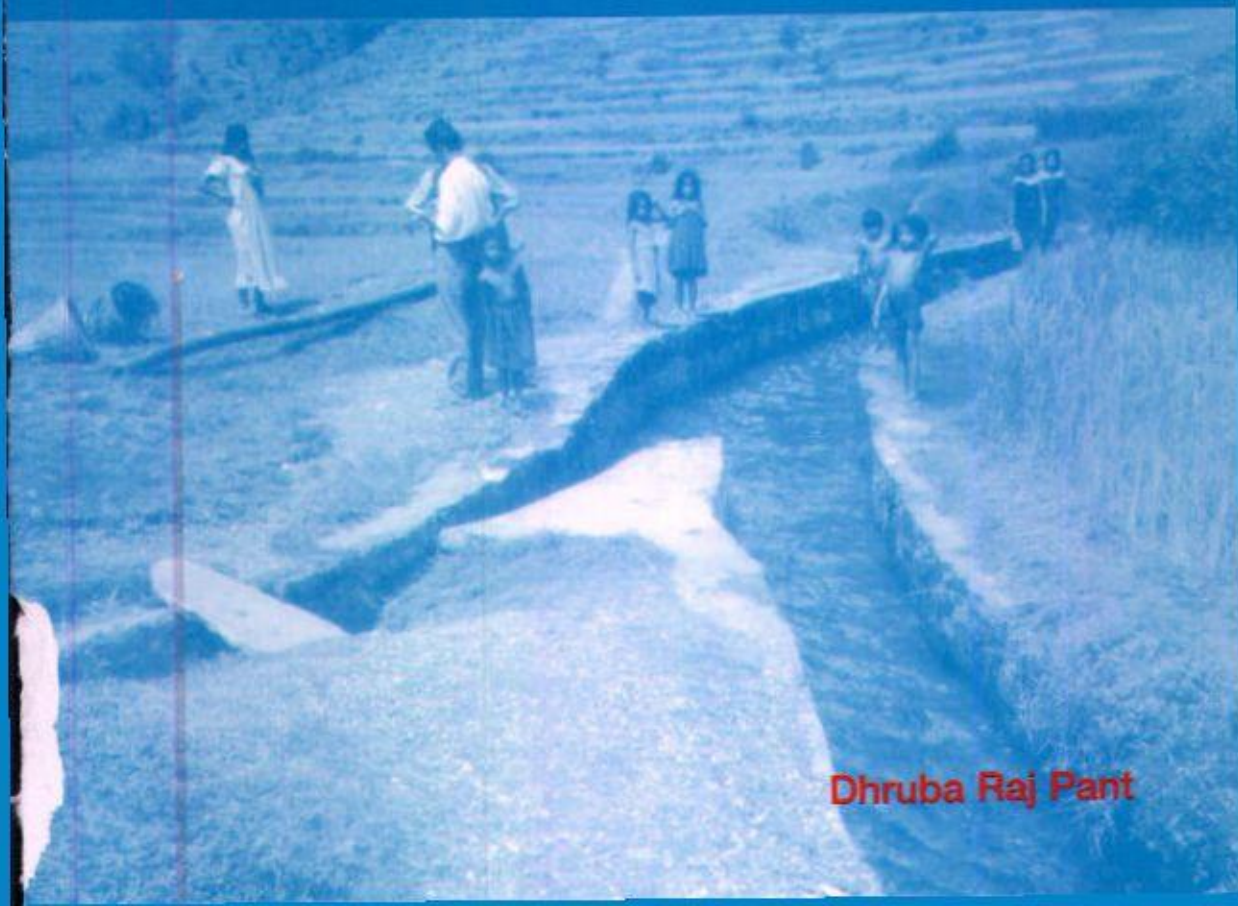
Intervention Processes and Irrigation Institutions

Sustainability of Farmer Managed Irrigation Systems in Nepal



Dhruba Raj Pant

Propositions

1. Any intervention that does not recognise the centrality of the social actors in development programs is bound to clash, rather than to fit, with the natural dynamic of socio-economic processes. (Michael M. Cernea, 1991)
2. Experience shows that the self-reliance and motivation of indigenous management groups can easily be undermined by too much external assistance, and that is a real danger in the present situation of growing international interest in small scale systems. (H.W. Underhill, 1984)
3. Intervention processes consist of a complex set of interlocking arenas of struggle, each characterised by specific constraints and possibilities of manoeuvre. (Norman Long, 1997)
4. Where external assistance occurs without corresponding local investment (such as in labour, materials and knowledge), dependency is reinforced and the benefits of the external investment are not sustained. (Douglas J. Merrey, 1997)
5. It is now generally acknowledged that the 15 billion dollars that used to be poured into the irrigation sub-sector in less-developed countries annually have not produced more than 50 percent of the anticipated output. (G. Diemer and F.S. Huibers, 1996)
6. The degree of people's interest in, commitment to and willingness to invest in irrigation will depend on how it is perceived to enhance or diminish their lives. (I. Guijt and J. Thompson, 1994)
7. Before intervention farmers were able and willing to maintain their irrigation system without outside support. However, after interventions there is growing dependency on external resources for the maintenance of irrigation system. (This thesis)
8. The changes effected by the irrigation intervention in the governance structure contributed to the increasing anarchy in rules-in-use. (This thesis)
9. The changes in physical infrastructure due to the introduction of new technology after intervention effected changes in the organisational control related to irrigation tasks. (This thesis)
10. Not only the irrigation interventions, but also broader changes in political, social, economic and administrative set up have effected changes in the existing irrigation institutions. (This thesis)
11. The institutions created by the interventions are not functioning after the intervention due to lack of a clear perception of their role by the government and the users. (This thesis)
12. The simple technical design facilitated a strong communal linking loop in the interfaces among the users and they had a greater role in the decision for the design of the technology. (This thesis)
13. The intervention for the construction of a new irrigation system has wider implications in terms of introduction of new technologies, financial resources and institutional requirement as compared to rehabilitation and improvement. (This thesis)
14. The interface between the actors facilitated the strengthening of the 'communal linking loops' for the initiation of the intervention, which was not always very transparent due to the different and hidden agendas of all the actors involved. (This thesis)

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Glossary of local terms used

Angul	The width of four fingers
Bais Khet	The land at the tail end of an irrigation system, which received irrigation water only for planting
Bhijaune palo	The turn to wet the terraces
Birta	The earning from the land for the services rendered to the state
Bitta	One Bitta = 6 inches
Dhalpas	The government employee who operates the irrigation system
Ditthawal	Now defunct local functionary who collected land taxes only on the *Khet* and oversaw the management of irrigation system
Guthi	Trust for the maintenance of public property like irrigation canals and temples
Jhankri	Local healer
Jimmawal	Now defunct local functionary who collected land taxes only on *Khet* land and oversaw the management of irrigation system
Katuwal	Messenger, who communicates the VDC messages
Khar	Natural thatch grass (*cymbopogon microtheca*)
Khet	Irrigated land suitable for rice cultivation
Khola	Stream
Kulo	Canal and earthen field channels for irrigation
Kulo Samiti	The committee formed to oversee the management of the irrigation system and the work of *Pale*
Mato muri	Unit of measurement of land. 4 mato muri = one ropani
Minaha	The land covered by public forest, foot trails, river and other public land.
Mukhiya	A non-official functionary who collected taxes only on *Bari* land
Muluki Ain	Civil code
Mul Kulo	Main canal
Pakho/ Bari	Upland, which is not suitable for irrigated agriculture
Pale	The person responsible for water allocation and distribution on *Khet land*
Panchsale	Land which is cultivated in every five years
Parma	Labour exchange among the households
Pradhan Pancha	Elected head of the village during Panchayat System
Pyan	Turn out at the branch canal.
Ropani	A measure of land; one *ropani* is equal to 0.05 ha
Samaha	Providing irrigation water from the upper field to the lower field by cutting a small section of the bunds in the upper field
Talukdar	He is the person who helped *Mukhiya* in the collection of land revenue for a specific area
Trisale	Land which is cultivated in every three years
Village Panchayat	Lowest unit of elected body during the Panchayat System, which is the Village Development Committee at present

