers have undertaken several research workers, conversing the impact of irrigation in Nepal.

Some irrigation impact-evolution study has been carried out by Agriculture Project Research Center (APROSC).

Among them the impact irrigation studies of Gajun irrigation project (1978), Khageri irriagation, Mahakali irrigation project (1979), Begnas irrigation project (2010) etc. constitute valuable literature in this field. In the report of Khageri irrigation project, it has printed out that diversified occupation depends up on agriculture where 73 percent of land is irrigated. More formers have adopted improved variety of paddy and maize. Employment is higher irrigated area where there is higher production, income, expenditure and saving. Irrigation has help for 69.66 percent income in output per Bigha land. Report has concluded that Khageri Canal is very poor due to the serious setting problems (APROSC, 1978). APROSE has analyzed Dedgauntar irrigation project, small former have got the highest percentage of irrigated land (61%)

highest impact of irrigation is on the small formers. There is an increase 11.21 percent in employment per Ropani and farm income is higher in the project area 50 percent two times.

Vaidya (1968) has reported that the irrigation is very important factors. He also stated that the relationship between irrigation and crops production has been positive and also stated that irritation cannot be developed due to lack the skill manpower and modern technology, modern equipment and lack of capital.

Bastola (1994) was studied on "The economic impact of irrigation in Rampur Palpa". He concludes that the irrigation facility there has been improvement in agriculture system. The production of crops & productivity of land has been increased and cropping was also changed after irrigation facility in the study area.

According to Leaky & T. B. Wills (1977) irrigation can be defined broadly as the artificial control of soil, moisture for agricultural purposes with the aim of increasing crop production. In Physical terms this control is achieved by applying water on the land when soil moisture became depleted and at the same time by making provision for the removal of excess water from the soil surface of profile.

Pokherel (1981) has found holding of land is still quite concentrated on a few hands. The cropping intensity of small farmers is higher than that of the big farmers. Access to irrigation facilities to big farmers is higher than that of small farmers. The per hectare ratio is smaller farmers but big farmers are leading in the local committee in all sectors.

Pangani (1987) has studied on the topic of impact of Chitwan irrigation project at Chitwan district. According to his conclusion production has been slightly changed due to irrigation facilities. So this project has bought great reforms in the agriculture sector in Narrayanpur VDC of Chitwan.

Lasmal (1989) carried out impact of the "Bijayapur irrigation project" who has pointed out that a large number of farmers are benefited by irrigation facility. Rice, wheat & vegetables has increased production tremendously soon after the completion of Canal irrigation many people irrigated there resulting in the emergence of settlement.

Parajuli (1991) has studied "The impact study of Pokhara irrigation project", he concludes that the cropping pattern has also been changing. People have adopted intensive agriculture and multiple cropping systems. Farmers are more oriented towards cash crops (especially vegetable farming) after complete the irrigation project and scale of production was also increased.

In words of Panta and Jain (1997) the absence of proper irrigation facilities the farmers themselves have evolved and agricultural pattern to suit the monsoon period. However, in a predominantly agricultural economy such as Nepal, effective development of irrigation is a pre-requisite for increased agricultural production. Extension of irrigation can bring about in general a substantial increase in agricultural production in the country and can serve as means for the diversification and intensification of agricultural production.

Pandey (1998) has studied about the "Impact of irrigation of Rural Development". He found that small size landholding families are more in the irrigated areas than in the non-irrigated areas. In irrigated area, for example 71.44percent people are affected by irrigation. They grow two crops with the advent of irrigation scheme.

Gautam (2000) has studied an economic impact of Babai irrigation project at Bardiya district. According to his conclusion Paddy production has increased by 80 percent and the cropping intensities change 1.4 times to 1.7 times increased in this area.

Bhattarai (2010) has studied on the topic "The Impact of Begnas Irrigation Project on its Command area of Lekhnath Municipality, Kaski". He found that

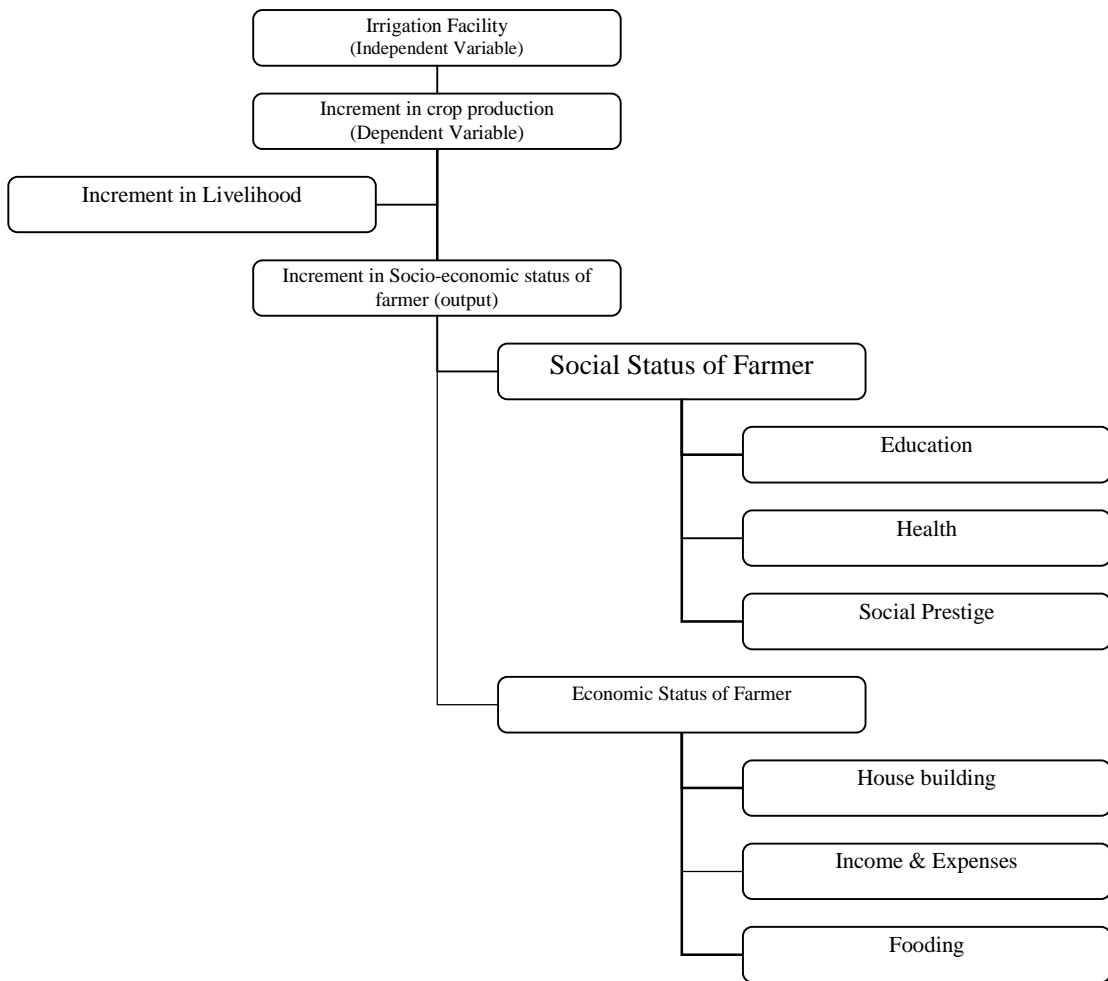
the total production of crop is increased by 90.88 percent after the irrigation facility. The productivity of crops is increased after irrigation facility. He also concluded that the cropping intensity has also changed between after and before irrigation facility. The cropping intensity has increased by 66.3 percent after the irrigation. The intensity of paddy production has also increased 85.7 percent and vegetable crops production has increased by 120 percent.

