CHAPTER - ONE

INTRODUCTION

1.0 Background

Nepal is a small landlocked agricultural country, shares 0.03 percent of the world land area and 0.3 percent of in the Asia, wedged between two neighboring economic power, India and China. The country lies between 26^0 22' to 30^0 27' north latitude and 80^0 4' to 88^0 12' east longitude. Geographically, the country is divided into three ecological zones, mainly Mountain, Hill and Terai. The total area of Nepal 147,181 Square Kilometers has been distributed ecologically as 35.2 percent in Mountain, 41.7 percent in Hill and 23.1 percent in Terai. According to census 2001, the total population of Nepal was 23,151,423 where 11,563,921 (49.95%) were males and 11,587,502 (50.05%) were females. Regarding the population distribution, 7.29 percent people live in Mountain, 44.28 percent in the Hill and remaining 48.43 percent in the Terai *(EKTA SCHOOL ATLAS, 2006).*

Nepal is one of the poorest countries in the world where 31 percent people live below poverty line and the average annual per-capita income is $360, which is substantially poor than the other countries in the south Asia *(Economic survey, 2006/07).* The economic parameters reveal that economic situation is fragile and vulnerable. The economic growth rate of Nepal is 2.5 percent where the agriculture sector contributes 0.7 percent and non-agriculture sector 3.6 percent. Agriculture sector contributes 36 percent of total GDP. Similarly the employment growth rate is 3.0 percent, women receiving maternity services from health workers is 23.4 percent, total fertility rate of women aged between 15 to 49 is 3.1 percent, maternal morality rate per 100,000 is 281, literacy rate above 15 years is 54.1 percent and other indicators show the dismal performance of the country *(Economic survey 2006/07).*

Agricultural works mainly depends on the vagaries of weather; about 68 percent of the people are dependent on agriculture for their income and employment. Agriculture sector was given top priority in the planning documents in the past considering the fact that the sustainable economic development was not possible without the development of agriculture sector *(Economic survey, 2006/07).* Having vibrant role in the country's economy the agriculture sector is still suffering from a

number of problems such as lack of knowledge to use input, lack of irrigation facility, poor productivity, traditional methods of cultivation and so forth.

Ecologically, Nepal is divided into three regions: The Mountain, Hill and Terai. The mountain region is less important for the agricultural production. Because of its high agricultural structure and fragile climate condition, about 2 percent of land area is suitable for cultivation and it is the most sparely populated region accommodated with 7.3 percent population. Comparing the mountain region, the Hilly region is suitable for cultivation accommodated with 46 percent population. Similarly the Terai region has significantly high agriculture production area. About 40 percent of its land area is suitable for cultivation accommodated with 47 percent population (CBS 1999). In Nepal, duration of monsoon is short. It starts from June and lasts up to September. The country's precipitation record shows that it is irregular in different part of the country. In this context surface irrigation is necessary for the cultivation of crops like paddy, maize etc. which are commonly being cultivated in all parts of the country. In this context it has been estimated that from the country's total land area (147,181 Sq. K.m) only about 20 percent is feasible for irrigation (Prachanda Pradhan and R Yoder, 1990).

Nepal has about 6000 rivers is the second richest country in the world possessing about 2.27 percent of water. But lack of well knowledge, practices and experiences the water resources is not properly utilized as natural resources in Nepal *(Nepal in Figure, 1999).* Only 11,68,144 hectares of land has been provided with irrigation facility so far in which the FMIS possesses about 70 percent of irrigated land *(Economic Survey , 2006/07)*. The Nepalese government cannot continue to construct manage and operate irrigation system in all extremely mountainous terrines because of irrigation canal construction and the lack of trained man power. A more feasible alternative would be to strengthen existing indigenous irrigation system through a set of supportive plans and policies sacking local people participation. The farmers were sustaining the farmers' irrigation system without support from the center in part.

Out of the total agricultural area of 1, 47, 18,100 hectares, the land suitable for arable agriculture is estimated to be about 26, 41,000 hectares of this land in Nepal. The potential irrigable area under surface and ground water sources is about 1,766,000 hectare. Owing to the rugged topography and landform with limited irrigable area and need for enhancing agricultural production to meet the food demand

of the growing population, the government has been making conscious effort in the development of irrigation infrastructure, which is a prerequisite to agricultural productivity enhancement *(Three year Interim Plan, 2007).*

In this concern Baidya (1965) stated that, "today irrigation is practiced in all part of the world. In arid region farming would not be possible without irrigation. Even in humid and sub humid region irrigation is essential to grow profitable crops of paddy and corn. A good source of irrigation serves as a stand by measure against probable or occasional drought in these areas. Growing of vegetable near town or supplying of vegetables to these areas is made possible and profitable only when good irrigation facility is available." In the field of agriculture, the surface irrigation is most important input for increasing agricultural output in comparison to sprinkler and drip irrigation method.

Parajuli (2001) in "Challenges to Farmer Managed Irrigation System", Paper presentation on "Irrigation Technology: Design Principle and system operation" has stated about the striking difference in design principles of irrigation infrastructure between FMISs, and AMISs. The difference is shown in the table hereunder:

Table 1.1

Difference in Design Principles of Irrigation Infrastructure Between FMISs, and AMISs.

Design Principles of Irrigation Infrastructure	FMISs	AMISs
i. Operation Objective	i. Simplicity Transparency, equality, flexibility	i. Flexibility
ii. Irrigation duty	ii. Technical and social requirements	ii.Technical requirement
iii. Functions	iii. Hydraulic and Managerial	iii. Hydraulic

The farmer management irrigation system is one of the oldest and successful irrigation systems in Nepal. In this system people living in a particular locality utilize water resources available in the locality for irrigation purposes. People also united for the purpose of canalizing water resources to irrigate their land. Moreover, farmers are responsible for overall management activities including water acquisition from the source, allocation and distribution of water, operation and maintenance of canal in the

system and collection of irrigation fees from the beneficiaries, decision making, conflict resolution etc. Also, the FMIS is comparatively small, seasonal, temporary in structure, often informal and feudal organizations are also some more characteristics of FMIS. In the agency managed irrigation system, the agency has the responsibility of constructing, operating and maintaining the irrigation system and its activities. In the AMIS, public officers are assigned many of the management tasks with varying level of farmer participation. The main attractions of the AMIS are: the huge amount of money, advanced technology and bureaucratically designed and financed and having minimum responsibility on the part of the water users to maintain system.

1.1 Statement of the Problem

Since long time the farmers of Nepal have been constructing irrigation systems at their own initiation. They design, construct and manage by themselves. Such irrigation systems constructed by mobilizing traditional style of local indigenous organizations. In view of the management aspect of the irrigation system, the system may be categorically called the Farmer Managed Irrigation system (FMIS). In addition to these indigenous irrigation practices there are some other irrigation projects which are designed, constructed and managed by government agencies. They are financed by the government and run by the bureaucratic administrative machineries of the state. Taking into consideration the management aspects, these systems have been termed as Agency Managed Irrigation System (AMIS). The main attraction of the AMIS, are the huge amount of money, advanced technology, and bureaucratically designed administrative set up and especially the minimum responsibility on the part of the water users to maintain the system. Although, the government of Nepal had handled a huge amount of budget, the result is still quite desperate. It has been found that a distinctive feature of such bureaucratically managed irrigation system is the separation of responsibility between the water personnel and water users. The degree of interaction of the water authorities or irrigation personnel with the water users is found very poor. The absence of peoples' participation in the system management has rescued in the poor performance of the system itself.

It has been recently realized that only the construction and bureaucratic administration of the irrigation project may not pave the way to the sustainable development of irrigation in this country.

Water use conflicts have been one of the common features of irrigation system of Nepal. It is because a limited amount of water has to be distributed among many members with different requirements. This requires better co-operation and participation of the members in all aspects of system. Lack of co-operation in the operation and maintenance, and water use activities generally result in conflict among different members of the system.

Any irrigation management projects intend to increase the institutional capabilities of farmers and concerned agency personnel to develop and sustain effective, equitable and reliable management practices in irrigation system of Nepal. Water conflicts and their resolution are important aspects of irrigation management.

In the Hill FMISs human resource mobilization based practice is more dominant than the cash contribution for operation and maintenance. Changing expectation and changing role for men and women, conflict, poverty and livelihood security and market and price uncertainty are some problems of farmers who involved in FMISs. FMISs must survive within and how system can involve in this complexity and how the needs of the FMISs are voiced, are the genuine questions bagged with the problems of FMIS. For most FMISs, staying functional and profitable is more important than being efficient and intensive. Rules and regulations developed for the management of the Hill FMISs are being practiced in the verbal way that are recognized as the customary law flourished in the local socio- economic and cultural and environmental setting.

In the Hill Irrigation system, the FMISs have been acknowledged on the socio-economic ground having the objective to fulfill the food requirement of the local people for livelihood. The FMISs provide empirical insights of the user's group on sustainable irrigation development. In FMISs, the local human resource, local tools and technology, strategy of natural resources management system, collective indigenous knowledge, experience, skill and attitude of the people and their initiation and participation on the process of resources exploitation appear to be more sustainable.

Excessive erosion and landslide of the canal banks and uphill slopes is also a problem of Hill FMIS. Sediment deposition problem in the irrigation system of Nepal is also a considerable matter. Sediment is the byproduct of erosion.

Conflicts on water distribution of FMIS are:

i. Users of the head section of the FMIS believed that they had senior right to use water.
ii. Users of the tail section have inverted more efforts so wanted equal right to use water.
iii. Users of the other canals and water turbines claimed that they should also get water equally.
iv. Not sufficient water in the peak season at the source.
v. Political leader and elite took water whenever they needed.

Conflicts on the management of FMIS are:

i. No regular operation and maintenance of the system, this resulted into insufficient use of water.
ii. Voice of tenants and poor farmers is suppressed.
iii. Conflict due to the political interference, power dynamics (exercise) and distorted social relation are also the burning problems of FMISs.

Social cohesiveness is maintained in the conflict less environment. Operation and maintenance works of the system are done with the available tools, technology, and resources. Thus, the system based on the basis of long time, trial and error methods developed by the beneficiaries of the multi-ethnic groups with their integrated indigenous knowledge and practice has been successful.