List of Acronyms

ACAP	Annapurna Area Conservation Project
ACC	Approval and Co-ordination Committee
ADB/M	Asian Development Bank/Manila
ADB/N	Agricultural Development Bank/Nepal
AGDP	Agriculture Share in GDP
AIC	Agricultural Input Corporation
AMIS	Agency Managed Irrigation System
APP	Agricultural Perspective Plan
APROSC	Agricultural Projects Services Centre
CBS	Central Bureau of Statistics
CIDA	Canadian International Development Agency
CIRDAP	Centre on Integrated Rural Development for Asia and the Pacific
CIWEC	Canadian International Water and Energy Consultants
DADO	District Agriculture Development Office
DADO	District Agriculture Development Officer
DCC	District Co-ordination Committee
DDC	District Development Committee
DDP	District Development Plans
DIDP	Dhaulagiri Irrigation Development Project
DIHM	Department of Irrigation Hydrology and Meteorology
DIO	District Irrigation Office
DOA	Department of Agriculture
DOI	Department of Irrigation
DTO	District Technical Office
FIA	Farmers Irrigation Association
FIWUD	Farm Irrigation and Water Utilisation Division
FMIS	Farmer Managed Irrigation System
GDP	Gross Domestic Product
GNP	Gross National Product
GO	Group organiser
ha	Hectare
HDR	Human Development Report, Nepal
HFPP	Hill Food Production Programme
HIP	Hill Irrigation Project
HMG/N	His Majesty's Government of Nepal
IAAS	Institute of Agriculture and Animal Sciences, Rampur Nepal
ICIMOD	International Centre for Integrated Mountain Development
IDA	International Development Agency
IIMI	International Irrigation Management Institute
ILC	Irrigation Line of Credit
ILO	International Labour Organisation
IMC	Irrigation Management Centre
IMP	Irrigation Management Project
IMTP	Irrigation Management Transfer Project
INGO	International Non-government Organisation
IRDP	Integrated Rural Development Projects
km	kilometer
LRMP	Land Resources Mapping Project

LARC	Lumle Agricultural Research Centre
LCB	Local Competitive Bidding
mm	millimetre
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOFA	Ministry of Food and Agriculture
MOLD	Ministry of Local Development
MOWR	Ministry of Water Resources
MPLD	Ministry of Panchayat and Local Development
m^3/sec	cubic metre(s) per second
mt	Metric Tonne
NGO	Non-government Organisation
NISP	Nepal Irrigation Sector Project
NPC	National Planning Commission
NRs.	Nepalese Rupees
ODA	Overseas Development Administration
PBME	Project Benefit Monitoring and Evaluation
PCR	Project Completion Report
RAC	Regional Appraisal Committee
RAD	Regional Agricultural Directorate
RCC	Regional Co-ordination Committee
SMD	System Management Division
SPWP	Special Public Work Programme
sq. m	square metre
UC	Users' Committee
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VDC	Village Development Committee
VP	Village Panchayat
WB	World Bank
WDR	Western Development Region
WECS	Water and Energy Commission Secretariat
WRID	Western Region Irrigation Directorate
WUA	Water Users' Association
WUO	Water Users' Organisation
WUS	Water Users' Society
WUT	Water Users' Team

Preface and Acknowledgements

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1. Introduction

1.1 Nature of the problem

Irrigated agriculture is seen as vital to both the welfare and economic development of Nepal and government policy has been to renovate and extend existing irrigation systems, as well as to build new ones. A recent estimate (APP; 1995) suggests that irrigation infrastructure has been developed to provide irrigation to 62 percent (1.1 million ha) of country's potentially irrigable areas. But actual irrigated area is only 71 percent of the developed potential. Out of this the farmer-managed irrigation systems (FMIS) cover 74 percent of the irrigated area and 26 percent is covered by the agency-managed irrigation systems. These farmer-managed systems are successfully managed and sustained well over time. Water users who are the owners of the system have formulated their own rules and regulations to regulate the behaviour of the members in relation to the functions of the irrigation system. This is largely due to the ownership feeling by the users and effective organisation in terms of water delivery, operation and maintenance, resource mobilisation and resolution of conflicts (Shrestha, 1987; Gautam, 1987). The protection of individual and communal rights over the resources (Pradhan, 1989b) is an important feature of these irrigation systems. However, these systems were operating far below the production level that they could potentially achieve (Pant, 1985; Tiwari, 1986). The limitation of resources contributed by each member or group was one of the principle reasons, among others for this situation.

The importance of FMIS in Nepal was not realised by the government until the Water and Energy Commission under Ministry of Water Resources conducted a study and drew attention towards them in 1981, although some independent researchers had highlighted the importance of FMIS before. The Asian Development Bank study estimated that about 60 per cent of FMIS in Nepal required major rehabilitation and upgrading works in order to utilise their optimum potential (ADB/M, 1988). A large number of FMIS were not receiving any kind of support from the government (Pradhan, 1989a) as government laid emphasis on the development of agency-managed irrigation system (AMIS) which were large irrigation projects. In 1989 the government drafted a policy to support FMIS after realising the importance of farmers' participation in managing irrigation systems in the country.

The government assistance programme was to promote equitable and flexible irrigation water distribution through changes in the infrastructure and institutions. This was to be achieved through the mobilisation of technical and financial resources of the government. Since then, the Department of Irrigation (DOI) is providing technical and financial assistance to FMIS. However, some Non-Governmental Organisations (NGOs), International Non-Governmental organisations (INGOs), District Development Committees (DDCs) and Village Development Committees (VDCs) were and are providing financial and technical support, although on a limited scale.

The broader political and administrative changes[1] in the country have had an influence on the implementation of the government intervention programme and its outcome on the local government village at level. This was largely due to the changes brought about in the government policy and the changes in the role of the local level institutions, which were directly or indirectly involved in the irrigation management vis-à-vis the role of the users of the irrigation system.

In FMIS, the processes by which farmers obtain, accumulate and use resources are more or less institutionalised, because these practices have existed for a long period of time. Resources required for their maintenance were internally created and gradually accumulated, commensurate with the inherent capability of the socio-economic structure of the community to generate, absorb and use surplus. In this respect institutions were playing an important role in the mobilisation and use of internal resources according to the need and capacity of its members. Further, institutions were important in increasing the absorptive capacity of their members, which is required to use additional resources made available to improve irrigation systems. Therefore, it is necessary to understand the structure and functions of such institutions. If this factor is not taken into account infusion of financial resources brought in along with technological intervention might create conflicts among the users or old institutions may be abandoned. When these conflicts are not resolved amicably, the very purpose of intervention could be defeated and the processes, which in the past have been sustained by the members, could be disrupted. In the process of intervention it is believed that either new institutions are created or existing institutions are transformed to be adapted to the new situation. Nevertheless, the sustainability of these institutions was largely dependent on how people perceived the emerging new institutions. In some cases it was found that government institutions replaced the old institutions but that people had not accepted new institutions. The result has been the disruption of the processes by which institutions were created and sustained for over a period of time.

The realisation of the full potential of irrigation in the hills to increase agricultural production and productivity however is also largely dependent on various other factors such as inaccessibility, fragility, marginality and diversity (Jodha, 1992). The production choices of the household are determined by these specificities. As a result the crops and cropping patterns vary widely within the agro-ecological regions depending on topography, the altitude and availability of irrigation water, which determines the land use intensification (Abbington, 1992). The pressure on the land due to population growth (Horberry, 1990) has also encouraged the land use intensification to meet the household needs. The irrigation assistance programmes are aimed at encouraging innovation in agriculture also. However, the farmers' willingness to take the risk and the benefit from it are important factors for innovation (Rigg, 1986) beside, the opportunity made available by irrigation and agricultural technology (Vincent, 1995). Thus, the irrigation intervention may make possible the intensification and extensification of land use but not the innovation in production in all cases. Nevertheless, lack of technological knowledge, financial constraints and lack of infrastructure were the main causes considered by the intervening agencies as reasons for support to FMIS.

