

CHAPTER - I : INTRODUCTION

1.1 Background of the Study

Nepal is situated on the northern rim of South Asia, land locked between India and China covers 147,181 Sq.km. and contains a complex maze of mountains and ridges, interspersed by deep valleys and lowlands. Situating The country is divided into three fairly distinct regions running east to west: the terai; between 60 and 600 meters above sea level; the hills, between 600 and 3000 meters; and the mountains, above 3,000 meters. These physiographic extremes have resulted in narrow bioclimatic zonation with tropical, temperate and tundra vegetations types and climates falling very close to one another. The hills and mountains collectively occupy 74 percent of the total area. Only the 17.97 percent of the total area is irrigable of which 66 percent of the land gets irrigated (CBS 2011).

The predominant position occupied by agriculture in Nepalese economy is due to the fact that about 74 percent of the population of working age engaged in agricultural activities and it contributes 32.12 percent of GDP (Economic Survey 2014/15). Although agricultural visibly dominates the national economy, its contribution is rather declining.

The agriculture economy, the source of livelihood and employment for 74 percent of the population of Nepal, largely depends on the erratic rains which come during the period of monsoon from June to September. For this reason, irrigation acquires great importance as a strategy for increasing agricultural efficiency, augmenting agricultural yields and generating larger incomes (Uprety 2000).

Irrigation is an age old art. Civilization has risen on irrigated land; they have also decayed and disintegrated in irrigated region. Most of the people, who are well-informed about irrigation, intelligently practiced it. Others think that a civilization based on agricultural under irrigation is destined sooner or later to decline, because some ancient civilization based on irrigation have declined.

Nepal is the second richest country in the world and the first richest country in Asia regarding the water resources. Nepalese farmers have recognized the importance of water resources for centuries and have been constructing irrigation systems at their own initiatives to intensify their agricultural productions. Irrigation system in the country remained in the hands of the people for many years. This tradition gave the birth to the Farmer Managed Irrigation System (FMIS) scattered all over the country. Irrigation systems built and managed by farmers (FMIS) in the hills of Nepal are among the world's oldest irrigation system.

Several of the Farmer Managed Irrigation System as we see today, have had their origin under Brita and Jagir type. Land tenures started by the state. Birta and Jagir land grants awarded to individuals by the rulers. The owners having authority can mobilize huge amount of labour needed for the construction of irrigation system (Shukla and Sharma 1997:12 citing Regmi 1978).

Irrigation system can be divided into two groups according to where the responsibility for their management lies: those that are Agency Managed and Farmer Managed System. In the farmer system, farmers are responsible for all management activities. FMIS include common areas ranging from less than 10 ha to 15000 ha (Pradhan 1989 a:2-3)

1.2. Statement of the Problem

Nepal is known as agricultural country. Majority of people are depended on rainfall from the Bay of Bengal. Rainfall and temperature are the two main factors affecting Nepalese agriculture, 80 percent of the total precipitation is received during the month June - October. Nepal is facing problems of attaining substantial increase in agriculture production to meet a growing demand of food. Till seventies, food grain production was sufficient to meet people's increasing population pressure and declining soil fertility have changed the one time food exporting country to a food importing ones, if the monsoon fails (Joshy 1997:8).

Agriculture in terai is better than that in the hills and mountains. As a result, the mountains and the hills are less sound, because of the lack improved irrigation,

transportation, technical knowledge and several other factors. Thus, Nepalese farmers are bound to continue their traditional occupation of agriculture by hook or crook. Agrarian change and agricultural development are quite untimely associated with the status of irrigation in Nepal. By the cause of irrigation one particular community, society or locality could be uplifted, through agricultural development food production of Nepal has not increased due to the lack of sound irrigation system on the above mentioned fact few would deny that the greatest potential for increased agricultural production lies in the provision of perennial irrigation facilities. But the irrigation should be integrated as a part of an agricultural development package (Ives and Messerli (1989:214).

Promotion of irrigated agriculture has been a prime concern of the government. Even traditional village heads were punished if an irrigable field was not planted to rice because of a failure of the irrigation system. In the beginning there were few *Raj Kulos* (Raja Canals) which had stage patronage (Pradhan 1989a:1/citing Ricardo 1977).

In an overall sense Nepal can be regarded as a “water rich” country. However, the spatial and temporal distribution of Nepal’s surface water resources create surplus at some times and place and shortages at other. Therefore, since the ancient time farmers have tried to manage water resources from rivers or streams for the purpose of irrigation. A long tradition of farmers constructed and managed irrigation exists in Nepal. In the hills have organized themselves fro centuries to construct, operate and maintain irrigation system that are often complex and typically require heavy commitments of donated labor to keep them operating efficiently (DOI: 1990).

Successful irrigation systems in the past may not be sustainably operated and managed in the future because of the changing economic, social and natural environment. These FMIS shall need support for modernization and improvement to match the changed environment. It is clear that more than 70% of the irrigated area is under farmer management.

Most of the people of Chitwan district live within the access of irrigation. Irrigation depends entirely on surface irrigation for survival. It is clear from their sale of products in market. In order to make optimum use of the water and land resources

and to increase agricultural fields irrigation systems are developing in Chitwan district. Basically, Ratna Nagar Municipality-9 & 10, Chitwan irrigation system is constructed by the GoN and transferred to the WUAs and operated by the local people. It is very useful to know how this irrigation system has been possible in organizing the people for the operation and maintenance of the project.

This study attempts to focus on the following questions:

- a. What are the indigenous water supply systems of village?
- b. What kinds of methods are applied to solve the problems of water mobilization?
- c. Is water source sufficient to irrigate land?
- d. What is the socio-economic condition of this village?
- e. How does it contribute for the development of the rural sector?

1.3. Limitations of the Study

As a core student who has no previous experiences of such research the findings are liable to be weak. The present study will be conducted for the partial fulfillment of the requirement for the Master Degree. Therefore, detailed study was not possible due to the lack of time and fund. This research was concerned with irrigation system of Panchyakanya Nahar Water User's Association, Ratna Nagar Municipality-9 & 10, Chitwan. Out of more than 2200 households, only 30 households were taken.

1.4. Significance of the Study

Ratna Nagar Municipality-9 & 10, Chitwan is selected for the study, which represents an indigenous single community managed irrigation system. Furthermore, agriculture is the main economic activity for their (inhabitants of Ratna Nagar Municipality-9 & 10, Chitwan) subsistence and agriculture is only possible through managed irrigation.

1.5. Rationale of the Study

The main objectives of this study was to derive the actual outcomes of the Panchakanya Nahar Irrigation System, Ratna Nagar Municipality-9 & 10, Chitwan through the management by the farmers. Furthermore, it has the following objectives:

- How does the FMIS helps to promote the living standard of the rural people?
- What sorts of fields are influenced by the FMIS?
- How does the FMIS helps for the rural development?
- What kinds of indigenous tools, techniques, skill and knowledge are used?
- What kinds of methods are applied to solve the problems of water mobilization?
- Whether the water source sufficient to irrigate land or not?
- What is the socio-economic condition of this village after the FMIS implementation?

1.6. Methodology of the Study

To achieve the main objectives of this study different methodology will be used.

1.6.1. Research Design

Descriptive research design has been used for the present study. Irrigation systems are complex socio-technical units so it describes the local system of irrigation management.

1.6.2. Study Area

The coverage of this study has covered Ratna Nagar Municipality-9 & 10, Chitwan, Nepal.

