CHAPTER - I

INTRODUCTION

1.1. General Background

In Nepalese economy agriculture has occupied pivotal position. It contributes about 40 percent of gross domestic product (GDP) and provides livelihood and employment to 81 percent of the population. However agriculture largely depends on the erratic rains which come during monsoon from June to September (Uprety, 2000). For this reason irrigation acquires great importance as a strategy for increasing agricultural efficiency augmenting agricultural yields and generating larger incomes.

The contribution of agriculture sector has fallen steadily from to seventy percent in fiscal year 1974/1975 to fifty one percent in 1990/1991 to 43 percent in 1992/1993 (Thapa and Rosegrant-199 5) and 40 percent in 1997/1998. Over this period productivity index of major food crops have been either stagnant or declining. The agriculture practices are still traditional rather than modern. The methods of crops' cultivation are traditional types. Farm mechanization is also traditional. Most of the farmers are still using local seeds and local technologies. However, some of the farmers are gradually introducing high yielding varieties of seeds, chemical fertilizers, pesticides and modern technologies but they don't have adequate knowledge recommended for it. The low earning source and lack of the agricultural education is the constraints in adopting advanced farming system.

Besides these above mentioned causes inadequate irrigation facility is also the cause of the poor performance in the agricultural sector. Hence irrigation is identified as the key to accelerate intensity and sustain the agricultural growth (Sharma 1994). Irrigation has great importance because agricultural is the main source of income and employment. Government of Nepal has emphasized the development of irrigation. However, the performance of the agricultural sector has been indolent comparatively with growth of population of the country. Irrigation is

therefore, one avenue which can create revolutionary effects on the performance of the sector in a short span of time from the limited cultivated land.

Nepal is very rich in indigenously built irrigation systems. According to the updated master plan for Irrigation Development-1995 the total irrigable agricultural area in Nepal is estimated at 1766 thousand hectares comprising 1,005 thousand hectares of the existing irrigation. Out of the total 75.7 percent irrigation area is in the Terai and remaining 24.3 percent in the hills and mountains. Out of the existing irrigated area of 1,005 thousand hectares about 721 thousands hectares of the farmer managed irrigation systems consists of 582 thousands hectares under surface irrigation and 139 thousands hectares under ground water (East Consult 1995). As such the indigenous irrigation systems remain the dominant source of irrigation in Nepal (Water and Energy Commission Nepal, 1981)

The commission also points out that general indigenous irrigation system operate better than government built systems. There are however, many irrigation systems through the world that were built by the independent groups of farmers. Since many of the groups were formed at the initiative of the farmers themselves the institutional resources of these groups had relatively much more time to gestate and mature before the actual full scale operation of their irrigation systems. As such, indigenously associations of then develop organizational skills and techniques which are in a manner of speaking more effective and appropriate than the administrative procedures of practices in systems that were not indigenously developed or designed. However there is not much detailed information on how such indigenous irrigation groups function and operate.

The Nepalese government can not continue to build the bureaucratically managed and operated irrigation systems in all extremely mountainous terrain because of the high cost of trained manpower. A more feasible alternative would be to strengthen existing indigenous irrigation systems through a set of supportive plans and policies, especially those using a people centered development paradigm. But to

formulate better supportive plans and policy, extensive knowledge of the organization and operation of existing indigenous irrigation is needed.

In a country with a low per-capital availability of arable land efforts to boost agricultural productivity need to be based on increasing intensity of production rather than on extending cultivated area irrigation development is an essential component in this strategy Nepalese subsistence farmers have recognized the importance of irrigation in intensifying agricultural production. For centuries, they have been constructing irrigation systems for controlling water at their own initiation.

So from the down of history, irrigation development remained in the hands of people for many years in Nepal. Farmers have developed their own irrigation system taking account of geographical condition, topography soil, climate and social structure of the particular location over a period of many years. The traditions of farmers involvement in the developments operation and maintenances of irrigations system has been given birth to a multitude of farmer managed system scattered all over the country (Pradhan and Yoder, 1991). In the world of irrigated agriculture Nepal is now being known as 'Land of farmer managed irrigation system' because more than 10 percent of the agriculture land is irrigated by farmers-managed irrigation system, (FMIS) (Ansari and Pradhan; 1991) Thus FMIS plays an important role in agricultural production of Nepal. It is estimated that about 45 percent cereal crops requirement of the nation is meat by the increased production from farmer managed system. This is attributed to Nepale's peasant community efforts of prevent the influence of draughts and meeting the water requirement for increased cropping intensities (Ansari and Pradhan, 1991)

Irrigation system is a joint collective social process where a complete attention is required. The social scientist and farmer can not blindly make organizational rules for its use without careful collaboration with technical scientist, engineers and hydrologists in turn the technicians can not specify pumping regimes without

regard to impact on organizational chapters and social dynamic (Freeman et. al, 1991). It is thus essential to fully understand the social environmental, technical and economic factors while implementing a new irrigation scheme or rehabilitating the existing irrigation system.

Irrigation management is beyond an individual capacity, it requires communal co-operation, where many mechanisms are evolved to perform the irrigation activities. And these mechanisms are conducted by individual involving with various organizations. Irrigation activities may be performed by users themselves, remoteness' and harsh topography of the country have induced the local people to work together in order to cater to their common needs. Users have built lasting arrangement among themselves where many self involved mechanisms are functioning actively and generating their own resources for operation and maintenance. Similarly outside interventions (local government officials, irrigation agency staff etc) may also perform the irrigation activities. There are also formal or informal institutions and organizations. Although the admitted point is that they all, whether self involved mechanism or outside interventions have occupied specific roles and rules, strategies and procedures. It will be fruitful, if all could retain their responsibility.

Irrigation Development in Nepal

Farmers in Nepal have been developing and managing irrigation since time immemorial that appears to have been contemporaneous with agriculture. Although, Nepal has a long history of irrigated agriculture; the importance of irrigation has been realized only in the recent year with the advancement in the irrigated agricultural technology.

Apprehending the importance of irrigation, for centuries people of Nepal engaged in agriculture, have tried to manage water resources from river or streams for purpose of irrigation with their own initiation. Historically irrigation development

was initiated either by religious trust or by an individual initiatives or community effort (Pradhan et. al. 1990)

Planned involvement of the government in irrigation development began only after 1951. The Department of Irrigation (DOI) came into existence in 1952. Before this period the irrigation needs were met by several Farmers Managed Irrigation System (FMIS) and tell state supported irrigation canals. The Chandra canal was the first public sector irrigation scheme built in 1923 under the supervision of British engineers. During 1932-1950 few more irrigation schemes were initiated in Terai under public works Department, a government department created then for public sector infrastructure development. These include Judha canal, Jagdishpur Reservoir (now Banaganga irrigation system). Manusmura and Sirsla-Dudhara irrigation schemes. During 1950 agreements were reached with India on construction of Koshi and Gandaki projects. The Koshi agreement led to the construction of Chatra canal and the west Koshi projects, while the agreement on Gandaki led to the construction of Narayani and west Gandaki schemes (Shukal and Sharma, 1997)

In order to take care of irrigation and agriculture, the Agriculture Council formed 1926 were collapsed after the revolution of 1951.Then an organized irrigation department established with Nepalese technicians came into existence in 1955 as a principle organization to look after the irrigation facilities throughout the country. Other governmental agencies like Farm Irrigation and Water Utilization Division (FIWUD). The Agricultural Development Bank, Nepal (ADBN) is involved in irrigation development programmers. The five Region Directorates are also strengthening and providing technical assistance and supervise newly established District. District irrigation Offices (DIO,s), through the district. DIO,s are also providing, assistance for repairing, rehabilitating and improving FMIS, mobilizing and promoting participation of beneficiaries. Briefly at present a full fledge of irrigation department of government and also various national and international

non-government agencies are making attempts to incorporate the local farmers ideas and experience without destroying farmers self-help (Sherestha, 1986).

Likewise, high priority has been given to farmer's active participation in eight/ periodic development plans (1992-1997). The planners have also realized that the new participation approach as indispensable for the nation's development and without people's participation development is neither meaningful nor sustainable or accelerate the pace of national economic growth.

For the first time in the legal history of the country the water Resource Act (WRA) 1992 recognizes water user organization (WUO) as the autonomous corporate entity with a right to perpetual succession. It also enables the government to transfer government adminstratified irrigation system to farmer ownership and management (Gautam, 1992). The eight/ five year plan (1992-1997) has targeted to promote irrigation facility in 2,93,895 hectare and total irrigated land will reach 8,92,699 hectare by the end of the plan period (NPC, HMG/N). The irrigation land area of the country has been estimated to be 1.6 million (1.3 million hectares in Terai and 0.3 million hectare in the hill and mountain) Out of the total cultivated land only 67 perccent is irrigable currently about 36 percent of the cultivated land is part of irrigated net command are (Baskota et.al.1992).

1.2 Statement of the Problem

The discouraging economic growth of Nepal characterized by low agricultural productivity agnist the rapid population growth. Providing food to people is perhaps Nepal's most problems and will continue to be so over the next two decades (Baskota, 1992).The World Bank Report – 1989, states that the main factor responsible for unsatisfactory agricultural growth has been slow and ineffective development of irrigation.

In one hand nearly all arable land in Nepal has been brought under cultivation and one other hand Nepal is facing the difficult problems of adequate food production.

The annual population growth rate is 2.08 (C.B.S, 1991) already exceeded the marginal increase in food production, which is not more than 1.5 percent per year.

Experiences have shown that agricultural activities are ignored in undertaking a project. An irrigation project is not economically successful and viable, if it does not contribute to increased crop production. If system is improved farmers get more water and will be able to increase yield. This increase in benefits encourages farmers to take more and more responsibility over the system and consequently the system become more sustainable.

Despite, considerable investments in infrastructure development and well trained cadre of technicians for design, development, operation and management, the public sector irrigation schemes in Nepal have been constantly performing as had been expected. A series of reports published by Agriculture Project Research Service Center (APROSC/NARC) during 1970s and 1980s were fundamental in drawing attention to poor performance of government sponsored irrigation schemes (APROSC, 1978a, 1978b, 19789c). Some of the deficiencies pointed were.

Irrigation coverage of command area has been partial in almost all the project. The effective irrigation area in most cases has been less than half of the targeted command. This state is largely due to incomplete development of project infrastructure including distribute and drainage system. System maintenance and management have been deficient thus impeding timely adequate and reliable supply of irrigation water. In most cases the irrigation systems have not been able to reduce the production risk as a result the response of the users has been far, below the satisfactory levels. The participation of users in most schemes has been neglected, even the schemes which are extensions of communal irrigation system have failed to solicit farmers co-operation in system operation and maintenance.

Irrigation should be taken as an economic opportunity to the farmers. The opportunity should be equitable to all users so that all can enjoy the benefits. This opportunity has enhanced the capability of farmers in order to think for further development activities at their household and community level. The economic empowerment alone does not bring the desired social change for equitable and sustainable benefit to the community this should be integrated with the activities related with social development to have equitable and sustain benefit in the thousand (man and woman, children community, ethnic group, rich and poor)

Nepal has abundant water resources. It is also estimated that Nepal has about 1.3 million hectors of land suitable for surface irrigation; however only 13 percent or 3, 71,130 hectors of land is under irrigation up to the sixth plan. (Cited,Parajuli 1989,NPC.1985)

Taking all these factors into consideration, this study was carried on to answer the following research question:

- What is the pattern of formal organization among the farmers?
- Can the users committee make transparency with regards to rules regulation, benefits sharing etc?
- Who participate and under what conditions to the users participate effectively in irrigation activities.
- What are the disputes and conflicts among the user groups in irrigation systems and how they are solved?
- How did the community organization for the improvement of the project?

1.3 Objective of the Study

The general objective of this study is to examine the effectiveness of people's participation on irrigation system management and its impact on people's daily life. The specific objectives are:

- To determine the factors effecting the irrigation management and the development of irrigated agriculture in the study area.
- To explore mechanism of water allocation and distribution among the beneficiaries.
- To find out the conflict and mechanism for its resolution.
- To comprehend the major changes brought by this project on people's daily life.

1.4 Rationale of the Study

Agriculture is the predominant sector of the Nepalese economy because about 90 percent of the population is dependent on agriculture. Although agriculture visibility dominates the national economy, its contribution is rather declining. The contribution of agriculture sector has fallen steadily from 70 percent in 1974/75 to 51 percent in 1984/85 and 47 percent in 1990/91 to 43 percent in 1992/93 (Thapa and Rose grant, 1995). Over this period productivity index of major food crops have been stagnant or decline. Nepal once a rice exporting country has now to import rice occasionally to meet the domestic needs. The identified reasons for poor performances of agriculture are: inadequate provision of irrigation production inputs, credit, market and extension of appropriate technological support the production growth (APP, 1994). Among them, irrigation has been identified to be the key to accelerate, intensify and sustain the agriculture growth.

Realizing this fact, suitable measures have been taken by government of Nepal to improve the subsistence farming system of the country of these measures many irrigation projects have been undertaken by the government. The Bhorletar Irrigation Project is also one such irrigation projects in Lamjung district. Bhorletar VDC which has contributed the farmers to improve the conditions of farming in their locality. This study which intends to analyze the impact of irrigation in cultivation would be useful to measure the major charges brought by this project on people's daily life. It provides some of the information to the government, other development parties who want to lunch such programme in other location. Hence,

such an attempt is essential for working out further plans and programmed. This study will try to highlight the significant role played by the B.I.P in Bhorletar VDC.

1.5 Limitation of the Study

Every study has its own limitation. No study can be free from drawbacks and short coming because of various constraints. And probably this study is not exceptional one. The study area covers three wards of the Bhorletar irrigation project. Thus, its finding may not be applicable to the country as a whole. However, research work has put every effort to make the research work more scientific and has tried to meet the objective as far as possible.

CHAPTER- II

LITERATURE REVIEW

Reviews of completed research are one of the most important components of research because the researcher should gain out of the experiences of others. The proper survey of the literature will help the researcher to gain insights on particular research problem issue which eventually assist him or her in formulating the research problem in a much more specifics manner. Similarly; review also helps to know what has already been alone. What are their strength and weakness? In so doing one can identify the research gaps which need to be bridged by the new research efforts.