Interventions can be made to create new schemes and improve existing FMIS. These schemes can become agency managed irrigation system (AMIS) or remain FMIS. The reasons for the difference include that the government manages the newly developed schemes through its employee called *Dhalpa* and also provides annual maintenance support. The existing FMIS is left to the farmers for its management after improvement and government does not provide annual maintenance support. Bromley (1982) argues that all farmers face some sort of uncertainty over the timing and quantity of water receipts. Uncertainty is caused by their physical interdependence (technological externalities) to other farmers and breaking of rules and convention (institutional uncertainty) by some farmers. This will constrain his investment in land improvement, as the farmer is a cautious optimiser. Any intervention in this regard should be made with due considerations to farmers' need, as it may help in removing the uncertainties. This in essence means that farmers should have some sort of control over the use of resources.

The study of FMIS in the hills of Nepal has been of interest to the researchers due to variations in the management practices of these FMIS. Most of the studies on FMIS in the hills completed so far in Nepal have focused on analysing the existing situation of FMIS. Some of these studies were able to document the processes applied by farmers in managing the irrigation systems in relation to property rights, resource mobilisation, and organisational structure. Studies on the intricacies of intervention, which are shaped by the interaction pattern between actors and its effect on the management of hill irrigation systems, are scarce. Even the officials from the Economic Development Institute of the World Bank admit that the effects of World Bank supported intervention programmes in irrigation are not fully analysed and documented (view expressed during a seminar at the Department of Irrigation, WAU on 8 Nov. 1995). Similarly, Coward and Levine (1987) have also pointed to the need for studies on government intervention in farmers-managed irrigation systems.

Shivakoti (1992) has highlighted the differences in results achieved as a result of differences in approach applied by different agencies while providing assistance to the FMIS. Similarly, the study (Benjamin et.al., 1994) prepared for the United States Agency for International Development have examined the governance structure and its effects on the performance of agency-managed and farmer-managed irrigation systems in Nepal. One of the findings of the study was that the governance structure of a farmer-managed system is conducive to better performance of irrigation systems as compared to agency-managed systems. This was due to the differences in institutional dimensions of these irrigation systems. Hence, there is a need to understand the complexities of processes of agency intervention and its objectives of empowering local people to act in development processes in relation to the emergence of institutions for irrigation management at local level. Also, there is need to understand how actors interact. The present study is an effort to bring new understanding in this area.

1.2 Research focus: Intervention, rural transformation and institutions

The need for intervention is felt both by the government and the farmers. The stated concern of the government has been to maximise the benefit to the users through improvements in the existing irrigation systems. Likewise, the users require agency support in improving existing conditions of irrigation systems which they cannot do on their own. With the support from various donors, the Government of Nepal has implemented support programmes with a view to transform water availability and agricultural production, and increasing the institutional capabilities of farmers to develop and sustain efficient, equitable and reliable irrigation management practices in irrigation systems in Nepal.

With the growing commitment of the government in various sectors of public life and also due to the responsibility to provide its services efficiently at low cost, the tendency of government policies is towards supporting groups and organisations at local level (Marsden, 1994) and decentralising management. The programmes thus designed are said to improve the existing situations of peasant production systems. Whatever may be the forms of support from the government it entails the interaction between the farmers and agencies and decision making at various levels directed towards achieving stated objectives.

In general, the stated objective of the interventions in irrigation in Nepal is to increase the food production through improvements in the irrigation systems and their management practices. The main activities of these projects in management improvement have been: a) to strengthen the capability of Water User Associations to assume greater responsibility and authority for the operation and maintenance of the irrigation system; b) to assist FMIS in improving their systems and c) to document the lessons learned which are to be applied in future research and training for improvement in water delivery and production (IMC, 1987). These intervention programmes aimed at:

- Reducing frequent breakdowns of the system to increase reliability of irrigation water.
- Increasing irrigated areas through better regulation of water at the river intake, reduction of water delivery losses and more efficient use of water.
- Encouraging multiple cropping through the availability of adequate amounts of water in time.
- Ensuring less 'scarcity' of water limiting rotations to support new high yielding varieties.
- Reducing resource mobilisation in terms of human labour for maintenance requirements, which can be diverted to intensive agriculture practices.
- Bringing in new technologies for better water control and management.
- Strengthening users' capability to manage irrigation system through their own resources.
- Organising new institutions for the sustainability of the irrigation systems

The changes in government policy at various times have resulted in differences in the intervention strategies designed for various programmes. Moreover, there was no consistency in the intervention policies for various programmes occuring at the same time[2]. As a consequence different institutional mechanisms were introduced for various programmes resulting into the variations in resource use, system design procedures and implementation mechanisms. Thus, there were differences in the intervention processes and organisational requirements of various programmes. This in effect led to the variation in responsibilities of the users and agencies at various stages of irrigation development, more particularly on the ownership of irrigation system, which had implications on the governance and management of irrigation schemes involved. Also, there was a difference in gains and benefits received by different farmers.

Government intervention programmes to support these FMIS have affected the existing institutions at local level. In this process, some existing irrigation institutions were reorganised and some new ones were created on the initiative of the government. In some irrigation schemes the users took the initiative to form farmers' organisations. This has brought about changes in management of irrigation tasks viz. water acquisition and system development, water allocation/distribution, conflict management, resource mobilisation and system maintenance. In some cases this has created a situation of conflict and in some apathy towards the irrigation system. Thus, assessing the effect of external intervention on existing institutions is of importance in the present context. In this context the present study is an effort to understand the social, administrative and political processes involved and changes brought about by development interventions in the management of AMIS and FMIS through the construction of new schemes and rehabilitation of old FMIS schemes and farmer's adoption to them. Knowing these processes is essential for efficient, effective and sustainable institution building at local level.

1.3 Structure of the thesis

The thesis has seven chapters. This first chapter has discussed the nature of the problem, research focus and research objective. The various concepts and the theoretical framework applied in the study along with the various methods used in generating information at the field level and for desk top study is presented in the second chapter. The characteristics and types of hill irrigation systems and the importance of irrigation in agriculture development under different plan periods are discussed in the third chapter. The third chapter also provides information on the general background of the country and the politico-administrative structure of the country. Four case studies are discussed in chapters four to six. The case studies consist of the description of the general environment along with the presentation of the individual irrigation schemes. Each presentation is followed by the analysis of the case with the use of the concepts in the theoretical framework. The final chapter includes major findings of the case studies and conclusions.

Notes

1 For detail see chapter 3.

2 See chapter three for the discussions on intervention policies and strategies for irrigation programmes.

2. Concepts, theoretical framework and research methodology

2.1 Introduction

The emergence of local institutions in the past has been due to the initiatives taken by the people themselves to access resources for livelihoods. Government efforts for institution development appropriate to new production opportunities and technology use has been slow to recognise the importance of these institutions. Sometimes this is due to the ignorance but is also due to the unwillingness to delegate power and control over resources by the central authority to the local level. Uphoff (1982) and Tang and Ostrom (1993) have observed that the existence of local institutions and their use for generation and mobilisation of local resources were overlooked in the past. The role local people are playing and could play in their development was not recognised in initial programmes of development assistance. The main reason for this was that planning and implementation of activities for rural development programmes focused on technical innovation and thus were located in agencies that also conceived planning and implementation in technocratic approaches, and that local people did not have any knowledge in this respect. The programmes designed were also sometimes far removed from reality and lacked flexibility to adapt them to the local situation. Another reason is that the development programmes were planned to serve the political and economic objectives of the government. Participation was sought only to fulfil government objectives (Hall, 1988). As a result the bureaucracy failed to deliver the goods and services that were asked for by the people living in the rural areas. In recent years however, the role of local institutions and the capacities of the people to steer their own development are being recognised and their involvement in development initiatives is increasing. Besides, pressure from the donors, who provided the bulk of the development resources, has also brought about this shift in the government policy. Nevertheless, there was bureaucratic neglect in understanding and analysing the local situation and the users' role in problem solving and using new opportunities. Therefore, there was always a gap in the design of the policy and its implementation. Moreover, the importance placed on achieving the physical target focused on administrative formalities at the cost of the real outcome. This has constrained the effective design and implementation of development programmes. As a result many of the development projects failed to realise their objectives. This has been a matter of discussion and concern among development practitioners.