1.6.3. Nature of Data

Both primary and secondary data were used for the study. The main fact of the study is based on primary data. The chief sources of primary data are the villagers, mainly (Inhabitants of Ratna Nagar Municipality-9 & 10, Chitwan) which were collected by households survey through semi-structured questionnaire, observation etc. through the field work.

The relevant secondary data and information have been obtained from earlier published books, research reports, irrigation office, DOI, MOI, journals and so forth. Inhabitants of Ratna Nagar Municipality-9 & 10, Chitwan provided the data. Yet, the present study focused on qualitative data than quantitative.

1.6.4. Universe and Sampling

Panchakanya Nahar Water User Association, Ratna Nagar Municipality-9 & 10, Chitwan was selected as a research site. Out of 304 household only 30 houses will be carried out for survey purpose which is approximately 10 percent of the total population.

1.6.5. Techniques of Data Collection

In order to generate both qualitative and quantitative data related to study topic, the following techniques and tools will be used. It will include:

- Informal interview
- Observation
- Questionnaire and
- Field visit

1.6.5.1. Interview Schedule

Data on the socio-economic condition of the people of the specific area were collected by interviewing heads of households using semi-structured interview schedule. This helped to collect data on personal identification demographic information,

educational status, economic activities and other socio-cultural information of the study area. These tools were employed to generate the required data on personal experience towards the irrigation organization and related activities.

1.6.5.2. Observation

Observation is probably one of the most effective techniques of data collections used over the decades in the fields of anthropology. This technique had been probably the best method to study settlement pattern, family structure, socio-cultural activities as practically possible.

1.6.5.3. Questionnaire

Respondents were given various questionnaires regarding FMIS at Ratna Nagar Municipality-9 & 10, Chitwan focussing on their livelihood and irrigation as well as its proper implementation and maintenance by the local villagers.

1.6.5.4. Field Visit

The field visit is also an important opportunity to build a relationship with the organization and foster an open, trusting and responsive partnership. Throughout the visit, the Field Representative will meet with programme staff and members of the board, as well as conducting one-on-one meetings with beneficiaries. This study will entertain the field visit as per the requirement.

1.6.6. Data Analysis and Interpretation

The data and information with the help of different tools and techniques processed, organized and reorganized them in different groups and heading. The data on natural condition of the study site, some political and cultural features, subsistence

activities, operational activities in respect of irrigation system and supplementary activities were qualitatively analyzed and described.

1.7. Organization of the Study

The study is organized into six chapters. The first chapter gives an introduction of the study and opens background of study which is followed by statement of problems and objectives of the study. The second chapter contains review of the relevant literature, it is divided into four parts: theoretical, indigenous knowledge, farmer managed irrigation system and institutional aspect of irrigation.

The third chapter discusses about the research method which contains about the techniques and instruments of the data collection. The fourth chapter presents a figure of socio-cultural and economic condition of the study area. The fifth chapter deals with organizational structure and the entire dissertation. The sixth chapter concludes summarizes, and makes recommendations and suggestions.

1.8. Review of the Literature

In a research process, the review of literature begins with a search for a suitable topic and continues throughout the duration of the research project. Since, a research aims to contribute new knowledge on a specific topic it is essential to know that is already known to the related topic. In doing so, one can identify the research gap which needs to be bridged by the new research efforts. It also helps to acknowledge the works previously done by the scholars. The fundamental assumption of the review in research is that no work is completely original of keeping this in mind relevant literatures are reviewed here.

1.8.1. Theoretical Perspective

Human societies adapt to their natural environment through their culture. In other words, nature is mediated through cultural perception and symbolic systems.

Certain cultural features and symbols are instrumental to protect valuable species of plants from their total destruction by human depredation (Gurung 1996). The interaction between the living organism and their environment are subject matter of ecological study. Ecological anthropology is the ecological approach in anthropology, which deals with the interaction between the human culture and environment.

Human ecological approach entered into anthropology with the work of Steward's (1950) "cultural Ecology" according to him human culture can be explained in ecological terms, some elements which he labeled as "cultural core" have adaptive significance. In particular, he thought technology, economic, population and social organization were likely to be part of the cultural environment is his model of cultural ecology. Cultural ecology is the study of the process of adaptation by a society to its environment, i.e. how social institution or origination interacts with their environment or nature.

From the prospective of cultural ecology, dissertation focuses particular attention on indigenous/traditional/socio-political and cultural institution and find out whether they have served as effective means for regulating irrigation management.

1.8.2. Indigenous Knowledge and Irrigation

Indigenous Knowledge is the sum of experience and knowledge of a given group that forms the basis for decision making in the face of familiar and unfamiliar problems and challenges.

It is accumulated knowledge skills and technology of the people derived from the direct interaction of human beings and their environment. Moreover, it consists of integrated system of production and consumption with the following components organized technical knowledge, social, institution, decision making, and the maintenance of diverse natural resources, technology and skilled labor (Ral. 1996:19 citing Warren and Cashman 1992; Alteri 1991).

Although the term indigenous knowledge is used in synonymous to traditional knowledge Gill (1993:24) clearly distinguishes these terms according to him indigenous refers to the point of origin, the source of initiative. It may incorporate elements and processes from the outside world, provided the initiative for their incorporation is local. Traditional system may not be of local origin, as their adoption

may have been imposed from outside. Traditional system is old by definition, but indigenous system is often quite new and constantly evolving presents the fact that the indigenous knowledge and systems of managing agriculture and other natural resources have existed in Nepal for centuries (Thapa 1993).

Local users of natural resource are often more competent and knowledgeable as resource managers than highly trained professionals from outside, because local users have extensive knowledge about the exact local physical conditions and history of the resources. This does not mean that indigenous systems do not have weakness or imperfections.

In addition, Tamang (1993:14) argues that on the basis of the differing needs of the village people, the opportunities provided by the particular natural resource situation and the need to be independent due to sheer isolation, farmers have collectively and individually devised, decided, decided upon, designed, constructed, planned, implemented, maintained and improved indigenous system for the management of natural resources through many centuries. The high level of participation of the users in the management of natural resources is more democratic than many other systems of the developed countries.

The indigenous organizations of FMIS (Farmer Managed Irrigation System) have evolved over time in response to physical conditions and the requirements of the irrigation task (Uprety 2000:42-45) highlights.

Indigenous irrigation systems have thrived of in Nepal for several centuries as in adaptive response to a water search environment demonstrate a very high degree of organizational and managerial inputs, both of which become imperative in view of the shortage of capital for the construction and maintenance of the canals. One time, the indigenous irrigation organization have developed their own rules and regulations regarding resource mobilization, water allocation, system maintenance, collect resolution, properly rights in water and the like. The Nepalese government cannot continue to build the bureaucratically managed and operated irrigation system in all extremely mountainous terrain because of the high cost of irrigation canal construction and lack of trained manpower.

Surface water from small streams are the most common sources of water in the hills. There are managed by local communities through either indigenous or government sponsored organizations Dhakal (1993:265) considers the importance of

in depth understanding of existing indigenous irrigation management system to ensure sustainable management of water resources.

Anthropologists have made substantial contributions towards a better understanding of traditional and indigenous resource management practices in Nepal (Chettri 1993 Chettri and Pandey 1992, Fisher 1989, 1991, furer-haimendrof 1964 Messerschmitt 1990 , Molner 1981 cited by Chhetri 1994). Research and development experiences have shown that the traditional knowledge and resource management practices of rural communities can be an effective basis for conservation and development.