2.1 Historical Development of Irrigation

Looking back to the history there are records and evidences of continuous irrigation for thousand of years in valley of Nile where human civilization started. Most of the people who are well informed in irrigation are certain that human civilization have arisen in irrigated land, while some other think that civilization based on agriculture under irrigation is distended sooner or later to decline because some ancient civilization based on irrigation bane declined. At present, it is the only one option to solve the food and fiber demand of growing population (Roe: 1950, 135)

Prehistoric tables and craving indicate that early civilization developed along rivers that supplied irrigation water to the fields. The Egyptians used water from the Nile to irrigate adjacent fields as early as 5,000 B.C. Historical records show that king Menes (who lived around 3100 BC) had a large masonry dam built to control the Nile river and provided water for irrigation. (Parajuli, 1991)

Irrigation in many countries is an old art as civilization but for the whole world it is a modern science. The science of survival. The antiquity of irrigation is well documented throughout the written history of mankind. Genesis mentions

Amophel, king of shiner, a contemporary of Abrahm, who is probably identical with Hammurabi, sixth king of the first dynasty of Babylon. He developed laws, bearing the name Hammurabim Indicating that the people had depend upon irrigation for existence. One of the laws of Hummurabi states that if a man neglects to strengthen his bank of the canal and waters caraway the meadow, the man in whose bank the breach is opened shall render back the corn which has caused to be lost. (Parajuli, 1991)

Irrigation canals supposed to have been built under the queen of Assyria are still delivering water, thus, there are records and evidence of continuous irrigation for thousands of years in the valleys of Nile and comparatively long periods likewise in Syria, Persia, Java and Italy. Egypt claims to have had the world's oldest dam 355 ft. long and 40 ft. high built 5000 years ago to store water for drinking and irrigation. Basin irrigation introduced on the Nile about 3300 B.C. still plays an important part in Egyptian agriculture.

The China, where reclamation was began more than 4000 years ago, the success of early kings was measured by their wisdom and progress in water-control activities. King ya of Hisa-Dynasty (2200 B.C.) was elected king by the people as a reward for his outstanding work in water control. The famous Tu Kiang Dam, still a successful dam today was built by a man named Mr.Liand his son in the China Dynasty (200 B.C) and provides irrigation water for about one-half million acres of rice fields. The water ladder, a widely used pumping device in China and neighboring countries is believed to have been invented about the same time. Its inventor was worshiped as a god by country carpenters. The Grand Canal 700 miles long was built by the Sui Empire, 589-618 AD.

Today over 200 million hectares of land are irrigated in five continents. There are many notable examples of heavy investments in large irrigation projects which have not turned out as planned and in which today less 50 percent of the irrigation facilities are actually being used. The output of major irrigation scheme is

sometime disappointingly low; more attention is now being given to the small scale farmer and scope for improving productivity in small units.

2.2 Irrigation in Nepal

In Nepal canal irrigation system seemed to have started during the period of Lichhavis (around 605 AD.). According to Tokha inscription king Amsu Verma had directed the construction of canal for irrigation.

Feudal Lords Amsuvarma, Jishnugupta etc had contributed a lot to improve agriculture. They have had made a number of Rajkulos (indigenous traditional canals) to irrigate the arable land. Kahtmandu valley and its periphery were irrigated during the Malla dynasty. By the middle of the 12th century, king Shivadev had built a dam at Balkhu Khola near Kritipur for irrigation. Several other Rajkulas were constructed during Malla regime. Naikes were appointed for regulating, governing, maintenance and operation of Rajkulos. (Parajuli, 1991)

The Green Revolution as well as industrial Revolution of Europe which took place in the 17th and 18th centuries had brought drastic changes in the irrigational system of western Hemi-sphere. However, Nepal, though an agricultural country, has not had a long history of canal irrigation system. The existing irrigational facilities in Nepal are extremely inadequate. After the national irrigation of Nepal, its rulers and statement had devoted their time, energy and national resources to wars and internal crisis much more then to reforms and development activities. No remarkable works has been done towards irrigation up to the Rana Prime minister Chandra Shamsher. An indigenous type of canal was built in Pokhara Miruwa in the early period of the Rana rule. Now it is 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 (1926), Jagadish canal (1942) and Juddha canal (1946)

were constructed in Saptari, Taulihawa and Rautahat respectively under the Rana regime. (Parajuli 1991).

Active government involvement in irrigation development in Nepal began in the early 1950s after the oligarchic Rana regime was over thrown. The national government began to be perceived as an agent of change and development for the society. Many activities that had been managed by local communities were to be activities undertaken by the government. Along with activities in regard to many natural resources such as forestry, the development and management of irrigation became a domain of active government involvement. The government of Nepal, in many instances with the assistance of international donor agencies has invested substantial amounts of money to construct, operate and maintain irrigation systems. The Department of Irrigation came in to existence only in 1952 with technical assistance from India. In 1988 new working policy was introduced which emphasized the participation of farmer beneficiaries at all stages of irrigation development. This policy was further refined and reiterated to the irrigation policy of 1992. This established a framework for long term irrigation sector development program seeking user participation. The legal bases for the improvement of the irrigation policy are water resources act and water resources regulation establishment in 1992 and 1993 respectively. During the Sixth Plan, 1980-1985, for example government investment in irrigation was approximately 3,130 million rupees. Almost 15 percent of the total development expenditure in that period of time. The large amounts of aid funds extended by international donor agencies to Nepal directly through the country's national government further fueled this trend. (W.F.Lam, 1998)

The source of irrigation are classified as canal, tube well, boreholes and pumping sets, tank and natural flows ad combination of two or more of the specific sources, However the sources of all water used for irrigation is undoubtedly precipitation i.e. the water received on the earth from the atmosphere in the from of rain, snow, hail and dew etc. When the process of utilization of this water involves the

construction of engineering works of appreciable magnitude it would be called artificial. There are various methods of irrigation they include the following.

1. Surface Irrigation:

a) By flooding tree flooding broader method or check method.

b) Furrow irrigation

2. Sprinkler Irrigation:

3. Sub-surface or sub-irrigation:

In Nepal, surface irrigation is the main system used in various part of the country. On the basis of as the traditional methods of irrigation, Nepal has pynes, terrace, well and canal irrigation.(Shrestha 1986, Parajuli, 1991) Now a days in the hills of Nepal various irrigation projects have been introduced for the development of canal irrigation. In the western development region of Nepal, various types of hill irrigation projects have completed several canals. Fewatal irrigation projects, Bijaypur, Begnas irrigation project. Hyanja irrigation project, Pokhara water conservancy and irrigation project, Shishaghat irrigation project, Dedgauntar irrigation project, Chapakottar irrigation project, Bhoreltarar irrigation project (Lamjung) Ramghatar and Handetar irrigation project (Lamjung) are the important hill irrigation project in this region.

The massive literature in the fields of agriculture shows the academic richness of this sector. Various institutions, research scholars, sociologists, economists and geographers have undertaken several research works concerning the impact of irrigation in Nepal. Some irrigation impact evaluation studies have been carried out by Agriculture Project Service Centre (APROSC). Among them the Impact Evaluation studies of Dedgauntar irrigation project (Sep 1978) Gajuri Irrigaion Project (Feb 1978), Khageri Irrigation project (Sep, 1978), Mahakali Irrigation Project (Feb, 1978) etc. constitute valuable literature in this field. APROSC has made approximately similar type of impact study in the above mentioned irrigation projects. In the report of Khageri irrigation project, it has pointed out that diversified occupation depends upon agriculture where 75 percent of land is crop

production and intensity of crop is higher. More farmers have adopted improved variety of paddy and maize. Employment is higher in irrigated area where there is higher production, income, expenditure and saving.

Similarly, the report of Tika Bhairab Irrigation Project, APROSC has summarized that most of the farmers have considered the project to be very useful but its extension service is very poor. The evaluation study of Dedgaun tar irrigation project APROSC has mentioned that small farmers have got the highest percentage of irrigation land (61.1), highest impact of irrigation is on the small farmers who have changed their cropping intensity in irrigated land is increasing. Another work is the impact of the Vijaypur-Begnas irrigation project evaluated by Krishna Lamsal, who has pointed out that a large number of farmers are benefited by irrigation facility. The production of rice, wheat and vegetable has gone up tremendously soon after the canal irrigation. Many people immigrated there resulting in the emergence of settlements.

Upreti has also made similar studies on the topic of "The Impact of Kankai Irrigation Project on Paddy Production." He has summarized in has report that the rate of paddy production has increased with the increase of irrigation. Facilities and that irrigation bring the higher intensity in the cropping pattern. Finally, he has concluded that there is positive relationship between irrigation and paddy production. (Parajuli, 1991)

Another study has been made by Shiva Hari Pangeni on the topic "The Impact of Chitwan Irrigation Project." In Chitwan district, according to this study due to the irrigation facilities crop production, cropping pattern and socio-economic activities have increased. He further said that there was also negative impact of irrigation the pumping scheme lifted sand with water during the irrigation period and pumping tools had been adversely affected by sandy water. Due to this sandy soil, pumping scheme may not be durable for long time to supply water.

Next study has been made by Parajuli on the topic " Impact of Irrigation" Pokhara Water Conservancy Project, in Kaski district. He concluded that because of irrigation facilities crop production, cropping pattern, irrigated area and socio-economic activities have increased in Pokhara valley.

Baidya (1968) has written about the importance of irrigation in "Farm Irrigation and Water Management Principles and Practices" and explained that is essential to grow a profitable crop. Growing of vegetable near city and supplying it to that city is possible and profitable only when good irrigation facility is available.

IMC 1989 has studied Impact of Linage Irrigation System; Parbat concluded that higher the intensity in irrigation, higher will be cropping intensities and crop yields. Further, IMC has concluded that irrigation is an important constrains to improve agriculture productivity. IMC (1989) has also made an impact assessment of Sirsia-Dudhara Irrigation System and summarized that proportion of land covered by rein-fed crops reduced by six percent and that covered by early paddy remarkable increased. Further, IMC observed that remarkable increase in yield for all cercal crops.

The irrigation system in Nepal can be divided into two broad categories with distinct different criteria acceding to responsibility of management of the system.

i) Farmer Managed Irrigation System (FMIS)
ii) Agency Managed Irrigation System (AMIS)

The department of irrigation (DIO) has formed a policy to share O&M responsibilities between the agency DIO and a legitimate organizations of beneficiaries for the large scale irrigation schemes in the hills and Terai (Gurung,1992)

The approach to the Eighth Plan (1992-1997) produced by the National Planning commission in November 1991 states that "the growing income and wealth

inequalities in the face of meager economic growth has pushed more people below the poverty line, Between 8 and 9 millions of the total population are estimated to be below the poverty line and deprived of the basic minimum needs for human living. Population growth has out paced the increase in food supply resulting in a declining per capital availability of food grains."

In 1967, the Department of irrigation Hydrology and Meteorology (DIHM) was established as a separate unit under the ministry of water resource. The general interest in small area irrigation development had continued this indicates that Nepal has taken sincere interest in the utilization of existing water resources to extend the irrigation facilities in different parts of the country.

Department of agriculture and ministry of local development launched a programmed in 1988 so as to increase food grains production. Agriculture development Bank (ADB/N) has continued its activities to promote irrigation facilities by providing technical and financial supports to the farmer. It has been investing on tub-ell irrigation program and Small Farmers Development Programmed (SFDP). Similarly, irrigation in Nepal has been extended through different agencies like World Bank (W.B) and Asian Development Bank (ADB). Likewise Farmer Managed Irrigation Scheme (FMIS) has been playing an important role in the development of irrigation. It constitutes more than 54 percent of total irrigation facilities provided in different ecological regions of the country.

2.3 Two Domains of Irrigation Development in Nepal AMIS and FMIS

In Nepal, where agriculture is the major economic activity, irrigation systems are important resources. Agriculture accounts for more than 60 percent of Nepal's gross domestic product and over 80 percent of the country's export earnings yet agricultural development of Nepal severely constrained by the limited availability of ecologically suitable land for agriculture as a result of the country's small size and mountainous topography, since the potential, the expansion of cultivated land

is limited, the importance of improving irrigation as a means to improve the country's agricultural sector.

Until the 1950s the government of Nepal had been largely insulated from the civil society and had only a minimal level of involvement in various social activities. Irrigation development like many other social activities was largely perceived by the government to be a domain of local concern. A result of such benign neglect of irrigation by the Nepali government was that farmers in disparate locations of as the country organized themselves to construct, govern, operate and maintain a large number of FMIS .As of 1988, there were more than 16,000 FMIS in Nepal irrigating a cultivated area of approximately 7, 14,000 hectors, which was about 67 percent of the total irrigable land in the country (Pradhan 1989:2)

Most of these FMIS are small in scale though there are some that have a service area of more than 3000 hectors. These systems usually do not have sophisticated physical infrastructure; their head works are often "primitive" and made out of stones, mud, leaves and three branches canals in many of these systems are either partially lined or not lined at all. Annual, or in some cases more frequent, repair works is necessary to keep these systems. Although most FMIS do not command a substantial amount of physical capital in terms of sophisticated engineering infrastructure, many of them are characterized by the presence of a substantial amount of social capital social capital is defined by Coleman (1987, 1990) as the aspect of the structure of relationships between individuals that enables them to create new values prior research has found that in many of these systems, farmers are able to arrange good working relationships among themselves to operate and maintain the systems in a comparative study of twenty-one FMIS in Nepal, for example. P. Pradhan (1989b) reported that in each of systems, there were diverse organizational arrangements. This enabled farmers to carry out various irrigation related activities. He concluded that the continuous operations of these systems are an example of irrigation systems where weak physical structures are compensated for by strong and discipline organization by farmers. Research by many other

scholars also indicates that farmers in many FMIS have succeeded in organizing themselves for the provision of irrigation even more interesting many FMIS have been able to achieve high levels of agricultural productivity (Yoder, 1986; Laitos et al 1986; Pradhan 1989a, 1989b svensdsen and small, 1990; Youder and Martin, 1990)

Although some of these AMIS are officially managed and operated by government agencies, almost all of them are governed and managed jointly by irrigation officials and farmers. Typically, irrigation officials are responsible for the O and M of the main system. Once the water flows into sub laterals; the activities of irrigation officials frequently end. Irrigation officials often presume that, at the sub laterals, farmers will organize themselves for the allocation of water to individual plots and the maintenance of farm ditches. Such a presumption, however, does not necessarily work out in reality. It is reported that in many agency-constructed and managed irrigation projects, farmers were reluctant either to contribute labor to the maintenance of the systems or to pay water charges for the O and M of the systems even though the charges were fixed at relatively low levels (Pradhan et.al. 1989) Despite Sophisticated engineering infrastructure and the presence of professional irrigation staffs, many AMIS perform inadequately poor maintenance severe deprivation of tail enders and low productivity are often found in these systems (Pant , 1982; Lam ,1998)

2.4 Definition of Irrigation

Irrigation is any process other than natural, precipitation, which supplies water to crops, orchards, grass or any other cultivated plants. Irrigation generally is the purpose of supplying the moisture essential for plant growth. However, a border and more inclusive definitions is that irrigation is the applications of water for the soil for any number of the following six purposes:

- To add water to soil to supply the moisture essential for plant growth.