Current thinking on 'development', which is viewed as an orientation towards progressive change (Thomas, 1999), in the developing countries has emphasised a lessening role of the government and the creation or development of 'intermediaries' between people and the government. The term intermediaries refer to institutions created either by the people or the government at the local level, to encourage and support local initiative. The process of transformation will be affected or influenced by economic, social and political changes occurring at national and local level.

However, the importance of these intermediary institutions lies in their efficacy in addressing the problems for which they came into existence.

The public resources and their use in the developing countries are controlled by the central government. Theoretically, resources from the government should be used in combination with mobilised local resources through the development of institutions at local level. However, the development strategies applied by the government did not pay attention to strengthening informal institutions in traditional societies so that they could evolve into stronger formal institutions at their own pace. Although these types of institutions have a greater chance to survive than those created from outside (Bagadion and Korten, 1985; Cernea, 1985; Freeman and Lowdermilk, 1985; Uphoff, 1992). Also, the institutional dimensions of technology and the social action that can take place around changes in technology were not taken into account.

The massive resource investments in the rural areas have not produced the desired results due to lack of a participatory approach to technology development (Ashby, and Sperling, 1994). Besides, there was a 'knowledge gap' about the potential of rural institutions and the lack of assessment of their importance for development (Uphoff, 1982). As a result the group action required to carry out development tasks was not forthcoming. Besides, the development programmes in the past seldom gave attention to building up grass-root institutions (Cernea, op cit.). But there have been gradual changes in the intervention processes applied by the government to overcome these problems. Nevertheless, the result of this shift in development intervention strategies, which laid emphasis on creation of institutions, also was not as expected. However, some individuals and groups of individuals were able to create new opportunities for their benefit due to these changes.

Hereafter the concepts and theoretical framework will be discussed.

2.2 Intervention as a process

Intervention is an external action with knowledge and resources to bring major or minor changes in an existing situation. Various actors participate in the design and implementation of the intervention. However, their role in the design and implementation are governed by the opportunities provided to them. The users play effective roles in some of the interventions. While in the others, the government agencies and the local elected institutions play an important role in the design and implementation of the interventions. In general, in Nepal the government staff and the local elected representatives were found to be active in the design and implementation of the project during the early eighties. However, users participation in the intervention processes since the later part of eighties was made mandatory. Thus, the processes of interventions are important in understanding its outcome. In this respect development intervention can be seen as arenas of struggle for scarce resources in which the actors involved will try to manipulate the situation for fulfilling their individual objectives (Dusseldorp, 1993). This implies that several individuals or groups of actors will compete for the control over the use of resources, in a way which promotes their interest. Thus, the outcome of the development

intervention is shaped and reshaped through the process of interaction between the actors involved in the process (Long, 1989). In this process some individuals or group of actors becomes successful in taking more benefits than the others take. In recent years development intervention is regarded as a process of consensus and coherence building among actors for public action (Wield, 1999). This approach recognises the existence of various actors rather than the supremacy of one single agency, which is the government. This is because multiple actors are promoting the public interests through the implementation of various development programmes. However, in Nepal most of the government interventions are implemented through a single agency and are task oriented rather than concerned to bring together the various actors to achieve the objectives of the intervention. As a result most of the 'projects' implemented by the government fail to achieve the objectives of the intervention because of limitations in understanding of livelihood strategies and related institutions (Vincent, 1995). Therefore, for the intervention to succeed, area specific strategies and actions are required due to the diversity in socio-institutional, physical and environmental conditions of the areas.

In order to look into the development intervention process, the 'communal linking loop' of the rationale decision making model will be used in the present study. This is defined as "the interrelated decisions and activities individuals have to make and perform, when they want to realise certain objectives, by conceptually and actually linking of their objectives, given their perception of the present situation and their (scarce) resources" (Dusseldorp, op cit). This model facilitates systematising the processes of the intervention.

To complement the analysis based on this model, the interface approach of Long (1989) will also be used as it facilitates to analysis of the interaction pattern developed among various actors and its outcome during the process of programme intervention.

These two approaches are found to be useful for this study because, the combination of these two approaches will help in analysing and understanding the problem to be studied more systematically. As pointed out by Dusseldorp, " ... no development will take place, whatever action is undertaken by organisations or institutions, unless individuals (actors) have decided to act" (Dusseldorp, op cit).

2.2.1 Rational decision making and 'communal linking loop'

A decision is a goal-directed behaviour and decision making is a process of choosing among the alternatives, and the important determinants are the needs of an individual and his perception of the environment (Jabes, 1982: 53). The normative and descriptive schools of thought, led by economists and behavioural scientists respectively, view decision making differently in terms of rationality. The former argues that the individual has access to all the information to make a decision. The latter emphasises that one may not have access to all the information or is not able to process all the available information (see Abell, 1992; Etzioni, 1988; Jabes, op cit.; March 1986 for various forms and conditions of rationality). Thus, decisions are not always optimal as argued by the economists. The rational decision model (Dusseldorp, op cit.), which is based on a system of logical thought within the world

views and knowledge system of the actor or deliberations (Etzioni, op cit), assumes that given the available information all people want to achieve their goals and objectives at the least possible cost. The 'basic linking loops' as described in this model are the interrelated decisions and activities individuals have to make and perform, when they want to realise certain objectives. When 'basic linking loops' of several actors are combined to attain certain objectives, then it becomes a 'communal linking loop'. This happens when individuals realise that the objective is not attainable individually and there needs to be a combined effort of all.

In order to combine the efforts, the actors will have to agree on the same set of objectives and they will have to negotiate over the resources. But conflicting individual objectives sometimes make it difficult to construct a 'communal linking loop'. Because, the conflicting objectives and the value preferences of the individual participants affect the communal decision making (March, op cit.). However, individual limitation in achieving an objective is the driving force, which brings people with identical objectives together to join a 'communal linking loop' that results in the realisation of the common objective. Communal linking loops are rather fragile constructs for the following reasons (Dusseldorp, op cit.):

- Objectives of actors and their perception of the present situation, or the means they have can change during the period a communal linking loops functions.
- Actors do not only have explicit objectives, which they openly express. They have in many occasions also implicit objectives.

Besides, the conditions for new opportunities of action through a linking loop can be episodic and highly dynamic. Their use requires also conscious recognition of options and use of resources, which may also be unpredictable in nature. Consequently, in the development of their 'communal linking loop', actors are pursuing their own self interests and manipulate their social networks to realise their objectives. These social networks might consist of religious groups, kinship and other social groups, which could have critical influence both on creation of new networks and new institutions.

2.2.2 Interfaces

The interaction of various actors at different points in time is termed as a 'social interface' which is defined "as a critical point of intersection of linkage between different social systems, fields or levels of social order where structural discontinuities, based upon differences in normative value and social interest are most likely found" (Long, 1989:1-2.). The importance of the analysis of interfaces lies in understanding the outcome of any planned development programme. The design and implementation of a development programme is generally thought to be a linear process. But in reality, different actors involved at various levels in the process of planned intervention influence the implementation and its outcome. Thus, there is always a differential response to the programme as various actors have different interests backed by different resources (Long, 1984) and actors involved would define the situation based on their own experience and apply various strategies to shape the event.

The interaction pattern among individuals and institutions is dynamic in nature and provides a venue for shaping and reshaping the outcome of development intervention. This shaping and reshaping of a development outcome is the result of power, negotiation and compromise among various individuals and institutions. Thus in development interface situations, a central issue is the way in which policy is applied and, often, in the process transformed (Long, 1984). In the process the policy, objective and strategies of development programmes are modified to accommodate the opinions of various actors or the development programme is likely to fall short of its intended achievement. The actor-oriented approach is an appropriate tool, in order to understand these processes in the intervention programme, as it recognises the central role played by human action and consciousness (Long, 1992).