We know that irrigation facility plays an important role for the production of crops and it brings change in socio-economic status of the people. Economic condition of farmers can change by the growth of crop production.

Ratikhola irrigation project is also become the backbone for agricultural development in the command area. Researcher has intended to assured the socio-economic changes in the people of the Ratikhola irrigation command area.

## **2.4 Conceptual Framework**

The relevant literature researcher may clearly state that the new technology, modern inputs, irrigation facility, high yielding varieties play a vital role in the increment of crop production. The increase in the crop production has improved to some increase in saving. So, it brings change in the socio-economic status of farmers. It ultimately uplifts their livelihood. Based on the relevant literature conceptual framework has been developed.



**Fig. 2.1: Conceptual Framework**

The figure shows that irrigation facility is the independent variables because irrigation increases productivity. The crop production increment is the dependent variable because the growth of crop production is largely influenced by the irrigation facility. Lastly, the outcome of large amount of crop production has improved the socio-economic status of the farmers. In this study, researcher has selected only one variable via irrigation.

## **CHAPTER-III**

### **RESEARCH METHODOLOGY**

This chapter basically illustrates the research method adopted in carrying out this study. Primarily this section of the study indicates the ground selection of the study site. Research design, Sampling procedures, Nature and sources of data, data collection tools and techniques (i.e. interview, schedule, observation and secondary information) and data analysis are formulated.

#### **3.1 Research Design**

The study is descriptive type. The exploratory research design is useful to explore the different aspects of the problem under study and descriptive design has implied to the description of crops production and economic impact has been studied as different variables.

#### **3.2 Nature and Sources of Data**

As per needed of the study, both primary and secondary data are collected but more priority have been given to collect primary data. The primary data are both qualitative and quantitative. Priority is given to qualitative data, but some important quantitative data has been collected by observation, questionnaire schedule, focus group discussion and key- informant interview. All the informants are the main sources of primary data. Secondary data has been collected from INGO, Government office, library, they are published and unpublished sources as per needed.

#### **3.3 Sampling Procedure**

The universe of this study is the total household of the catchments areas of this irrigation project. This irrigation project has covered 123 hector land which lies

in the ward no.1, 2, 3 and 6 Gijyan of Tilahar VDC. The universe of this study consists of 250 households of the commands area. Among 250 households of the universe 50 households has been selected as sampled by simple random sampling. From each sample household one of the head members has selected as a respondents of this study. Key-informants for this study are local leaders, some of the staff of this project, official members of district irrigation project in Prabat. Validity of the tools have been ensured from careful planning of questionnaire schedule and interview questions.

### **3.4 Data Collection Tools and Techniques**

This research is mainly based on primary data; primary data has been collected by using following different of data collection tools:

#### **3.4.1 Interview**

A relevant questionnaire has been designed for interview. It has filled in the field by visiting door to door in the study area. Direct interview had taken to collect information for the study area with some key-informants such as; local leaders, local intellectuals, representatives of this project working in the office. This interview had totally unstructured for qualitative data. Generally interview had been conducted with the head of the family.

#### **3.4.2 Questionnaire Schedule**

This technique is become the main tool for the collection of primary data. To collect needed data in the study area, a schedule with both open questions had been prepared. The questions in the schedule had been structured type.

#### **3.4.3 Observation**

The researcher was observed by himself in the study area. The actual condition of respondents, water distribution system, cropping system, harvesting was observed in the study area. It has adopted to collect much more qualitative data

and information about changing pattern of crop production and farmers of the study area.

#### **3.4.4 Focus Group Discussion (FGD)**

A focus group discussion was performed in order to get much more data on economic impact by this irrigation project, the cropping pattern and the changing condition of farmers after or before irrigation. This discussion was conducted by himself from the farmer groups discussion. In this period the water users group member involved in this process. Three members were involved in the group discussion and farmers had presented their view about the water distribution.

### **3.5 Methods of Data Analysis**

The data obtained both primary and secondary sources were analyzed by using descriptive statistics such as average percentage & some indices data are represented in terms of tables and diagram to support the explanation. The collected data have been tabulated to meet the definite objectives.



## CHAPTER-IV

### SOCIO-ECONOMIC AND NATURAL ENVIRONMENT OF THE STUDY AREA

#### 4.1 Socio-economic Profile

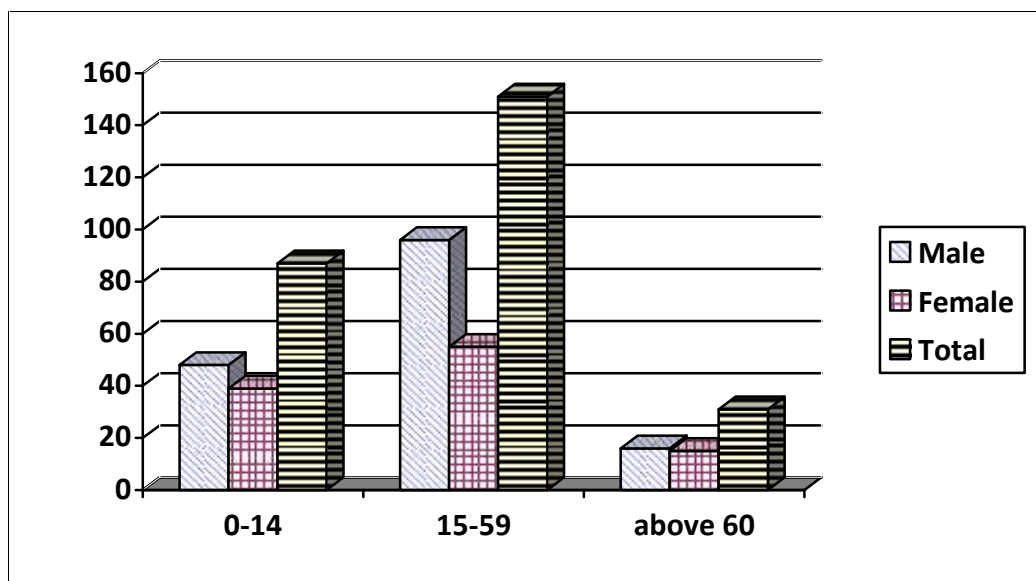
##### 4.1.1 Population Structure

The total sampled population of the study area is 269 out of which male is 59.48 percent and female is 40.52 percent. There is high production of dependent population. Children and above 60 aged 43.87 percent of the total population. The production of male is a little bit more than female among 0-14 years and above 60 years of age group. This indicates that the female child birth rate is lower than male due to the concept of new small family planning concept.

**Table 4.1: Economically Active and Dependent Population**

Age group	Male		Female		Total	
	Population	Percent	Population	Percent	Population	Percent
0-14 years	48	30	39	35.78	87	32.34
15-59	96	60	55	50.46	151	56.13
60 above	16	10	15	13.76	31	11.53
Total	160	100	109	100	269	100

*Sources: Field Survey, 2013.*



**Fig. 4.1: Economically Active and Dependent Population**

Table 4.1 shows the economically active and dependent population of the study area. The age group of economically active people is generally considered as to be 15-59 years but in the context of Nepal, it is 10-59 years. The percentage of working population is 56.13 and other 43.87 percent people are dependent.

From the above table, we know that there is a decreasing percentage of population in succeeding higher percentage and adult above 60 years is lower percentage.

#### **4.1.2 Ethnic Composition**

The society of the study area has been heterogeneous. There are many ethnic groups. The following table shows that population of Chhetri (introduced with Lamichhane) is higher i.e. 40 percent. They are going to change and slowly removed the caste system. It is true that they are sharing with lower caste group (Dalit) 12 percent, Brahman is 24 percent, Magar 8 percent, Newar 4 percent and others different castes are 12 percent of the total households number.