- ❖ To provide crop insurance against short duration droughts.
- ❖ To cool the soil and atmosphere thereby making more favorable environment for plant growth.
- ❖ To wash out or dilute salts on the soil.
- ❖ To reduce the hazard of soil piping.
- ❖ To soften tillage pans.

According to Rao in his book principle of “Irrigation and Drainage” has stated that "Irrigation includes all operation or practices in artificially applying water to be the soil for growing crops. It includes also in general sense, the conservation and storage of water supply, the carrying of water from the source of supply to the irrigated area and distributing it to the lands it involves in many cases, the development and bringing to the surface of water from underground source by pumping or other means to the lands which can not be reached by gravity from the source of supply" (Rao, 1945:1)

The water management system for irrigated agriculture includes (Lowdermilk et al, 1988) a. productivity subsystem b. economic subsystem c. social organizational subsystem d. water control subsystem.

2.5 Irrigation Facilities Before and During the Plan Period:

Period	Area in hector
Before plan	6228
First plan (1956/57-1960/1961)	5200
Second plan (1962/63-1964/65)	1035
Third plan (1965/66-1969/70)	52860
Fourth plan (1970/71-1974/75)	37733
Fifth plan (1975/76-1979/80)	95425
Sixth plan (1980/81-1984/85)	172649
Seventh plan (1985/86-189/90)	179337
1990/91	20011
1991/92	33462

1992/93		59632
1993/94		33542
1994/95		312872
1995/96		22121
1996/97		34305
	Total	785412

Source National Planning Commission Depart of Irrigation.

2.6 Conceptual Framework:

On the basis of the review of the relevant literature, we may clearly state that new technology; modern inputs, high yielding varieties, irrigation facility etc. play a vital role in the increase of crop production and thereby saving.

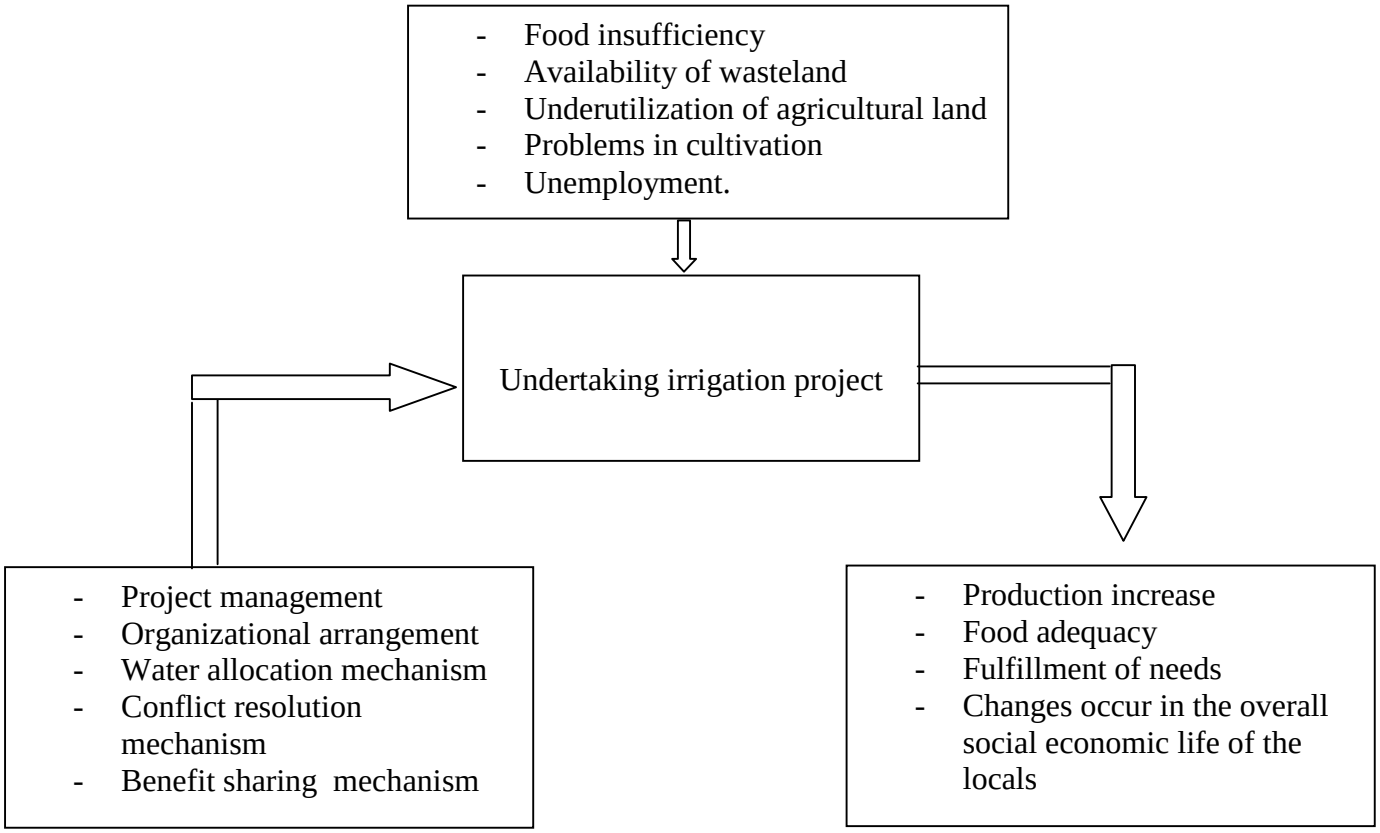


Figure 1.1: Conceptual Frame Work for Irrigation Management.

CHAPTER- III

RESEARCH METHODS

After dealing with the introduction and literature review, the research methodology will be described in this chapter. This chapter will provide a clear picture on the procedure of data collection and process of analyzing the finding.

3.1 Selection of Study Area

The study is the portion of 6,8 and 9 no.wards of Bhorletar V.D.C. This V.D.C. is located 40 km from the district headquarters 'Beshishar' of Lamjung. The selected area is designed is such a way that the equality and access to the use of this irrigation projects of ward no 9 is located at the starting areas and the 8 no is the middle one and the 6 is the ending point of this project. The selected areas of the V.D.C. are very important from the point view of water distribution, allocation and water accessibilities.

3.2 Research Design

This study is based on an exploratory cum descriptive research design. It will be exploratory because it endeavors to explore the issues concerned with management of surface irrigation and role of irrigation in irrigated agriculture in present system. It is descriptive because it seeks to describe the factors affecting the irrigation management and the development of irrigated agriculture in the study area.

3.3 Nature and Source of Data

The study includes both the primary as well as secondary data. Mainly this study focused on qualitative nature of data but to some extent qualitative data also used in the study. Primary data was collected from the respondents with the help of interview schedule/questionnaire; secondary data were collected from irrigation department government and its other institutions and BWUA, different journals, news papers, internet, books as well as different published and unpublished sources.

3.4 Sampling Procedure

The universe of this study is 246 household among them 30 percent household, were selected from each ward as the respondents of the study by simple random sampling method for the representation of the respective area. The ward wise distribution of households and sample selection is as follows.

Ward No.	Total Household	Sampled households
6	84	24
8	86	24
9	76	24
Total	246	72

Source: Field survey 2007.

3.5 Data Collection Techniques

The following techniques were adopted to collect the required information.

3.5.1 Questionnaire Schedule

A set of presented questionnaire schedule was used to collect the information at the household level for the collection of primary data. 30 percent of sampled household heads are interviewed for information. Researcher himself involves in interview at the door to door of the respondents and direct face to face interview was conducted to acquire real and detailed information necessary for the study. Such information's are about Participation effects, benefit sharing and water distribution and ways of maintenance in this irrigation project. Questionnaire schedule is semi-structured and includes both open ended and close ended question. Since researcher himself involved in data collection process possible observation also are applied to perceive the actual situation, and the real information.

3.5.2 Key Informant Interview

In order to acquire in depth knowledge about the irrigation impact, system management interview was carried out with 9 key informants (3 from each, head, middle, and tail of the system) such as V.D.C. chairperson/vice chairperson, secretary (V.D.C) ward chairperson, chairman and members of the WUC line agencies in the V.D.C level and school teacher. The checklists were designed to gather the information about the historical antecedents of the irrigation system, WUC'S role and responsibility, decision making process, performance of physical system, agriculture service and production and impact on agriculture development etc.

3.5.3 Secondary Source of Information

The information were also collected from secondary sources such as district irrigation office Agriculture sub center and Agriculture development program, V.D.C and local magazine.

3.6 Reliability and Validity of the Data

Since the qualitative and quantitative information was collected from the researcher himself and various tools and techniques were used for the collection of information the information obtained through this process is expected to be reliable. The study was design in a sampling procedure representing head middle and tail of the irrigation system. The validity of the data was maintained.

3.7 Data Processing and Analysis

All the collected data has been analyzed both qualititatively as well as quantitatively. Quantifiable raw data have been analyzed by using computer software SPSS. While presenting the data, simple statistical tools like; frequencies and percentage has been used. Likewise, tabulation and graphical representation has also been made. The non-quantifiable qualitative data have been managed manually and analyzed descriptively. In order to present some quantitative data, figures, charts, diagrams have been used.

CHAPTER- IV

GENERAL INTRODUCTION OF THE STUDY AREA

In this chapter, a brief introduction of the study area is presented. More focus has been given to present the socio-economic status of the WUC of the irrigation system with its population composition, economics activities, educational background, labor, organization and so on.

4.1 Physical Setting

The study area is situated to the north from Damauli Bazar of Tanuhu District, 120 km west of Beshishar (District headquarter of lamjung) and 47 km east of Begnas Tal. Midimkhola is the perennial source of this irrigation system. The project was constructed on the period of B.S. 2040 and is to provide irrigation to 220 ha. The total cost of construction was Nrs.1, 6,000,000.All the support was from ILO. By this project 635 household are benefited. The irrigated command area is plain terrain where is the catchments of the rivers mostly covered by hilly area with forest. The V.D.C is surrounded by Middim khola and Pisti Khola. The climate of the area is tropical and average minimum temperature is 8^0c and average maximum temperature is 36^0c. The maximum rainfall is 3000 mm.(DIO 1999).The types of soils are alluvial, moderately fine silty loams, silty clays. The soils are suitable for growing a wide range of crops.

The study area, which is called Bhorletar V.D.C, consists 730 households. The rough motorable road has passed through the village. The settlement is divided in three parts namely Ranipani, (upper parts of the command area) Bazar area, (Middle part) and Pakhuri Chock (lower end tole of the village and project area also). Besides this the Kaure and Dhodre village is located out of project command area. The middle parts of the irrigated command area are wider than the other two parts but not all land is irrigated by this project. Mainly upper parts people (Ranipani's people) were affected. The V.D.C is surrounded by two rivers called Midim(Gomati) and Pisti.

4.2 Natural Resources

The village is situated in the foothill of mountain. The northern and western part is surrounded by forest, northern part is surrounded by Midim(Gomati) river and east-south part also surrounded by Pisti river. The area in between the irrigation canal is covered by thin forest. Recently, the forest has been handed over to the community for the improvement in the quality of forest. The flow of people in colleting the firewood and illegal cutting of timber outside of the community forest in the range has been increased, which has deteriorated the condition of forest. Due to the poor management of the forest and environmentally unfriendly cultivation practices in the uphill of the range have accelerated the soil erosion and increased bed level in the plain area. The river cutting and loss of arable land was found one of the major problems in the study area. The planting fruit tree is not the common practice in the command area. Farmers are not so aware about the importance of protecting the water sources.

4.3. Development Activities

The main development activity of the Bhorletar V.D.C as they expressed is irrigation. The other activities are bridge, school and formation of agriculture group and saving and credit co-operative management of community forest.

4.4 Socio-Economic Characteristics of the Study Area

4.4.1 Settlement Pattern

About 65 percent of the households are settled in the both side of the rough motor-able road. The remaining households are not connected with motor able road but with foot trail or irrigation canal. The village is divided into three clusters. The middle cluster is bigger than the other two clusters. The irrigated command is wider in the central part than in the upper end and lower end of the study area.

4.4.2 Sampled households in the study are

A simple random sampling procedure was used in order to identify the households for the study purpose. The command area was divided in to three sections namely head, middle and tail, (Ward no 9 head, word no 8, middle and word no 6 tail). The households sampling was used for taking 30 percent sample from each section of the command area. Total 72 households were studied.

4.4.3 Population structure of study area

The study area has scattered settlements out of them 72 households were taken as a sample size. The total population of Bhorletar V.D.C. is 1835 Female, 1591 Male, (A.D.C.2062). Table No. 4.1 shows the population distribution of study area only.

Table No. 4.1 Distribution of population by sex:

Sex	Number of population	Percent
Female	194	48.4
Male	207	51.6
Total	401	100.00

Source: field survey 2007

Above table shows that the female population size of the study area is smaller than the size of male. Its shows the different situation to the national population scene. On national population female population size is greater than male's population size.

4.4.4 Age specific population distribution

In this study researcher tried to categorize the population into three different groups on the basis of economic activities. The composition of population shows that there is smaller size of dependent population.(Age group below 10 and above 60 years in the study area).

Table 4.2. Age specific population distribution:

Age group	Number of Population	Percentage
Below10	100	24.9
10-59	249	62.1
60and above	52	13.0
Total	401	100.0

Source: field survey 2007.

Table 4.2 gives a picture of the economically active manpower. The age group of economically active people is generally considered to be 15-59 years, but in the context of Nepal, it is 10-59 years. Thus the full time of economically active groups represents the majority of the percentages (62.1%). The old age or dependents structure was found less than other groups (13%). Similarly, the school going age group is 24.9 percent.