2.2.3 Intervention and technology

In many interventions, new technologies are introduced to bring changes in the existing situation. Technology is defined 'as the production and use of artefacts, and artefacts as materials altered through human agency' (Feibleman, 1982). The development and application of technology is a socio-technical process as it involves human interaction with infrastructure. The technology includes the material and equipment needed for construction. The other aspect of the technology is the intellectual as well as managerial, organisational, administrative and economic arrangements needed for the use and maintenance of the system. Intellectual, material and institutional elements are the constitutive parts of any technology (Swantz, 1989). Several different technologies may require to be combined together to take advantage from the introduction of new technology. For example intervention in irrigation needs to take into account the agricultural technology and its social and organisational dimensions as well. Therefore, the technology needs to be viewed in a broader social context of its social use, social construction and social effects (Mollinga, 1998) which is significant for the success of any technology in relation to its acceptance by the people.

The actors could influence the change process by acceptance, rejection or through modification of the technology introduced, or reduction of resources allocated for technical intervention. The cultural differences between the external agents and the actors will have an effect on the transfer and adoption of technology and the control of resources. Therefore, the success of any technology developed and disseminated by the government depends on participation of people. Further there needs to be a shared view among the individuals at different levels of organisation who are engaged in planned intervention. The success of intervention is measured in terms of the benefits it provides to all the people.

2.2.4 Intervention and participation

Dusseldorp (1993:48-49) views participation as the realisation of the common goal by the set of individuals and the group through the formation of a 'communal linking loop'. He discusses various forms of participation. It could be direct and complete or indirect and partial. The size of the group may influence the forms of participation.

The smaller the group the more direct and complete can be the participation. Besides, involvement in the community activities is also based on customary participation. The necessary conditions for the participation are that the people concerned have to organise themselves, they control the resources and make decisions for the use of resources at their disposal (Gow and Vansant, 1983) for realising the goal. But at the same time participatory technology development and its implementation entail accountability among the actors involved in it (Ashby and Sperling, 1994:756). Participation in government-implemented programmes is often related to the material or labour contribution from the people but not on the control over the entire resources and the decision making for its use. Low participation in resource contribution (Chand, 1994) has been found in the government-designed and -implemented programme due to the processes applied in it. While interventions are often used as a means to link people and state (Vincent, 1995:130), this does not mean that participation is present.

The knowledge of local culture and the commitment of the people for personal investment and assurance of benefit are required to stimulate increased participation of the local people. Individuals are by and large motivated by personal benefit and they try to maximise it. But their activities have to conform to the norms set by the community, which is regulated by various sanctions applied by the community. Nevertheless, conformity to those norms is dependent on weighing of benefits to costs. This is one of the reasons why an individual is always keeping open his option to remain in the institution or to leave it. This is of importance for continuing the activities of the institution. In essence, any intervention programme should take into account the likely effect on role, rules, authority structure, and decision making of an existing institution and community.

Participation is translated in the form of role expectation and its performance, which requires a defined authority structure between the institutions, and within the institutions (Bagadion and Korten, 1985). Classification of the activities each individual and each institution are supposed to carry out will delineate the authority among them. This will reflect the domain of the power among institutions and among individuals. This sort of delineation is possible through the interaction of the people involved.

2.2.5 Intervention and knowledge

The nature of interaction between multiple knowledge systems determines the outcomes of innovation. Basically, it is the utilisation of knowledge and skills of the people to be affected, which requires greater interaction between local people and outside agency. Appropriate studies for the analysis of existing situations and the discussion with the actors to find out their perspectives and what they want are important aspects for successful technological interventions, which are often multiple in nature. The approach followed in the development and transfer of technology is influenced by exchange of knowledge that takes place between the people from different cultural settings. Actors in that set up are seen as active participants or passive recipients, in other words whether use is made of their knowledge or not, outside intervention determines whether the approach is 'top down' or 'bottom up'.

That is crucial for the success or failure for the transfer of technology. Studies (Van der Zaag, 1992 and Paudyal, 1994) have shown that actors used to disregard the arrangement created by the introduction of a new technology if it is against their interest and they will develop new arrangements that will lead to the solution of their problems. One of the implications of this finding is that introduction of a new technology may create new problems instead of solving existing problems if local processes are not understood properly.

2.2.6 Intervention and agency

Agency is used here to mean a government agency such as Department of irrigation (DOI). The intervention policies and strategies of government agencies are dynamic in nature. Consequently, there have been changes in government policies and programmes. The current emphasis is on promoting the self-help capabilities of the people while confining the state's role to facilitator. This shift in focus at present is due to the emphasis on the reduced role of the government in order to cut the costs and to make clients more responsible towards their development. Besides, the proliferation of multiple agencies providing support at the local level and the changes in the local government and agencies have created new space in their interaction with the people thereby changing the role of the government in the development activities. The change in the role of the state in the development programme however, is recognised as the process of democratisation and local empowerment (Vandergeest, 1991).

The differences in the intervention policies and strategies among the agencies involved in development intervention could be observed at two levels. The first is within the agency and the second is across the agencies. The changes within the agencies were found in terms of the programme focus, in which special programmes are designed by targeting a special group of people. The other is more general in nature, which is applied without any focus on a specific target group. Thus, in recent years various implementation strategies were applied to promote self-help. The variations in the intervention strategies within and across the agencies have a differential impact in the output as reported by Shivakoti (1992) in the study of intervention in FMIS in Nepal. This is because, the programmes had different requirements in terms of resource contribution, rules in its application and the policy requirement to be demand driven. Moreover the crucial factor was the interface between the community and the agency and how these shaped the formation of a linking loop at the local level. That would have implications in the design and implementation of the intervention.

2.2.7 Intervention and project environment

The environment in which it is operating influences the outcomes of development projects. Dusseldorp (1993:27) has identified four sets of environments- economic, social and cultural; institutional, political and legal; physical and ecological and technological. Thus, the present emphasis by the government on development projects which are designed to achieve specific objectives in a given period of time

are also influenced by these environments. However, depending upon the project environment these could be further categorised into controlled environment, influencing environments and appreciated environments (Smith et al., 1981 cited in Wield, 1999:36). The government's role at present is viewed as to create an enabling environment for the clients to take up their own activities. In this context, Thomas, (1999) however, has presented a balanced view. He argues that the prime objective of a development programme should be successful completion of tasks at hand, which requires a mix of both 'command and control' and 'empowerment and enabling' environments.

2.3 Institutions

We can find variation in the definition of the term 'institution' as used by different writers but we can see some commonality in the usage of the term. Some definitions of 'institution' will help in finding these commonalties and identifying the ingredients of an institution.

An institution is the rules actually used (rules-in-use or working rules) by a set of individuals to organise repetitive activities that produce outcomes affecting those individuals and potentially affecting others (E. Ostrom, 1990 cited in Tang and E. Ostrom, 1993).

An institution is also defined as complexes of norms and behaviour that persist overtime by serving collectively valued purposes. Meaning that an institution is a combination of roles, rules, procedures, a practice, and a system of relations (Uphoff, 1986a).

An institution is "... an enduring, complex, integrated, organised, behaviour pattern through which social control is exerted and by means of which fundamental social desires and needs are met". (Fairchild, 1955 cited in Dusseldorp, 1993:56)

These definitions emphasise different elements of institutions as rules constituted in a group requiring a complex of practices and control. Besides, these definitions discuss the performance of the role by an individual and the rules that regulate actions of the individuals/groups. The action is always guided by the role expected by other members of the community and one is judged by the performance associated with the role. Coward (1985) opines that this role expectation and role performance are the institutional and organisational dimensions respectively which are regulated by the rules. It has to be realised that institutions are not functioning in a vacuum. Changes in the political environment and opening up of the villages are changing the strength of social control, which is of great importance for the functioning of the institutions. The well functioning institutions will have greater control on the use of the resources and its distribution.

It can be said that an individual's role performance is based on his social construction of reality. Social construction of reality may differ among individuals and among groups also. It is also influenced by the knowledge they acquire through various means. One of the means to acquire it is through the interaction and dialogue between specific actors and it involves aspects of control, authority and power that are embedded in social relationships (Long and Villareal, 1994). The knowledge one

has and his construction of reality may have significant influence on the interaction pattern among the people, which ultimately will affect the performance of the institution through decision making at various points.