Mainly water stealing, turn overlapping, population pressure and other conflicting issues are the pertinent example of the hindering factor of irrigation system. How the difficulties are managed, whether the farmers are really benefited or not through the irrigation system; considering the income and production, and in what level does the FMIS in Baglung Municipality ward No- 5 success to increase the productivity and to examine the problems faced by the farmers of the command area are some issues undergoing in this research paper.

1.2 Objectives of the Study

The general objectives of the study is to examine the impacts of FMIS of Mulpani-5 by showing changes in socio and economic characteristics of water users farmers and changing in the cropping pattern and agricultural productivity after the FMIS.

The specific objectives of this study are:

1. To analyze the changes on the cropping pattern and crops productivity brought by the development of the irrigation system.
2. To analyzed the farmers' participation in water management system in the command area.
3. To examine the problems faced by the farmer in the area with reference to agriculture productivity and canal management system and to suggest some useful measures to resolve the seen problems.

1.3 Limitation of the Study

This system is limited to FMIS to a small area of Baglung Municipality ward no -5, covering 45 hectares of cultivated land . Moreover, the study is limited to the economic impact of FMIS by showing changes in economic characteristics of water users' farmers and changing in the cropping pattern and productivity after the FMIS. Similarly, the study is limited to look over the maintenance and operation system of the canal and water distribution of the study area. Therefore, finding of the study may not be generalized to the system of other irrigation projects in the country. Scope of this study may not extend to look over the physical capacity and engineering aspect of the canal.

CHAPTER - TWO
REVIEW OF LITERATURE

The main objectives of review of literature are identifying variables relevant for research, avoidance of repetition, synthesis of prior works and determining meaning and relationship among variables. The main reason for a review of literature in the part is to know the outcome of those investigations in areas where similar concepts and methodologies had been used successfully. Further, an extensive or even expansive process of such review may offer vital links with the various trends and phases in the researcher in one's area of specification, familiarizing with the characteristics precepts, concepts and interpretations, with the special terminology, with the rational for under taking one's proposed investigation. A review of previous related research will help the research to formulate a satisfactory structure for his/her research.

Some findings of the related works on the farmer managed irrigation system, which may have significant role in this study, have been summarized here. An attempt is made to review the findings of FMIS along with the definition of irrigation, historical development of irrigation system, plan and policies of irrigation system.

2.0 Irrigation System Defined and Types

Hiller (1987) defines Irrigation is the supply of water to agricultural crops by artificial means, designed to permit farming in arid regions and to offset drought in semi arid or semi humid regions. Irrigation is the artificial application of water to soil for the purpose of crops production. Michael (1997) stated that Irrigation water is supplied to supplement the water available from rainfall and the contribution to the soil moisture from ground water.

Types of Irrigation: Irrigation has the following types as described:

1. Flow Irrigation: Flow irrigation is a type of irrigation in which the supply of irrigation water available is at such a level that it is conveyed on to the land by the gravity flow. Flow irrigation may further be divided into two classes: - i) Perennial Irrigation: - In perennial irrigation system, the water required for irrigation is supplied in accordance with the crop requirements through one cropping period. ii) Inundating irrigation: - Inundating irrigation is carried out

by deep flooding and through saturation of the land to be cultivated which is then drained off prior to the planning to the crop.

Pumnima and Pande (1990) stated that depending up on the source from which the water is drawn, flow irrigation can be further sub divided into three types:

a) Direct irrigation or River canal irrigation: In this irrigation system, water is directly diverted to the canal without attempting to store the water. For such a system, a low diversion weir or diversion barrage is constructed across the river.

b) Storage irrigation or tank irrigation: - In this irrigation system, a solid barrier, such as a dam or a storage weir is constructed across the river and water is stored in the reservoir or lake so formed.

2. Lift irrigation: Lift irrigation is practiced when the water supply is at too low level to run by gravitation on to the land. In such a circumstances water is lifted up by mechanical means.

2.1 Historical Overview of Irrigation Development

So, as the historical background of the irrigation in the world is concerned, the Egyptian had used water from the Nile River to irrigate the field during the 5000 B.C. Similarly, the ancient Babylonians developed a flushing cultivation with irrigation as input. They used the irrigation system before the 2200 BC (Encyclopedia, 1943 - 1973).

The Raja of Mysore in India had constructed an enormous dam across the Cavery River in about 1700 A.D and diverted the water of river in to his kingdom. Likewise many proofs were found that irrigation had been practiced in Egypt, Iraq, India, Philippines and other part of the world for the last several thousands years . The practiced of irrigation management system in china was known to have had irrigation before 2200 BC, Famous Chinese irrigation works Tu-kian dam was built about 200 BC which used to provide water for about 200,000 hectares of land. (Benton, 1977)

Little is known about the evolution of irrigation agriculture in Nepal. Irrigation development probably started as early as the first agriculture settlement. Many authors agree that the history of irrigation development in the hill valley of Nepal dates back centuries. Some of them represent the world's oldest irrigation system built and operated by farmers (IIMI, 1991). Historically, irrigation development in Nepal has fallen under the domain of religious trusts, individual initiatives or community efforts.

Some ancient irrigation system and their institutions are still working in the hills. Farmers customary and religion laws for water use were first recognized during the Lichhabi dynasty (464-782). Since then, the legal tradition and local administrative structure have permitted FMIS to operate without interference from an irrigation agency or other administrative unit. The Malla kings (782-1768), however made, repair and maintenance of the irrigation canal by their respective users' mandatory ones every years. Non compliance with this rule was punishable by the state agencies. Water use in to the service area was regulated turn by turn.

The Shah Dynasty's rule had also emphasized the importance of irrigation water. In the 16th century, Ram Shah, the king of Gorkha from 1549 to 1606, ordered the construction of irrigation canals and wells in his kingdom (Adhikari, 1982). The used for rural institutions to maintain and oversee the distribution of irrigation water seems to have been felt even during that era when local Panchayet were empowered to oversee these matters. Today those irrigation systems are commonly known as "Raj kulo" in the Katmandu valley and western hill of Nepal. Except for those Raj kulo, public sector irrigation development in Nepal did not have a long history. (Poudel, 1996; cited by Rabi Paudel, 2000)

The first national legal code in the unified Nepal was the Muluki Ain of 1853(Pradhan, 1994). Some customary or tradition laws relating to water rights were incorporated in to Mulukin Ain. According to provisions of Muluki Ain, irrigation construction canal were granted right-of-way. New canals could be constructed upstream of existing ones only if the water supply to the latter would not be reduced; water rights were secured to the prior investor and prior rights were granted to the upstream canals. Irrigation water could not be withheld from their lands that were irrigated first. The Muluki Ain also incorporated some of the resources mobilization obligations and property rights into its legal framework that were followed at local level. It also recognized the traditional customary level and water rights provision developed and practiced by farmers in their irrigation systems. It also described the conditions under which government agencies might assist in the repair and maintenance of farmers managed irrigation system, as well as the rights and obligations that the farmers-landowners within the government assisted irrigation system.

The Chandra Nahar, Constructed in Saptari district in 1923, was the first irrigation scheme built by government of Nepal. As a result of growing government

interest in irrigation development, an agriculture council was established in 1926 to administer Nepal's irrigation activities. Next, the Juddha Nahar of Sarlahi district began its operation in 1945 as the second government built irrigation system in Nepal. The ruler's at that time were, however, interested in constructing the canals as a way of collecting state revenues by applying a water tax to the irrigation farmers. The state had developed rules to collect irrigation fee from each farmer who owned land within the irrigated area of government constructed and managed irrigation systems. The amount of irrigation fee collected was fixed on the basis of land size within the service area. (Paudel, 2000)

One most important example of farmer-managed irrigation system is Chhattis Mauja. Before 150 years, the permission of construction of canal was given to Jetha Tharu from the Tinau River in Butwal and linked with Kumari village. Then the Chhattis Mauja irrigation system came in to existance as large sized FMIS which was designed to serve Chhattis Mauja or villagers and it is also called “Kumari Irrigation System”, it served the Kumari village in the beginning. The water users were participated in the decision making process concerning the water management. If some mistakes were done by the users, they would have given punishment in cash and kind to maintain irrigation system properly .In the farmer managed irrigation system the farmers had to work to acquire and distribute water themselves in the agriculture production. Beneficiaries of the Chhattis Mauja Irrigation System were expected to provide labors to operate and maintain irrigation system. The water was allocation and supplied according to the demand of the farmers or users. Conflicts occurred in the system were solved through the democratic way (Ibid, 1992, cited by pun, 2000; 29).

Immediately after democracy began in 1950 (2007 B.S.), the Irrigation Department replaced the Agriculture Council in 1952 (Shukla and Sharma 1994).The Irrigation Department was also organized into the Department of Irrigation, Hydrology and Meteorology(DIHM). At that time, the Ministry of Panchayat and Local Development, Farm Irrigation and Water Utilization Division (FIWUD) of the Department of Agriculture (DOA), the Water and Energy Commission Secretariat (WECS) and the Agriculture Development Bank of Nepal (ADB/N) were also involved in irrigation development. Despite the high priority and enormous investment in public sector irrigation developments many large scale irrigation projects in developing countries have not been suitable. The same problems can also

be seen in many Agency Managed Irrigation Systems in Nepal (Poudel et. al. 1994; Gill 1994; Shukla et.al. 1995). Farmer Managed Irrigation Systems have generally proven to be more effective in terms of their management and performance than AMIS's (Acharya et.al. 1995; IMC 1989). Because of this the government of Nepal has now developed the policy of turning AMIS over to FMIS or to join management between the agency and WUA, depending upon the size and nature of the systems.

In 2013 B.S. planned development of irrigation works began with the start of the planned economic development of the country. Though, the government had recognized the importance of irrigation for increasing agricultural production at there stages, the country did not have adequate technical manpower and financial resources to implement large scale irrigation works. Consequently only a few medium sized irrigation systems were accomplished during first five year plan, 2013-2018 B.S. (NPC, 2013/18).