Although people below 10 years and above 60 years fall under the economically inactive manpower, but in this area, they are observed to be involved in various types of household works, viz. rearing cattle and goat, looking after children, fetching water, cooking etc. Among the dependent population 24.9 percent are children. i.e. bellow 10 years, which indicates the measurable condition of the study area in terms of demographic character low percentage; viz. 13 percent of old age group i.e. above 60 years population denotes the relatively short life expectancy in Nepal.

4.4.5 Marital status of the population

All the respondents were found married. Of the total household members 61.1 percent were married and 38.9 percent were unmarried.

Table No .4.3. Marital status of the population:

Marital status	Number of population	Percent
Married	245	61.1
Unmarried	156	38.9
Total	401	100.0

Source: Field survey 2007

Table 4.3 mentioned that there are large size of population are married.

4.4.6 Birth place and cause of migration

On the basis of birth place not so different of the respondents of this study area.

Table no. 4.4. Birth place of respondents:

Birth place	Number of respondents	Percent
Local	37	51.4
Other	35	48.6
Total	72	100.00

Source: Field survey 2007

The above table shows that 51.4 percent people were local born and 48.6 percent migrated from other places for various reasons. During the field survey, the respondent's gave a number of causes for migration. About 49 percent respondents are migrants out of the total migrants they have causes behind migration. These causes are presented in the table that follows:

Table 4.5 Cause of migration of respondents:

Causes	Number of Respondents	Percent
For mother side property (Mawali)	2	5.7
Lack of education, health, market and development facility (development facility)	23	65.7
Marriage (separated)	3	8.6
For father side property (Maiti)	1	2.9
Other	6	17.1
Total	35	100.00

Source: Field survey 2007

According to the table above, the cause of migration were availability of education, health, market, transportation facility in the study area and another important cause was marriage of the respondents, some people have ticked more than one cause thus the number of migrants and frequency of cause do not coincide.

Now a days cause of development facility in Bhorletar V.D.C. the process of buying and selling of land is increasing day by day. Thus, the trend of urbanization or migration is greater in this urban residents and bazaar area than in the other command area. That's why; the migrant people are fewer in the study area in competition to Bhorletar as a whole.

4.4.7 Educational status

Education has been regarded as a vehicle of change and development. However in Nepal, due to traditional value system prevalent in the society and gender discrimination at homes, most women and girls have been deprived of educational opportunities**.**

The village has one higher secondary, one secondary, three lower secondary, four primaries and two boarding schools. Study area has one higher secondary 1

secondary and 2 primary and two boarding schools. It suggests that there is a high school facility in comparison to the national average. According to table 4.6 of the total enumeration of 5 years and above 92.4 percent are literate.

Table 4.6: Educational status of Sampled Population by gender

Education of the family members	**Gender of the family members**		**Total**
	Women	**Men**	
Illiterate	25 (13.6%)	4 (2.0%)	29 (7.6%)
Literate	83 (45.1%)	84 (42.0%)	167 (43.5%)
Primary level passed	16 (8.7%)	13 (6.5%)	29 (7.6%)
Lower secondary passed	18 (9.8%)	19 (9.5%)	37 (9.6%)
Secondary passed	8 (4.3%)	8 (4.0%)	16 (4.2%)
SLC passed	23 (12.5%)	41 (20.5%)	64 (16.7%)
Intermediate passed	8 (4.3%)	25 (12.5%)	33 (8.6%)
Bachelor or above passed	3 (1.6%)	6 (3.0%)	9 (2.3%)
Total	**184 (100.0%)**	**200 (100.0%)**	**384 (100.0%)**

* Children under 5 years of age are excluded.

Source: Field Survey 2007

Table 4.6 indicates the number of people according to their acquired level of education. The illiteracy rate of the study area is found 7.6 percent. The illiteracy rate in female was 13.6 Percent, which is higher than the illiteracy rate 2 percent in male. The literacy rate 92.4 percent is higher than the national average literacy rate. The rate of S.L.C is also quite low in female. Where total of the total 16.7 percent population passed S.L.C, about them only 12.5 percent female passed the S.L.C and 20.5 percent male passed the S.L.C. This shows that the dropout rate

before S.L.C was found quite high in female due to various cause viz. early marriage, economic condition, discrimination on female etc. Only 8.6 percent people passed higher education and 2.3 percent people have acquired bachelor or above. Among them only 1.6 percent female have passed bachelor or above where as male has 3 percent.

4.4.8 Caste/Ethnic composition

Demography of study area represents ethnic diversity as any other society in Nepal. Table 4.7 explains the ethnic distribution of study area. Brahmin is the dominant caste group in the sampled households of study area that accounts 41.7 percent of total sample population. Followed by ethnic group 31.9 percent. Similarly Dalit accounts 16.7 percent and then by Chhetri 9.7 percent. .

Having the influence of Brahmin in the study area they also highly represent in the WUA in the Bhorletar irrigation project which play the significant role in irrigation management, organization procedure and its O & M of the system.

Table 4.7 Caste/Ethnic composition of the study area

Caste/Ethnicity	Number of households	Percentage
Brahmin	30	41.7
Chhetri	7	9.7
Ethnic group	23	31.9
Dalit	12	16.7
Total	72	100.00

Source: Field survey 200

4.4.9 Religion and Language

Nepal has two major religions; Hinduism and Buddhism, among them majority of people (68.1%) Hindus, 29.2 percent are Buddhist and 2.8 percent people found accepted both religions in the study area.

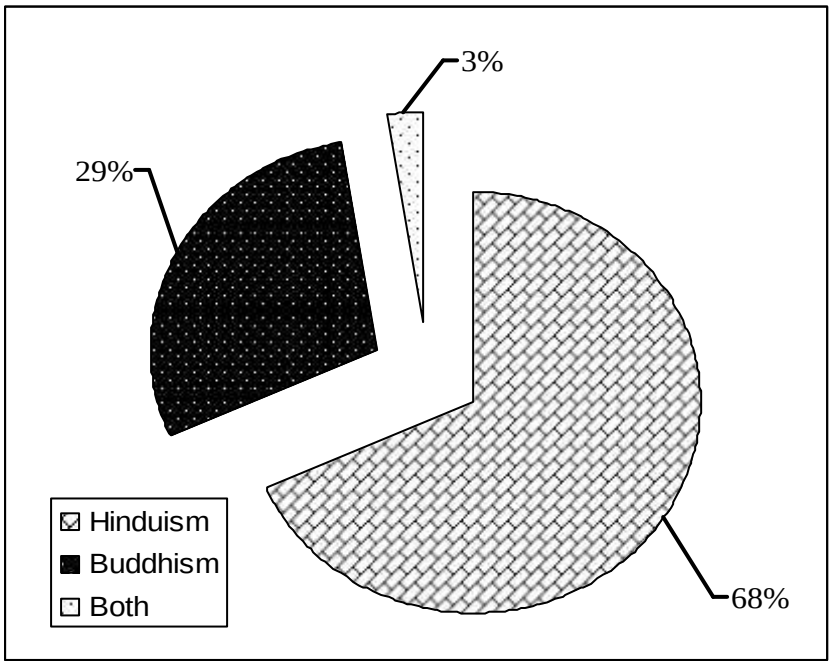
Table: 4.8. Religion of the respondent

Religion	Number households	Percent
Hinduism	49	68.1
Buddhism	21	29.2
Both	2	2.8
Total	72	100

Source: Field survey 2007

People of study area speak Nepali. Besides Nepali, different ethnic languages are also presents. But among the ethnic group, all of them do not speak their mother tongue.Mainly young generation does not practice their mother tongue.

Figure: 4.1. Religion of the respondent



Source Field survey 2007

4.4.10 Occupational Composition

Larger amount of population of the study area are engaged in agriculture. But the process of development, Bhorletar VDC is trying slightly diversifed the occupational structure. Occupation is an index of social position of a person. This position is usually judged by various working conditions. Monetary rewards and various other kind of honors and large, the rural people take on more than one occupation at a time and it is difficult to distinguish their occupation in particular. A Nepalese style of agriculture farming is basically a family enterprise. Each of the family members contributes more or less time to the farming.

Table 4.9: Occupation of the family members:

Occupation	Number of family members	Percent
Agriculture	129	33.6
Business	22	5.7
Students	136	35.4
Service	33	8.6
Foreign employment	29	7.6
House wife	24	6.3
Pensioner	11	2.9
Total	**384**	**100.0**

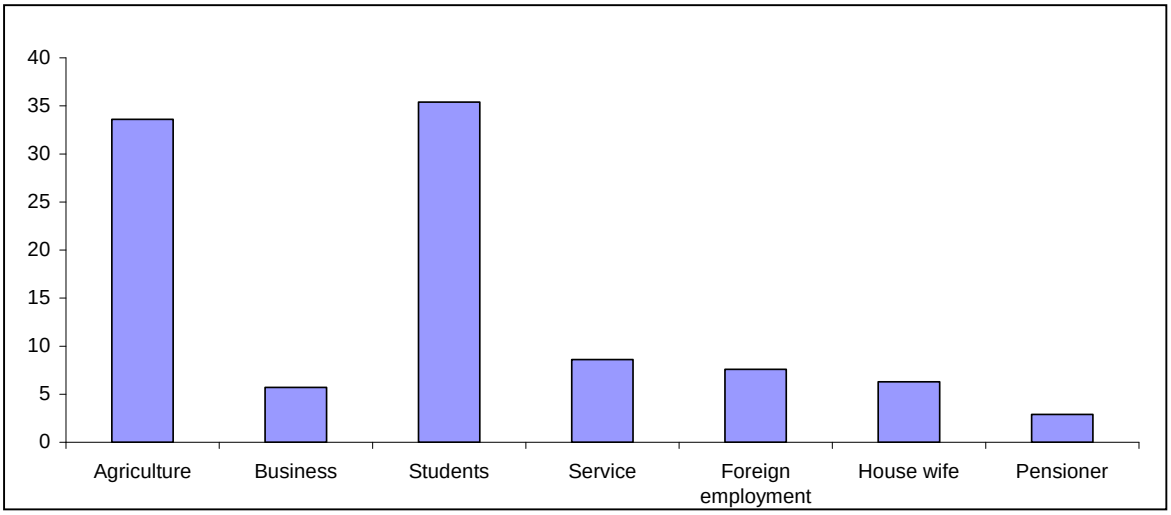
Source: Field Survey 2007

As mention earlier, only 62.1 percent of the total sample population of 401 belonged to the age group of 10-59 years. Here economically active populations were 384 in number which included 200 males and 184 females.

The table shows that 35.4 percent people are engaged in study. As mention earlier, the rural people take on more occupation at a time and each of the family members contributes more or less time to the farming. Researcher thinks that it is not necessary to say more about the contribution of students on agriculture. Table shows that 33.6 percent people are dependent in agricultural sector. The occupational participation of female is also higher than male so is in other occupation. Occupation other than the farm works included employment in government and private office (8.6 percent), trade and business (5.7 percent)

respectively. A remarkable number of people, viz. 7.6 percent are in to foreign employment. All of them no female are in to foreign employment.

Figure 4.2: Occupational composition of Households:



4.4.11 Food Situation and Source of Income

Table4.10 presents that the 58.4 percent households of the sampled households had surplus food 25 percent have enough food for all years round. 16.6 percent households have not enough food from their own production. They have to rely on other alternatives for getting food for their family.

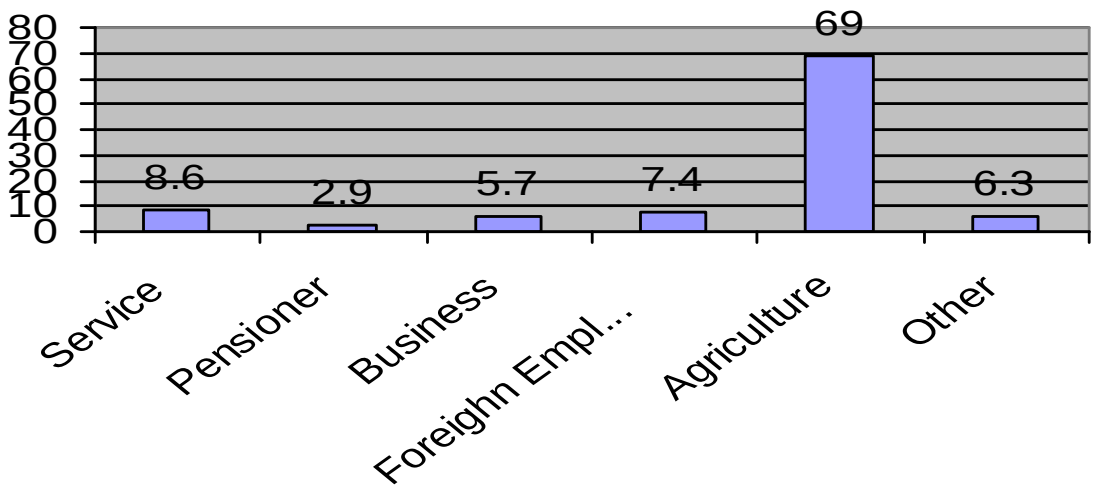
Table no: 4.10. Food situation on sampled households:

Food situation	Households	Percent
3-6 months	6	8.3
7-9 months	6	8.3
10-12 months	18	25
More than 12 months/surplus	42	58.4
Total	72	100.00

Source: Field survey 2007

Total of them 7 percent (12 households) have not sufficient food from own production. Among them 50 percent (6 households) rely to fulfill their needs from foreign employment. 25 percent have managed from seasonal business and some people manage by borrowing and credit from other.

Figure: 4.3. Income source of Family: (In percent)



4.5. Agriculture Profile of the Study Area

This sub-heading briefly reviews the agriculture condition of the study area, highlighting the landholding size, main crops production and labor arrangements of the area.

4.5.1 Agriculture

Agriculture, as it is the backbone of Nepalese economy plays, vital role for the development of nation. It determines the economic growth of rural area as well as whole country's economy. Similarly in the study area, agriculture is the basic economic activity. As found by the field study, 69 percent of the WUG population are engaged in agriculture .Hence it can be considered the economy of the village is agro based.