1.8.3. Farmers Managed Irrigation System in Nepal

Pradhan and Yoder (1990) classified the irrigation systems in Nepal into two broad categories by two distinctively different criteria. Firstly, the source of financing and technical assistance is the most common distinction to refer to government system as those that have received some substantial amount of government assistance, as compared to farmer or private system which have received little or no assistance, Secondly, The most recently emerged criterion is to distinguish between groups of system on the basis of major management responsibility. Systems in which farmers take overall management responsibility on a continuous basis and control the water from source to disposal of excess as drainage are referred to as farmer managed. These are in contrast to systems in which government personal are responsible for most of the management activities with varying levels of farmer participation.

Dhakal (1995) write farmer managed irrigation system (FMISS) is the main means of irrigation for agricultural land in Nepal. Farmers in Nepal have been developing and management irrigation since time immemorial that appears to have been contemporaneous with agriculture. Historically, irrigation development has fallen under the domain of religious trust, individuals initiatives or community effort. The legal tradition and local administrative structures over a period of time have permitted farmer managed system to operate without interference from an irrigation agency or other governmental administrative units. Farmers have developed their own irrigation systems taking account of geographical impediments and limited services

from the government in the past. They have managed their systems by adjusting the operation to the soils, climates, topography and social structure of the particular location over a period of many years (Pradhan 1998a).

Nepal has a long history of irrigated agriculture; the importance of irrigation has been realized only in the recent years with the advancement in the irrigated agricultural technology. Planned involvement of the government in irrigation development began only 1951. The department of irrigation (DOI) came into existence in 1952. Before this period the irrigation needs were met by several farmer managed irrigation systems (FMIS) and few state supported irrigation canals. Chandra Nahar was the first public sector irrigation scheme built in 1923 under the supervision of British engineers. A substantial portion of the country's irrigated area is under numerous farmer managed irrigation system (FMIS), scattered throughout the country. FMIS, in Nepal has been recognized as potential and cost-effective alternative to government managed systems through which to expand and intensify irrigation development in the country and improve the performance of irrigated agriculture.

A number of research studies reported relatively better performance of FMIS (Farmer Managed Irrigation System) over government run irrigation schemes. There are quite convincing reasons why the performance of FMIS (Farmer Managed Irrigation System) is better than that of the agency or government managed irrigation system (AMIS), Panta and Lohani (1983) have identified a number of such strengths of FMIS (Farmer Managed Irrigation System) (Shukla and Sharma 1997:2-4) :

-) That the management intensive and technical deficiencies are largely compensated by intensive management inputs backed by flexible but strong organization.
-) That they are low cost and based on mobilization of local resources.
-) That users in FMIS (Farmer Managed Irrigation System) usually exercise some forms of property rights to rights to retire membership.
-) That effective and functional irrigation organizations exist in many FMIS and that initiative for such organization invariably come from the users themselves.
-) That leadership of the system is accountable to the users.

J) That rules and roles for water allocation, distribution resources mobilization, system maintenance and a conflict resolution are made to fit to local needs, usually governed by social and economic forces.

Pradhan (1989b:47) opines that the limited function of the government and the tradition of non-intervention in irrigation water management at the community level for hundreds of years led to the development of farmer managed irrigation systems in Nepal, by and large, these systems are autonomous, self-governing entities.

Yoder (1991) views the importance of FMIS in Nepal, from several perspectives. At the household level, survival of many families in densely populated hills areas depends on the increased production made possible by their irrigation systems. At the national level 45 percent of the population subsistence cereal requirements is being met by the increase in food production made possible by irrigation from FMIS. This estimate assumes a conservative annual increase in production of 2000 kilograms per hectare (Kg/Ha) with irrigation as compared to rainfall conditions.

FMIS are of great significance for Nepal because about 70 percent of the total irrigated area in the southern plains (Terai) and percent in the hills are irrigated by them.

1.8.4. Institutional and Organizational Aspect of Irrigation

As defined by Parajuli (2001:27), an irrigation system refers to both the physical and institutional and delivery of irrigation water to a farmer or farmer groups. The physical components of an irrigation system includes an acquisition structure, a conveyance canal, and a network of distribution canals with suitable water division which is referred to as water distribution of these components, a distribution system plays an important role in the operation and maintenance of an irrigation system and it determines mode of water allocation and delivery to farmers.

Existence of irrigation institutions is considered to be crucial for the management of irrigation systems. An institution is the rules actually used (rules in

use or working rules) by a set of individuals to organize repetitive activities that produce outcomes affecting those individuals to organize and potentially affecting others. The FMIS in Nepal have been able to function for a long time due to their strong institutional and organizational arrangements, which consists of key rules, important roles and significant social groups. The self governance (crafting or rules and development of mechanisms to enforce them) enabled collected actions in the management of these irrigation systems due to rules in use (Parajuli et al 2001:5 citing Jang and Ostrom, 1993: Coward 1980 and Osrom, 1992).

People in all culture have recognized that they must make arrangement to secure and manage collective what they could not obtain individually. Irrigated agriculture has always meant the organized, collective attempt to control water efficiently to fulfill crop consumptive needs, and the progress of irrigation system has always depended upon the design and quality of their respective irrigation organization (Freeman et al, 1991 cited by Rai, 1997).

Uprety (2000) defines irrigation organization is understood as a local farmers association capable of mobilization materials and labour resources for irrigation systems construction and maintenance, allocating among the farmers and resolving conflicts arising from water sharing.

Pradhan (1989a & b) defines an organization as a group of people who seek to achieve a defined purpose through unified action. Different mechanisms evolve within the organization depending on the purpose for which the group has come together.

An irrigation organization come into existence to perform certain tasks for making the system work however the organizations may also degenerate and disorganize or change its role when change takes place in the resource endowment within the environment of the system. The intensity of the task that an irrigation organization performs is sensitive to the environmental factor, whether physical or socio-economic, influences how that task is performed by the organization. Farmer managed organizations are flexible, tailoring their methods for water acquisition, labor mobilization, water allocation and distribution to the needs of the farmers.

Gill (1993:31) uses the example of a typical Nepali farmer-initiated and farmer managed irrigation system to describe the interactions between farming systems and involving the interactions of numbers of farmer. According to him, in this institutional system the “processes” consist largely of formulation and enforcing regulations producers for selecting a governing body, regulations concerning access to the resource, measures for protecting the resource from outside incursion, rules governing contributions to repair and maintenance provisions for conflict resolution and so forth.

Parajuli (et al 2001) describes the institutional and organizational arrangement across irrigation systems ranging from single committee to main and branch committees depending on the management intensity in the system. River valley systems had two or three tiers of organization due to large command areas and also large numbers of users whereas hill irrigation also large numbers of users whereas hill irrigation systems had only a single tier organization.

Many studies have shown that most of the irrigation organizations evolved over a long period of time. In the words of Pradhan (1989 a :47) “Irrigation organization are like living organisms. The continually change in relation to the changing environment is not static, the irrigation organizations have to be dynamic to meet the challenges created by the socio-economic, physical, technological, political and demographic conditions.”

An irrigation organization has to perform a verity of functions ranging from water acquisition, allocation and distribution, conflict resolution and resource mobilization to daily operation. The types of irrigation tasks to be performed by each organization differ from system to system. In all cases one or more identifiable common problems keep the organization intact. These problems remind the irrigation of the need to work together and force them to make collective decision.

It is not necessary to have all these features present for an irrigation organization to function. The concept of community property has become the basis for organization in other sectors as well. “Forest” or “pasture land” in much community properly, the group must organize to preserve it and distribute benefits to the members of the community. This requires viable community based organization as has emerged is most FMIS.