**Table 4.2: Ethnic Composition**

<b>Caste Group</b>	<b>household</b>	<b>Percent</b>	<b>Population</b>	<b>Percent</b>
Chhetri	20	40	84	31.23
Brahman	12	24	75	27.90
Magar	4	8	19	7.06
Newar	2	4	11	4.08
Dalit	6	12	43	15.98
Others	6	12	37	13.75
Total	50	100	269	100

*Sources: Field Survey, 2013.*

In the table 4.2 shows that Chhetri has the highest percent of population 31.23 percent and Newar has the lowest 4.08 percent population.

#### **4.1.3 Literacy and Education**

In the study area literacy rate is 78.44 percent and illiterate population rate is 21.56 percent. Among them 85 percent male are literate and 15 percent are illiterate in the total population. Female literate population is 68.81 percent and 31.19 percent female population is illiterate.

**Table 4.3: Literacy Composition by Sex**

	Male		Female		Total	
	Population	Percent	Population	Percent	Population	Percent
Literate	136	85	75	68.81	211	78.44
Illiterate	24	15	34	31.19	58	21.56
Total	160	100	109	100	269	100

*Sources: Field Survey, 2013.*

From the above table 4.3 shows that female literacy rate is lower than male literacy rate. It signifies that females are dominated in terms of education.

**Table 4.4: Academic Status of Literate Population**

	Male		Female		Total	
	Population	Percent	Population	Percent	Population	Percent
Below SLC	67	49.27	42	56.00	109	51.65
SLC	38	27.94	17	22.67	55	26.07
IA/+2	22	16.18	13	17.33	35	16.59
BA or above	9	6.61	3	4.00	12	5.69
Total	136	100	75	100	211	100

*Sources: Field Survey, 2013.*

There is much difference between male and female below SLC level. In the SLC level, there is lower number of female population than male. Only 26.07 percent people are able to pass SLC. Out of them 27.94 percent are male and 22.67 percent are female. Out of total population, there is less percent i.e. 9.89 percent of people are B.A. or above. Among them 6.61 percent are male and only 4.00 percent are female.

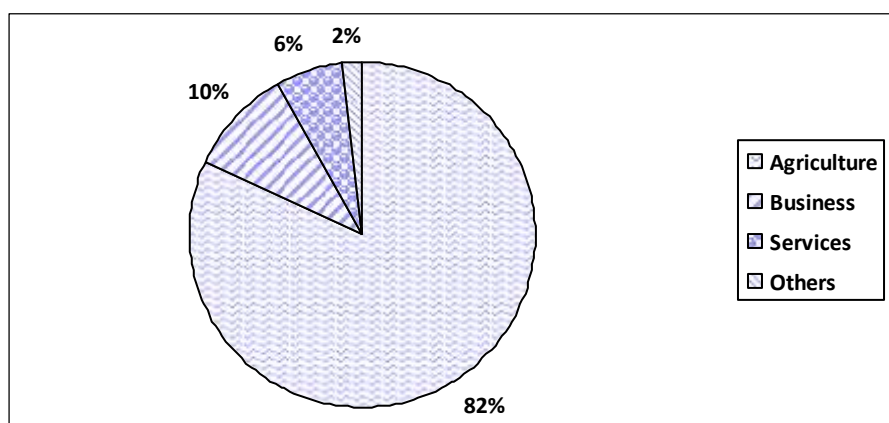
#### **4.1.4 Occupational Structure**

The command area of Ratikhola irrigation project 82.00 percent of the total population is engaged in agriculture. Only 18.00 percent people are employed in non-agricultural sectors, such as; business services and others.

**Table 4.5: Occupational Structure**

<b>Occupation</b>	<b>household</b>	<b>Percent</b>
Agriculture	41	82.00
Business	5	10.00
Services	3	6.00
Others	1	2.00
Total	50	100

*Sources: Field Survey 2013.*



**Fig. 4.2: Occupational Structure**

Table 4.5 shows that highest proportion of population is involved in agriculture activities. Business, services and other occupations come under the second supportive position with 10 percent, 6 percent and 2 percent respectively.

#### **4.1.5 Cultivated Land in Own Family**

In the command area, the highest percent of respondent have their own land both irrigated and non-irrigated. Most of the people cultivated in own irrigated land and only 40 percent of population cultivated contract and others irrigated land to fulfill their crop scarcity.

**Table 4.6: Cultivated Land**

Types of land	Irrigated		Non-irrigated	
	respondent	Percent	respondent	Percent
Own land	30	60.00	43	86.00
Other land	12	24.00	7	14.00
Contract land	8	16.00	-	-
Total	50	100	50	100

*Source: Field Survey 2013*

Table 4.6 indicates that most of the population cultivated in own irrigated land and then only 24 percent of population cultivated others irrigated land to fulfill crop shortage. Very little populations cultivated in contract irrigated land. Above table 4.6 also indicates that more population cultivated irrigated and non-irrigated land together. Among them highest population cultivated own

non-irrigated land and only few population i.e. 14 percent does others non-irrigated land. None of them cultivated in contract non-irrigated land.

## **4.2 Natural Environment of Ratikhola Irrigation Command Area**

Ratikhola irrigation project located between 28<sup>0</sup>26' W latitude and 83<sup>0</sup>75' east longitude. This command area is situated at Parbat district in western development region of Nepal. It is a prominent site situated along the bank of Kali Gandaki river.

The total area of the command is 123 hector, the average elevation range from the sea level is 891 meters. The slope of the command area is about 5<sup>0</sup> to 10<sup>0</sup> (degree). It is tilted towards south. Land is suitable and fertile for crop cultivation. Ratikhola irrigation command area falls on subtropical monsoon type of climate. Summer season is hot and wet. The temperature reaches up to 32<sup>0</sup>C in this season. In winter season average temperature falls down to 8<sup>0</sup>C. Rainfall begins from June and ends in October. During months of south east monsoon brings rainfall. About 90 percent of the total annual rainfall occurs in June to August. Perception amount up to 1950 mm per amount and temperature from 26<sup>0</sup> C to 30<sup>0</sup>C. Winter season average temperature range from 8<sup>0</sup>C to 14<sup>0</sup>C and average rainfall ranges from 50 to 80 mm depending upon westerlics in winter.

Winter months are fuggy and frosty in the morning and clear weather in day time and at night. Natural vegetation is deciduous types of forest in the command area. The dominant species of trees are Chilawane, Sal, Katus, Bamboo. However, most of the forest has already been deforested and converted into agricultural land.

The distribution of soil type is different. About 60 percent soils are loamy soil and 40 percent are clayey loamy soil of reddish in color. It is found in the northern part of the study area and is less fertile than the soil of southern part.

## CHAPTER-V

### IMPACT OF IRRIGATION PROJECT IN THE STUDY AREA

#### 5.1 Cultivated Land before the Irrigation

Before the irrigation project, the cultivated area was 79 hector. The soil of this area was productive and fruitful but due to the lack of irrigation the land had not been used properly. Single cropping pattern was widespread.

**Table 5.1: Cultivated Area before Irrigation**

SN	Crops	Cultivated area (in hector)	Percent
1	Paddy	43	54.43
2	Maize	9	11.39
3	Millet	8	10.13
4	Mustard	5	6.33
5	Wheat	9	11.39
6	Pulse	2	2.53
7	Vegetable	3	3.80
	Total	79	100

*Source: Field Survey 2013*

From the above table 5.1 indicates that paddy was dominant crops and produced in 54.43 percent of the total cultivated land before the irrigation facility. Maize and wheat were second crops and produced in 11.39 percent of total cultivated land. Millet was third crop and produced in 10.13 percent of the total land. Mustard was produced 6.33 percent. In the same way, vegetable was also produced in 3.80 percent land and pulse was produced in 2.53 percent of total cultivated land.