4.5.2. Land Ownership

The landholding size in the country is quite unfavorable from the point of view of equitable distribution. More than 50 percent of the households have less than one hector of land or more than ten percent of the total area is under cultivation. While four percent of upper class controls about forty percent of the total land (Parajuli,

1991).Because of the existing land system of our country the number of small holder is expected to be much higher in the study area. The size of the landholding in this area is smaller than that in the Terai. The land holding size of the study area is presented in the following table.

Table no.4.12-Distribution of landholding size:

Land size in ropani	Households	Percent
Up to 10	24	33.5
10-20	21	29
20-30	18	25
30 to above	9	12.5
Total	72	100

Source: Field survey 2007

The above table indicates that 33.3 percent family has very marginal land. 12.5 percent people have more than 30 ropanis of land. Similarly 29 percent holds 10 to 20 ropanis of land in study area.

4.5.3 Major Crops and Cropping Pattern of the Study Area

The main crops grown in the BIP command area is paddy. The summer paddy of which seeding trans-planting and harvesting time is Ashad/Sharwan to Aswin/Kartik is given throughout the command area.

The second major crop in the study area is wheat, the broadcasting and harvesting date of Wheat is Kartik/Mangsir to Magh/Flagun. Similarly, Aarmali (chaite Dhan) is also a second major crop in the study area. Which seeding/transplanting and harvesting time is Chaitra/Baishak to Ashad/Sharwan. Recently growing vegetable at commercial scale is becoming increasing popular Before BIP,Ghaiya was also a major crops in the study area but now BIP totally replaces it's crops. and also vegetable totally seems to replace the wheat production in future. It needs much more chemical fertilizer and market price of the product is not attractive on.

Maize is third important crops in terms of the area coverage. It is grown on spring season. The winter crops grown in the study area are mainly potato or garlic and onion.

4.5.4. Labor Arrangement

Agro-farming is the only source of livelihood for a vast majority of the people in the command area. However it was also reported that supply of labor to the agriculture farming is in decreasing trends and this is likely to result in the shortage of agricultural labor in the area. The main reason for this trend was reported as over increasing sinarieo to go to school, preference of the people to take an a non-farm occupation such as small business, teaching, labor etc. and male members of the households mainly the adult people go to foreign employment for job.

On the basis of the sample households a large number of respondents viz. 78 percent, practice three types of labor system. Prevailing in the area i.e. household member as workers' labor exchange and hired labor (Khetala). The system of labor arrangements through mutual labor exchange which is popularly known a "Parma" system was found which is much more common among them.

In either of the cases i.e. household's members as a farm worker and the workers arranged through the "Parma" system, the farmer themselves are the supplies of the farm-workers. Besides hired labor 22 percent is a common practice in the command area. Usually large farmers employ labor on hire. This type of labor force is supplied from the households of the small and marginal farmers or landless.

In the command area like any other part of Nepal, male dominate the households. They make the decisions and the issue related with agriculture farming. However, their involvement as the workers on farm is low that of the female. However, there are some works, which are exclusively done by male, say for example plougging

and there are some who are at least traditionally confirmed to the female, say manure application. There are some other works which are done by both male and female together.

Recently, the gender discrimination in the agricultural practice is however in its decreasing trend. The literacy rate of female (35.3 percent) of the command area is satisfied in comparison to the national figures on female literacy rate. In view of this one may expect that female education might have contribution to the decrease in the male's domination and thereby to the decrease in the gender discrimination in the farm activities. Nevertheless, female are more busy than male.

CHAPTER-V

IRRIGATION MANAGEMENT

5.1. Theoretical Notion of Irrigation Organization

An organization is defined as a group of people exerting efforts to achieve common goals. The principal components of organizational activities in irrigation management are decision making, resource mobilization, communication and conflict management, which are closely associated with physical structure and resource flows (Uphooff, 1986)

Organization is formulated intending to cope with vital resources as it is beyond the capability of a single individual. And it is embodiment with certain of the society. Hence it patterns some social behavior like norms, customs, conventions etiquette etc. in the society.

The formation of an organization depends upon natural setting, population, materials and non-material culture and environment, similarly the procedure of farming organization depends on its type goals and nature, for instance forming the political organization elite may be considered as the most valuable estate, while in a case of irrigation local farmers (the grass root people of the locality) are the most valuable estate of the organization.

Irrigation has to be treated as hydrological, engineering, agricultural, economic, organizational and institutional entity. The human side of both the organization and operation of the irrigation system must be taken into account in irrigation studies.

Uphooff (1986) points out irrigation have to understand as a "socio-technical" process which combines both material resources and people. Uphooff also holds the notion that four basic sets of activities-decision making and planning, resource mobilization and management, communication and coordination and conflict resolution constitute the core of an organization. In other words, an irrigation

organization exists to insure that these four sets of activities occur on a regular and predictable basis. Moreover, an irrigation organization is formal if these four sets of activities occur according to explicit, written and possibly legal requirements. But even though they are informal i.e. based on implicit understanding and social sanctions, they still exists on irrigation organization.

Freeman and Lowder Milk (1987) emphasize that it is through people's organized effort that water is acquired and distributed and conflict resolution. They conclude that the success of effective delivery and operation of irrigation water entirely depends upon the effective irrigation water entirely depends upon the effective irrigation organization.

Kortein (1982) shares: local associations are capable of mobilization that signify amounts of labor on a long-term basis for maintaining the system; allocating water is close responsiveness to crops needs, resolving local conflicts over water, and coordinating cropping schedules to maximize the productivity of available water. When effective, these local groups have significant advantages over bureaucratic management, their ultimate knowledge of local needs for both water distribution and system maintenance; they can use social pressure to enforce rules and they place the cost of operation and maintenance on those who benefit form the system avoiding a perennial drain on government resources.

In the present study, irrigation is conceived as an adaptation wherein hydrological engineering, agricultural economic and organizational elements are present. In turn, irrigation organization is understood as a local farmer's association capable of mobilization of material and labor resources for irrigation system, construction and maintenance, allocating rights to water use and distributing water among the farmers and resolving conflicts, arising from water sharing.

5.2 Irrigation Organization of the Study Area:

The farmers in Bhorletar village were not organized to utilize the common property of water resource form Middim Khola before 1978. They had irrigated their land from the water of kulo of Pisti Khola .They had frequent conflict between users for sharing water. Due to scare of water and the urgent need to increase production to feed the increasing population, the farmers had several time of informal dialogue among the users for new irrigation canal from Middim Khola. They called a mass meeting for the formation of water user management committee for the first time in 1979. At that time Dharmashali Poudel was chairperson of WUMC. The committee was active in the construction new system by getting participation from all users in planning, resource mobilization and implementation. .Besides they face many difficulties and the committee is also able to get external support.That committee acts as a self help group. There are different factors that bring water users together to form such help organization. The feeling of water as" community property" is one such major unifying factor. Resource mobilization, water allocation and distribution, sense of belonging to the community, preservation of an individual's share and acquisition of water are other unifying factors.

Since the water user committee was organized for common benefit, the minor operation and maintenance of irrigation system was smoothly carried out. Last 25 years the system at headwork was heavily damaged (In 2007) on the period of field work, the repair and maintenance was beyond the capacity of the local people. Due to which, the system was not functioning for 6-8 months. The water user committee was constantly trying to get external support from VDC, DDC and external aid agencies during that time farmers had faced difficult time. This situation forced them for unification, and ultimately their proposal was accepted by DIO. The rehabilitation work (Maintenance) was started and took six months for completion.While working with DIO, their organization skills have been increased.

By July 1981, the formal irrigation organization consisted of nine executive members with the following designations: Chairman, Vice-Chairman, Secretary and other six members. The executive committee members were selected from each upstream, midstream and down stream.

The chairman presided all organization meetings, played a key role in settling disputes and instructed the secretary to maintain all the labour contribution and financial records. The vice-chair man did these tasks in the absence of the chairman. In turn the six other members helped these officials in discharging their duties. The irrigation organization, locally known as "Sinchai Sammitti" was governed by the rules and regulations prepared in July 1981 by the formal irrigation organization after the project was duly constructed. The selection criteria of the nine officials were as follows:

- The official to be selected ought to possess a leadership capacity to mobilize cash, labour and other material resources when needed for construction and system maintenance activities. The leadership capacity was judged by the villagers from the role played by these officials in the village.
- The secretary had to be capable of maintaining records regulating irrigation fees, fine collection and attendance of the participant in canal maintenance activities.
- The officials had to be capable of collecting compensation (such as fines) from water thieft.
- The officials had to be impartial durries the conflict resolution process.
- The officials should not be corrupt in the eyes of general members.

If an official was found not to comply with the five criteria laid down above the general members processed to discuss ways to reorganize the existing association. A general member stood in front of the assembly and nominated a person as a potential official. This same general assembly then asked other farmers whether

the proposed candidate is acceptable or unacceptable to them. When the majority accepted the nomination, the proposed candidate chooses officials. If any proposed candidate was unanimously opposed, then another person was nominated until the selection process was fully completed. The officials tenure lasted for a period of six months but could continue so long as the official discharged his/ her duties well, an assessment which was made by general members in separate meetings:

The duties of the officials of the irrigation organization were as follows:

- effective mobilization of resources such as cash, labor and material resources for the necessary maintenance activities;
- properly maintain the organizational regarding income and expenditures;
- strictly collect fines from water thieves and farmers whose absence during system maintenance;
- effectively resolve conflicts arising from water stealing;
- actively deal with agencies who can supply needed sources for the rehabilitation of the existing canal;
- communicate information such as canal damage to all the members for an emergency maintenances activity; and
- instruct the water distributor (Locally known as "Pale") to make regular check ups of the canal and the rotational distribution of water as fixed by the organization.

The officials of the irrigation organization were not remunerated as their job was voluntary. But when found corrupt, they were dismissed from the position during a general members assembly, As in the selection process, the majority decision was followed. Almost all key informants reported that the irrigation organization though sometimes full of minor disagreements, has been successful in fulfilling its responsibilities.

5.3 Function of the Organization

In order to smooth functioning of the organization, the monthly meeting of the main committee where held on a regular basis. The minute of the meeting has been recorded. The general meeting involving all water users was conducted once a year (Before Monsoon). The general meeting could be held if they have made the decision which is beyond the authority of the committee. These kind of general meetings were held when there were the huge tasks for repair and maintenance. The meetings of other were held as per the need of the community.

The principal functions of the organization of the study area as elsewhere, are decision making, resource mobilization, water acquisition, water allocation and distribution, system maintenance and conflict resolution. These functions have been elaborately discussed below along with a brief conceptual exposition of each of them.

5.3.1 Co-Ordination

The committee primarily coordinates with line agency and agriculture development office for getting technical assistance for irrigation management and agriculture development. In addition to these, they have maintained coordination with Village Development Committee, District Development Committee, District Irrigation Office and District Forest Office for the protection and management of forest area where the irrigation canal passes the rough.

5.3.2 Resource Mobilization

Resource mobilization is the most visible organizational activity in irrigation management. Labour is the most extensively mobilized resource, although money and materials are also important; likewise, farmer information should be regarded as a major available resource (Uphooff 1986). Similarly, information can also be used as another major available resource.

U.Pradhan (1988) pointed out that resource mobilization is a process by which an individual or a group is able to secure individual or collective control over the resources needed for individual or collective action. Resources already controlled prior to the mobilization efforts, the process or mechanism of pooling the resources and supplementary resources provided by outsiders. One can think of resources as being tangible or intangible, for example money, physical materials, leadership or information. For an irrigation system water, land, money, capital, skilled and unskilled labor, organization, leadership and information would be mobilized internally and others externally.

Resource mobilization is one of the most important functions of the irrigation organization since it is only through the effective mobilization of cash, labor and material resources that an irrigation system can develop and be sustained for a long period of time.

People of the study area practiced considerable internal resource mobilization during canal construction; the following internal resources were mobilized:

- Household labour,
- Fees: the service charge for water distributions,
- Fines imposed on farmers who were absent during maintenance activities,
- Fines imposed on water thieves,
- Local technology for maintenance activities and
- To propagate information regarding water acquisition, resource mobilization, water distribution, system maintenance and conflict resolution activities.

The amount of repair work needed to be done was estimated by irrigation organization officials before the start of actual repair. Then household were asked to contribute labor as fixed by the organization.

The irrigation fees were also collected on the basis of the size of the irrigated landholding. The general formula was: if one ropani of land was irrigated by the irrigation system, the beneficiary farmer had to pay 25 rupees per season.

Since the start of canal construction both human and financial resources were actively mobilize twice a year for routine and emergency maintenance. In these activities irrigation activities the irrigation organization always recorded the beneficiary's attendance for construction and repair work.

The irrigation organization also fixes the amount of fines relative to the daily wage rate in the village. The general formula was: if a farmer was absent during the repair work of the irrigation system, he was asked to pay the equivalent of a day's collected amount as saving to the 'Sammitte's' fund. The secretary of the irrigation organization collects or receives payments and fines from the water users. He also keeps the money of the organization and makes records of financial transactions. If he/she is found to have misused the money, he would be dismissed from his post and pressured to return whatever amount of money was misused.

Uphoff (1986) claims that "information can also be considered as a resource in the analysis of an irrigation system.Decision made about water acquisition, human and financial resource mobilization system maintenance and conflict occurrence and the like are expected to be immediately conveyed to the general members" in the study area communication of information helped to achieve coordination in the various functions of the system, viz. if there was an urgent need to mobilize for major repair in the canal, the need was quickly relayed to all the concerned persons by the Pale or secretary. If the operation and maintenances is beyond the capacity of the user's from technical as well as financial aspects, the WUC will seek outside help either from District Irrigation Office or from District Development Committee and Village Development Committee. (Key informants interview: 2007)

5.3.3. Water Acquisition

Uphooff (1986) defines water acquisition as "a process of acquiring water from the surface or subsurface sources or by creating and operation physical structures like dams, weirs or by actions to obtain for users some share of an existing supply." To achieve this, beneficiary farmers of the indigenous irrigation system must center their attention on the design, construction operation and maintenance of water acquisition activities.