1.8.5 Conceptual Framework

The FMIS of Ratna Nagar Municipality-9 & 10, Chitwan has helped to uplift the living standard of the people living there. It has brought a drastic change in the living standard of the people of that area after its implementation.

CHAPTER - II : PROFILE OF THE STUDY AREA

In this chapter a brief introduction of the study area is presented. It presents the physical setting, settlements, population, indigenous political system and economy of the study site.

2.1. Physical Setting

Panchkanya Nahar Irrigation System situated in Ratna Nagar Municipality-9 & 10, Chitwan, nearly 10 km east from Narayangarh. Located in Terai basin, its command area is almost plain. The main source of it is Panchnadi. The command area of this Nahar covers about 600 Hares. Among the command area about 10 percent of it is northward from the east - west main highway and remaining 90 percent is southward of the highway. So, it is easy to make trade, made a living primarily from agriculture. Most of the rain falls in the summer which lasts from June to September. In spring and autumn, the days remain while nights are cold.

2.2 Settlement Pattern

Agriculture affects the architecture and layout of the village. Since it is a municipality, the houses are made closely. The farming land is nearby the houses. And the agri-road is also made which helps in easy harvesting and transportation of the crops. In the most of the houses, cattle are domesticated and in few houses it is not. Some farmers follow the professional farming such as poultry farming, cash crops such as vegetable, fruits which helps them to earn the cash.

2.3 The Village Assembly

The village assembly meets at least twice a year in August and early December. The meeting of December is regarded as a main one. Besides these, two annual meetings, the assembly also can call other meetings when a situation demands it. The

meeting of August appoints the village workers on the rotational basis while meeting of December collects fines, audits village accounts and discusses village laws and rules.

2.3.1 Public Work Programmes

In Ratna Nagar Municipality-9 & 10, Chitwan, public work programmes include the construction and maintenance of roads/streets, irrigation canals, drinking water system and so forth. When a work has to be undertaken, the village chairman usually orders the heads of the households or female heads and if necessary all adults to participate. It includes fine for non-attending.

CHAPTER - III : DATA PRESENTATION AND ANALYSIS

A brief introduction irrigation system along with the indigenous organization of water users in the system is discussed in this chapter. Various activities related to irrigation system and management viz. water allocation and distribution, operation and maintenances, resource educational development are described here in this chapter.

3.1. Existance and Construction of Ratna Nagar Nahar Irrigation System

This irrigation system is managed and operated by the residents of Panchkanya Nahar WUA is situated in Ratna Nagar Municipality-9 & 10, Chitwan. The villagers use it for multipurpose in terms of agricultural activities to run water mills and as a source of drinking water.

Parajuli (2001:25) opines the irrigation technologies in FMIS do not entirely follow the standard engineering and agronomic design. Besides, these consideration, they are also strongly influenced by a number of other factors which are often social and cannot be planned. Thus, all the structures in this use designed and constructed irrigation system was of simple and indigenous technologies and locally available materials such as boulders, stones, branches of trees and wood. Nowadays, they also use the pipes. The households are responsible for the operation, minor repairs and is shared out among the households by irrigating their fields on a rotational basis.

This system has been rehabilitated at various times by the villagers using locally available materials and technology. However, in 20052 B.S. this irrigation system was rehabilitated with the assistance of District Irrigation Office, Surkhet. This rehabilitation work has changed old physical characteristics of the rehabilitation. One is substitution of capital for labour, i.e. use of external purchase of polythene pipes and cement for replacing the majority of hollowed out logs used as conduits. Second, the water repair and maintenance of the system. Table below shows the details about the rehabilitation work.

3.2. Population Composition

There were total 2200 households benefited from this irrigation system. Out of which only 30 households were taken. The distribution of the population of those households is given below:

Table No.1

Distribution of Population Caste Wise

S.N.	Caste	Households	Percentage
1	Brahamins/ Chhetris	5	16.66
2	Janjatis (Chaudhary and Mongolian)	23	76.67
3	Dalits	2	6.67
Total		30	100.00

Source: Field Survey, 2072

The above table shows that there is the dominance of the Chaudhary and Mongolian, collectively it is denoted as Janjatis, which consists of 76.67% of the total population of that very site. Similarly, the percentage of Bhramins and Chhetri are 6.67 percent.

3.3. Irrigation Coverage Facility

The land is fertile and many people depend on agriculture. The total land is about 600 Ha. (900 Bigha). In which all the seasonal crops such as peddy, maize, wheat and musturd seeds as well as Chaite Peddy and other vegetables such as potato, tomato, onion, capsicum, beans, cowly flower etc. are grown well. The facility of the irrigation of Panchkanya Nahar Irrigation System can be shown below.

Table No.2

Irrigation Coverage Facility

S.N.	Season	Irrigation coverage (In Hactres)
1.	Rainy Season	600
2.	Winter Season	400 - 450
3.	Spring	250 - 300

Source: Field Survey, 2072

The above table shows that the complete command area is irrigated during the rainy season because of the plenty of rain and the water source. In the winter season it decreases and comes down to 400 - 450 Ha. because of the downsizing of the resource. On the Spring Season (Chaita, Baishakh and Jeshtha) only 250 - 300 Ha. of the command area is irrigated. This very condition shows that the condition of the whole Nepal's irrigation system's problem.

3.4. Animal Husbandry

Animal husbandry is the science of taking care of domestic animals that are used primarily as food or product sources. In many places throughout the world, people are essentially specialists in animal husbandry to means of being farmers, ranchers, sheepherders, or anyone who takes care of a variety of animals. Anyone who takes care of domesticated animals, especially in large group, is practicing animal husbandry.

Animal husbandry also plays significant role irrigation the subsistence economy of village. Livestock are the integral part of the subsistence economy. The table below shows the situation of animal husbandry in Rata Tar Irrigation System.

Table No. 2

State of Animal Husbandry

S.N.	Livestock	Number of Livestock
1	Cows	157
2	Bullock	14
3	Buffalo	64
4	Goat	38
5	Pig	26
6	Poultry	7250
7	Duck	74
	Total	8147

Source: Field Survey, 2072

Buffaloes and cows are mainly kept for milk and dung for fertilizer. Similarly, the poultry, duck, he goat and pig are domesticated for the meat propose. The above table shows that there are the large numbers of farmers domesticating the poultry and cows. Farmers found to be following the poultry farming and cow farming from which they earn the cash on one one hand and the composted fertilizers for the crops and vegetable on the other hand. Oxen are mainly used for ploughing the fields. Here, the oxen are domisticated in a low number by the farmers because the tractor and triller have replaced oxen in terms of ploughing propose.

3.4.1. Occupational Status

Occupational is an act or process which occupies or engages the time and attention; the principle business of one's life; vocation employment; calling; trade. It is an act or process of occupying or taking occupation; actual occupation and control; the state of being occupied; a holding or keeping (Terence, 1972)

Nepal is an agricultural country and the majority of Nepalese are engaged in agricultural activities. However, the people of the village follow different types of occupations. The major occupations followed by the people can be shown as below:

Table No.3
Occupational Status

S.N.	Occupation	Number	Percentage
1	Agriculture	60	44.77
2	Service	15	11.19
3	Business	2	1.50
4	Agri Labour	2	1.50
5	Students	55	41.04
Total		134	100

Source: Field Survey, 2072

The table above shows that the primary occupation of the villagers is agriculture. About 44.77 percent of the population of the study area are engaged in agriculture. Similarly, 11.19 percent of the people engage in different services such as government service, teaching, health service etc. Very few percent of people engage in business and agri-labour which is 1.5 percent of each. Finally, 41.04 percent are students.