## 5.2 Production of Crops before Irrigation Facility

Before construction of Ratikhola irrigation project, there was a lack of irrigation facilities and there was some small sources like temporary kulo, pipe and stream were used limitedly for irrigation in the agricultural fields. Some limited agricultural land had a seasonal irrigation facility. At that time, irrigation was available only in rainy season by temporary kulo, pipe and stream which start from outlet land region. Subsistence farming was the dominant economic activity of this area. This area is the fertile and little bit plain region but due to the lack of proper irrigation facility, agriculture couldn't give sufficient production. Before the construction of the Ratikhola irrigation project; paddy, wheat, maize, millet, mustard, vegetable etc. were the main production of the study area. The proportion of the land was higher dry corps. Paddy cultivation was limited in wet or swamp land area.

**Table 5.2: Crop Production before the Irrigation**

SN	Crops	Production in quintal (per hector)	Percent
1	Paddy	24	29.27
2	Maize	16	19.51
3	Millet	12	14.64
4	Mustard	4	4.88
5	Wheat	15	18.29
6	Pulse	11	13.41
7	Vegetable	-	-
Total		82	100

*Source: Field Survey 2013.*

Table 5.2 shows that paddy was main food grain formed at study area. It was produced in 29.27 percent of the total food grain production. Second crop was maize which was produced in 19.51 percent of the total production. Wheat was the third crop which was grown in 18.29 percent. The production of mustard oilseeds and pulse was less. Paddy was grown in rainy season at the dry land.



Before the construction of canal this area was dry or semi-dry and crop production was depending on monsoon rainfall. The monsoon rain was not reliable in time.

### 5.3 Productivity of Crops

Due to the lack of irrigation facility, production of crops was not satisfactory before the irrigation project. The productivity of the crops was less and subsistence survival farming was prevailing in the study area before the construction of irrigation project. The productivity of crops has been given below:

**Table 5.3: Productivity of Crops before the Irrigation**

SN	Crops	Production in quintal(per hector)
1	Paddy	36
2	Maize	32
3	Millet	13
4	Mustard	4
5	Wheat	14
6	Pulse	7
7	Vegetable	-
Total		106

*Source: Field Survey 2013.*

Table 5.3 shows the productivity of crops before the irrigation projects in the study area. The productivity of paddy was 36 quintal per hector. In the same way, the wheat was produced 14 quintal per hector. Maize was produced 32 quintal; millet was 13 quintal per hector. Green vegetable was also produced in small scale and other crops such as pulse and mustard were produced 11.9 quintal per hector before the irrigation facility.

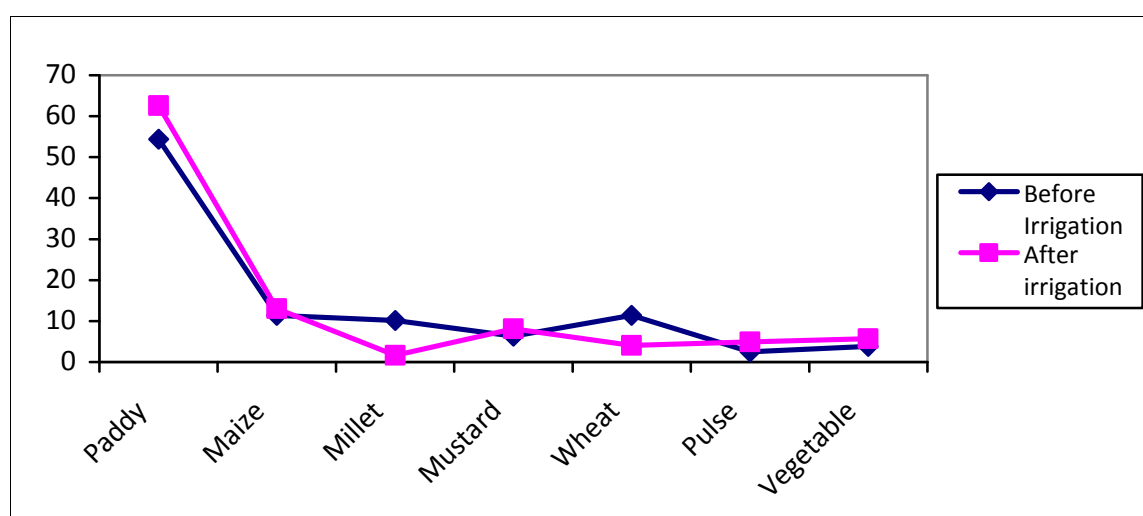
## 5.4 Cultivated Area Before and After Irrigation

Changes in cultivated area after irrigation facility, the crop production area has also increased in the study area. It means that irrigation brings changes in cultivated area. Table 5.4 shows the crops production area before and after irrigation project. According to this table crop production has increased due to the irrigation facility.

**Table 5.4: Cultivated Area before and after Irrigation**

crops	Before Irrigation (in hector)	Percent	After Irrigation (in hector)	Percent	Change (in hector)	Change in percent
Paddy	43	54.43	81	62.60	+38	88.37
Maize	9	11.39	15	13.01	+6	66.66
Millet	8	10.13	2	1.63	-6	-75.00
Mustard	5	6.33	9	8.13	+4	80.00
Wheat	9	11.39	4	4.06	-5	55.55
Pulse	2	2.53	6	4.88	+4	200.00
Vegetable	3	3.80	7	5.69	+4	133.33
Total	79	100	123	100	+45	493.36

*Source: Field Survey 2013.*



**Fig.5.1: Cultivated Area before and after Irrigation**

After the irrigation 45 hector cultivated land was increase in the study area. Paddy production area has increased by 88.37 percent. Before the irrigation, paddy cultivation area was 43 hector and it has reached 81 hector after the irrigation. Maize production area has increased by 66.66 percent, mustard production areas has increased by 80.00 percent, vegetable and pulse production area has increased by 200, 133.33 percent respectively.

The construction of irrigation has brought drastic changes in cultivated land. The dry lands are converted into irrigated land. There is facility of water supply. After the irrigation facility, the amount of fallow and dry land has been converted into cultivated land after the irrigation facility.

Before the irrigation facility crop production was totally depended upon the monsoon rain. So, the production and productivity of crops was low and people were not thinking about the increasing of cultivated land. But when irrigation facility has been provided by the Ratikhola irrigation project, the production of crops has also increased and people has changed the 45 hector fallow and meadow land into cultivated land. The increasing of cultivated land has automatically increased the crop production. The cultivated land has increased by 45 hector at the study area than the before the construction of Ratikhola irrigation project. This became possible by bringing waste land under plough and expansion of irrigation facility to un-irrigated farm lands.

## **5.5 Production of Crops**

Irrigation facility is available in the study area after construction of canal. Almost all land has been irrigated after the irrigation facility. Irrigation has brought a remarkable change in agricultural production in Gijyan. Paddy, Maize and Millet were grown in rainy season and wheat, mustard, vegetable, pulse were grown in winter season, vegetable was grown in limited area.