Since this system has permanent headwork, water acquisition is not difficult one; some farmers were initially hesitant to participate in the water acquisition activity. They initially thought that it was almost impossible to acquire water from the river because the canal had to pass through many cliffs, steep slopes and landslide prone hill sides. They also thought that investment in canal construction was a waste of resources. But when the canal was half-constructed the reluctant farmers became optimistic about possible irrigation system and contributed their labor resource system. Thus, village cooperation, though arriving belatedly, played an instrumental role in the completion of the canal. (Key informants interview 2007)

5.3.4. Water Allocation and Distribution

Uphooff (1986) defines the allocation of water as "The assignment of rights to users to determine who shall have access to water." Likewise, he defines distribution as "The apportionment of water brought from the source among users at certain places, in certain amounts and at certain". There was number of methods of water allocation which comprises from priorities, turns, shares, crop priorities and market etc.

5.3.5. System Maintenance

System maintenance is the repairing and cleaning of the canal for regular and efficient water acquisition, distribution and removal. Maintenance activities were usually done before and during the monsoon season. Both routine and emergency maintenance activities were performed by the farmers themselves.

In the command area, routine maintenance took place in twice a year. Each maintenance task lasted from 5-10 days in depending upon the amount if repair work is required.

5.3.6. Conflict Resolution

Conflict is usually manifested in the form of competition, ordinary discussion with physical threat fight war etc. If two or one individual groups posed the right to use particular resource system at a time conflict over it's use become a normal phenomena.

De Los Reyes (1980) deals with the causes of irrigation conflict. She claims that many disagreements among farmers in indigenous irrigation system from its physical layout when the system depends on a single source.

5.3.7. Decision Making

There is provision of two levels of decision making body in Bhorletar irrigation system. These are general assembly is composed of representative of each household. All the members are welcomed to participate in general assembly, which is held once in a year. The income and expenditure report will be presented by the executive committee, which should be passed by majority of the general assembly. Two-third of the representatives of the total beneficiary households must be present for holding the assembly. This assembly can recommend for amendment in the constitution of the water user committee. The general meeting is called once in a month to discuss and decide on specific issues. Most of the decision in past were made from the consensus. If there is no consensus, the majority voice will be considered in decision making. In case of equal vote on issues, the chairman will play the role of deciding vote. If the committee could not make the decision on major issues, they will invite all users for having the consensus from each household. This kind of situation was occurred in last year at the time of great flood during monsoon. Due to the consensus or getting

commitment from all users, the huge amount of labor contribution became possible.

5.4. Roles and Responsibilities of WUC

The rules and responsibilities of the executive committee officials such as chairman, vice-chairman and secretary are listed below.

position	Role and Responsibilities
chairman	⎫ Chaired general council and committee's meeting. ⎫ Setting meeting agenda, time, date and place. ⎫ If there is no consensus during the meeting, act as a decision maker. ⎫ Representative of the committee. ⎫ Called emergency meeting when required. ⎫ Co-ordination and linkage with various institutions. ⎫ Monitor the function of committee. ⎫ Resolve conflict.
Vice-chairman	⎫ Assist. chairman in his/her work. ⎫ Carried out all duties and responsibilities of chairman in his absence. ⎫ Provide feedback about the functioning of the committee. ⎫ Monitoring of the performance of canal.
Secretary	⎫ Call meeting as per the rule of the committee. ⎫ Call meeting as per the decision made by the chairman. ⎫ Keeping record of all minute, attendance and other. ⎫ Prepare annual report in order to present to general council. ⎫ Operationalized rule and regulation as material in constitution.
Treasurer	⎫ Keep financial record up to date. ⎫ Collect fee and fined as per the rules. ⎫ Present financial report in general meeting and general assembly. ⎫ Performed other duties as demanded by committee.
Members	⎫ Regular and active participation in the meeting. ⎫ Play a role in decision making. ⎫ Act as a bridge between committee and users.

It has been found that there is clear role and responsibilities with in the members of water users committee, the users have also understood the roles and importance of committee in smooth functioning of the irrigation system. The ownership of the user is high.

CHAPTER-VI

WATER ALLOCATION AND DISTRIBUTION

6.1. Mechanism of Water Allocation and Distribution

The terms "allocation and distribution" are used interchangeably in much of the irrigation literature, but they have different meaning, and the distinction between them is important in the farmer managed system. "Allocation" refers to entitlement to water from an irrigation system and principal or basis by which water rights are shared among the irrigators. Water "allocation" identities the fields or farmers that have access to water from the system and the amount or duration of the water delivery to each. Water "distribution" refers to the physical delivery of water to the fields. The actual distribution may or may not be in accordance with the allocation scheme, depending on the effectiveness of the organization and physical structure."(Yoder et.al, 1986)

Water allocation, in the context of the research site, refers to the farmers' entitlement to water from an irrigation system. Water right was given to those farmers who had contributed labour, cash to the construction, operation and maintenance activities of the canal. One didn't claim the right to water use unless one had contributed to the irrigation system. According to Upreti (200) non-members were strictly prohibited to use the water obtained from the irrigation system. Almost, every irrigation system is involved with one or other forms of water right arrangement. The type of water right depends on the nature of water source itself, the intensity of its use national codes and some other factors such as preceding uses. The supply of water and hence, the water right management primarily depends on the nature of water source like its physical environment, frequency of rainfall over the year, and size and capacity of the water production-unit.

Pradhan, (1989) also mentioned that "water allocation and distribution are important and distinctive task for the irrigation mobilization, water allocation is an

assignment entitlement to water from an irrigation system and water distribution is the implementation of the allocation principle as agreed by the beneficiaries" In other word, water allocation means the entitlement to water from an irrigation system and are shared among the beneficiaries and distribution means the physical delivery of water to the fields.

In BIP, Sinchai Samittee was responsible in managing the water distribution to each user's field. In case of paddy field, the rotation for irrigation the field will be decided either by head or from tail portion as per the consensus of the farmer beneficiaries The allocated time for the distribution of water in case of paddy field is day after day per tole W.U.A with farmer beneficiaries has formed group at head, middle and tail stream to have a rotation from one field to another field smoothly in other corps like wheat, lentil, onion, there is also rotation system from head to tail.

Water distribution is the actual physical delivery of water to the field. In the Bhorletar irrigation project, the irrigation organization followed the system of employing one water distributors, locally known as the 'Pale' to handle this task, and one watchman employing by DIO since operating the project. The duties of watchman are not satisfy; he stays only like employ officials. Besides these 'Pale'(who is appointed by WUA) served system. The duties of the Pale's were as follows:

- be watchful of the water at all times to prevent water stealing;
- if water is stolen, warn the water thief not to disregard the distributional rules; if the thief refused to obey, the 'pale' had to inform to the irrigation officials for further action;
- minor repairing;
- prevent cattle and
- turn water to the user's fields on the rotational schedule fixed by the executive officials.

The amount paid to pale was fixed by a general formula as follows: if one ropani of and was irrigated by the irrigation system, the beneficiary farmers have to pay Rs.25 to the pale, which was already fixed by 'Sinchai Sammittee'. The Pale was always watchful of the canal in all season. Water discipline was strictly maintained during the period of dry season by the Sinchai Sammittee.

CHAPTER-VII

CONFLICT AND RESOLUTION MECHANISM

7.1. Conflict Resolution

Many social science researchers also stress the conflicts inherent in irrigation system as well as the mechanisms for the resolution of these conflicts. B. Pradhan (1982) claims that water sharing faces problems and disputes because farmers in the head generally take as much water as they need at the cost of tail-enders. Though the disputes sometimes get serious and violent, farmers have themselves developed social mechanisms for their resolution.

Conflict may arise in any topic related to irrigation system in the organization. It may come over the matter of water allocation and distribution, maintenance of the system and construction and rehabilitation of the system. Mostly three type of water conflicts are seen in irrigation system

- Conflicts between irrigation systems.
- Conflict with water user and the concerned agency within a system.
- Conflicts among water users of a system.

The conflicts between irrigation systems occurred basically due to lack of clear definition of water rights concerning a particular natural resource. The conflicts between water users and the concerning agency within a system was a reflection of the gap between the goals and the interest of the two parties. And the third conflicts among beneficiaries are types of conflicts of a system were more common and serious than the farmer of two types.

Water sharing is replete with problems and conflicts as every farmer tends to maximize his benefit, at the cost of others. The following were among the main causes of conflicts in water sharing among farmers in the study area:

- the use of more water by upstream farmers at the cost of midstream and downstream farmers;

- ❖ the release of excess water by upstream farmers in the midstream and downstream fields;
- ❖ nocturnal water stealing of other farmers, and the use of this water in one's own field; and
- ❖ non-participation in system maintenance by potential beneficiaries of irrigation.

Of these nocturnal water stealing occurring monthly during dry season, and sometime summer season also. Water conflicts were resolved by the farmers themselves in several ways as follows;

- ❖ farmers caught, stealing water were, at times, physically punished by the damaged party;
- ❖ in the general, water thieves were fine and collect the amount on organization's account. The amount of the fined depends on the nature of damage; the frequency was decided by officials of the irrigation organization;
- ❖ the upstream farmers who used more water during the dry season at the cost of midstream and downstream farmers were first issued a warning by the irrigation organization. If they continued to ignore the warning, they were denied the use of water for a period of time specified by the organization; and
- ❖ if the upstream farmers intentionally released excess water in the fields of midstream and down stream farmers and thereby caused crop damage, they were required to pay a fine to the damaged party. The amount frequency was decided by officials of the organization.

All these social mechanisms developed by the irrigation organization had so far been successful in resolving water conflicts. Besides these the traditional adjudication process appeared more effective and functional than legalistic ones.

The traditional process occurred between or among the farmers using the irrigation facility; the incident was immediately reported by the affected party to the chairman of the irrigation organization, locally known as "Sinchai Sammittee". The chairman immediately ordered the Pale to communicate this incident to the eight other executive members. All nine executive members then assembled in the particular place, (When irrigation office is broke-out by Maoist) and faced the conflicting parties. In this, the conflicting parties reported their side of the problem. After the hearing, the officials of the irrigation organization met separately to judge the case. The decision was usually a unanimous one (uncontroversial one).When there were differences of opinion among executive members; the majority voice was held as the final decision. The decision was always accepted by the conflicting parties. Some times, elite persons were called on meeting.

Sometimes, factions would appear in the irrigation organization particularly between the upstream and downstream farmer. This would usually happen during the dry season when every farmer in the upstream area would want to use more water at the cost of downstream farmers. When this happens, the executive members from the downstream would put more pressure on the executive members who participate from the upstream area and forced immediate penalties for upstream farmers who would be found violating the water distributional rules.

In such, the officials of the irrigation organization played vital role in resolving conflict cases. So far, water conflicts had not been forwarded to the formal courts yet, for resolution because the organization members themselves served as effective legislators and enforces of the rules and regulation.

CHAPTER-VIII

DEVELOPMENT OF IRRIGATED AGRICULTURE AND CHANGES

8.1. Irrigation Facility

Irrigation has played an important role in increasing the production as well as cultivated area. The easiest and best way of meeting water requirement of crops is by construction irrigational canals from rivers. (Parajuli, 1991). In the study area, the river Middim has irrigated the cultivated area is Rani Pani, Maj Phant, Bagaincha, Pakhuirchock. To some extent these areas were dry and semi-dry before project. The agro-production and cultivated area have been increasing after the operation of this project. Table 5.7.1 contains the irrigation facility before the construction of BIP.

Table: 8.1.1. Availability of irrigation before BIP.

Answer	Households	Percent
Yes	60	81.65
No	12	18.35
Total	72	100

Source: Field survey 2007

Before the construction of Bhorletar irrigation project, there was not any regular means of irrigation except in Majh Phant (Current Midstream of the command area) which was irrigated by indigenous Kulo of Pisti Khola. Due to the lack of sufficient water, people were unable to transplant paddy in monsoon too. Lack of sufficient water sometime resulted conflict between farmers in Paddy transplanted time before B.I.S. The irrigation system was in very poor condition. Some farmers were depending upon rainfall water for transplant to Paddy. (Key informants interview). It means that Kulo was insufficient and irregular too to supply the irrigation water.

Table: 8.1.2.Source of irrigation before BIP.

Source of irrigation	No. of Households	Percent
Kulo	45	61.25
Khola	10	13.60
Rainfall	5	6.80
None	12	18.35
	72	100

Source: Field Survey 2007

Table indicates that 61.25 Percent of the households had used kulo in limited area, 13.6 Percent source of irrigation was Khola; 6.8 percent depend upon rainfall for irrigation and 18.35 percent had not any source of water for irrigation.

Irrigation is essential for producing various types of crops and vegetables. It is artificial water supply to the field from streams and river which are linked by canals. Paddy and vegetables need a lot of water for their real growth. Earlier mentioned that, before the operation of this project some of the cultivated area of Bhorletar was dry and semi-dry and some of them depend upon monsoon rainfall for crop-production. As the irrigated area was smaller, the total production was also lower. In the past, people had hard life in agriculture in the lack of irrigation. Cultivated area as well as its production also limited in the study area before the operation of these projects. (BIP)

This project irrigation facility has been made available in Bhorletar V.D.C., since 1984(2040, Ashad). But all cultivated land of this valley has not yet been irrigated. Anyway, after providing irrigation facilities it has brought more prosperity and happiness to the peoples of Bhorletar V.D.C.

As a whole, 94 percent of the cultivated land of the study area has been provided with irrigation facilities and its production has increased. Vegetables constitute the main cash crop in this area which consumers can buy easily.˝ People say that we crop vegetable to utilize the leisure time but it constitutes the main cash crop". The

price of local vegetables has been relatively cheap then imported vegetable. Owning to the increased irrigation facilities with the operation of BIP, People's daily life has been slightly changed and raised also.

8.2 Changes Brought by the Irrigation Project

8.2.1 Changes in Agricultural Practices/ Labor System

Agro-farming is the only source of livelihood for a vast majority of the people in the command area. However it was also reported that supply of labor to the agriculture farming is in decreasing trends and this is likely to result in the shortage of agricultural labor in the study area. The main reason for this trend were reported as over increasing sinarieo to go to school, preference of the people to take a non-farm occupation such as small business, teaching etc and male members of households mainly the adult people go to foreign employment.