3.4.2 Production of Crops

Nepal can be divided into three ecological zones, namely: Terai (plain), Mid-hills and High hills. Terai is the main where cereal crops can be extensively grown. Because of the tropical and sub-tropical climate in the region, food crops, vegetables and fruits of tropical and sub-tropical nature are the main agricultural products. As we go higher we have mid-hills where different climates are available. For example, at the foot of hills the climate is sub-tropical whereas at the top of the hills it is temperate. Food crops at the foot and fruits as well as potato at the top of the hills are

the main crops in this region. High hills is a region where as snowy (alpine) climate is prevailing. Potatoes, temperate fruits, livestock (sheep and goat) are the main commodities of this area. So it is the ecology that creates a lot of differences in temperature and commodity and these create a possibility for crop diversification.

Crop diversification represents the growing of a variety of agricultural commodities that are commercially viable and locally acceptable. The farmers have limited land where he wants to grow everything possible for home consumption. Whatever may be the crop intensity, this type of approach is not commercially viable. These days the farmer has to be commercialized for sustained livelihood. Commodities having higher comparative advantage and higher marketability should be grown on a commercial basis. In order to encourage commercialization, the production pocket concept and farmers group approach as encouraged by the Agriculture Prospective Plan (APP) should be fully implemented.

Selecting the crops or commodities with higher comparative advantage and higher marketability and growing them on a commercial basis is defined as crop diversification. Commodities grown on hills can be off-seasons for terai. If this is the case, why not encourage hills farmers to grow these types, such as off-seasons vegetables?

We know hill farmers face many problems and constraints. They are simply on a subsistence level and hence they cannot talk of commercialization as such. They have to have a group attitude, production pocket approach, commercial outlook, and innovative ideas. Similarly, terai farmers have also several constraints of different nature. They have to change the existing agricultural system drastically. Before they change the system they should be changed mentally, meaning that they should develop the mentality of entrepreneurship and learn a trading mechanism, so that their agricultural system is guided by commercialization.

Considering this, crop diversification is defined as an instrument by which the farmer can grow the best profitable commodities on their land and earn money from it. For this, they should know which commodities are suited to their locality and earn more profit.

Rice, wheat and maize are the major crops of Nepal. Farming systems and crop production in Nepal vary across the agro-ecological zones. Physically, the country is divided into four ecological strata. The southern Terai Plain; the southern mountains ranges; the central hill complex; the northern great himalyas. Rice-based cropping systems, with wheat or maize as a secondary crop, are predominant in the Terai and middle hills, whears in the high mountains maize, millet, barley and buckwheat are cultivated. Tea, cardamom, ginger and coffee are the important cash crops of the middle hills; tropical/ subtropical fruits growing in kitchen gardens is practiced at all elevation (UNDP, 2007).

After the implementation of FMIS, production has been highly flourishing in the study area. Villagers mainly grow rice wheat and maize. The table shows the crop production of the study area.

The cropping intensity has increased by about 116% in F. Y 2069/70 (252.9%), 106% in FY: 2068/69 (242.4%), and about 73% in FY 2067/68 (209.4%) compared to Pre-project condition (FSR-2009 -136.5%). The crop coverage of spring crop depends on water in the river and scare of water in the drought condition. The cropping intensity has greatly increased due to timely irrigation water and sufficiency of water for crop use. The cropping area and cropping intensity before and after rehabilitation of the sub-project is given below.

Cropping area and cropping intensity before rehabilitation and current years

Crops	Pre-Project Condition		FY: 2067/68		FY: 2068/69		Current Condition (FY 2069/70)	
	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Summer Crops								
Paddy	35	41.2	65.0	76.5	76.0	89.4	78	91.8
Maize		0.0	15.0	17.6	5.0	5.9	3	3.5
Vegetables		0.0	3.0	3.5	3.0	3.5	4	4.7
Sub-Total	35	41.2	83.0	97.6	84	98.8	85	100

Crops	Pre-Project Condition		FY: 2067/68		FY: 2068/69		Current Condition (FY 2069/70)	
	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Winter Crops								
Wheat	32	37.6	32.0	37.6	38.0	44.7	35	41.2
Oil crops	8	9.4	10.0	11.8	10.0	11.8	10	11.8
Pulses	12	14.1	15.0	17.6	16.0	18.8	10	11.8
Potato	16	18.8	16.0	18.8	16.0	18.8	18	21.2
Vegetables	3	3.5	5.0	5.9	5.0	5.9	10	11.8
Sub-Total	71	83.5	78.0	91.8	85	100.0	83	97.6
Spring Crops								
Paddy		0.0						
Maize	10	11.8	15.0	17.6	30.0	35.3	40	47.1
Pulses		0.0	1.0	1.2	2.0	2.4	2	2.4
Vegetables		0.0	1.0	1.2	5.0	5.9	5	5.9
Sub-Total	10	11.8	17.0	20.0	37.0	43.5	47.0	55.3
Overall Total	116	136.5	178	209.4	206	242.4	215	252.9

Table No.4

Production of Crops

Crop Yields of Major Crops

Crops	Yield Data (Tons/ha)			
	Pre-Project	FY: 2067/68	FY: 2068/69	FY: 2069/70
Paddy	3.000	3.200	3.600	4.000
Maize	1.900	2.200	2.700	2.720
Wheat	1.700	2.100	2.700	3.060
Oil crops	0.660	0.650		0.830
Pulses	0.750	0.700		0.630
Potato	7.000	12.200	16.700	16.500
Vegetables	7.500	11.500	15.500	16.200

- Note: 1. * = Baseline Data as per “Feasibility Study Report”, 2008
 2. ** = Present Situation in given year as reported by Focal Person or DADO Official of respective District. - Field visit of TA-Team

3.4.3. Land Irrigable before FMIS in Ratna Nagar-9 & 10, Chitwan

As the survey was carried out in Ratna Nagar Municipality 9 & 10, most of the people admitted that very less amount of land was irrigated before. It was depended on the rain. But after the implementation of irrigation system, it brought a drastic change in the living standard of the farmers. The following table shows the responses of the villagers about the implementation of FMIS in the study area :

Table No. 5

Distribution of the Land Irrigable Before FMIS in Ratna Nagar

S.N.	Fuels	Number of Households	Percentage
1	Before FMIS	100 Bigha	11.00
2	After FMIS	800 Bigha	89.00
Total		900 Bigha	100

Source: Field Survey, 2072

Before the implementation of FMIS at Ratna Nagar, the irrigation was not effective and only less amount of land was irrigable that was only 11 percent but after the implementation of FMIS it has increase in 89 percent that shows a large number of people were getting the profit irrigation.

3.4.4 People's Participation in FMIS

Many people of Ratna Nagar Municipality 9 & 10 were directly and indirectly engaged in FMIS. This is the reasons why FMIS came into existence. As the survey was carried out, the people responded differently. Some of the people, however, admitted that they did not want to participate in FMIS. The following table shows about people's participation in FMIS.

Table No.6

Participation in FMIS

S.N.	FMIS Participation	Number of Households	Percentage
1	Direct	27	90.00
2	Indirect	03	10.00
Total		30	100

Source: Field Survey, 2072

The above table shows that most of the villagers were active and helped FMIS through physically or by providing money.