**Table 5.5: Production of Different Crops after Irrigation Facility**

<b>SN</b>	<b>Crops</b>	<b>Production in quintal (per hecter)</b>	<b>Percent</b>
1	Paddy	42	36.21
2	Maize	24	20.69
3	Millet	4	3.45
4	Mustard	6	5.17
5	Wheat	21	18.10
6	Pulse	14	12.07
7	Vegetable	5	4.31
	Total	116	100

*Source: Field Survey 2013*

Before the construction of irrigation project, the total production of different crops was 82 quintal. But now total production of various crops is 116 quintal. Production of crop is increased by 41.46 percent after irrigation facility. Paddy cultivation is increased is 36.21 percent of the total crops. Production of wheat was 18.10 percent of the total production. The production of maize and millet are going to be decrease after the irrigation facility. It is because maize and millet land is converted into paddy land by the irrigation facility. Pulse and vegetable accounts are produced 16.38 percent after the irrigation facility.

## **5.6 Changes in Crops Production**

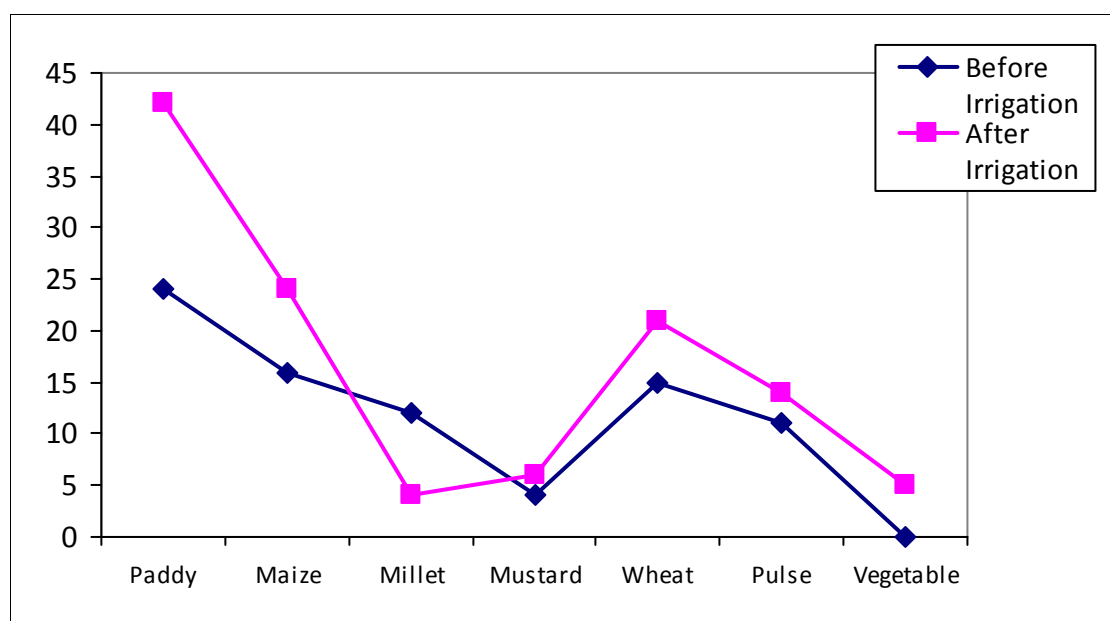
After the development of irrigation, it has increased the production of crops than before. It is due to the increase of irrigation facility in a cultivated land.

The data indicates that the production of crops has been increased with the increased of irrigation facility in the study area.

**Table 5.6: Production of Crops before and after Irrigation**

Crops	Production in quintal(per hector) before Irrigation	Percent	Production in quintal (per hector) after Irrigation	Percent
Paddy	24	29.27	42	36.21
Maize	16	19.51	24	20.69
Millet	12	14.64	4	3.45
Mustard	4	4.88	6	5.17
Wheat	15	18.29	21	18.10
Pulse	11	13.41	14	12.07
Vegetable	-	-	5	4.31
Total	82	100	116	100

*Source: Field Survey, 2013.*



**Fig.5.2: Production of Crops before and after Irrigation**

Above table shows the comparative crops production in the study area. The production of paddy has increased by 75 percent after the irrigation facility, production of wheat is increasing after the irrigation and it is increased by 37.5 percent. Likewise the production of maize has increased by 50 percent. Vegetable has increased by 5 times than before the project, mustard has

increased by 50 percent, pulse has increased by 16.67 percent. But millet is going to decreasing by 66.67 percent. Because of after irrigation facility, all millet land is being converted into paddy land.

## 5.7 Productivity of Crops after Irrigation Facility

The productivity of crops also increased after the irrigation facility. Due to the irrigation facility per hector, production of crops has increased after the canal in this area.

**Table 5.7: Productivity of Crops after Irrigation**

SN	Crops	Production in quintal (per hector)
1	Paddy	48
2	Maize	42
3	Millet	13
4	Mustard	8
5	Wheat	28
6	Pulse	16
7	Vegetable	60
Total		215

*Source: Field Survey 2013.*

Table 5.7 shows the productivity of crops after the irrigation facility in the Gijyan at Tilahar. The productivity of paddy is 48 quintal per hector, wheat production is 28 quintal. The productivity of maize has been increased after the irrigation facility but the productivity of maize has been increased i.e. 42 quintal per hector. The productivity of millet is remaining the same as before because the irrigation doesn't affect the production of millet. The productivity of mustard has been increased by 8 quintal per hector and pulse has been 16 quintal per hector. In the same way, the productivity of vegetable is 60 quintal per hector. The productivity of crops is increased after irrigation facility in the study area.

## 5.8 Changes in Agricultural Productivity

It is true that the irrigation has increased the productivity of crops. It has made possible to grow crops by using modern technology of production as such the local farmer have adopted high yielding varieties of seeds, chemical fertilizers, modern tools and insecticides by which they are able to increase per the yield of crops.

**Table 5.8: Productivity of Crops before and after Irrigation (in quintal)**

Crops	Production (per hectore) before irrigation	Production (per hectore) after irrigation	Absolute increase (in quintal)	Increased percent
Paddy	36	48	12	33.33
Maize	32	42	10	31.25
Millet	13	13	0	0
Mustard	4	8	4	100
Wheat	14	28	14	100
Pulse	7	16	9	128.57
Vegetable	-	60	60	Many times
Total	106	215		

*Source: Field Survey 2013.*

From the table 5.8, we know that the productivity of crops has also increased after irrigation facility. Productivity of paddy was 36 quintal per hectore before irrigation facility, but after the irrigation, productivity of paddy per hectore has increased by 33.33 percent and the production is 48 quintal. The productivity of maize has increased by 31.25 percent; wheat per hectore has increased by 100 percent after irrigation. The productivity of vegetable has increased by many times. Mustard has increased by 100 percent and pulse has increased by 128.57 percent after the construction of irrigation project. But the productivity of millet has consisted the same as before. It is true that the construction of irrigation doesn't affect the production of millet. Except millet, the productivity

of all crops has been increased after the irrigation facility due to the available of proper irrigation of crops.

## **5.9 Cropping Pattern**

### **5.9.1 Cropping Pattern before the Irrigation Project**

Before the construction of Ratikhola irrigation project agricultural activities were fully depends on monsoon rainfall in this area. There was no any source of irrigation. During that period there was diversified cropping pattern. Various types of crops were produced such as paddy, maize, millet, wheat, mustard, vegetable. Paddy and maize were grown in summer season, paddy in dry land. Wheat, mustard, pulse and vegetable were grown in winter season and dry season.

**Table 5.9: Cropping Pattern before in Irrigation**

<b>Area</b>	<b>Summer crop</b>	<b>Winter crop</b>
Wet land	Paddy	Wheat, Mustard, Pulse
Dry land	Maize, Millet	Mustard, Pulse, Sugarcane

*Source: Field Survey 2013.*

From the above table 5.9, paddy was grown in wet land during the summer season and cultivated in July. Maize was grown in both wet land and upland during the summer season but mostly grown in dry land. Millet was produced in summer season on wet land. Mustard was grown in dry and wet land and vegetables were used to produce in wet land during the winter season.