Government approaches and policies for irrigation development introduce major changes beginning with the Seventh Five year development plan (1985-1990), which emphasized people's participation in irrigation development and management. In 1988, the government introduced the working policy on irrigation development for the fulfillment of basic needs. These documents encouraged farmer participation at all level of irrigation development from project identification, design, and construction to operation and maintenance of irrigation schemes. The Eighth Five year development plan (1992-1996) also further emphasized users' participation from inception to operation and management of the irrigation schemes, use of local technology and materials, and private sector involvement in irrigation development. The government's policy on peoples' participation in irrigation development has also continued in the Tenth Five year plan (2002-2007) and also continued in the ongoing three year interim plan (2007-2010). The irrigation development accomplished towards the end of the Tenth plan has been in total 1,194,628 hectares as stated here under:

Table 2.1

Irrigated Area Under Two Systems by the End of the Tenth Plan

S.N.	Program /Projects	Total Irrigation from by the end of the 10^{th} plan (ha)
1.	With the initiative of Government Agencies:	
	a) Surface Irrigation Development	654,749
	b) Ground water irrigation Development	253, 292
2.	Farmer Managed Irrigation System	286, 637
	Total	1,194,678

Source: National Planning Commission, 2007

2.2 Previous Studies

Sapkota (1997), reports in his study on "People's Participation in Irrigation in Dhaulagiri Zone" the Dhaulagiri Irrigation Development Projects assisted participatory irrigation system improve the quality and quantity of irrigation water and yielded positive impacts on the agriculture system and livelihood of the people. In order to sustain the implemented infrastructure, people's participation was received not only as involving farmers in construction and rehabilitation of irrigation schemes, but also primarily to develop institution, financial and administrative unit which a community needed to operate and maintain an irrigation system vis-à-vis the old approach of governments program i.e. all the decisions regarding the irrigation projects were taken by government staffs and villagers were made to participate as wage labor and / or "Sponsored participants ".

Dhungana (1996), has made a study on "Irrigation System Activities and their impact on Agriculture Practices." The study concluded that the participatory approach in irrigation system management, laid equal opportunities to be involved in decision making, which made the decision well acceptable to all the member of the system. This, in turn, provides the organization with better communication channels and capabilities of resolving the conflicts more promptly. He further stated that irrigation system performance does have its impacts on the agricultural practice and thereby yields of the various crops in the system of command area.

Tamang (2003), has done research on "Farmer Managed Irrigation System of Changunarayan VDC" and concluded that the socio economic life of people in the

area had been positive influenced from FMIS. The hindrances of FMIS were as water stealing, turn overlapping, population pressure, canal encroachment etc. Despite numerous hindrances, the farmers were using the water for irrigation purpose. The head users of the study area were more benefited as compared to middle and tail. However, through irrigation system the farmer were able to receive cash earning from crops production. Tamang has recommended that in order to mitigate the problem raised in the FMIS, the intake and the main canal should either be rehabilitated or improved with permanent structure using modern technology in support of government agencies. Similarly to overcome the problems of water stealing, turn overlapping, breaking rules and conflicts related to water allocation the rules and regulation should be strictly enacted either by charging the high penalty in rupees or isolated him/ her from the system organization.

Pant (1987), studied on "Community Participation in irrigation management" a case study of Solma Irrigation Project in east Nepal, and revealed the idea that a study breakdown in the system of irrigation management had led to reduce crop yield lives of the farmers were harder and food deficits more frequent. As a result seasonal and permanent migrations were increasing. He had recommended that despite the fragile ecology of the hills there was potential for developing irrigation. It had not been possible to harness that potential because of a take of resource and commitment. A single, well equipped agency should take responsible for developing hill irrigation. It was important to encourage beneficiaries to participate in the construction and maintenance of new canal to ensure sufficient repair work and equitable distribution of water. Farmers were usually willing to make an active contribution if there was a good working environment. The problem laid in finding an accepted and committed leader to organize and control resources and to make the best use of government grants. A-Non political person or body should be entrusted with the responsibility of mobilizing local resources.

Sukla and Sharma (2000) studied Chhetis Mauja Irrigation System (lies in Rupandehi District) and Pithuwa (source, Khayarkhola from the Mahabharat Range) as effective study included in the paper. While Chhattis Mauja Irrigation System was initiated constructed by farmers and Pithuwa Scheme was originally developed by DOI and the users took over the operation and management of the system. The conclusion drawn from the comparison of these FMIS is as follows:

i. Membership Defined by Property Rights: The FMIS in most cases are found to exercise some kind of property right in defining membership and irrigation access. In Chhattis Mauja, membership in the system is defined by Kulara entitlement. The resource mobilization obligations and participation in decision making are also tied to irrigation entitlement. In Pithuwa too, the size of the branch canal outlet has been the basis for irrigation allocation and resources mobilization.

ii. Local Control on Institutional Innovation: In FMIS the rights, roles and duties are entirely under local control with users themselves defining the roles and duties for operation and management. The rules and roles of the users are tailored to local needs and interest of the users.

iii. Prompt Decision Making and Effective Enforcement: Prompt decision making and effective communication of decisions ensure higher degree of compliance to the decisions. In Chhattis Mauja, the mukhtiyars and messengers at different levels of the system have the responsibility of communicating the decisions. In Pithuwa, the communication of decisions is through the functionaries of water user's association at the main and branch canal levels.

iv. Equity in Resource Mobilization and Irrigation Access: Equity in resource mobilization and irrigation access has been the basis for prompt and assured mobilization of resources and compliance to rules in use. In FMIS, the users are assured of due share of water in return to there investment of time, labor and money during system construction, operation and maintenance. Equity in both the systems is also ensured by regular monitoring of branch canal inlets.

v. Transparency and Accountability: The FMIS maintain transparency in rules and regulations and accounts and book keeping. The functionaries of the WUA are accountable to the users and therefore the chances of favorites and fraudulent behavior is minimized. In Chhattis Mauja and Pithuwa, the general assembly of the users provide open forum to expose the problems.

Seeing the potential of intensifying irrigation agriculture in a short time through rehabilitation and improvements of farmer-operated systems, the government

irrigation agency launched such a program during 1984 several small communal system have been renovated, rehabilitated and even enlarged through a participatory approach where costs have been shared between the government and farmers group at 75 percent and 25 percent respectively such completed projects have shown increasing performance and use. Hence the government has adopted a new participatory approach and strategy for improving the existing communal schemes to extract benefits in a short while (Ansari, 1989).

Prachanda Pradhan and Robert Yoder (1990) presented their views by comparing the water management between farmers system and agency system in a discussion paper; Irrigation Development, The management and use of irrigation the mountain of Nepal, 1990. A common feature among beneficiaries of many FMIS is a view of water as a community resource". This views leads to collective decision making as well as well developed organizations, rules, roles and mechanism for conflicts management.

Sukla and Sharma (2000) concluded that the common complaint of farmers in agency or jointly managed systems were that the water delivery is not reliable. This complaint had not been verified by field measurements, but was heard frequently enough to assume some validity. Since farmers were dependent upon agency staff to deliver water from the source to some point in the system where they can take over, they had no control over water availability. In contrast, in FMIS, the control was entirely in the hand of the farmers who must decide how hard they want to work to acquire water in a timely and reliable fashion. Intensive manpower employment was often required to make the system work. In flowing distribution less super vision was requested than in systems where rational water delivery must be practiced. The ratio of irrigation related personnel to area in FMIS is one person for 1.5 to 10 hectares, which was much higher than in agency managed system. In well managed FMIS, the beneficiaries participate in decision- making called to address specific problems through annul assemblies and meetings of all beneficiaries. The assembly made decisions on basic issues which makes the organization strong. Individual or communities were often appointed or elected to implement the decision made by the assembly.

2.3 Irrigation Policy : Irrigation Policy 1996

The latest irrigation policy was formulated by the Ministry of Water Resources (MOWR) in 1992 and amended in 1996. It was formulated and is enforced by the government of Nepal as a requirement of the national policy to implement and operate irrigation development programs in Nepal.

Major Objectives of Irrigation Policy in 1996 were:

- To develop quick cost effective, viable, sustainable and environmentally efficient irrigation systems;
- To bring uniformity to the irrigation development process and projects of all concerned governmental, non-governmental and donor agencies;
- To decrease government involvement and encourage peoples participation in irrigation development and management;
- To increase the capabilities of governmental and non governmental irrigation institution for the research and training related to technical and social aspect of irrigation management;
- To develop laws giving WUA rights to collect water tax and use it for further development of the systems
- To increase the formers capabilities in resource mobilization, rehabilitation and construction works in traditional FMIS.

To fulfill these objectives, the irrigation policy has on lined the following programmers which were expected to help in the better management and improvement of the existing irrigation systems within the kingdom of Nepal.

2.4 Irrigation Act, 2056

Irrigation Act 2056 has defined some rights, duty and works for the consumers. They are

- To repair conduct and manage the irrigation system that is run by farmers.
- To provide water for the consumer according to types of crops and land structure at right time and right manner.
- To modify the public participation for the reconstruction and repairing of water system.
- To build structures to increase irrigation areas, thinking the supply and demand of water resources.

2.5 Irrigation in Interim plan (Three Year Interim, Plan 2007 - 2010)

Interim plan states the problems faced by the irrigation system as:

- Lack of dependable irrigation services to targeted areas in the absence of the development and expansion of area under irrigation command, and inadequate repair, maintenance and upkeep in several irrigation schemes, due to the lack of financial resources from internal as well as external sources.
- Lack of initiative in undertaking development of large and reservoir backed irrigation schemes with irrigation coverage as envisage by the water resources strategy and the National Water Plan.
- Lack of active participation of user farmers in the operation, repair and maintenance of public sector irrigation schemes.

The challenges faced by the irrigation system are as:

- Provisions of year-round and dependable irrigation service in the irrigated areas.
- Collections of Irrigation Service Fee (ISF) to cover the operation repair and maintenance cost of irrigation schemes,
- Management transfer of public sectors irrigation schemes to organized groups of water users for operation and management on a sustained basis;
- Timely rehabilitation and upkeep of essential irrigation infrastructures damaged during monsoon for irrigation delivery in target areas.