Institutions could be classified into two types: formal and informal. A government agency is a formal institution as it has rules, which are officially laid down in a written form. Farmers' institutions could be both formal and informal. An institution, which has written rules, is termed as formal, whereas an institution, which does not have written rules, is an informal institution. In general, government-recognised institutions are formal. In many of the informal institutions the rules are not in written form but they are practised for a long period of time. They serve as a rule in their day to day interaction.

Another important aspect of the definition is legitimacy, which is acquired through the recognition of its authority. The organisation needs some sort of authority to enforce the rules. (Freeman and Lowdermilk, 1985; Bagadion and Korten, 1985). Authority not in a legal sense but of acceptability from its members is required and which becomes a practice (Curtis, 1991) among its members.

In the process of transfer and adoption of technology, the various institutional dimensions that it may encompass need to be considered. Need may arise for the creation of new institutions or existing institutions have to be adjusted to facilitate the introduction of a new technology. The important thing to take into account is the institutional capability required to manage the technology, which encompasses levels of knowledge, skills and cultural practices of the people concerned besides specific task demands of keeping technology operational. Institutions are not only shaped by operational needs and tasks but also by preferences on organisation and financial arrangements, which also shape the linking loop.

Long (1977) opines that the success of the government intervention programme for building local institutions lies in democratic participation and self determination by the people concerned, whereas increased participation by bureaucrats and party officials will hinder the development of community or organisations. Increased involvement of the people in the affairs affecting them will also help in distributing the benefits more evenly among the participants provided it takes place in a true democratic context and under honest leadership. From the discussions however, it becomes clear that the formation and strengthening the capability of the local institutions can create the social capital[1] for the common good. New organisations create new roles and networks. They demand new skills, but training can also give local actors new skills. These all affect the linking loop.

2.4 Institutions, organisations and the process of irrigation

A number of researchers have developed conceptual frameworks for the study of institutions and organisations involved in the delivery of irrigation water. These enable the study of rules and practices in the different areas of irrigation water management, particularly for governance and property rights developed to ensure access to water, execution of management tasks and the control needed for assured water delivery. These concepts are presented here as a means to identify particular

areas of possible institutional change in the irrigation systems studied, their relationship with the intervention process and particular features of the linking loops involved in the intervention.

2.4.1 Governance and property rights

Ostrom (1992) provides an analytical framework of institutions for governance of irrigation systems, with three nested sets of rules which are necessary for the effective functioning of the irrigation system (Kiser and E. Ostrom, 1982 cited by Ostrom, 1992:44-45). The *operational rules* govern the daily use of water, monitoring the activities of others and rewards and sanctions for the combination of action and outcomes. *Collective choice rules* confirm how schemes should be operated and managed. *Constitutional choice rules* determine who is able to participate in a scheme and who will draw up the operational and collective choice rules. Ostrom (1992:67-78) also has identified several conditions for long enduring irrigation systems. These include: a clearly defined set of users with shared cost and benefit, equal participation in the decision making; proper monitoring of the behaviour of the members and an effective sanction procedure applied from within the group; and minimal external intervention in the design of the rules. The formulation and implementation of these rules could be formal or informal but they are essential. However, the external intervention in an irrigation system may bring changes in the formulation and implementation of these rules. One of the likely causes of the changes in these rules could be due to the change in the property rights in an irrigation system.

These governance rules are often related with the property rights governing access to water. Studies have looked at the nature of rights (whether water rights may be owned, and inherited or sold, or be rights of use only) and how they can materialise. The concept of 'hydraulic property rights' as developed by Coward (1977) has been found operating in many farmer-managed irrigation systems, where rights to use infrastructure and receive water are related to the contribution made in construction and/or maintenance of a system. The rights are expressed in terms of access to the use of resources, which is specified in terms of water quantity and also responsibility towards maintenance of the system (Martin, Yoder and Groenfeldt, 1986). In most of the cases the right over use of water belongs to those who have invested in its development. However, other forms of tenure found in irrigation systems are discussed in Vincent [2](1995). From the study of traditional irrigation systems in India, Coward (1990) observed that shared property rights among the users provide social glue for operating and sustaining the hydraulic works and patterns of distributing water to different users. Cowards' work triggered interest in the responsiveness of irrigation to change. Dani and Siddiqui (1987) suggest irrigation institutions do respond to economic change and externalities, but this change will usually reflect underlying property arrangements and pre-existing institutions. Thus external interventions might only succeed to the extent that they build on existing institutions. Lack of due consideration to these aspects could increase dependence on government resources, alienate users from the system and weaken the traditional organisation and affect equity (Chand, 1994:26; Curtis, 1991:122-123) due to the

changes in property right and the tasks carried out by the users (Vincent op cit). Thus, the development assistance needs to take into account the complexities of local institutions, as it may affect the institutional practices (Ambler, 1989) pertaining to the water right. Thus, protecting the right of the old users and guaranteeing the right of new users, who have formed 'communal linking loop' to access external resources is important in achieving the objective of intervention. These changes in the roles and status entail a new set of behaviour by the actors, which is dependent on enforcement of rules, which requires social control. The degree of social control exercised by the community is affected by homogeneity of the group and existing social structure and the power relations within it.

Farmer's concern over water rights may have implications in the implementation of the programme and realisation of stated objectives of intervention in terms of inclusion of new users and expansion of irrigated area. The objective of the government may not coincide with the objective of the farmers. For instance present users may be reluctant to include new members as it may affect their use of water and control over it. Thus, it is interesting to note whether the government via the intervention will facilitate consolidation of farmers' right over the water or will try to take control of water in its own hand. As Coward (1990) has pointed out government interventions in existing irrigation networks are not likely to be successful if they attempt to erode rather than enhance the existing water rights. Benda-Beckmann et al (1997) reported that the old users felt that their interests and rights were not considered during the rehabilitation of an irrigation system in Nepal.

The security of the system's water rights may vary from system to system. In some cases, the community of users may have the sole right over water sources. However, in many cases the users of a water source may be from more than one irrigation systems. If more than one community is using the same source there must exist some rules for the allocation of water so that the each system obtain their fair share of water. In such cases, the water may have to be divided at the source itself. Irrigation institutions have to represent the water users to obtain their share of water, which may include proving their right to use from that source and obtaining a fair share. Nevertheless, in some cases the users of down stream irrigation system have been able to establish their right due to the opportunity provided by new intervention. This was largely because they were able to obtain government resources before the intervention in up stream irrigation system by influencing government decision making through their linkages at government bureaucracy. This could have implications in terms of irrigation tasks as mentioned below.

2.4.2 Management of irrigation tasks

Uphoff (1986b) described irrigation as a 'socio-technical process', where both human and physical aspects interact continually and profoundly. Uphoff studied management of irrigation systems in three dimensions, which was based on group actions performing important irrigation tasks. These were actions related to: the *control structure* (design, construction, operation and maintenance), *water use activities* (acquisition, allocation, distribution, drainage), and *organisational activities* (decision making, resource mobilisation, communication and conflict resolution).

Institutional arrangements are necessary in order to accomplish irrigation tasks. But the preferences for the institution are subjective to the local group. Some irrigation systems have a formal organisational structure whereas others have informal structures to enforce the institutional arrangement of irrigation practices. Studies have revealed that area covered by an irrigation system has direct effects on the type of organisational structure. The larger the area coverage the more formal a structure it would be and vice versa (Martin and Yoder, 1987). However, some sort of organisational structure does exist in any irrigation system. Organisations may exist at different levels or there could be tiers of these organisations. Organisations exist within the group of farmers and across the group of farmers within an irrigation system. However, there could be one single organisation (institution added) at the apex of all (Coward, 1979; Pradhan, 1989a).

Government agency's involvement in the form of financial and technical support to indigenously managed irrigation systems requires also a process of institutional building or institutional strengthening. Institution building implies creation of new institutions according to the need perceived by the government agency at the cost of existing ones. Supporting the existing institutions or transforming them to cope with the new situation is institutional strengthening. The organisation of irrigation systems however, involves negotiation and co-ordination, which has been described as a transaction cost (van Steenbergen, 1997:26-27). Thus, the changes in the institutional arrangement will also affect the transaction cost. Therefore, adherence to the new institutional arrangement by the user will depend on the transaction cost and the likely benefit from it. Nevertheless, the benefit from the change should exceed the cost in order to encourage the user to invest in institutional change (van Steenbergen, op cit.). In this context, acceptance of farmers' institutions as a resource for better management of irrigation systems is necessary to achieve the expected output from technological and financial intervention. Thus, intervention should take into account the institutional strength of farmers managed irrigation systems.