### **5.9.2 Changes Cropping Pattern after the Irrigation Project**

Irrigation has brought a remarkable change in cropping pattern. People used to grow various types of crops in dry land after the irrigation facility. At present cultivated land has been irrigated in the study area. Due to this irrigation facility, people also have growing varied crops.



**Table 5.10: Cropping Pattern after Irrigation**

<b>Area</b>	<b>Summer crop</b>	<b>Winter crop</b>
Wet land	Paddy	Wheat, Mustard, Pulse
Dry land	Paddy, Maize and Millet	Mustard, Pulse, Sugarcane, vegetable, wheat

*Source: Field Survey 2013.*

Cropping pattern has changed after the irrigation facility. After the construction of irrigation canal, paddy used to produce both in dry and wet land during the rainy season. Besides paddy, maize and millet are used to grow in some of dry land but paddy is grown more than other in dry land. Similarly, wheat is also used to grow in both wet and dry land during the winter season.

### **5.9.3 Changes in Cropping Pattern after the Irrigation Project**

After the irrigation facility, there have been changed in cropping pattern. Before the irrigation, paddy is used to produce in dry land during rainy season. Before the construction of irrigation canal, wheat was produce only in wet land. But after the irrigation, wheat, mustard and vegetable occupies in dry land in winter season. People are practicing to grow different types of vegetable at dry land. Before the irrigation substance, type of farming was adopted by the people. But present day people are slowly changing the agriculture system and adopting the commercial type of farming.

### **5.9.4 Cropping Calendar**

**Table 5.11: Cropping Calendar**

<b>Crop</b>	<b>Time</b>
Paddy	May-November
Wheat	November-March
Maize	March- July
Millet	June-November
Mustard	October-February
Winter Vegetable	September-February
Summer Vegetable	February-September

*Source: Field Survey 2013.*

From the table 5.11, double cropping system is practice in the study area. During the four months period February – June the cultivated land of the command area remain unplanted. This may be because irrigation water in not sufficiently available during this period. Cropping pattern and cropping intensity is generally dieted by water availability. After the irrigation facility people at the study area are adopting double cropping system. Irrigation facility will be helpful for the practice of triple copping system in the study area after the regular supply of water from irrigation canal.

### 5.10 Use of Chemical Fertilizer

Comparative data at the chemical fertilizer per hector per hector at Ratikhola irrigation project command area for different crops before and after irrigation facility is presented in below table 5.12. Use of chemical fertilizer has increased after the irrigation facility. The increase of chemical fertilizer has also helped to increase the production of crops.

**Table 5.12: Use of Chemical Fertilizer before and after Irrigation (per hector)**

<b>Crops</b>	<b>User of chemical fertilizer before irrigation (in Kg)</b>	<b>User of chemical fertilizer after irrigation (in Kg)</b>	<b>Changes in percentage</b>
Paddy	60	120	100.00
Wheat	50	90	80.00
Maize	15	30	100.00
Millet	5	10	100.00
Mustard	12	30	150.00
Pulse	3	10	233.33
Vegetable	35	100	185.72

*Source: Field Survey 2013.*

Table 5.12 shows that the use of chemical fertilizer has increased after the irrigation. Before the irrigation, use of chemical fertilizer was very low. Only 60Kg per hector chemical fertilizer was used for paddy production and it has

increased by 100 percent and reached 120Kg per hector. Before irrigation 50Kg per hector fertilizer was used for wheat production which has increased by 80 percent and reached 90Kg per hector after the irrigation. Likewise; for the production of pulse and mustard, low amount of chemical fertilizer was used before the irrigation facility. But after the irrigation facility it has increased by 133.33 percent and 150 percent respectively. Only 5Kg in millet and 15Kg in maize were used before irrigation, which were increased by 100/100 percent and reached 10Kg and 30Kg in millet and maize respectively. For the production of vegetable, only 35Kg per hector chemical fertilizer was used before irrigation. It has increased by 185.72 percent and reached 100kg per hector after the irrigation facility.

### **5.11 Changes in the Occupational Structure**

Irrigation is not only essential for crop production but it has also changed the status of society and its people. Irrigation has influenced the occupational structure of society after the irrigation facility. There is low density of population on agricultural sector because higher production does the higher saving. People invest their money in other activities. Due to the irrigation facility, people can grow higher amount of crop.

In the study area, 75.42 percent populations are engaged in agriculture and more land is used for cultivation. The living standard of people has been increased than before. The production of crops on this area has been increased and food surplus of people has been changed after the irrigation facility.

In the study area, 11.32 percent of total population are engaged in business, 11.32 percent are in service and 1.9 percent are engaged in other different occupations.

In this area, the living standard of people has increased due to the higher amount of crop production, which has effected on the occupational structure of people. Increasing of crop production means increasing the source of income of

the people. The main income source of people of this area is agricultural production. We already know that the crop production of the study area has increased after irrigation facilities. People have invested their saving money in different activities, which helps them for improving their economic conditions.

### **5.11.1 Food Grain Sufficiently in Ratikhola Irrigation Project**

Most of the respondent have sufficient their food grain and few amount of respondents are not sufficient in 2012.

**Table 5.13: Food Grain Sufficiently in Ratikhola Irrigation Command Area in 2012**

<b>Sufficient</b>	<b>Number</b>	<b>Percent</b>
Yes	31	62.00
No	19	38.00
Total	50.00	100.00

*Source: Field Survey, 2013.*

Table 5.13 indicates that food grain is sufficient last year for 62 percent respondents. But only 38 percent of respondents of the study area food grain are not sufficient last year. Most of the respondents i.e. 38 percent have food dearth only for 3 months, but sufficient for 9 months. It shows that crop and vegetable production need to buy for eat.

### **5.11.2 Income after Selling Agricultural Product in Ratikhola Irrigation Command Area**

Agriculture production has invested vital role of the farmers. Ratikhola irrigation has increased agriculture product and their annual income after the irrigation facilities. Income after selling agricultural product in irrigation command area has been given below.

**Table 5.14: Income after Selling Agricultural Product in 2012**

<b>Income</b>	<b>Number</b>	<b>Percent</b>
Below 5,000	25	50.00
6,000-10,000	22	44.00
11,000- 15,000	2	4.00
Above 15,000	1	2.00
Total	50	100.00

*Source: Field Survey, 2013.*

Table 5.14 indicate that highest percent or 50 percent of respondents sell their agricultural product below Rs. 5,000 and followed by Rs. 6,000-10,000 i.e. 44 percent. Only 4 percent of respondents earn Rs. 11,000-15,000 by selling their vegetable product and crop production. Among of them very little i.e. 2 percent earn above Rs. 15,000 only.

### **5.11.3 Expenses of People in Ratikhola Command Area**

Irrigation has played a important role in increasing the production as well as expenses of people. The people has been increased their expenses in the command area Such as; food, clothes, fuel, health and education, cultural functions and others that are given below in table 5.15.

**Table 5.15: Expenses of People in 2012**

<b>Items</b>	<b>Number</b>	<b>Percent</b>
Fooding	50	100.00
clothes	50	100.00
Fuel	36	72.00
Health and education	50	100.00
Festival	50	100.00
Entertainment	45	90.00
Other	50	100.00

*Source: Field Survey, 2013.*

Table 5.15 indicates that 100 percent of respondents spend their income on fooding, cloths, festival, health and education. Among them 72 percent of respondents use up their income on fuel which is lower than others expenditure. Only 90 percent of them use their income on entertainment. Others mean donation, social works, transportation cost, unexpected expenses, etc. so 100 percent respondents spend on such previous title.