3.4.5. Attending the Meeting

In Ratna Nagar Municipality 9 & 10, only 30 households were surveyed and found that most of the householders actively attend the meeting. The following table presents the detail about the meeting.

Table No.7

Attending of the Meeting

S.N.	Attendance in the Meeting	Number of Households	Percentage
1	Regular	26	91.33
2	Irregular	04	8.66
Total		30	100

Source: Field Survey, 2072

The above table shows that only few people do not attend the meeting whose percentage is 8.66 percent whereas 91.33 percent of the villagers attended the meeting twice a year in general and whenever it is required.

3.4.6. Contribution from the People

FMIS is mainly operated by indigenous knowledge of the people of this area. The people have contributed a great deal of labour, cash and other requiring assistance.

Table No. 8

Contribution from the People

S.N.	Contribution	Number of Households	Percentage
1	Physical	25	83.33
2	Financial	05	16.66
Total		30	100

Source: Field Survey, 2072

As presented in the table above, contribution from people's side has been categorized into two groups as physical and financial contribution. The above table shows that there is very active physical contribution of 83.33 percent. On the other hand the people who are busy in other activities and can not contribute physically, contribute financial contribution which is 16.66 percent.

3.4.7. Monthly Income of the People

Almost all the households which were surveyed could be described as agricultural dependent family. Among the total population of 72.51 percent of the population is depending on agriculture. Monthly income of the people of the study area is shown below in table.

Table No.9

Monthly Income Distribution of the People

S.N.	Monthly Income	Number of Households	Percentage
1	Below Rs. 5,000	05	16.66
2	Rs.5,000 to 10,000	10	33.33
3	Rs. 10,000 above	15	50.00
Total		30	100

Source: Field Survey, 2072

The above table shows that 5 households (16.66 percent) have income less than Rs.5,000 per month whereas one third of the households earn Rs.5,000 to Rs. 10,000 per month and 50 percent of the household's monthly income is above Rs.10,000 per month.

3.4.8. Monthly Deposit

The WUA has its own account in Rastriya Banijya Bank, and Nepal Rastra Bank. All the official transactions are done through the bank transaction. On the other hand, the farmers of Ratna Nagar Municipality 9 & 10 have kept cattle and fowls. People sell milk in nearest dairy named Amrit Dugdha Utpadak Co-operative, Ratna Nagar and have good source of income. Along with cattle's milk, they sell fowls, crops and vegetables. Following the rapid growth in production, farmers began earning good income. All the households own at least some cultivatable land and grow crops with family labour and in some case exchanges labour. The following table provides the details about the deposit of money.

Table No.10

Monthly Money Deposit

S.N.	Monthly Deposit Amount (Per month)	Number of Households	Remarks
1	Less than Rs.1,000	30	in Co-operative (less or more but deposit is compulsory)
2	Rs. 1,000 to Rs. 10,000	8	both in co-operative and bank
3	More than Rs.10,000	5	both in co-operative and bank
4	No Deposit	0	
Total		30	Frequency based. Therefore total may not match.

Source: Field Survey, 2072

As the table shows that all the households deposit less or more amount from Rs. 100 to Rs. 1000 in the Co-operative named Janajagriti Co-operative, Ratna Municipality 9 & 10. It is almost compulsory to deposit the money no matter how much it is. This kind of amount depositing helps the farmers habit of saving. The saved amount can be withdrawn by them as per the requirement. They also can get the loan at a very nominal interest rate.

3.4.9. Children Studying in Government or Private Schools

People of Ratna Nagar are aware about the importance of education and send their children either government or private schools. The survey shows that maximum number of children study in private boarding schools. Furthermore, the percentage of children going to boarding schools and government schools is different. The following table shows the number and percentage of children going boarding and government schools in the study area.

Table No.11

Children Reading in Boarding and Government Schools

S.N.	School	Number of Children	Percentage
1	Private(Boarding Schools)	40	58.12
2	Government Schools	28	41.18
Total		68	100

Source: Field Survey, 2072

During the study period, the total population of children were found to be 68 in 66 households. Study reveals that 40 children were studying in boarding schools for good education and 28 children were studying in government schools. Above table also reveals that there are some boarding schools in the village.

Table No.12

Description of Irrigation Project

S.N.	Discription	Date
1	Start year	2032/33
2	Completed	2054
3	Handed over to Farmers	2054
Cost		
1	District Irrigation Office (Government and IMTP)	Rs.68,00,000
Command Area		
1	Command Area Initially	900 Ha.
2	Command Area Recently	600 Ha.

Source: Secretary of FMIS 2072

According to the informants, Giri Raj Mainali, Secretary of Panchkanya Nahar WUA, the irrigation system was initiated by the government in 2032/33 BS. It took a long time to complete and tend to be completed in 2054. The government spent Rs. 68,00,000 for its construction. The government had the aid of IMTP. After that it was transfered to the WUA with the committment that reamining 1 km. of Nahar would be completed by the government on the following year. Initially, it had 900 Ha. the of command area. But with the growing urbanization now it has only 600 Ha. of command area.

3.5. Rights to Irrigation water

Rights to irrigation water are closely tied to land rights. Changes in land rights often result in changes in rights to irrigation water. In general, two conditions have to be met to established and maintain rights to irrigation water in farmer managed

irrigation systems. First, investment of cash or labour for the original construction and second rights to land in the designated command area. In this irrigation system, rights to irrigation water was established by the households having land in the command area. And by contribution of labour for the construction and maintenance of the irrigation irrespective of land size irrigated but water sharing is based on rotational basis.

Since it is household as a unit and not individual who have water rights and land rights, all members of the household irrespective of generation have the rights to use a resource and get benefit from it. Exceptional households which are headed by women and occupational caste also have rights to use water.

3.6. Organization

Uprety (2005:45) holds the notion that an irrigation organization is formal if all core activities occur according to explicit, written and possibly legal requirements. But even though they are informal, i.e. based on implicit understanding and social sanction, these still exist in irrigation organization. This study reveals that there was no any formal canal users committee in the village. However, they have clearly defined user rights and physical conditions. As Thapa (1993) states in most instances, the formal indigenous institutes are "Councils" represented by all the permanently settled households of a village.

The councils promulgate the rules for the management of natural resources, usually by consensus. Often the councils may elect or nominate one or several of the households for specific periods (usually one year) to act as the "Enforcer" of rules meant for the management of natural resources. Similarly, as this irrigation system is being farmer managed and indigenous one, there was no any formal and specific irrigation organization. The village assembly is the multifaceted institution which is responsible for executing duties of the village and irrigation activities fall under the same domain.

Due to the lack of formal irrigation organization/committee, one chairman having the group of even members led the people. They were responsible for smooth functioning of irrigation system. Hence, they manage intake and discharge of water in the main canal and leakage checking from time to time; carry out maintenance work, in case of major problems, co-ordinate annual maintenance and desilting at the division and in the main canal.

The village assembly is normally held twice a year. However, unscheduled meetings are frequent. There is a fixed place where it has been holding meetings since many years. The decisions made by functionaries are conveyed to all the villagers.

For the purpose of water allocation and distribution beneficiary households within the command area were divided into four groups and further divided into eight groups, an unit. The village assembly holds a major meeting in December every year. One of the major purposes of this meeting is to conduct an official count of the households in the village. This event tries to ensure every group has approximately same size of land. Therefore, all groups get the equal chance of irrigation and access to irrigation water.

Therefore, formal irrigation organization, written rules and regulation for the harmonious management of irrigation system related activities have not come into practice and all the activities are done under the social norms and values that have existed from time in memorial. The social norms and values stamped in the local peoples mind related to irrigation management activities have been developed as a part of culture.