8.2.2 Improvement in Educational Level

The village has very 16.7 percent people who had passed SLC. The dropout rate was high especially in secondary level. The drop rate is even higher in the girl than in the boy. There are no women who had passed master degree till now. This is basically due to low economic condition. The increased production helped them in continuing their further education. The rate of drop out is decreased as compare to the last 8-9 years before

8.2.3 Improved in Ecology

For the protection dam, canal and adequate in the irrigation system, community or the people of Bhorletar village have protected natural forest. This forest was in worse condition and the local environment was deteriorated day by day. The community had realized that the sustainability of the irrigation system largely depends upon the condition of the forest in the watershed area of the Middim Khola. They approached the D.F.O and ownership of the forest handed over to the Bhorletar village. They controlled the free grazing system in their forest. They established rules and regulation for the protection and utilization of forest

product.After handing over the forest the condition of forest has been improved as mentioned by the general members. The other aspect is the use of forest product while diverting the water from dam to reduced the minimum level. After having the permanent dam for diversion, the relation between water source protection and forest management is clearly visible during the observation of the site.

8.2.4 Increased Participation in Development Activities

Peoples in Bhorletar village development committee have joined in various groups.

i) Laligunaras Saving and Credit Co-Operative

There are 260 members. The total amount in co operative is 5 lakh. The value of one share is Rs. 50. The improved irrigation system and increased in production has encouraged people to participate in co operative. The interest rate is lower than the rate of landlord.

ii) Narayani Ama Samuha

This group consists of 13 women members. The major areas of intervention of the groups are social empowerment of the women. Saving and credit linking with other organizations.

iii) Mahila Jagriti Ama Samuha

This group consist is 13 members. The major area of intervention of the groups is social empowerment of the women saving and credit, linking with other organizations, literacy and sanitation. The leader of the group expressed that the group is feeling easier in social empowerment due the increased economic condition of the village. They realized that the economic and social empowerment should go together.

iv) Krishi Samuha

This is the one of the Krishi Samuhas which is supported by agriculture development office. They had developed model plot for demonstrating high yielding varieties of different crops. They had received various training regarding agriculture.

v) Increased in Consumption of Vegetable

Farmers expressed that the practices of growing vegetable cultivation has been encouraged by the agriculture development office after completion of the irrigation systems. They are limited to the kitchen garden. The consumption of vegetable has been increased.

Major Crops and Cropping Pattern

Crops before the Project

Because of insufficiency and irregularity of irrigation, crop production depends upon the monsoon rainfall in the study area. In that case diversified cropping pattern was prevalent in the study are. Various types of crops such as paddy, wheat, "Ghaiyya", millet, maize, limited vegetable; mustard-oilseed, etc were product. On the basis of irrigation facility, land was categorized into two types: the khet (wet land) and pakho (dry land). In the khet paddy cultivation is dominated and in the dry up land maize and millets cultivations is dominated.

Paddy production was the first ranking crop, maize and 'Ghaiyya' the second ranking crop in the study area. Similarly, wheat is the third ranking crop, followed by millet, mustard-oilseed. The production of vegetable was un-measurement-able.

Present Cropping Pattern

The main crops grown in the BIP command area is paddy. The summer paddy of which seeding trans-planting and harvesting time is Ashad/Sharwan to Aswin/Kartik is given throughout the command area.

The second major crops in the study area are wheat and harvesting date of Wheat is Kartik/Mangsir to Magh/Flagun. Similarly, Aarmali (chaite Dhan) also a second major crops in the study area. Which seeding/transplanting and harvesting time is Chaitra/Baishak to Ashad/Sharwan. Recently growing vegetable at commercial scale is becoming increasing popular. Before BIP,Ghaiyya was also a major crops in the study area but now BIP totally replace it's production. And also vegetable seems to replace wheat production in future. It needs much more chemical fertilizer and market price of the product is not attractive also.

Maize is third important crops in terms of the area coverage. It is grown on spring season. The winter crops grown in the study area are mainly potato or garlic and onion.

- **Cropping Calendar**

  The farmers in the command area grow three crops a year. A mentioned earlier the main crops in the command area are Paddy, Wheat and Maize. The cropping calendar of major crop is presented below.

Table: 8.1.3.Cropping Calendar

Seasons	Crops	Planting/Seeding seasons	Harvesting season
Spring	Maize	Falgun/Chitra	Ashad/Shrawan
Spring	Chaite Dhan	Falgun/Chitra	Ashad/Shrawan
Summer	Paddy	Ashad/Shrawan	Kartik/Mansir
Winter	Wheat, Veg, Onion, Potato, Garlic	Kartik/Mansir Aswin/Kartik Aswin/Kartik	Kartik/Mansir Magh/Falgun Magh/Falgun

As shown on the table maize and Chaite Dhan (Armali Dhan) are sown in spring season in command area. The sowing and harvesting months for spring maize and

Chaite Dhan are Chaitra, Baishak and Ashad/Sharawan respectively. In summer season paddy is grown in command area. In summer the irrigation water seems to be sufficient for paddy cultivation throughout the area. The seedling planting and harvesting season for Paddy is Ashad/ Shrawn and Kartik/Mangsir respectively. In winter wheat, garlic, potato seems to be corp at all. Wheat is planting in Kartik/Mangsir and harvesting in Chaitra. In common area planting and harvesting seasons for lentil, veg etc. are Aswin/Kartik and Magh/Falgun. Potato is also planting in Aswin/Kartik and harvesting in Magh/Falgun.

Factor Affecting the Cropping Pattern

During the sample household study and key interview the following factors played the important role in affecting the cropping pattern:

Awareness

Farmers have no knowledge about the cost benefit of each crop in one hand and no technical knowledge how to grow the high value crops on the other hand. They have little information about the market and time of growing season for each crop to sell for a good price.

Traditional Practice

Farmer's attitude towards the traditional practice of growing crops is still positive. They are religious and other Social cultural values viz. they thought that the person who have more rice is prestigious person in the society.

Risk

Farmers expressed that the shifting from one cropping pattern to another is risky business. They will shift within the traditional practices. Some time they will try to grow vegetable, oilseed, wheat in more area and less area for maize. They knew that such kind of crop are based on the improved seeds, chemical fertilizer, modern technologies and knowledge, more labor and water also. They expressed that if the chemical fertilizer, pesticide, and technical knowledge are not available, the area under such kinds of crops will be decreased. They also expressed that there is high degree of correlation between yield of wheat crop and use of fertilizer. Therefore,

high risk crop like high value vegetable crops have low priority and low risk crops like maize, mustard have high priority in selecting the crops.

Market price

They expressed that the cropping patterns also vary in regards to prevailing market price especially on mustard, garlic onion. The coverage area under maize will be high, and demand of maize is also higher.

Availability of labor

Availability of manpower in household level and in the market is also deciding factor for choosing crops Due to this constraint, the area under labor intensive crops will be reduced.

Availability of water

A Farmer choice of the crop is based on the water need. They will choose wheat, vegetable etc. (Which is required more water) if the water is easily available during the critical period in dry season. If not, they will prefer less water-demanding crop like, maize, oil seed etc. Therefore, there is interrelation between those above mentioned factors and earlier mentioned that other cultural aspects in deciding the cropping patterns in a certain locality.

Benefit From the Irrigation Canal

- ❖ increased production
- ❖ Timely preparation of paddy seed bed
- ❖ Easy and timely transplanting of paddy
- ❖ Transplanting paddy twice a year.
- ❖ Protection of forest
- ❖ Improved health condition
- ❖ Save time
- ❖ Run a "Pani Ghatta"
- ❖ Equitable distribution of water.
- ❖ Water related conflict reduced.
- ❖ Increased vegetable production

CHAPTER- IX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This last chapter includes a brief conclusion of the purposive study. The core of the research study's findings has been focused in this along with some recommendation for its betterment.

9.1. Summary

During the assessment process, the main focus was given to investigate and understand the socioeconomic characteristics, management aspects, water conflict management and factor affecting cropping pattern. The changes brought by the irrigation development were also assessed as an impact of the irrigation project.

Bhorletar irrigation project is located in Lamjung District. The construction of the system was initiated in 1979 and completed in July 1981. The total cost of construction Nrs. 1,06,00,00,000 (1 corer and 6 lakh only), where include 35 households in order to choose a represented sample from the universe for the study of 72 households were taken by using simple random sample method. Data collection instruments such as interview schedule, key interview, focus group, observation were used.

In the study area the population of the sample households of the system female population occupied 48.4 percent and male population occupied 51.6 percent. The case of caste ethnic composition of sample households of the water users, Brahamin is the dominant caste who accounts 41.7 percent and ethnic groups accounts 31.9 percent. Similarly Dalit accounts 16.7 percent and followed by 9.7 percent by Chhettri. Occupational structure of the sample households of users group shows that 69 percent people are dependent in agricultural sector. Other non-farm works included employment in government and private offices (8.6 percent), trade and business (5.7 percent) and a remarkable number of people (7.6 percent) are in foreign employment. The educational status also shows that 92.4

percent of the total sample population is literate and only 7.6 percent are illiterate. In study area, 68.1 percent are Hindu and remaining 29.2 are Buddisht. Among them besides ethnic group all can speak Nepali language.

Because of the irrigation facilities, crop production, cropping pattern and irrigated areas socio-economic activities has increased in the Bhorletar V.D.C. The socio-economic condition of households has also been influenced by irrigation facilities.

Before starting of irrigation facilities, the area had limited agro-producing farmland and the scale of production was also low. But after the completion of the BIP in 1981, its productivity as well as the proportion of irrigated area has increased significantly. Due to the increased irrigation facilities, the cropping pattern has also been changing. People have intensive agriculture and multiple cropping systems. Paddy, wheat, Maize 'Ghaiyya' and millet are the major crops of this area. Now a day, farmers are more oriented towards cash crops. Before BIP, 'Ghaiyya' was the third ranked crop but now it is totally replaced by 'Aarmali Dhan'.

BIP provides multipurpose facilities in the Bhorletar VDC. Its water supply is one such facility; construction work is another. BIP has led to the construction of about 5.768 km of 'Godeto Bato' from the Bhorletar Bazar to the headwork site (Neta VDC) 7 foot bridges and several culverts has been constructed.

Since the irrigation development was initiated on the basis of felt need, villagers of Bhorletar had realized the importance of water utilization and management as an important vehicle for their development. The villagers organized many more other groups for the development activities. Water acquisition is not a problem in Bhorletar because of its permanent headwork. The diminishing water supply at the river source itself has affected the irrigation management practices. In Bhorletar the WUA has recently made some efforts to control preserve activities around its water source. Maintenance of the system is observed strictly disciplined. It has

been carried out a regular basis every year. If the household failed to provide the labor, they would have option to compensate in cash to the water user management committee comprised of nine members for water allocation, conflict resolution and system maintenance. This committee was found functioning satisfactorily as noticed during the interview with key informants and users. The women participation in committee was low.

The financial system was found transparent. The inventories of record about labor and cash contribution from each household were kept accurately and safe. The records were updated every month during the WUMC'S meeting. The general assemblies were held each year. The committee was successful in operation and maintenance with conflict resolution of the system. The decision making process has found democratic. "Apart from family labor, the labor organization system locally known as "PARMA" is prevalent in this area."

The major problems related with farming are unavailability of good quality fertilizer on time, insect pest problem on vegetables crops, and unavailability of some cereal crop has been increased, farmers have not explored the other possibilities of cultivating high value crops and tending productive live stock bread. The major barriers found during the study were lack of knowledge about modern technology and agricultural activities, not been able to bear risk, preference to traditional practice, subsistence farming and lack of unity in regards to specialization on product.

Another major problem related with organization is that they have not tried to keep the canal neat and clean.

9.2 Conclusion

The irrigation organization under the system studied intensively seems quite efficient. The government has supported to their initiative as per the felt need of the community.

The management is free from controversy and that a free, fair and democratic norms and practice are regulated in overall system operation and maintenance. The management is able to control and regulate the operation of the system at the canal quite impartially and effectively. WUA has started intervening the system for repair and maintenance using the resources of both government and the farmers. Under current management funds are raised. This is definitely going to generate local resources which could be used as complementary fund for the repair and maintenance of the system.

There are general meeting and general assembly on regular basis. The collective decision making process of the system is found to effective and made on time in a democratic manner which are recorded and transparent for all users.

Regular maintenance before monsoon (June) and emergency canal maintenance in the system is one of the major function of the organization or users. It is found that labor mobilization for the maintenance is conducted on the basis of households. It is observed that there is not strict discipline among users because now a day there is not sufficient water as required to crop production due to many obstacles.

The records about the revenue collection are updated. Any changes made by the committee regarding the rule and regulation are communicated effectively through secretary and members.

The water allocation system has been well established. The conflict regarding resource mobilization and water distribution are seldom and solved internally by the committee.

WUC'S has good linkage with DIO and VDC in order to get necessary support for upgrading the quality of irrigation system.

Due to construction of the system, the cropping intensity has been increased. The vegetable consumption rate has been increased due to availability of water for kitchen gardening. Actually, farmers are not interested in agriculture farming in the study area. They are measuring their economy in terms of cash rather than the quality of agricultural product. They feel that agricultural farming is slow, less beneficial and risky business. People of the village are also not much familiar with limited available improved seed, chemical fertilizer, pesticide and advance technology.

Irrigation water has facilitated the process of commercialization of subsistence agriculture which is a positive indicator of agriculture development.

The people participation was found increased in other community development activities due to positive impact of irrigation.

9.3 Recommendation

Farmer's organization is the important aspect for improving the management of irrigation system. Since the farmers from BIP were organized for fulfilling their common goal, they have success in managing the irrigation system in a proper way. But during the research time many problems were found, Which were not only concerned with the locality but also associates with national level on the basis of these problems the following recommendation are given to minimize the several existed constrain of the irrigation.

Government agencies usually considered only on physical improvement of the system, as the important aspect. However, in order to functions irrigation properly non-physical elements are the most essential for the sustainability. So both should be equally emphasized.

There is seems mark discrepancy in water distribution among the farmers in up streams and tail streams. So WUA must try to make water distribution more justly and equity.

Although the cropping intensity and yield has been increased, but the users are not ready for moving towards introducing high value crops. Therefore, there should be a provision for at least one agricultural extension officer. In the common area in order to provide efficient extension services to the farm households.

Across the settlement area, the canal should not remain open. It is necessary to put slabs and iron nets to keep the canal neat and clean, those who try to use canal as a dustbin should be punished.

It is necessary to generate skilled manpower to maintain, repair and supervise the operation of the canal.

New technology and modern inputs i.e. tractors, thrasher machine etc should be used to reduce the need for manual labor.

The study area consists being an urban area. As cash crop farming is more profitable in an urban area such crops. e.g. Vegetables, fruits should be encouraged.