#### 5.11.4 Expenses Rate in Agriculture Sectors in Ratikhola Irrigation Command Area

An efficiency of irrigation related to agriculture production depends upon the management of an input used in agriculture sectors such as; human labour, fertilizer, seedy and others. Small farm managed input more effectively and increase production efficiency when compared to large and medium size land holders. Ratikhola irrigation command area use different crops in relation to land-holding categories are presented below:

**Table 5.16: Expenses rate in agriculture sectors**

Expenditure (Rs.)	Labour		Fertilizer		Seeds		Other	
	Number	percent	Number	percent	Number	percent	Number	percent
0-5000	29	58.00	24	48.00	50	100.00	50	100.00
6000-10000	14	28.00	19	36.00	-	-	-	-
11000-15000	7	14.00	7	14.00	-	-	-	-
16000-20000	-	-	-	-	-	-	-	-
21000-25000	-	-	-	-	-	-	-	-
Total	50	100.00	50	100.00	50	100.00	50	100.00

*Source: Field Survey, 2013.*

Table 5.16 shows that the last year expenditure rate on agriculture sector of the study area in different subject. Highest percent i.e. 58 of respondents spend Rs. 0-5,000 on labour last year and followed by Rs. 6,000-10,000 that is 28 percent. Very few of them spend Rs. 11,000-15,000 on labour.

Above table indicate that most of the respondents i.e. 48 are spent Rs. 0-5,000 on fertilizer and than 36 percent of respondents are spent Rs. 6,000-10,000. Only 14 percent of respondents spent Rs. 11,000-15,000 on fertilizer.

And 100 percent of respondents spent Rs. 0-5,000 to buy seeds. Nobody spent more than Rs. 5,000 to buy seeds. Others means to buy tools, transportation cost, communication cost, food and drink cost for labour, unexpected cost, etc. so that 100 percent respondents spent less than Rs. 5,000 for others things.

## 5.12 Problems of Ratikhola Irrigation

Below table shows the problem faced by people in Tilahar VDC from Ratikhola irrigation project.

**Table 5.17: Problems of Ratikhola Irrigation**

Problems	Number	Percent
Lack of continuous irrigation	40	80.00
Capacity of canal has not sufficient	35	70.00
Branch canal has not constructed	15	30.00
The volume water has not sufficient	40	80.00
Water was not equally distributed by irrigation project	37	74.00
Others	28	56.00

*Source: Field Survey, 2013.*

Table 5.18 shows that different problem faced from irrigation project. Highest percent as well as equal percent i.e. 80 of respondents had faced lack of continuous irrigation and the water volume of water has not sufficient from Ratikhola irrigation. And followed by water was not equally distributed by irrigation project that is 74 percent. Among them 70 percent of respondents had faced the problem of capacity of canal has not sufficient. Very few respondents had faced problem from branch canal because branch canal has not constructed according to requirement. Only 56 percent had also faced others problem such as lack of regular monitoring of irrigation after starting, lack of co-operation, lack of maintenance, lack of group discussion about irrigation etc.

## **CHAPTER-VI**

### **SUMMARY FINDINGS AND RECOMMENDATION**

Nepal has 18 percent agricultural land out of the total land area, where only 1765840 hectares land is possible for the irrigation. However, there are 1168144 hectares land is irrigated the last of the 10<sup>th</sup> plan. In WDR of Nepal, total land have occupied 2939800 hectares and 420976 hectares land for the agriculture purpose. But only 190924 hectares land is irrigated. However Parbat district has occupied 2370.7 hectares land. But it has covered 2268 hectares land irrigated by the many irrigation projects.

Tilahar VDC has covered 1020 hectares land of the district. It is situated at the North eastern part of Kusma Bazar in Parbat district. The net irrigated land of this VDC has 123 hectare in the dry season; where rice, maize, wheat, oilseeds, vegetable are the main crops.

Tilahar VDC has fertile land in the valley floor but due to the lack of irrigation facility crop & vegetable production was not satisfactory before the Ratikhola irrigation project. Before the irrigation project, limited area was irrigated by the method of traditional system. After the construction of canal water was supplied in the command area.

#### **6.1 Summary and Findings**

Irrigation facility is the most important phenomenon in the sense of crop production. It plays the important role for the production of crops and it brings change in socio-economic status of the people. Economic condition of the farmers can change by the growth of crop production.

Ratikhola irrigation project is also become the backbone for agricultural development in the command area. The present research is primarily concerned with the "*The impact study of Ratikhola irrigation project*". The study had the



general objective of studying to find out the socio-economic impact of Ratikhola irrigation project where as, following were the specific objectives of the research: to study an economic impact of Ratikhola irrigation project, to examine the existing crop production before and after irrigation project and to access the changes in the cropping pattern after the irrigation project.

The study is mainly focused on the impact of Ratikhola irrigation project. The study is explorative and descriptive in the nature. The ward no. 1, 2, 3 and 6 Gijyan of Tilahar VDC is selected for this study purpose. The universe of this study has been consisted of 250 households of the command area. Among them 50 households has been selected as sample by the simple random sampling method.

The data were gathered from both primary and secondary sources. The nature of data is qualitative as well as quantitative. Household survey, observation, interview schedule, key-informant interview were the data collection techniques used for the study. The key informants of this study are local leaders, staffs of this project, official members of district irrigation project in Parbat and one of the head members of 50 households.

There is 123 hectars land utilization for the food grain, vegetable crops, oilseeds etc. Tilahar VDC has only one irrigation project, which is occupied 123 hectars land irrigated. The total area of irrigated land of this VDC is covered by Ratikhola irrigation project. About 250 households and 1456 populations are lived in the Ratikhola irrigation command area. This project can be improved by developing agriculture system and can be uplifted changing livelihoods of the farmers.

Ratikhola command area has 43.87 percent people are dependent the age of under 14 & over 60 years, 56.13 percent respondent are found on the age of 15-59. The literacy rate is 78.44 percent out of the total respondent, which is lower. Among them 85 percent male are literate and 68.81 percent female are

literate. Female literacy rate is lower than male literacy rate. In the study area 82 percent population is engaged in agriculture. Only 18 percent people are employed in non agricultural activities such as business, service and other functions.

Before the irrigation project, the cultivated area was 79 hectars and single cropping system is prevailed. Vegetable crops has 3.80 percent before the irrigation project. Only 10 percent agricultural land has seasonal irrigation facility. In rainy season by temporary "Kulo" which start from outlet of wetland area. Before the project, there are many means of irrigation such as pipe, kulo, stream and others.

Paddy accounted for 29.27 percent of the total food grain production and the share of maize and millet production is 19.51 and 14.64 percent respectively in the total production. The productivity of crops was very low before the construction of irrigation project.

After the irrigation 45 hector cultivated land was increase in the study area. Paddy production area has increased by 88.37 percent. Before the irrigation, paddy cultivation area was 43 hector and it has reached 81 hector after the irrigation. Maize production area has increased by 66.66 percent, mustard production areas has increased by 80.00 percent, vegetable and pulse production area has increased by 200, 133.33 percent respectively.

The total production of crop is increased by 41.46 percent after the irrigation facility. However most of the millet field people have replaced the area under maize to paddy cultivation.

After the construction of irrigation cannel, paddy used to produce both in dry and wet land. After the irrigation facility, people are adopting double and triple cropping system in the study area. Chemical fertilizers has 100 percent increased after the irrigation in the study area. For vegetable production 185.72

percent chemical fertilizer has increased after the irrigation facility. However, the use of chemical fertilizer has increased after the irrigation facility.