3.7. Water Allocation and Distribution

Water allocation means the entitlement to water from an irrigation system and the basis by which it is shared among the beneficiaries while the distribution means physical delivery of water to the fields as per the water allocation practice done in the system.

Farmers who have contributed labour and cash during the construction, operation and maintenance have equal water rights in the process of sharing and utilization water in the system. In the irrigation system, the process of water allocation and distribution among the farmers has been undertaken on the rotational basis which follows eight days' circle. Therefore, all the farmers in the command area have equal rights in the allocation and distribution of water but in practice this is shared according to the size of land they own within the command area.

3.8. Operation and Maintenance

Operation means continuous mobilization process of the system on the basis of technology, resources and the physical system whereas maintenance of irrigation system mainly includes the tasks of repairing and cleaning of the canal for regular and efficient water acquisition and distribution.

The system is originally user designed, constructed and maintained. The indigenous institution is responsible for overall operation and maintenance work. On behalf of the village assembly, one person was there to check operation and maintenance of the system.

The resources required for operation and maintenance take the form of labour and cash. Compulsory labour for repair and maintenance is the main input in the system. Villagers/users are required to work according to the decision of the indigenous village functionaries and established norms. Intake, main canal silt removal are important activities. These activities need to be carried out on a regular basis ever year. At present, major annual maintenance and cleaning is done in September and October. For this purpose, all household heads/women headed households eligible adults assemble in a fixed place of the command areas as informed by the security person (chaukidaar). Absentee is obliged to pay cash instead of the physical labour required. Canal maintenance work involves canal cleaning, rehabilitation of the damaged portion, repair of the diversion structure and replace or repair damaged wooden aqueducts and the leakages.

Repair and maintenance to the diversion is frequently required during the monsoon. Security person (chaukidarr) is responsible to carry out this sort of minor work. But if the damage is massive, villagers are asked to participate in the repair work.

3.9. Resource Mobilization

Labour, cash and other kinds of contribution are the common modes of local resources mobilization that can easily be observed in irrigation management and substantial development. The effective mobilization of these resources can develop the irrigation system and make it sustainable. Up off (1986 cited by Uprety 2000) notes that resource mobilization is the most visible organizational activity in irrigation management particularly for canal construction, maintenance and rehabilitation. Labour is the resource most extensively mobilized through money and materials are also important.

This irrigation system has the ability to mobilize resource for its smooth and sustainable operation. Resources mobilized in irrigation system includes labour resources mobilized for canal repair and maintenance of the canal and cash resources generated from village treasury from time to time for system improvement and rehabilitation. In addition, cash resources are also generated from fines and penalties which usually are much smaller.

Forest resources were used for making conduits, but during the major rehabilitation work, wooden logs were replaced by polythene pipes. Therefore, obviously more cash resources might be needed in future to maintain the system.

3.10. Decision Making

Decision making refers to the institutional management of the irrigation system on the basis of organizational values and norms. It is one of the most important key points by which the system is operated and maintained in a proper way.

As already mentioned in previous chapter, Ratna Nagar Nahar irrigation system did not have formal irrigation organization. Therefore, village assembly made all the decisions in which only household heads are eligible to participate.

At the meeting, all the participants are democratically given a chance to put forward their views on the problems and the issue is discussed for decision making. All the decisions and consensus are verbally made and regarded as the rules and regulation in the succeeding days. However, the tradition of keeping records of economic affairs and big disputes in written form also can be found.

3.11. Dispute Management

Dispute is a process in which conflicting and contradictory claims are made public and brought to the notice of a third party. It then, may be processed through various modes of dispute management.

Dhakal (1993) has opined that the existence of mutual understanding and cohesiveness among the water users were observed to be the conflict minimizing factors in the system. As the study revealed that in principle, disputes are to be resolved or settled locally through mutual understanding and consent.

Because of the incompleting Nahar of 1 km., that the government had given the words of commitment to complete it even after its transformation to WUA, there occurs problem in distribution of the water to the farmers' field. This brings the dispute. Sometimes, the farmers who are unable to get the irrigation facility even come to surround the houses of the committee members with anger. This very situation brings the dispute. However, such disputes have been resolved themselves.

CHAPTER - IV : SUMMARY, FINDINGS, CONCLUSION AND RECOMANDATION

4.1. Summary

Agriculture forms the mainstay of Nepali economy, which provides employment for eight percent active labour force of the country. The agricultural activities not only play an important role in the national economy but also have strong influence on the socio-culture life of the people. However, irrigation has proved to be one of the most important means of agricultural production in those areas where the rainfall is not adequate. Hence, irrigation is agricultural production.

Irrigation generally meant the application of water to use for the purpose of supplying the moisture essential for plant growth. Historically, civilization has followed the development of irrigation it is an old art. Irrigation is made possible through the use of irrigation system to direct and use water in order to support plant growth and transfer of bio mass production.

Water is one of the primary resources of Nepal. The Nepali farmers have recognized the value of water resources for centuries with their own initiatives and have been constructing irrigation infrastructures themselves to intensify their agricultural production. Irrigation development in the country remained in the hands of the people for many years. This tradition gave birth to the farmer managed irrigation system scattered all over the country.

The history of the system dates back to the start of human settlement in the site. This system has been vital for villagers' subsistences as their main occupation is agriculture. Inhabitants of Ratna Nagar Municipality 9 & 10 have constructed this irrigation system using their own initiative knowledge, technology and resources.

Ratna Nagar Nahar WUA has its own traditional irrigation system through which villagers perform their collective work including irrigation activities. The village assembly holds its annual meeting twice a year. Meeting appoints the village workers who are solely responsible for day operation and maintenance and operation of the irrigation system. However, all the users continue labour and material as need

for repair, maintenance and operation of the system. Fines and penalties, as decided by the others users, are imposed on those who fail to make necessary contribution when needed.

Existence of formal water users group is not a pre-requisite for efficient operation and management of irrigation system. In this irrigation system, farmers take the responsibility for water acquisition, allocation and distribution and the overall management of the system on a continuous basis. Any external assistance to irrigation is occasional as specific needs arise.

4.2. Findings

After the completion of a case study of Panchkanya Nahar WUA, the following findings were found:

- The FMIS has fully helped to grow both the seasonal and non-seasonal crops, vegetables, fruits. Not only that this has indirectly helped to conduct other agro-based activities such as poultry farming, cow farming, buffaloes farming, fishery etc.
- The FMIS has increased productivity and production of the crops. On the other hand it has increased the sense of co-operation, and gaining the collective goal collectively.
- Most of the people of the selected area follow the agriculture as their main occupation which is possible only through the plenty of irrigation service. This very service is made easy by the FMIS.
- After the implementation of FMIS, farmer began to grow the inter-crop farming.
- The implementation of FMIS has led the irrigation facility from 11 percent to 89 percent which means that large number of people are benefited from it.
- It has increased the self participation and decision making capability of the local level of people.

- The Co-operative formed by the local people have promoted the level of knowledge of the local people. Each member of that area can now introduce themselves without any hesitation.
- It has increased the income level of the local level of people.
- The earning made through the irrigation facility and agricultural activities has promoted the living standard of the people. This very earning is deposited in their co-operatives. This deposited amount helps them in future days.
- Because of the income made by the agricultural activities with the help of easy irrigation system of FMIS, the people are now able to give their children a quality of education in private schools and college.
- The farming area has been found to be decreasing from 900 Ha. to 600 Ha. because of the unmanaged urbanization.
- The system is originally user designed, constructed and maintained by the people so that the government load has found to be less regarding to that specific location.
- Local level of unskilled and semi-skilled males and female people are found to be engaged in agricultural activities.
- This irrigation system has the ability to mobilize resource for its smooth and sustainable operation.
- Because of the unbalanced infrastructure development and distribution of water , sometimes there occurs the dispute.