Some positive impact has been observed regarding the schooling and participating in other development activities such as operating saving and credit, managing community forestry and agriculture development committee. These activities have direct co-relation for social empowerment for equitable sharing of benefit in the household and the community. This kind of example could replicate in other systems too.

People's participation is not only in operation and maintenance but should involve in every decision making process. Other wise, the turn over programs will not be fruitful and may arise the question of sustainability of system in future.

At last, the present study has shown that the farmer's own initiative in the formation and maintenance of local irrigation organization led to the success of the irrigation development program in Bhorletar. Moreover, given the opportunity to maintain their sense of ownership towards the irrigation system. Farmers were able to employ democratic practices in handling organizational matters and work out egalitarian procedures to distribute scarce water resource.

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APPENDIX-1

INTERVIEW SCHEDULE

IRRIGATION INDUCED SOCIO-ECONOMICS CHANGE

A study of Bhorletar Irrigation Project

Lamjung

Questionnaire Schedule

1. General Introduction:

Name of Household Head:- Occupation:- Religious:-
Respondent's Name:- Ethnicity:-

A. Family Details:-

S.No.	Sex	Marital Status	Education	Occupation	Remarks

S. No.	Questions	Answers	Skipping
2	Types of Family	a. Nuclear b. Joint c. Other...	
3	Ownership of house	a. cemented b. Mud masonry c. Hut d. other…	
4	How long does the production of the land help you all to sustain?	a……Months	
5	Are you the real inhabitant of this place or migrated from other place?	a. Migrated from other place b. Inhabitant ⟶	7
6	For why?	a……	
7	what are the main sources of income of your family?	a. Agriculture b. Wage labor c. Foreign Employment d. Business e .Traditional occupation g. Other….	
8	How much is the monthly income of your family?	a…….Nrs.	
9	In which way, water is distributed?	a. Turn by tole-tole b. Individual turn c. Area wise turn d. Other….	
10	You Know, where your tax is used?	a. Maintenance b. Pale c. Both d. Other….d. Don't know	
11	Are you satisfied with water distribution process?	a. Yes b. No ⟶	13

12	If not, why?	a. Unhealthy distribution b. Insufficient water distribution c. Careless of Pale.	
13	Is there any inequality in distribution?	a. Yes b. No →	15
14	If yes, what kind of inequality in distribution?	a. High priority to committee members' b. High priority to more land owners c. More facilities taken by male. d. other….	
15	Are their more consuming chances for high tax paying consumer?	a. Yes b. No	
16	Which is the main cause of unhealthy distribution?	a. Unhealthy distribution by distributor b. Canal's peripheral people c. Land-slide d. Dispute between farmer's e. others….	
17	Is canal's water is used for any purpose without irrigation?	a. Yes b. No →	19
18	If yes, which purpose?	a. For drinking b. For washing c. For cattle d. Other..	
19	Is there any dispute between consumers for water?	a. Yes b. No	
20	Dispute between whom?	a. Individual b. Group c. Other…	
21	What is the main issue?	a. For water distribution b. Irrigation tax c. Maintenance d. Other..	
22	How are they solved?	a. By discussing b. In the mediation of committee c. In the mediation of VDC d. Other….	
23	Is there equal access between up-stream and down-stream consumer?	a. Yes b. No →	25
24	Is it the cause of dispute?	a. Yes b. No	
25	Is there any case of water stealing?	a. Yes b. No c. Don't know	
26	Is there any dispute with canal's peri-pherials peoples?	a. Yes b. No →	28
27	With committee's or villagers'?	a. Committee's b. Villagers'	
28	Is there any dispute in up-stream and down-stream consumers?	a. Yes b. No c. Don't know →	30
29	how is it solved?	a. By committee b. By VDC c. Within Consumer d. Other…	
30	what kind of punishment is given for water stealers?	a. Fine b. Through restriction c. dismissed from WUC d. Other…	

31	Where is that fine used?	a. Maintenance b. Refreshment c. Saving d. Other…	
32	Is there presence of all consumers or committee only in dispute solving?	a. Only committee b. All consumers.	
33	Is committee's decision is final one?	a. Yes b. No	
34	Is consumer suggestion is observed in decision making?	a. Yes b. No	
35	Was there any irrigation facility before this project?	a. Yes b. No	
36	If yes, how much land was irrigated?	a….. ropani	
37	Which procedure was used for irrigation?	a. Kulo b. Drain c. Rainfall	
38	Do you change your agricultural pattern after this project?	a. Yes. b. No →	41
39	If yes, than what?	a. Vegetable farming b. Aarmali c. Other… →	41
40	What kind of advantages do you get from vegetable farming?	a. Cash revenue b. Improve in health c. Utilization of leasure time.	
41	How are you managing labor (khetala) in farming?	a. Family members b. Hiring labors c. Parma d. a+b e. all above	
42	Was last year production sufficient?	a. Yes b. No c. Some are sold →	44
43	If not sufficient, how was it managed?	a. Borrowing b. Loan taking c. Service d. Business e. Other…	
44	Do you use modern fertilizers, techniques and pesticides?	a. Yes b. No →	48
45	What kind of technology is used?	a. Modern plough b. Tractor c. seeds planting machine.	
46	What kinds of advantages do you get from modern technology and tools?	a. Easy to work b. Increasing in production c. Other….	
47	How do you know about modern technology?	a. Neighbors b. J.T.A c. Training d. others….	
48	Did you get any training about farming?	a. Yes b. No	

49	What are the major problems of this project?	a. Irregular irrigation b. Insufficient water supply c. Lack of protection of canal d. Unhealthy distribution e. Obstacles of floods	

		f. Others…..	

50. Any comments for this project?

51. Do you have any suggestion for this project?

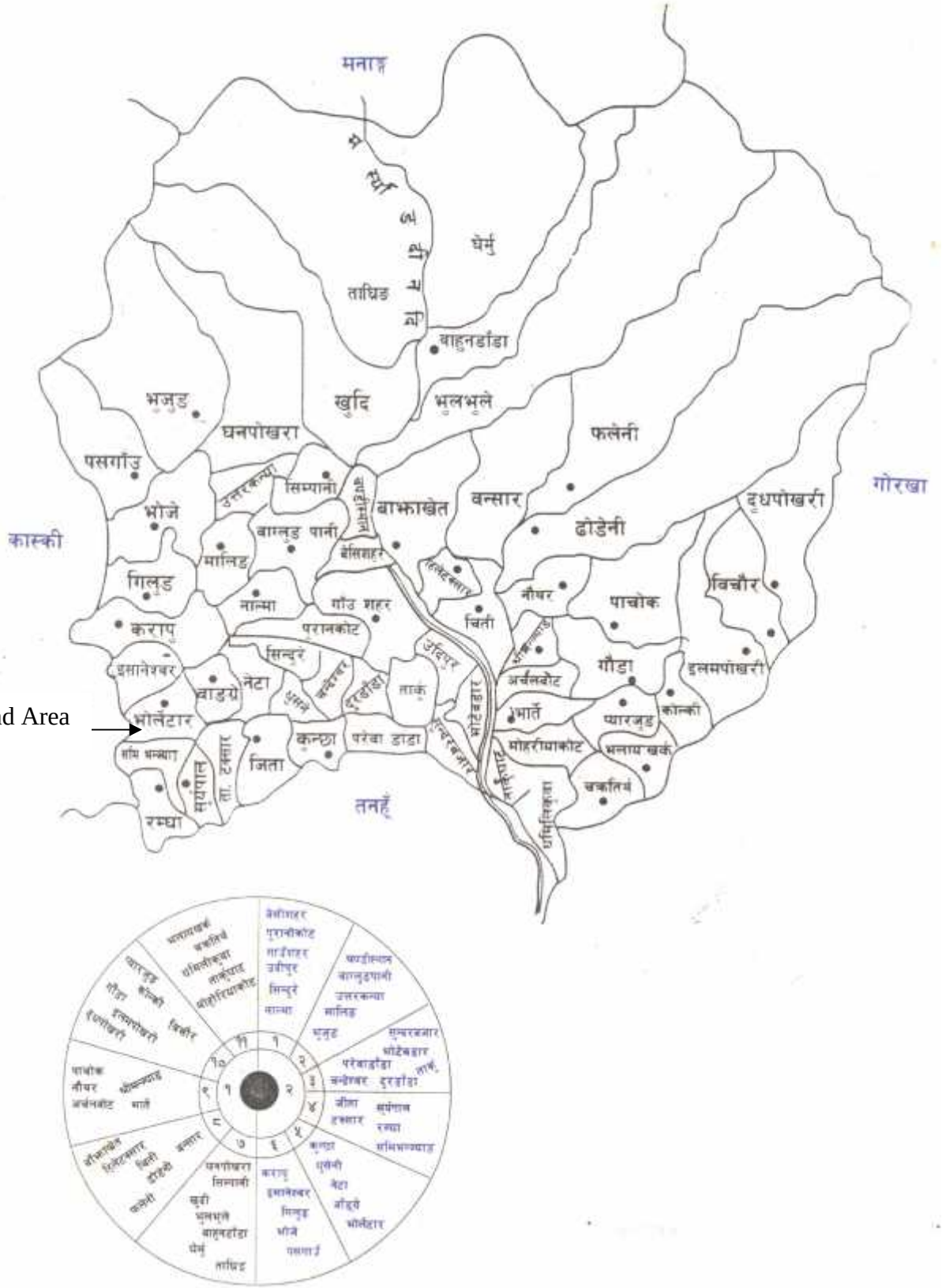
List of Water User Management Committee's Members

Chairperson:	Mr.Ram Krishna Ghimire
Secretary:	Mr.Indra Prasad Regmi
Treasures:	Mr.Basanta Ghimire
Member:	Mr. JayaKrishna Ghimire
Member:	Mr.Purna Bahadur Poudel
Member:	Mr.DhanaPati Regmi
Member:	Mr. Hari Bhadur Thapa
Member:	Mr. Shuk Bahadur Dura
Member:	Ms. Lok Kumari Dura
Member:	Ms. Mahakali Regmi
Member:	Mr. Gokarna Regmi
Facilitator:	Mr. Gobinda Poudel

KEY INFORMANTS INTERVIEW CHEKLIST

1. Source of Water Supply.
2. Location.
3. Area Covered by System.
4. Total cost.
5. Type of System.
6. Total Taxation.
7. Resource Mobilization.
8. Structure and Function of Organization.
9. Duties and Responsibilities of the Different Members of the Organization.
10. Procedure for Organizing Different Level of Members.
11. Factors Affecting the Agriculture Development.

LAMJUNG DISTRICT



Command Area →

Figure: 1.2

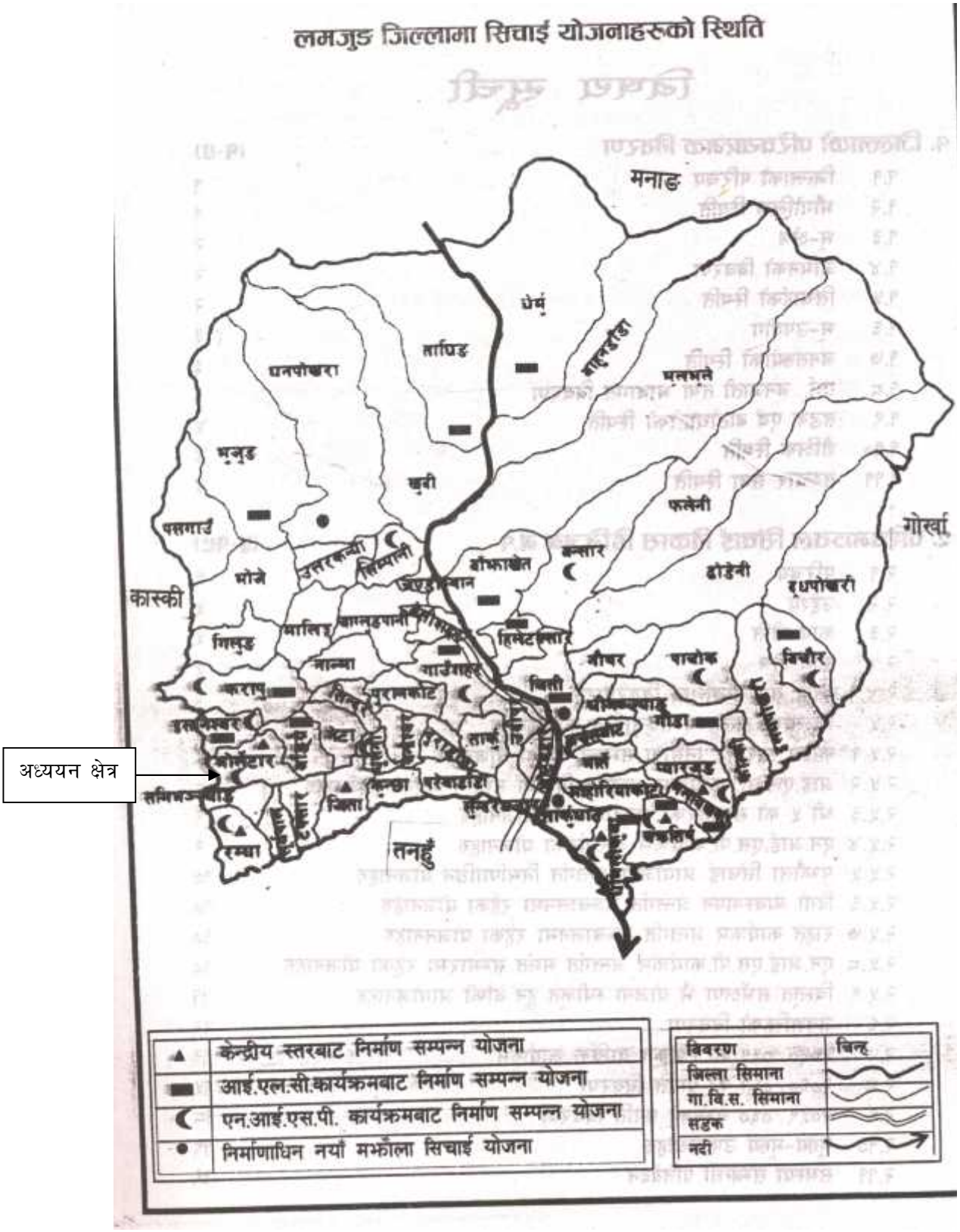


Figure: 1.3