## **6.2 Conclusion**

Irrigation facility is the most important for crop production in agriculture sector. Almost 74 percent people of Nepal are engaged in agriculture. The main occupation of Nepalese people is agriculture. But agriculture is depends on irrigation. The study area is based on Tilahar VDC Ward No. 1, 2, 3 and 6 Gijyan. The total population of this area is 269 out of which 59.47 percent are male and 40.53 percent female. In the study area 82 percent population is engaged in agriculture. Only 18 percent people are employed in non agricultural activities such as business, service and other functions. To conclude, sufficient branch canal to all people is the burning issue. Due to lack of branch canal all people were unable to take equal benefit from the irrigation. Water in Ratikhola river is insufficient in winter to provide irrigation facility for the command area. So the production is very low in winter. Institutional development is not well maintain due to ignore at repair and maintenance at the canal. Lack of co-ordination of water user association and water user group, people participation and operation and management of allocation and distribution of water brought conflict for water issue. The farming technology is very poor due to the lack of technical services and modern well equipment for agriculture activities such as lack of quality seeds, harvesting machine. Lack of agricultural market to sell the agricultural production on the reasonable price. In fact the government should bring new policies to enhance the people who are actively involved in agricultural sectors. In conclusion, however farmers have replaced an area under millet and maize.

## **6.3 Recommendation**

Ratikhola irrigation has brought changes in the community of its command area. However, there are different types of problems in this area which are

affecting the production of crops that may cause the degradation of their life style by the economic condition. Following recommendation has been made for improvement and further research.

**A. Recommendation Related with Canal**

- ) There should be availability of skilled manpower and sufficient tools for the maintenance and operation works.
- ) Public participation is necessary for maintenance and operation of main and branch canals.
- ) There should be tree plantation along the side of canal.
- ) It is necessary to supply regular water for crop production from main canal to all command area.
- ) Institutional linkage with various agencies like government, different NGO/INGOs, and private organization is very important for the development of irrigation project.
- ) Systematic planning of labour contribution to maintenance and operation of canal.
- ) Water user groups should be active for the maintenance of the canal.

**B. Recommendation Related with Agriculture Sector**

- ) Distribution of chemical fertilizer improved seed and tools should be distributed in certain time and place with equal quality.
- ) New technology should be applied in agriculture fields such as bio-culture, poly-culture, multiple cropping system, rotation system and diversification.
- ) To link it with transportation network is necessary to developed agro-technology.
- ) There should be arrangement for scale & distribution.
- ) Credit from government for agro-production to the farmers is necessary.

- ) Co-operative should be formulated for the selling agricultural production.
- ) The farmers should be encouraged to for the organic vegetable production.
- ) There must be facility to training to the farmers to improved agro-technology.
- ) There should be encouraged to the farmers for the fisheries in the wet land area should be conserved agricultural land for the future.
- ) There should be controlled haphazardly development of residential area in the agricultural land.

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**Appendix-I**  
**Questionnaire Use for Data Collection**  
**Ratikhola Irrigation**

This survey is conducted within Cannal command area in Tilahar VDC Ward no. 1, 2, 3 and 6 for the partial fulfillment of MA in Sociology/Anthropology.

Questionnaire No..... Date: .....

1. The head of the family name.....
2. No. of family: Male ( ) Female ( ) Total ( )

Age	0-14	15-29	30-44	45-59	60 above
Male					
Female					

3. Number of family members according to literacy (6 years above)

	Illiterate	only literate	8 pass	SLC pass	IA	BA or +
Male						
Female						

4. Major occupation of the family members. (14 years above)

SN	Occupation	No. of persons		Total
		Male	Female	
1	Agriculture			
2	Business			
3	Service			
4	Industry			
5	Others			

5. Who are the original castes of this area?

.....

6. Annual income source.
- (a) Agriculture      (b) industry      (c) wages  
 (d) Business      (e) service      (f) others

7. How much cultivated land owned by your family? (in Ropani)

Types of land	Own land	Other land	Contract	Total
Irrigated				
Non-irrigated				
Total				

8. How much cultivated land owned before the Ratikhola irrigation project?

Ans ..... Ropani

9. Was there irrigation facility in your land before irrigation project?

Yes (      )      No (      )

10. If irrigation facility was provided, how much land was irrigated?

Ans ..... Ropani

11. What was the means of irrigation?

Pipe (      )      Canal (      )      River/Stream (      ),  
 Other (      )

12. Changed in factor that you have after the irrigation project.

(a) economic factor      (b) social factor      (c) political factor  
 (d) educational factor      (e) All

13. If changed in all factors, what was the cause?

(a) Achievement of irrigation facilities  
 (b) Awareness of people about the irrigation and it's proper utilization.  
 (c) Utilization of fertilizer  
 (d) Improvement the economic as well as social status of farmers

14. Achievement after the construction of Ratikhola irrigation project.

(a) decrease in crop production  
 (b) increase in crop production  
 (c) constant in crop production

15. If increase in crop production what are the causes?
- (a) Achievement of irrigation facilities
  - (b) Utilization of improved seeds.
  - (c) Utilization of higher quality of labour.
  - (d) Increase in cultivated land.
  - (e) Purchase the new land by farmer.
  - (f) Utilization of fertilizer
16. If decrease in crop production. What are the cause.
- (a) Irregular water supply in all season.
  - (b) Canal has damaged in time to time.
  - (c) Unequally distributed of water
  - (d) Other
17. Agriculture production before and after the Ratikhola irrigation project.

Crops	Before irrigation	After irrigation
Paddy		
wheat		
maize		
mustard		
pulse		
vegetable (kg)		
others		

18. Use of fertilizer to produce the agriculture crops.

Crops	Before irrigation		After irrigation	
	Area in (Ropani)	Chemical, fertilizer (kg)	Area in Ropani	Chemical fertilizer (kg)
Paddy				
wheat				
maize				
pulse				
vegetable				
others				

19. Food grain sufficiently at last year.

	paddy	maize	wheat	pulse	vegetable	other
Sufficient						
dearth						

20. If you have dearth, how long did the food dearth.

..... month.

21. Selling price of surplus food (per quintal or muri)

Crop	paddy	maize	wheat	pulses	vegetable	other
Price Rs.						

22. How much expenditure for your family last year? (A part from agriculture)

Heading	fooding	cloth	fuel	Health & education	festival	entertainment	other
expenditure Rs.							

23. Expenditure in agriculture per Ropani at last year (Rs.)

Crop→	paddy	wheat	maize	pulse	vegetable	other	total
labour							
fertilizer							
seeds							
others							
total							

24. If you have saving the money, where you invest your money or goods?

- (a) to buy land                      (b) to gain in interest  
(c) to business                      (d) to keep in bank  
(e) to buy ornament              (f) to lend money              (g) others

25. Annual cropping pattern

Winter crops	Area Ropani	Production in quintal	Summer crops	Area Ropani	Production in quintal
After Irrigation					

26. Problems related with Ratikhola irrigation.

- a) Lack of regular irrigation.
- b) Capacity of canal has not sufficient.
- c) Branch canal has not constructed.
- d) The volume water has not sufficient.
- e) Water was not equally distributed by irrigation project.
- f) Others.

27. Problem related with the agriculture sector

- a) Chemical fertilizer, seeds, agriculture tools have not use.
- b) JT and JTA service has not facilitated.
- c) Chemical fertilizer, seeds and agriculture foods have not sufficiently provided.
- d) Lack of irrigation
- e) Lack of capital and labour
- f) lack of agriculture market
- g) others.

28. Have you any comments and suggestion to Ratikhola irrigation project.

.....  
 .....

**Thank you !**