The strength of the irrigation sector, and thereby the opportunities can be stated as hereunder:

- Possibilities of year-round and dependable irrigation in larger parts of potentially irrigable area with existing surface and ground water potential.
- Adequate human resources within the country for the development of irrigation infrastructure.
- Continued progress in the participation users farmers and their capacity building in the development and management of irrigation
- Increased access of small and marginal farmers to non-conventional irrigation technologies, such as drip and sprinkler irrigation and shallow tube wells.

It is found on the basis of the review of literature that the irrigation is considered as an important input of cultivation and in Nepal the irrigation development probably started as early as the first agriculture settlement. Many authors agree that the history of irrigation development in the hill of Nepal dates back centuries. Though, the government has recognized the importance of irrigation for increasing agricultural production, the country does not have adequate technical manpower and finance resources to implement large scale irrigation works so that FMISs have become successful. Water stealing, turn overlapping, population pressure, breaking rules, conflicts etc are some draw backs of FMISs, and to overcome these problems the rules and regulation should be strictly enacted either by charging penalty in rupees or isolated from the system organization. It is important to encourage beneficiaries to participate in the construction and maintenance of new canal to ensure efficient repair work and equitable distribution of water. Farmers are usually willing to make an active contribution if there is a good working environment. Many irrigation plans and policies have been launched to develop quick, cost effective, viable, sustainable and environmentally efficient irrigation systems and to increase the farmers' capabilities in resources mobilization rehabilitation and construction works in the farmed managed irrigation systems.

CHAPTER – THREE

METHODOLOGY OF THE STUDY

3.0 Methodology

In this chapter the methodology of study is presented. The methodology includes rationale for the selection of the study area, introduction of the study area, universe and sampling, source of data, method of data collection, method of data analysis and definition and concept of terms and variables.

3.1 Rationale for the Selection of Study Area

Mulpani, the study area, which lies in ward No. 5 of Baglung Munacipality of Baglung district. Although, it is situated in Baglung Municipality, the district headquarter of Baglung, any agencies including the agriculture and irrigation office are not properly and regularly providing any assistance for this irrigation. Therefore, the researcher has selected this place for research and tries to explore the economic impact laid by this FMIS on that community. As well as, the researcher try to explore the role and participation of people on the management of irrigation system and its corresponding impact on crop production, productivity and cropping pattern. Similarly, the researcher of this study is a student, and time and money are the two main constraints. The researcher who has familiar in Baglung Municapality, Mulpani and there is a less chances of facing problems and difficulties for finding the detailed information in various aspects of the study area. Due to the familiarity with the location the researcher has reduced the cost and time to collect data on the one hand and on the other hand he has been able to collect reliable data.

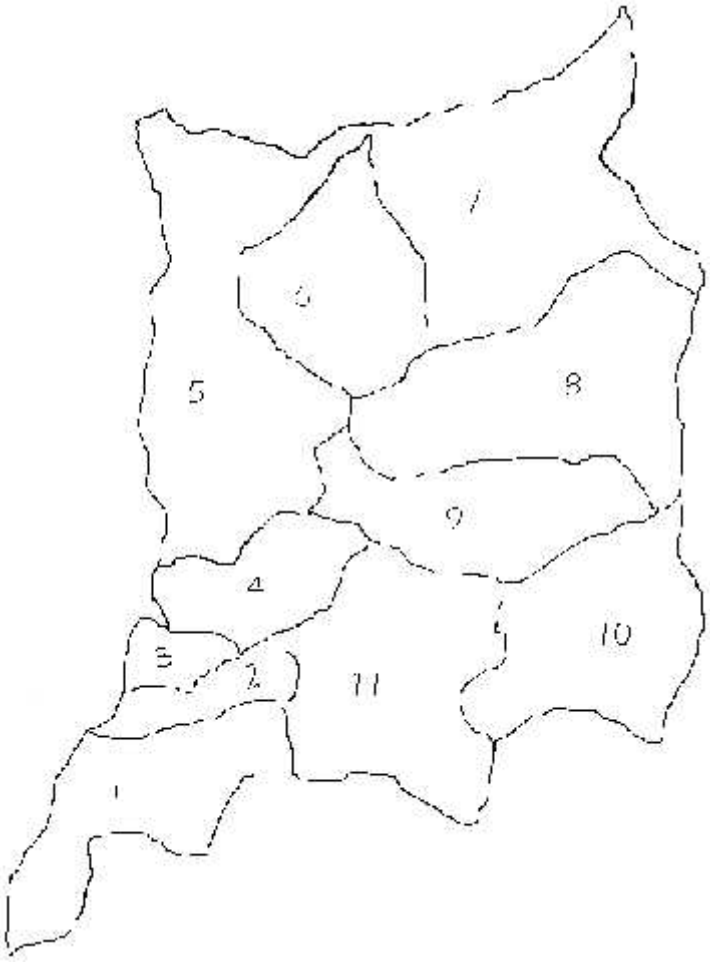
3.2 Introduction of the Study Area

Baglung is the headquater of Baglung district. Baglung lise in Dhaulagiri zone of western development region. Geographically, Baglung district is located 28° 15’ to 28° 37’ latitude in North and 83° 22’ to 83° 36’ east longitude. Baglung is surrounded by Parbat district in the east, Gulmi in the south, Myagdi in the north and Rukum, Rolpa and Pyuthan in the west. The map of Baglung district has similar shape of Nepal’s map. According to the census 2001, the total population of Baglung is 2,68,937 where the population of male and female is 1,23,528 and 1,45,490 respectively. (Baglung Municipality, 2062).

Map No. 1 - Baglung District

Baglung municipality is situated on a beautiful green flat land upon a hill on the bank of Kaligandaki River. Baglung Municipality was established in 2054 B.S by joining three different VDC's named Kalika,Mulpani and Lahare Peepal. Baglung Municipality is situated in the west, 272 kilometers away from Kathmandu. Famous River for Saligram, the Kaligandaki and the Kanthekhola are the territory respectively to the east and south, Pala VDC in west and Malika and Retnechour VDC in north from this municipality. It occupied altogether 19.23 square kilometers area and located between 83° 22' to 83° 36' longitude in east and 28° 15' to 28° 37' latitude in the north. According to the census of 2001, the total population of Baglung Municipality is 20,852 where the population of male and female is 10,039 and 10,813 respectively. The total cultivable land of the municipality is 1475 hectares where only 385 hectares land is irrigated and 1090 hectares land is unirrigated. (Baglung Municipality, 2062).

Map No. 2 -Baglung Municipality



Out of the 11 wards of Baglung Municipality, the study area, Mulpani, lies in ward No- 5. The study area is situated nearly 4 kilometers away from Baglung Bazar. Munpani is the heterogeneous society having composition of Brahman, Chhetri, Magar and Gurung where the number of Brahman is dominant in this community. The economy of the study area is based upon agriculture. Thus most of the male and female of this area found to be involved in agricultural activities. Some of the people of this community are involved in government services, some are found involved in business and some adopted remittance as the major source of income. All the people who reside in this community followed Hindu religion. Dashain, Tihar are the main festivals and other festivals such as Maghesakrati, Chaitra Dashain, Saune Sakranti are also celebrated. There is one government high school and one privately managed boarding school in the study area. For higher education people have to go Baglung Bazar. In the study area the pre-primary, primary and secondary education facilities are available but the people of this community have to go Baglung Bazar for medical treatment and to drop letters and documents.

MAP No. 3 - STUDY AREA (MULPANI WARD NO 5)

Land, forest and water are the major natural resources of this study area. Most of the people of this area are depending upon land. Soil of this study area is fertile. The main crops produced here are paddy, maize, corn and different types of vegetables. There are some wells, springs and streams. The water from these sources is used for irrigation and drinking. The “Sudhare Khola” a seasonal stream which is the main river near by the study area. Moreover, there are some natural springs/Muhans on the private land, which the community has now a day managed for irrigation and drinking purposes.

The people of the study area had been practicing in indigenous knowledge or traditional ways to irrigate land since 1980 to 2051. The maintenance and reconstruction of irrigation canal was done in unsystematic ways. After 2051, farmers of the study area formed a committee; the ILO donated cements for reformation of canal and about 1 kilometer was cemented to prevent the water leakage. In 2055/56, the Baglung Golkot road construction work destroyed about 50 meter length of canal and the canal runs through the side of the rough motor able road. Occasionally department of district irrigation office and district irrigation office provide some

amount as a financial aid for the maintenance of the canal. The Sudhare Khola FMIS's main canal is about 2 kilometers and when it reaches to the command area, it divides into several sub canals. Water acquision related activities such as; design, construction by the local people. In the beginning, the canal is completely made of with the local materials such as rocks, clay, shrubs, tree trunks and eastern other materials which are available in the study area. Now, a management committee of nine (9) members has been formed to fenerate water supply, role to irrigate, repair and conflict resolution. The FMIS canal serves 45 hectares of land.

3.3 Universe and Sampling

All the items under consideration are any field of inquiry constitutes a universe or population. A complete enumeration of all the items in the population is known as a census inquiry. The population or universe of this study area is 279 households.

A small part of population which contains finite number of elements is called sample of that population and the process of drawing a samp0le from a population is called sampling.

For the household selection with in each three strata (Brahman, Chhetri and Magar), a systematic random sampling procedure has been applied. First of all a complete list of household of the study area was taken. The sample size of the study has been taken as 19 percent.

Table No. 3.1

Number of Households and Sample Households by Caste and Ethnicity

Caste	No. of Households	Sample size %	Sample household in round figure
Brahman	155	19	30
Chhetri	83	19	16
Magar	41	19	8
Total	279	19	54

From the above table it has been cleared that 19 percent of the total 279 households of the study area have been taken as a sample for the study purpose.

3.4 Sources of Data

This study basically utilizes data from the two sources i.e. primary and secondary data .The secondary data have been obtained from the related Ministry, Department and concerned district offices. But the primary data have been collected through direct oral interview procedure using the well structured and pretested questionnaire schedule.