Uphoff's three-dimension analysis has a particular utility for studying the inter-relationships between different dimensions, to show how technology may be related to management. However, the purpose of this study is to look more at the institutions and practices, which allow the process of irrigation water delivery to take place. For this reason, the following areas of task execution are selected for further study.

Water acquisition, system development and system water allocation

This refers to the securing of water rights for the system within the allocation across the catchment, and the building of intake and the system capable to supply water to the plants. System development consists of construction of headwork, canals and the field channels capable of supplying water reliably, with an allocation of water accepted by all other affected users in the catchment. Basically the topography, water requirement, water availability and water rights all shape this development. The technology involved in these constructions may vary from system to system due to variations in design choices (Vincent, 1995:115) which also shapes the management requirements of an irrigation system. It means the size of the system, topography to

be covered and the number of users it has to serve will have an effect on system development.

The physical infrastructure e. g. the headwork, the canals and the field channels of a system may be permanent constructions. The components may also be temporary constructions, which have to be maintained regularly. This determines the activities to be carried out in a year or seasonally. This will greatly affect the operation and maintenance of the system and resource mobilisation for it. The physical structure, particularly the headwork of most hill irrigation systems is of temporary nature as the resources available to the farmers may not be sufficient to construct a permanent weir. Consequently, farmers have to put more resources in its maintenance seasonally.

The area under irrigation and types of crop and cropping calendar determines the water demand in an irrigation system. However, the water delivery and its use are determined by the supply (availability) of water in the catchment. The difference in the supply and the demand could be one of the reasons for the occurrence of disputes as there could be some scarcity in supply and inequitable distribution of water across the system. One of the strong arguments behind any intervention programme is to raise the production and productivity through improved supply of water thereby making more water available for use to the system. However, the performance criteria of the agency and the farmer may be different. This in essence requires understanding the local conditions and opinion of the users to come to an appropriate design. This will help in mobilising local resources for system development and its continued operation.

In the past FMIS have devised their own set of rules for the system water allocation, installation of technology and use of resources. Differences can be observed due to the size and location of the system, the number of users the system has, the distance of the water source, and whether there is only one source or whether there are multiple sources of obtaining water. This determines the nature of the work and the resources required. These arrangements are often changed by interventions (Vincent, 1995:99).

User allocation, system operation and water distribution

This refers to dividing and distributing the water available in the system to its users. Bringing water from the source involves a lot of work, which an individual may not be capable of doing on his own. For this task group action is required and it is the institutional arrangements which mobilises the individual members for this task, without which the task of obtaining water for the irrigation system through regular or extraordinary means is not possible (K.C. and Pradhan, 1992). The primary work in any irrigation system is to obtain water from its source for the distribution to plants in fields.

The role of institutions is to establish rights, allocate and to distribute water to its members. The allocation and distribution could be based on the share purchased by the user, in proportion to the area to be irrigated and through special arrangements in periods of scarcity. The arrangements made by the institution to allocate and distribute water could be formal or informal. The role of an institution is to ensure that all members follow the agreed rules. The larger the system, the more complex

arrangements it would have. This means there could be tiers of organisations within an institution.

The abundance or scarcity of water also determines the tasks of these institutions. Also, the relative importance of tasks of resource mobilisation and maintenance, versus secure delivery of water supplies, also shapes water management organisations (Parajuli, 1999). Studies (Martin and Yoder, 1987) of various FMIS in Nepal have shown that in irrigation systems where water supply is abundant institutions may not have a formal organisation, but when there is water scarcity the involvement of these institutions in water distribution increases which demands a more formal organisation. This is largely due to the necessity to enforce rules. Further, irrigation water has a seasonal importance. This means that farmers would like to ensure that they receive adequate water and in time. The arrangement is particularly required to address the problem of tail enders who are always at the disadvantage when there is scarcity of water which could be the source of conflicts (Uphoff, 1986b). Thus, the institution plays an important role in applying rules to ensure that the user receives adequate amounts of water on time, and the system stays functional. This is necessary to avoid conflicts among users. Thus, the operational and institutional complexities (Vincent, 1995:116) determine the management requirement which is fundamental to maintain the processes by which resources are allocated and distributed among the members, and this is of importance in the design of intervention programmes.

Conflict management

Broadly speaking, conflicts can be categorised into three groups in an irrigation system. They are: conflicts between irrigation systems, conflicts between water users within a system and conflicts between the water users and the agency concerned. The first type of conflict is about rights over the source of water. The second type of conflict arises when the needs of individuals or groups of farmers are not addressed properly. The third type of conflict may arise due to conflicting goals or interests of the water users and agency concerned. The agency's concern could be efficiency in water distribution and minimising water losses whereas the farmers' concern could be unhindered access to water without any concern over water losses.

However, irrespective of the type of conflict, there will be institutions developed for the specific goal of managing conflicts and they may change with the nature and level of conflict. 'Legal pluralism'[3], which refers to existence and use of a mix of state law and customs and conventions, is often applied for the resolution of conflicts by these institutions depending on the type and intensity of conflict. Internal conflict in most of the cases will be resolved based on the 'convention and customs', whereas the external[4] conflict resolution may be through the state. For the resolution of internal conflicts generally, rules are developed and applied by the institution created by its members. The rules could be either in a written form or simply based on customary practices. Each individual as a member of the group is expected to conform to group rules. Also, the institution possesses power rendered to it by the members of the group, which it can enforce in maintaining the rules. It can also enforce sanctions to make one conform to the group rules. It can manage conflicts

occurring outside the system through the strength of the group so that the access to water is ensured.

The situation of conflict may occur primarily due to the scarcity of water for which there are several competing parties. Conflict or dispute management by the institution is an attempt to solve the problems so that the institution can achieve ends approved by its members.

An institution cannot be created without the involvement of the individuals in a group and without the association of groups. Common interest and protection of individual rights are two important factors for bringing people together.

Resource mobilisation

Resources are necessary to make an irrigation system function effectively. In most FMIS resources are mobilised internally while some irrigation systems obtain resources from external sources also. One of the functions of these institutions is to determine how much resources are required and how to generate them (Pradhan, 1989a). The types of internal resources mobilised are mainly cash and labour. In times of great calamities external resources are necessary which include cash, material and technical support. Beside cash and labour, other resources are also necessary to operate and maintain the system if required and to pay people involved in water distribution if necessary. Collection of forest products like trunks and bushes and mobilisation of local expertise are also part of resource mobilisation.

Also these institutions establish linkages with outside agencies and external resources are mobilised. The type of external resource mobilisation may consist of available technical services and direct financial support. External sources could be from government offices at district or national level, NGOs and donors, who could support the institutions to manage and improve the irrigation system. Reliance on external support also depends on the nature of technology used and the size of the system. External resources are sought when internal resources are inadequate or major rehabilitation works are to be carried out requiring financial and technical inputs, which are beyond the means of the farmers.

System maintenance

Maintenance is an integral part of any irrigation system. Maintenance is affected by the size, agro-ecological factors like topography and climate, and the technology used in the system. Those who have exclusive rights on the use of water contribute for the regular and emergency maintenance. However, in case of emergency maintenance the other users, who do not have exclusive rights may be called upon for help and external help also may be sought. However, the participation in emergency maintenance does not guarantee the rights for the use of water (Benda-Beckmann et al, 1997:233). Institutions in an irrigation system mobilise required resources for system maintenance. The maintenance of the system could be categorised as follows:

- Regular maintenance
- Emergency maintenance

Regular Maintenance
In an irrigation system regular maintenance is necessary. Farmers get involved collectively in the maintenance of headwork, canals, field channels and bunds before the start of the cropping season. The task of maintenance is divided among the users' groups and individuals within the group. The tasks to be carried out by groups are regulated under certain rules. The structure of the institution whether it is formal or informal plays an active role in assigning the tasks to individuals and groups. The work is also divided on the basis of sex in Nepal. Usually, women are assigned the weeding of the canal and other less hazardous tasks, whereas men are assigned complex tasks like headwork maintenance. This is because the work requires more physical strength and may require work far from the house or from the village.