4.3. Conclusion

Since long ago, people of the hilly regions in Nepal have been managing and promoting the FMIS in their localities with the indigenous knowledge, methods and practices. This study was initiated with the aim to understand and describe the farmers organization and operational activities of irrigation system. As describe in this study, the ancient and indigenous systems are still used by the farmers and proved to be more reliable than the new systems that have been introduced more recently.

The study site is far from the market. The agriculture is only the main occupation and source of earning. The villagers, therefore, have been compelled to use their own initiative, knowledge and resource for construction, smooth operation and maintenance of irrigation system. This is completely operated by the local farmers based on indigenous practices and rules.

Contribution of existing institutional arrangement for allocation and distribution of irrigation water by employing security man has contributed to enforcement of rules for allocation and distribution of water. Social cohesiveness and homogenous culture and tradition have contributed to maintain the conflict free irrigation activities.

The FMIS shall need support for modern section improvement to match the changed environment. However, support should be cost effective and essential. This should be directed towards strengthening the existing farmer organizations and improving the performance of the system.

Indiscriminate interventions would erode the self help attitude of the farmers and increase the dependency syndrome. Irrigation systems are complex socio-technical units and development activities have directly and indirectly affected the status of this system. However, change and invention of technology and materials have increased the maintenance costs. This had implication for the sustenance of irrigation systems.

Finally, researcher fully agrees the vinding's (1994) opinion the political organization at the village level is strong in Ratna Nagar, because the fields in the areas are irrigated and the construction, maintenance and operation of the irrigation system require strong political institutions. This continues the sustainability and proper management of the system. However, in the changing context of contemporary Nepal and specially increasing trend of irrigation of people from village for sustainable operation and maintenance of the irrigation system, the voices of women and Dalit castes to be addressed appropriately. They should have chance to participate in decision making process. As this is an indigenous one, it can be hoped that missing elements will be incorporated in due course.

4.4. Recommendations & Suggestions

Ratna Nagar Nahar irrigation system is built by the GoN, transferred to the WUA, operated and sustained by the WUA members of Ratna Nagar Nahar WUA in their own way. Since the local people involved, organized and managed this irrigation system possessing valuable skills and technology as the indigenous designers, planners and implementers. The villagers have taken the irrigation system and the management activities as part of their culture developed in due course of livelihood in the physically difficult and resource scarce local setting. Based on this study, the following recommendations/suggestions are made for consideration.

- a. The government cannot continue to build the bureaucratically managed and operated irrigations systems in all areas. Because of high cost and the lack of trained manpower, a more feasible alternative should be made for strengthening existing irrigation system through a set of supportive plans and policies.
- b. The government should complete the Nahar (1 km remaining) which was incomplete at the time of transfer to the WUA with the agreement that government would make it complete. Because of the incomplete Nahar, there is very difficult in distribution of the water. Sometimes, the people even come to surround the house of the committee members that brings dispute.
- c. The traditional irrigation system exists in the local settlement and villages cannot be ignored in order to get efficient management of natural resources including irrigation systems. Therefore, the political leaders, planners, policy makers should observe, analyze and from rational and sound measures in this respect.
- d. Farmers' knowledge and organizational skills can facilitate the creation of effective farmer organizations (formal or informal) for irrigation management. These should be taken into consideration during the designing and implementing rehabilitation as well as new irrigation projects.
- e. The existing institution has been weakened after intervention. This is where more attention should be placed in order to make the system operational and sustainable.

- f. The technological change from local and labour intensive and capital-intensive introduced in the system requires strong institutional and organizational arrangement which is capable of mobilization of financial resources.
- g. The government should make some encouraging programmes to promote such irrigation system so that the farmers get motivated to this sector.
- h. The government should apply the motivational and provide the soft loan to retain the local manpower in the agriculture sector of rural area for the rural development which finally adds breaks in national economy development.

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APPENDIX I

QUESTIONNAIRE BASED ON FUMES

Name :.....

Age :

Gender :.....

Religion :

Cast :.....

Occupation :

Education :.....

Q.N.1. How much land do you hold for Agricultural activities ?

S.N.	Types of Land	Area	Remarks
1	Irrigable Land		
2	Unirrigable Land		

Q.N.2 What do you grow in your land ?

S.N.	Grain/Crop/Vegetables	Quantities	Remarks
1	Barley		
2	Wheat		
3	Maize		
4	Potato		
5	Bean		
6	Rice		
7	Garlic		
8	Other vegetables		

Q.N.3. How many families are involved in FMIS of Ratna Nagar Municipality?

.....

Q.N.4. What type of life stock do you have ?

S.N.	Types of life stock	Number	Remarks
1	Cow		
2	Oxen		
3	Goat		
4	Buffalo		
5	Horse		
6	Other (Specify)		

Q.N.5. What is the main source of family income ?

- a. Agriculture
- b. Trade
- c. Service
- d. Other (specify)

Q.N.6. Can nyou support your family with your own agricultural Production for whole year ?

- a. Yes
- b. No

Q.N.7. What is the main source of energy ?

- a. Firewood
- b. Electricity
- c. Other(Specify)

Q.N.8. How much land was irrigated before the implementation of FMIS?

- a. Less
- b. Very less
- c. More than now days

Participation of Local Organization

1. Is there any help given by organizations?
 - a. Yes
 - b. No
2. What do you think, all of the people of this ara are involved in FMIS or not ?
 - a. Yes
 - b. No
3. Do the people help economically or Physically in this FMIS ?
 - a. Yes
 - b. No
4. What type of duties and responsibilities do you perform in Irrigation System management as a member ?

.....
5. Is there any provision for general body meeting ?
 - a. Yes
 - b. No
6. Have you ever attended the general meeting ?
 - a. Yes
 - b. No
7. If yes how many times in year do you attend the meeting?

.....
8. If No, why did you not attended the meeting?

.....
9. What types of resources do you contribute for operation and maintenances of the system ?
 - a. Labour
 - b. Cash
 - c. Others
10. What do you think, the present Irrigation system is working perfectly or not ?
 - a. Yes
 - b. No

Livivng Standard

1. Has your income increased after FMIS in this area ?
 - a. Yes
 - b. No
2. Do people find difficulty to meet their needs ?
 - a. Yes
 - b. No
3. How much is the monthly income ?
 - a. Below 5,000
 - b. 5000-10,000
 - c. 10,000-15,000

- d. 15,000 above
4. How much are you saving the bank ?
a. Bellow 1,000 b. 1,000-3,000 c. 3,000 above
5. Where are your children reading ?
a. Government school b. boarding school c. nowhere
6. Are your children going to government school ?
a. Yes b. No
7. How much are you spending for your children's yearly education ?
a. 500-1,000 b. 1,000-1,500 c. 1,500-2,000 d. 2,000 above
8. How much money do you earn by selling vegetables ?
a. Below 1,000 b. 1,000-2,000 c. 2,000-3,000

d. 3,000 above
9. Are you getting facilities to sell your vegetables in the market ?
a. Yes b. No
10. How is the condition of your family after this FMIS ?
a. Poor b. Good c. Best