3.5 Interview

The interview method of the collecting data involves presentation of oral verbal responses. For the study a check list was prepared to interview informant. The structured interview was done by using predetermined questions and the questions were asked to the local farmers. The question concerning the socio economic condition, crops production and productivity, cropping pattern, peoples' participation and maintenance of the irrigation system and difficulties found their.

3.6 Definition and concepts of Terms and Variables

Bari	:	Dry up land, where crops like maize, millet, wheat etc are grown.
Khet	:	Low land where paddy and wheat are cultivated.
Community	:	All people living in the study area despite their nature of caste and ethnic identity.
Participation	:	Participation generally means to take part in any activities. Participation refers to the involvement contribution, sharing of benefits in the process of development.
Cropping Pattern	:	It is a way of cultivation followed by next crops on the basis of land structure along with the facility of irrigation.
Operation	:	Operation means continuous mobilization process of the system on the basis of technology, resources and physical system.
Maintenance	:	Maintenance of Irrigation system mainly includes the task of repairing and cleaning of the canal for regular and efficient water acquisition and distribution.

Decision Making	:	Decision making refers to the institutional management of irrigation system on the basis of organizational values and norms.
Water Acquisition	:	Water acquisition is the process of acquiring water from the sources.
Water Allocation	:	Water allocation means the field and farmers that have access to water from the system and the amount or duration of the water delivery to each.
Water Distribution	:	Water distribution means the provision and methods of how the available volume of water is used with in a specified farm.
Water Management	:	Water management is conceptualized as a process of how farmers govern, operate and maintain an irrigation system.
Water Users Committee	:	A group formed to regulate the system for the better management of water supply and to mitigate the dispute or conflicts.

3.7 Method of Data Analysis

The information which the researcher collected from primary and secondary sources were processed, tabulated and analyzed by using simple mathematical and statistical method like average, percentage, ratio etc.

Standardization: The information collected in the survey schedules were in local units which is familiar to the common people. The purpose of comparison and standardization the local units of amount and quantity have been either extrapolated (Calculate approximately from known value) or interpolated (inserted new or missing matters) by adjustment of factors of standard measurement units. For example, one Ropani of land equal to 0.05087 hectares of land. Similarly so as the grains are concerned 2.5 Muri paddy = 1 Quintal of paddy and 1.5 Muri of Corn Maze Millet - 1 Quintal of corn Maze, Millet.

Average: Average is defined as a result of adding several amounts together and dividing the total by the number of amounts.

Ratio: When one magnitude is expressed in term of the other as its multiple or fraction, it is called ratio of the two magnitudes.

Percentage: When ratios are multiplied by 100, they are expressed as percentage. In calculating percentage the base figure is always represented by 100.

Productivity: It is a state of being producing or ability to produce crops where the size of the crops depends on the productivity of the soil. When the total production of crops is divided by total area, the productivity can be obtained.

CHAPTER - FOUR
DATA ANALYSIS

4.0 Socio Economic Characteristics of the Population

This chapter discusses about the socio-economic characteristics of the sample respondents household as the educational status of the sample household, income status, land holding pattern along with cropping pattern, crop production and productivity. Besides, this chapter discusses about the management of irrigation system and existing problems of the systems.

4.1 Frequency Distribution of Population of the Sample Households

The total population of sampled households is 273, where 153 are male and 120 are female which covers 56 percent and 44 percent of male and female respectively. The caste wise population distribution and the structure of the sample household are as follows:

Table No. 4.1

Distribution of Population of the Sample Household by Cast and Ethnicity

S.N.	Caste	Number			Percentage		
		Male	Female	Total	Male	Female	Total
1.	Brahman	84	67	151	55.62	44.37	55.32
2.	Chhetri	46	36	82	56.09	43.90	30.03
3.	Magar	23	17	40	57.5	42.50	14.65
Total		153	120	273	56.05	43.95	100.00

Source: Field Survey, 2008

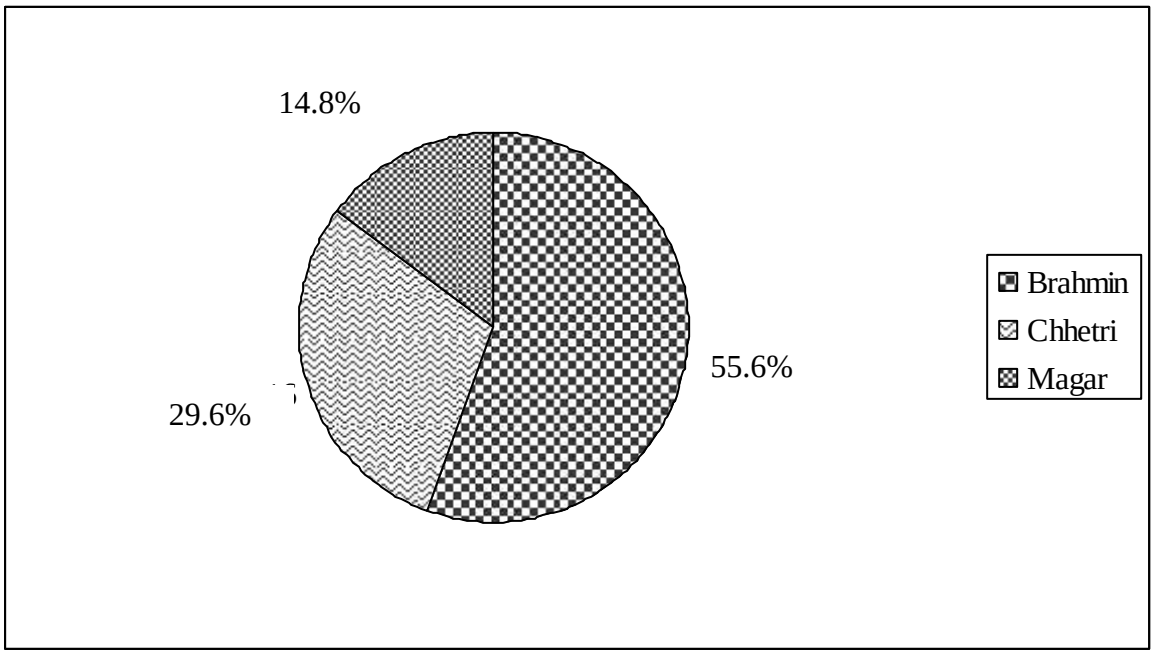
The above table No. 4.1 disclosed the idea that the percent of Brahman people is dominant than the Chhetri and Magar people as 55.32 percent, 30.03 percent and 14.65 percent respectively. The number of male is greater than the female in each caste. In figure 67, 36 and 17 female are there in Brahman, Chhetri and Magar caste in comparison to 84, 46 and 23 male in the Brahman, Chhetri and Magar caste respectively. The percentage of total female and male is 43.95 and 56.05 percentage respectively where the national average population composition by sex is 49.9 percent of male and 50.1 percent is female.

4.1.1 Caste/Ethnic Composition of Sample Households:

Out of the total 54 households 55.55% belonged to the Brahman followed by 29.62% Chhetri and 14.81% Magar. Brahmans are in dominant number in this community.

Chart No. 4.1

Caste /Ethnic Composition of Sample Households



This above chart shows that out of the total 54 households, Brahmin and Chhetri caste cover 30 (55.6%) and 16(29.6%) households which is educationally ,socially politically and economically known as active people in the research area, where the Magar caste covers 8(14.8%) households.

4.1.2 Literacy Status by Caste

Education has been considered as one of the important indicators of the socio-economic development. Considering this fact, this study attempts to collect information on literacy in the sample households. Literacy also influences water management; therefore, an analysis of literacy status is important.

Table No. 4.2

Educational Status of the Sample Households by Cast and Ethnicity

S.N.	Caste	Literate			Illiterate		
		Male	Female	Total	Male	Female	Total
1.	Brahman	63(65%)	34(35%)	97(64%)	21(39%)	33(61%)	54(36%)
2.	Chhetri	34(71%)	14(29%)	48(59%)	12(35%)	22(65%)	34(41%)
3.	Magar	11(69%)	5(31%)	16(40%)	12(50%)	12(50%)	24(60%)
Total Literate Population				161(59%)	Total Illiterate Pop.		112(41%)
Male %				108(67%)			45(40%)
Female %				53(33%)			67(60%)

Source: Field Survey, 2008

From the table 4.2 it can be seen that out of the total 273 population, 161(59%) are literate and the rest 112(41%) are illiterate. Out of total literate population the male covers 108(67%) where the number and percentage of literate female is 53(33%). Similarly, out of total illiterate population the female covers 67(60%) and male covers 45(40%). As the caste wise literacy status is concerned; 97(64%) Brahman, 48(59%) Chhetri and 16(40%) Magar people are literate where 54(36%) Brahman, 34(41%) Chhetri and 24(60%) Magar people are illiterate. The total literacy rate of Brahman is greater than the other castes. One universal consistently revealed fact is that in all the castes, literacy rate of female population is quite low than that of male counterparts.

4.1.3 Income Status

Income status of the population living in the command area is another aspect to see the relevancy of the implementation of the irrigation system in the area. In this regard implementation of all irrigation systems can only be fruitful when the people of the command area are living with agricultural pursuit of economy with a minimum size of land holding and full of eagerness to increases the production. Therefore here it has been viewed to present a short discussion on the income status of the sample household considering, agriculture, services, business and remittance as the main source of income of different castes as Brahman, Chhetri and Magar.

Table No. 4. 3

Distribution of Sample Households by Sources of Income and Cast and Ethnicity

Caste	Total	Agriculture		Service		Business		Remittance	
	No.	No	%	No	%	No	%	No	%
Brahman	30	16	55	5	63	3	50	6	55
Chhetri	16	10	34	2	25	2	33	2	18
Magar	8	3	11	1	12	1	17	3	27
Total	54	29 (54%)		8 (15%)		6 (11%)		11(20%)	

Source: Field Survey, 2008

The table 4.3 reveals the fact that out of the total 54 households 29(54%) are living with the agricultural pursuit of economy or taking it as a main source of income. Similarly only 8(15%) and 6(11%) households are found to depend on services and business sector as source of income and 11(20%) households are taking remittance as a main source of income. It is also found from the above table 5.3 that either Brahman or Chhetri or Magar are found heavily dependent on agriculture than the other sources of income as service, business and remittance. Magar caste is found to be depended on remittance more than the Chhetri caste but the percentage of Brahman is found higher in all sources of income than other castes.

4. 2 Land Distribution

4.2.1 Land Holding Pattern

The land is mainly categorized into two ways; low land (khet),where paddy is predominantly cultivated because of the facility of irrigation and up land(Bari) which includes pakho also ,where maize and millet are mainly grown because of the lack of irrigation system. It is disclosed on the basis of the field study that all land has not been utilized for the agriculture purpose yet (after the irrigation system) because the upland which includes pakho with rugged topography has been used for grass and somewhere trees are planted but all the Khet land has been used. It is also found in the research area that neither had they used rented land nor rented out to others. Rather they used their own land for the production. Moreover, farming system in the research area is completely practiced by applying the local methods, skills, techniques and experiences on the basis of long time trial.

Table No.4.4

Pattern of Average Land Owned by Caste and Ethnic Groups

S.N.	Caste	Average Size of land Holding Pattern in Ropani		
		Low land (Khet)	Up land (Bari)	Total Average
1.	Brahman	7.20	1.23	8.44
2.	Chhetri	7.18	1.56	8.74
3.	Magar	7.25	2.25	9.50
Total Average		7.21	1.48	8.69

Source: Field Survey, 2008

The table 4.4 shows that the total land is bifurcated as low land (Khet) and up land (Bari). Out of total average size of land 8.69(469) ropani, only 1.48(80) ropani land is covered by upland (Bari) and remaining portion is covered by low land (Khet). The average land holding pattern of Magar is higher, 7.25(58) ropani low land and 2.25(18) ropani upland, than other castes as Brahman and Chhetri. In the table the caste wise average land is obtained by dividing the land in ropani by the number of people of particular caste.

Table No. 4.5

Pattern of Average Operated Land Holding by Caste and Ethnic Groups

S.N.	Caste	Average Size of land Holding Pattern in Ropani		
		Low land (Khet)	Up land (Bari)	Total Average
1.	Brahman	7.20	0.97	8.17
2.	Chhetri	7.18	1.06	8.24
3.	Magar	7.25	1.25	8.50
Total Average		7.21	1.04	8.24

Source: Field Survey, 2008

The adjoining table reflects the views that the operated land with irrigation facilities has been categorized as Brahman, Chhetri and Magar having 245 ropani, 132 ropani and 68 ropani land respectively. Similarly the total average land holding pattern of Brahman, Chhetri and Magar is 8.17 ropani, 8.24 ropani and 8.50 ropani, where this disclosed the fact that the average land possession of Magar is higher than the other castes. Beside this out of total average operated land 8.24 ropani, 7.21 average land ropani is covered by low land and remaining 1.04 average land ropani is

covered by upland. Moreover, this table also gives the idea that out of total own land the Khet land 389 ropani has been used totally with irrigation facility but only 56 ropani Bari land has been operated because some Pakho land is excluded from the Bari land which is not arable.

4.2.2 Cropping Pattern

The cropping pattern before and after the availability of the irrigation facility is presented hereunder:

Cropping Pattern Calendar in Months

Before the Irrigation System			
Months	Ashad - Mangsir	Mangsir- Chaitra	Chaitra- Ashad
Khetland	Paddy	Wheat	Maire + Vegetables
Bari – land	Maire +Millet	Fallow	Vegetables
After the Irrigation System			
Months	Ashad- Mangsir	Mangsir- Chaitra	Chaitra- Ashad
Khetland	Paddy	Wheat	Paddy+Vegetable+Maize
Bari Land	Millet	Vegetable +Wheat	Maize+ vegetables

Though the country's main crops are paddy, maize, wheat and millet, the dominant crops of the study area are paddy and wheat. Almost all cultivable land of this area is viable for both crops (paddy and wheat) but paddy is universal than the wheat. Land of study area is divided into two types; the up land (Bari) where summer maize, millet, vegetables and winter wheat and vegetables are planted after the irrigation system but before irrigation Bari Land left fallow in the winter season and the low land (Khet) where both summer and Spring Paddy (which is possible after irrigation), maize, vegetables and winter wheat are planted.

4.2.3 Crop Production (Before and After the Irrigation System)

Crop production depends on the irrigation facility. Before the FMIS some cultivated land in the study area was left fallow, and the cultivated land could not give production in optimum level because of insufficient irrigation. Before the irrigation most of the up land (Bari) was used to produce Millet instead of some cash crops like vegetables and high demanded crops like Maize and Wheat. But after the FMIS in the

study area the productivity of the land has been increased. Instead of producing Millet in low land (Khet), farmers are laboring to produce cash crops.

Comparatively paddy, wheat and vegetables need water in high rate so here is going to find the fact of change in production and productivity of Paddy, Wheat and Vegetables below:

Table 4.6

Frequency Distribution of Caste Showing Change in Productivity of Paddy Production Before and After the Irrigation System

Caste	Before Irrigation			After Irrigation			% Change in productivity
	Area in Ropani	Production in Quintal	productivity	Area in Ropani	Production in Quintal	productivity	
Brahman	99	184	1.86	155	435	2.80	50.53
Chhetri	57	106	1.85	83	233	2.81	51.89
Magar	33	61	1.84	43	121	2.81	52.71
Total	189	351	1.86	281	789	2.81	51.07

Source: Field Survey, 2008

It is identified from the table 4.6 that the Paddy production area before the irrigation system was 189 Ropani, where 351 quintal of rice was produced with 1.86 productivity rates. The castes, Brahman, chhetri and Magar produced 184 quintal, 106 quintal and 61 quintal rice from 99 Ropani, 57 Ropani and33 Ropani land respectively. After the irrigation system the area of paddy production has increased (by 48.67%) to 281 Ropani, this is because the fallow land is converted into oasis land. Obviously the production has been accelerated to 789 quintal having 2.81 productivity rates where the percentage change in productivity of paddy production from the given area is 51.07 percentages. In the same way, the caste Brahman, Chhetri and Magar has been produced 439 quintal, 233 quintal and 121quintal rice from 155 ropani, 83 Ropani and 43 Ropani land respectively after the irrigation system.

Table 4.7

Frequency Distribution of Caste Showing Change in Productivity of Wheat Production Before and After the Irrigation system

Caste	Before Irrigation			After Irrigation			% Change in productivity
	Area in Ropani	Production in Quintal	productivity	Area in Ropani	Production in Quintal	productivity	
Brahman	20	23	1.15	33	72	2.18	89.56
Chhetri	12	14	1.17	18	39	2.17	85.47
Magar	07	08	1.14	09	19	2.11	85.09
Total	39	45	1.15	60	130	2.17	88.69

Source: Field Survey, 2008

From the table 4.7, it can be revealed that before the irrigation system the production of wheat was negligible. In figure, out of total 39 Ropani wheat production land, only 45 quintal wheat was produced with 1.15 productivity rate .From this data it can be said that the farmers cultivated wheat for the sake of cultivation. After the irrigation system there is revolution in the production of wheat. From the total 60 Ropani of wheat production land, 130 quintal wheat has been produced with 2.17 productivity rate where the percentage change in the productivity of wheat production in the given land is 88.69 percentages

Table 4.8

Frequency Distribution of Caste Showing Change in Productivity of Vegetable Production Before and After the Irrigation System

Caste	Before Irrigation			After Irrigation			% Change in productivity
	Area in Ropani	Production in Quintal	productivity	Area in Ropani	Production in Quintal	productivity	
Brahman	26	106	4.07	28	244	8.71	114.00
Chhetri	15	61	4.06	15	131	8.73	115.02
Magar	09	37	4.11	08	70	8.75	112.89
Total	50	204	4.08	51	445	8.73	113.97

Source: Field Survey, 2008

The table 4.8 disclosed the fact that the land separated for vegetable before the irrigation system was 50 Ropani where 204 quintal vegetables were produced with 4.08 productivity rate. Similarly Brahman Chhetri and Magar people were produced 106 quintal from 26 Ropani, 61 quintal from 15 Ropani and 37 quintal from 9 Ropani respectively. After the irrigation system there has been complete changed in the productivity of vegetables production. From the nearly same land (51 Ropani), 445 quintal of vegetable has been produced in total with 8.73 productivity rate where the

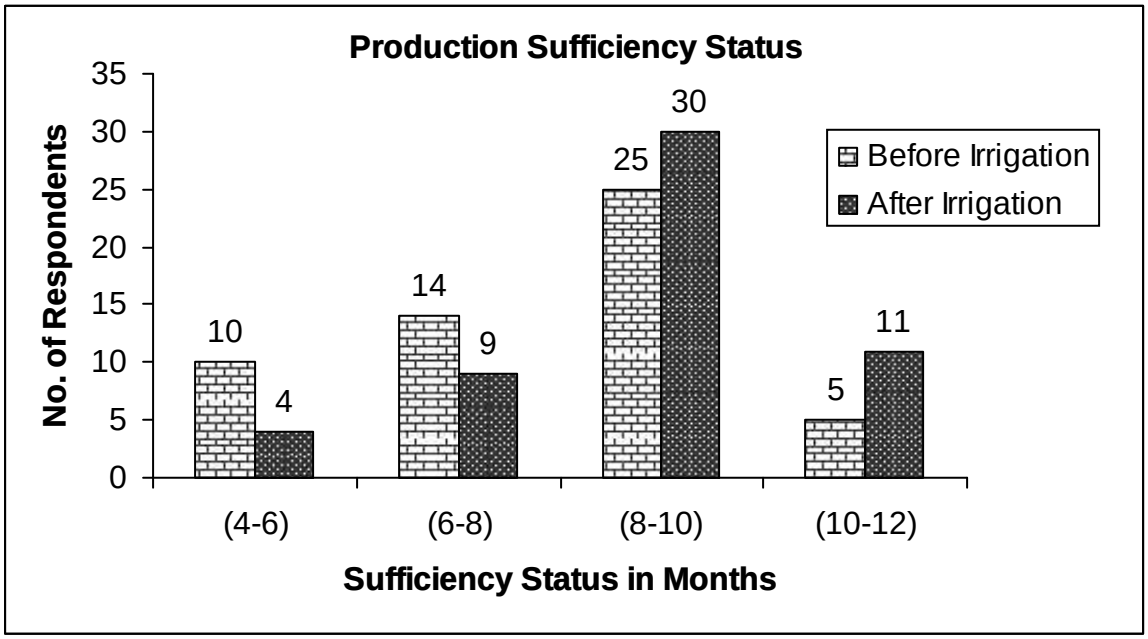
percentage change in productivity is 113.97. Vegetable, a quick yielding cash crops, need water in great rate so that after the irrigation system there is facility of water, aftermath, massively change in production and productivity of vegetables.

4.2.4 Production Sufficiency Status (Before and After the Irrigation System)

Irrigation, an input of crop production has played a significant role to increase the production and correspondingly to enhance the production sufficiency status than before, the farmer managed irrigation system. The figure below shows the production sufficiency status before and after the irrigation facility.

Graph 4.2

Food Sufficiency Status of Sampled Households in Months Before and After the Irrigation System



The graph above depicts that the respondents, who were asked about their production sufficiency status before the irrigation system, responded that only 5 household have (10-12) months production sufficiency and 25 respondents replied (8-10) months production sufficiency. Similarly 10 and 14 respondents answered (4-6) and (6-8) months, respectively, about production sufficiency before the irrigation system. But after the irrigation system, the food sufficiency status has been changed where 11 respondents replied about sufficient production all over the year. Out of 54 respondents, 30 replied (8-10) months production sufficiency and 9 replied that food

production by them meet (6-8) months of a year. Only 4 replied that it is sufficient for their family no more than 6 months. Thus the availability of irrigation has significantly improved the production sufficiency status of household in the command area.

People, who do not produce sufficient food grain for consumption, perform different types of labor works in the fields, farms and in other sector of the rich people for livelihood.

4.3 Management of Irrigation System

Irrigation management system is the process of supplying necessary amount of water artificially for agriculture production or plants. Irrigation management system examines the construction, operation, maintenance and preservation of the local irrigation system adopted by the local people in the backward area. On the other hand, FMISs reveal locally adopted indigenous knowledge and practice regarding various irrigation management activities, i.e. water acquisition, water allocation, water distribution, resources mobilization and conflict management.

4.3.1 Water User's Committee (WUC)

There has been a Water User's Committee since B.S. 2051 Falgun. It consists of nine members which includes Chairperson, Vice Chairperson, Secretary, Joint Secretary, Treasurer and Four General members, all representing from beneficiary households. This committee’s time duration is for five years.

4.3.2 Responsibilities of the Water Users Committee

Distribution of the water equally among the users, maintaining the facilities of the system effectively, solving conflicts among its members and mobilizing the resources for maintaining the system and collecting money are the main responsibilities of WUC. According to the WUC's rules the entire member will perform their responsibilities as follows:

- To preside all meetings, resolve conflicts by the users, solve the problems in the executive committee and supervise the canal lining are the main responsibilities of the Chairperson.

- Vice-Chairperson will help the Chairperson and handle all the responsibilities in the absentee of chairperson.
- The secretary maintain minutes of regular meeting, call the general assemble meeting according to the executive committee, mobilization of the person during the general and participatory works and to keep records of those who participated in the meeting.
- Joint-Secretary will help the secretary and in absence of secretary, joint secretary will handle all the responsibility of secretary.
- The main duty of the Treasurer is to keep financial records of the Canal.

The four general members have also some responsibilities like communicating the people for meetings, mobilization of labor for the maintenance works, communicating the message from the executive committee to the beneficiary households etc.

4.3.3 Meetings

There are three types of meetings held in the study area. They are as follows:

1) General Assemble Meeting
2) Executive's Meeting
3) Emergency Meeting

The general assemble meeting holds two times a year. It is held in winter season and summer season. In this meeting people discuss about their problem related with irrigation system.

The general meeting of the executive committee meets four times a year. In this meeting they discuss on different issues relating to resources mobilization, water distribution, and conflict resolution, to draw the committee's attention.

Similarly the emergency meeting is held whenever it is necessary. It depends on the situation.

4.3.4 Water Use Activities

Irrigation management systems on the use of water are known as water use activities. The activities related to irrigation organization as water use activities are water acquisition, allocation and distribution. Therefore, this FMIS is undertaken into operation on the basis of these operational indicators.

4.3.4.1 Water Acquisition

Nepal is the second richest country in the world possessing about 2.27% of the world water resource (CBS, 1999). However, the availability of water varies in all parts of Nepal according to season and location. Thus, the water resources in the country, according to the geographical variations, are difference. Therefore, water acquisition is the process of acquiring water from the sources (Sharma, 1996:37).

Similarly, the water resource of the study area's FMIS is a stream known as the Sudhara Khola. The main canal is about 2 k.m. When it reaches to the command area, is divided into several sub-canals. Water acquisition related activities such as; design, construction, operation and maintenance of the canal are carried out by the local people applying the indigenous knowledge and practice. In the beginning, the canal is completely made of with the local materials such as rocks, clay, herbs, shrubs, tree trunks and earthen other materials which are available in the study area.

4.3.4.2 Water Allocation

Water allocation, on the basis of the user's group and cultivated land means the sharing of water of the system on the process of irrigation. In the study area, the process of water allocation among the farmers has been undertaken on the basis of the size of cultivated land, and types of crops grown. Farmers, who have contributed labor and cash during the canal construction, operation and maintenance, have equal water right on the processes of sharing of water of the system. In summer the water flows with full capacity in the canal. But, in winter, the volume of water in the stream becomes low. During the winter season, the farmers share water for irrigation on the basis of turn/rotation. But, in winter season, the head users get the first turn and the turn transfers to the middle and tails users on the basis of their system.

4.3.4.3 Water Distribution

In general water distribution means the provision and methods of how the available volume of water is used within a specified farm. In the study area the

process of water distribution is completely similar to water allocation adopted by the local people. Water is distributed among the sub-canals, according to the needs in the land. Several sub-canals are constructed to make quick and easy distribution of water but they are not equal in size.

In the study area, there is systematic water distribution system. For the irrigation, people of this area have to pay Rs. 50 per Ropani per year. The water users' committee has made some rules and regulation concerned to the irrigation system. Those who disobey the rules must pay Rs. 200 as penalty and if he repeats the same mistake, he will be punished by curtailing the time of water distribution. The water users committee is responsible in managing the water distribution to each user's field. The committee has formed group at head, middle and tail to have a rotation from one field to another field smoothly. Sometimes, the rule of 'Lottery' is also practiced by the local people, Therefore, all the farmers in the command area have equal right in the distribution of water but water is shared according to their size of land in practice.

4.3.5 Operation and Maintenance

Operation means the continuous process of mobilization of the system on the basis of technology, resources and physical system. And, Maintenance means the tasks of repairing and cleaning of the canal for regular and efficient water acquisition, distribution and removal. The main canal of the FMIS has been constructed with the collective labor contribution of the local farmers.

WUC is responsible for operation and maintenance works. For this, beneficiary households should pay NRs. 50 per Ropani per year for water charge. The maintenance works, in general have been carried out according to the needs of cultivation, before the transplantation of summer paddy in the month of June. The works include removing of grass, gravel, dry leaves and tree trunk is accumulated in the main canal which blocks the flow of water. The sub-canals are maintained by the individual farmers according to the need of the user's group. Thus, maintenance activities in the main canal and sub-canals are corresponded with the cultivation of paddy and wheat in the study area. For operation and maintenance, the two types of activities have been found in the study area. These are routinely operation and maintenance and emergency operation and maintenance.

The routinely operation and maintenance works have been undertaken before the plantation of winter wheat and summer paddy. Each of the beneficiaries'

household should have a meeting time and again to discuss about the requirement and to mobilize their collective labor and kind resource in the canal maintenance. If any one is absent s/he is obliged to pay cash as well as the physical labor in the study area. Similarly, for emergency operation and maintenance there is no fixed time.

4.3.6 Resource Mobilization

Resource mobilization is an important process of irrigation because it is only through effective mobilization of cash, labor and necessary materials that an irrigation system can develop and be sustained for a long time. The major functions of the FMISs are to mobilize the maximum local resources to grow major crops for subsistence. Contribution of labor and cash and unitization of available resources are the required condition for irrigation system sustainable and long lasting.

Every land holders have paid equal labor contributions in the construction of the system and the local resources are exploited to mobilize the system. All the beneficiaries' households have equal contribution of labor and cash. Every land holders are contributing free labor services on the mobilization of the system and local resources in cleaning, repairing and maintenance. If any one can not contribute labor, s/he has to pay cash equal to labor contribution. Therefore, cleaning, repairing and maintenance works of the canal has been done according to the need.

4.3.7 Conflict Management

Conflict is the manifestation of competition, discussion and dispute with the physical threat, fight, and war and so on. Conflict resolution means to solve the problems occurred in the management system of organizational activities. These activities can be occurred in case of the FMIS which is common property of the local people. Thus, the conflict may occur among the members of the user's groups, individuals and systems and inter groups within the system and outsiders and system on the process of mobilization of organizational activities in the irrigation management system.

The conflicts related to water use and rights, which are of the great challenges, have affected the system as a whole. Water rights, turn overlapping, water stealing canal encroachment are some major causes of the conflicts occurred in the research area. Mainly conflict occurs when water theft cases came out. But now rules are very strict and water thieves are punishable by WUC.

The fair water distribution, timely repair and maintenance and transparency about the management system were key elements identified during the study in reducing the conflict in regards to water management. Similarly conflicts are observed between the users of the head and tail areas of the irrigation system. According to the tail users, it is unfair because water takes long time to reach their fields; WUC should consider them and manages all these problems.

4.3.8 Existing Problems

The main problem of water shortage aries form the leakage and frequently breakdown of canal edger. Due to the absence of field outlets for land to land irrigation system water tends to be accumulated into the sloppy and damp land. At the time of monsoon, heavy rain causes overflow of water which cuts the side of canal.

Another serious problem of water distribution is the washing out of fertilizer by over irrigation. Similarly, next burning problem brought about by the irrigation system in this area is over siltation of the land as reported by the farmers. To resolve this problem from individual level all farmers who directly use water from the canal to their field should dig a small pond in their own field and use water in irrigation.

CHAPTER – FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

This study attempted to address the farmer's participation in water resources management system for the enhancement of production yield of different crops, before and after the Farmers Managed Irrigation System. This study is based on primary data obtained through the method of probability sampling ie the procedure of systematic random sampling. All finding derived in the study represents the response of the local farmers. A well structured set of questionnaire was made in the survey with a view to include required information. This study is held on Baglung Municipality -5, Mulpani and comprised 279 households. Out of 279 households, 54 households were selected through the random sampling method.

5.1 Summary and Conclusion

Agriculture is the largest sector and the backbone of Nepalese economy and it is the major source of livelihood of majority of the population. Agricultural economy of the Nepalese people is mainly dependent on monsoon rainfall which comes during the period from June to September. One of the strategies for agricultural development is to create additional irrigation system in the public sector to boost the agricultural productivity through various planned period.

Several studies have proved that in agricultural sector, irrigation is the key input for the higher yields. In this context this study attempted to show that irrigation is directly related to high productivity through the FMIS. Their tendency towards establishing a system for the operation and maintenance of the canal for their own benefit still needs to make positive.

- Out of the total 54 households, 55.54 percentages belonged to the Brahman followed by 29.62 percentage Chhetri and 14.81 percentages. Magar. Brahmans are in dominant number in this community. The percentage of total female and male is 43.95 and 56.05 respectively where the national average population composition by sex is 49.9 percent of male and 50.1 percent is female.

- The overall literacy rate of the study area is found 59 percent where the percentage of literate population of male and female is found 67 percent and 33 percent respectively. As the caste wise literacy status is concerned, 64 percent Brahman, 48 percent Chhetri and 16 percent Magar people are literate. The total literacy rate of the Brahman is greater than the other castes. One universal consistently revealed fact is that in all the castes, literacy rate of female population is quite low than that of male counterparts.
- Out of the total 54 households, 54 percent are living with the agriculture pursuit of economy and 15 percent and 11 percent households are found to depend on services and business sectors respectively. Similarly 20 percent households are taking remittance as a main source of income.
- The operated land with irrigation facilities has been categorized as Brahman, Chhetri and Magar having 245, 132 and 68 Ropani respectively and the average land holding pattern of Brahman, Chhetri and Magar is 8.17 Ropani, 8.24 Ropani and 8.5 Ropani respectively. It is found that the average land procession of Magar is higher than the other castes.
- The cropping pattern has been changed in both Up land and Low land after the farmer managed irrigation system. Though the country's main crops are paddy, maized, wheat and millet, the dominant crops of the study area are paddy and wheat. In low land where both summer and spring paddy, maize, vegetables and winter wheat are planted after the irrigation system and in the up land where summer maize, millet, vegetables and winter wheat and vegetables are planted by utilizing fallow land.
- After the irrigation system the area of paddy production has been increased by 48.67 percent to 281 Ropani and the production has been accelerated to 789 quintal having 2.81 productivity rates where the percentage change in productivity of paddy production form the given area is 51.07 percentages.
- Similarly, after the irrigation system there is revolution in the production of Wheat. From the total 60 Ropani of Wheat production land, 130 quintal Wheat has been produced with 2.17 productivity rate where the percentage change in the productivity of Wheat production in the given land is 88.69 percentages.
- There has been complete changed in the production of vegetables, after the irrigation system. From the 51 Ropani land, 445 quintal of vegetables has been

produced in total with 8.73 productivity rate where the percentage change in productivity is 113.97 percent.

- Irrigation, an input of crop production has played a significant role to increase the production and correspondingly to enhance the production sufficiency status after the farmer managed irrigation system in the study area. The production sufficiency status has to be changed after the farmer managed irrigation system on the basis of 54 respondents replied where 30 answered (8-10) months, 9 replied (6-8) months and only 4 replied the production sufficiency for their family is no more than 6 months. But on the basis of their answered the asked questions about production sufficiency status before the irrigation system, where only 5 respondents replied (10-12) months, 25 said (8-10) months, 10 said (4-6) months and 14 replied (6-8) months.
- Water Users Committee (WUC) is working for the system running. Distribution of the water equally among the users, maintaining the facilities of the system effectively, solving conflicts among its members and mobilization the resources for maintaining the system and collecting money are the main responsibilities of WUC's.
- Three types of meetings held on the study area viz. general, executive and emergency meetings. The general assemble meeting holds on two times (winter and Summer Season) where people discussed about their problems related with irrigation system. The meeting of executive Committee holds four times a year where they discuss on resources mobilization, water distribution and conflicts resolution. Similarly, the emergency meeting is held whenever it is necessary.
- Water acquisition related activities such as, design; construction, operation and maintenance of canal are carried out by the local people applying the indigenous knowledge and practice.
- Farmers who have contributed labour and cash during the canal construction operation and maintenance, have equal water right on the process of sharing of water of the system.
- During the summer season the farmers share water for irrigation on the basis of turn/rotation. But in the winter season the head users get the first turn and the turn transfer to the middle and tail users on the basis of their system.

- For the irrigation, people of this study area have to pay Rs. 50 per Ropani per year. The WUC has made some rules and regulation concerned to the irrigation on system and those who disobey the rules must pay Rs. 200 as penalty and if he repeats the same mistake he will be punished by curtailing the time of water distribution.
- The maintenance works of the canal in general have been carried out according to the needs of cultivation and before the transplantation of summer paddy in the month of June. The works include removing of grass, graves, dry leaves and tree trunk accumulated in the main canal which blocks of flow of water.
- Turn overlapping, water stealing, canal encroachment are some major causes of conflicts occurred in the research area. Leakage of frequently breakdown of canal edger, washing out of fertilizer by over irrigation during summer and over siltation are some burning problems of the study area.

5.2 Recommendation

Farmer's organization is the important aspects for improving the management of irrigation system. Since the farmers from FMIS were organized for fulfilling their common goal, they have success in managing the irrigation system in a proper way.

This system is designed as a case study conducted for the partial fulfillment of the requirement of Master Degree in economics, so it might not be wide enough to provide appropriate recommendations for the details. However based on field observation, some suggestive recommendations are made to FMIS users and implementers which are presented as follows:

- Water should be distributed properly on the priority basis for paddy, corn and vegetables.
- To overcome the existing problems in water allocation and maintenance system in the study area, the role of the beneficiaries and district irrigation office need to be made clear and crucial. On the request of the local beneficiaries, district irrigation office and water users organization should be prepared to repair damaged canal, lining in critical part of the canal to clear stone, clay and unnecessary particles from canal before the time of field bed

preparation. In the same way the disposition of sand and silt in the canal is necessary to clear up appropriately.

- During dry period the water is still scarce for irrigation, Planner can think about the collection pond for storing. The better utilization aspects should be explored. One example can be plastic lining to reduce the leakage and quick access to field.
- The registered water users' association should be active to mobilize water utilizes and allocation of water and every part of command area should be equally maintained. The problems of the water allocation could be solved only by increasing the farmers incentives to the irrigation system.
- To overcome the problem of WUO's inactivity in resource maintenance government has to provide more legislative power to them under the current water Act. So that water users' organization can charge penalties to those who violate the rules of water allocation.
- There should be an appropriate market system to confirm that the farmers are ensured a good price of their products.

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Appendix

Schedule of Household Survey, 2065

1. General Information

Respondent's Name:……. Sex …… Age:……

Municipality/ VDC: ……. Ward No.: …….. Religion …….

2. Details about the family members of the respondents

S.N.	Full Name	Relation	Age	Sex	Education	Occupation
1						
2						
3						
4						
5						
6						
7						
8						
9						

3. Description of land holding?

Types	Total Land Area in Ropani			Irrigated Land Area in Ropani		
	Low land (Khet)	Up Land (Bari)	Total	Low land (Khet)	Up Land (Bari)	Total
Owned						
Rented In						
Rented Out						
Operated						

4. What is the Main source of income?

a. Agriculture ☐ b. Business ☐ c. Service ☐ d. Remittance ☐

5. When the irrigation system was made in operation? ……. B.S.

6. Crop production before irrigation and after irrigation?

Before Irrigation		Crops	After Irrigation	
Area in Ropani	Production in Quintal		Area in Ropani	Production in Quintal
		Paddy		
		Maize		
		Wheat		
		Millet		
		Vegetables		

7. Could you say the production sufficiency status in months now and then?

i. Before FMIS ☐ Months

ii. After FMIS ☐ Months

8. What are the changes in cropping pattern brought in your farm by irrigation?

i. Before Irrigation (KHET): a) ……. b) …….. c) ……

ii. Before Irrigation (BARI): a) ……. b) …….. c) ……

iii. After Irrigation (KHET): a) ……. b) …….. c) ……

iv. After Irrigation (BARI): a) ……. b) …….. c) ……

9. What method is used to distribute water in your irrigation system?

a)…… b)…….

c) …… d)…….

10. How frequent do the maintenance of the canal from which you get water for irrigation is required?

a) Seasonally ☐ b) Monthly ☐ c) Yearly ☐

d) According to need ☐

11. What are the conflicts in your irrigation system?

a)…… b)…….

c) …… d)…….

12. Who will solve the problems introduced in your irrigation system?

a. Water users Committee ☐ b. Farmer themselves ☐

c. Both of 'a' and 'b' ☐ d. Government units ☐

13. What contribution do you make to your irrigation system?

a) Money donation Rs. ☐ b. Paying water charges Rs. ☐

c) Participation in meeting days/ year ☐ d. Voluntary labour days/ years ☐

14. Is there any system of penalty to those who disobey irrigation system rules?

i. Yes ☐ ii. No ☐

15. If yes then, how the penalty is charged?

a. By curtailing the time of water distribution ☐

b. By increasing the days of voluntary service ☐

c. By charging money ☐

16. Finally do you have any suggestions for the better management of the irrigation in your area?

a)…… b)…….

c) …… d)…….