Emergency Maintenance
Emergency maintenance is required when the system is damaged by natural calamities like floods or landslides. In this situation it is the institution which assigns the tasks needed to repair the damaged part. The institution takes into consideration the resources required to maintain the system and decisions regarding task assignment. Some individuals in the group may be more knowledgeable and may possess the skill to carry out certain activities. These factors are also considered while assigning the tasks. Often the mobilisation of external resources by the institution is necessary. The vulnerable systems often incorporate a process where farmers or water guards check the system daily and inform the users when maintenance is required.

2.4.3 Water control

Mollinga (1998) further developed the concept of irrigation as a socio-technical process, whose processes and outcomes could be studied through the social construction, social conditions of use and social impacts. Technological intervention can also be studied through this framework. He also employs the concept of control as a means to study irrigation processes in their wider context. In this perspective the three dimensions of water control - technical control, organisational control and socio-economic and political control (Mollinga, 1998:25-30) are significant for the understanding of the complexities of irrigation development and its management in the context of interventions in farmer-managed irrigation systems. The technical control refers to the manipulating and mastering of physical processes, organisational control refers to the commanding-managing of people's behaviour and the socio-economic and political control refers to the domination of people ('s labour) and regulation of social processes. The changes in the physical structure by intervention programmes through the use of a new technology and financial resources could be viewed as the politico-administrative control of the water resources as it entails redistribution of resources as deemed necessary by the government agency. As a result new linking loops will be formed between the agency and the users and other local institutions depending upon the mode of intervention. The changes in the physical structure and the redistribution of the resources due to the alteration in the physical layout and inclusion of new users

would alter the existing pattern of social behaviour in relation to irrigation management. Nevertheless, the competition for the access to and use of water resources may result in changes in the existing linking loops among the users after the intervention. The formation of new linking loops could result into either co-operation or struggle among users, which could have both positive and negative effects on the existing irrigation institutions.

In Nepal, the type of intervention, which had significant effect on control mechanisms, also affected the evolution of the irrigation institutions. The creation of an AMIS had wider implications in terms of technical, organisational, and socio-economic and political control. This was largely due to the role of the agency, which is more embedded in terms of financial and organisational control in the management of AMIS. The financial and organisational control was necessitated by the technical control in place and the policy of the government at that time. At the same time the role of agency in the FMIS intervention was to facilitate functioning of the irrigation system through the introduction of appropriate technical and organisational control. However, the focus was more on technical control although stated government policy placed due importance to the organisational control.

2.4.4 A framework to study irrigation processes and interventions in the hills of Nepal

Based on the discussions in this section, the following set of activities is selected by the researcher for particular study in the field, as a framework to study the inter-relation between intervention and change in institutions shaping irrigation processes i.e.:

- water acquisition, system development and system allocation
- water allocation, system operation and water distribution
- conflict management
- resource mobilisation
- system maintenance
- governance and property rights
- relationships of control

2.5 Research questions

The focus of the study is on the actor involvement in intervention and the outcomes of government interventions on irrigation systems. The various initiatives used to get the intervention and related resources will be described and analysed. Also the effect on the irrigation institutions and their rules and power base is an issue. That is closely related with the communal linking loop that people have established inside and outside the institutions. The changes in property rights and the consequences for ownership feeling among the users will be examined because it has considerable consequences for the resource mobilisation necessary for the regular maintenance. That had led to the following research questions:

1. What were the forms of intervention and what strategies were followed in the design and execution of public interventions in irrigation systems?
2. What actors participated in the interventions, how, and what effect did they have on the outcomes?
3. What institutional arrangements for irrigation emerged after the interventions and how were they different from former arrangements?
4. What implications did the new institutional arrangements have on water management in practice?

2.6 Methodology

2.6.1 Introduction

Broadly speaking there are five major research strategies (Yin, 1984) used in social science study. They are - experiments, surveys, archival analysis, histories and case studies. The choice of an appropriate strategy is largely determined by the nature of the study and the kind of information to be generated. The information to be acquired could be both qualitative and quantitative. Most of the information generated for this study was qualitative. Thus, the qualitative method was employed to receive information through case studies. The rationale for choosing this method is that it facilitates the interpretative study (Denzin and Lincoln, 1994; Yin, 1984). Various approaches in qualitative research have been discussed by different writers (Denzin and Lincoln, 1994; Guba and Lincoln, 1989) and more particularly about the case study (Stake, 1994). Out of various approaches used in qualitative research the study combined both secondary and primary sources of information for the case studies. The case study approach was useful to understand complex social phenomena to answer the question of why and how (Yin, 1984) in relation to the effects of interventions on management practices of farmer-managed irrigation systems.

The case study method has been increasingly used in the study of socio-technical characteristics. The importance of this method as discussed by Yin (1984:19-20) is:

> *Case study is suitable in examining the contemporary events but when the relevant behaviour cannot be manipulated. ...it provides direct observation and systematic interviewing. Case studies' strength lies in its ability to deal with a full variety of evidence.*

Stake (1994) argues that case study is useful, if the object of the study is a specific, unique, bounded system, because a case study in itself is a process of learning and a product of learning.

Since this study is of an evaluative nature, detailed study and analysis of many aspects of intervention in relation to institutions is essential, as there is a variation in the size, agrarian condition, technology, agro-ecological conditions and governance and management of each of the irrigation systems. Different actors and arenas came into the intervention process. Interventions had different impacts on each of the systems and gave actors different room for action. In-depth analysis of the intricacies involved in intervention and its effects were possible through this method. In

evaluative research the actors who are the supposed users of the programme have a major role to play in the outcome of the study which is different from the conventional approach of evaluation wherein the actors or users have little role to play (Guba and Lincoln, 1989). This is to emphasise the generation of information through the interaction of the researcher and the actors. The effort was on generating the broadest set of information in order to make in-depth analyses of the cases.

One of the difficult tasks in developing a case study is to get people's confidence. Otherwise, there is every chance of distortion of information. The researcher however, did not have much problems to persuade the community in giving information. Nevertheless, there was some difficulty in accessing the quantitative information due largely to the primitive way of record keeping by the agencies concerned.

2.6.2 Unit of observation

The units of observation in this study were four irrigation systems. Also the government officials at various levels who were involved in the design, planning and execution of the intervention programme in farmers-managed irrigation systems, individual farmers, groups of farmers, contractors and selected key informants were units of observation.

2.6.3 Unit of analysis

The unit of analysis of the irrigation systems consisted of the following:
Irrigation Systems and Water Users' Association or Organisation involved and the intervention processes that took place in them.

Since the intervention had effected changes in the irrigation system, the system as a whole was the unit of analysis. The analysis at this level emphasised the effect of intervention on the existing institutions of FMIS.

The farmers groups at head, middle and tail end were other units of analyses in order to prepare micro level analyses to observe the changes produced by the intervention process within the group and across the group. This enabled the researcher to know how the farmers look at the intervention process and what changes it has brought.

2.6.4 Methods and techniques of information generation

The information collection during field work was through secondary materials, interviews, observation and various types of personal histories. The information from the field was supplemented by previous studies, official documents and personal experience. Survey and Rapid Appraisal methods were also used to generate area-specific and irrigation system-specific information.

One of the issues to be addressed in this study was to obtain information related to significant events that occurred during the process of intervention. For this, information was collected from multiple sources.

Secondary data
Information from official documents with respect to the irrigation systems from the government agencies concerned was obtained through desk-top study. This method was also useful in the collection of information from the records kept by the users such as minutes and the decisions or resolutions on different aspects of irrigation management e.g. resource mobilisation and conflict resolution.

Personal observation
The information on the functioning of the irrigation system, and existing status of the physical system of irrigation was recorded through personal observation. The physical system was observed by walking from the headwork to the tail end and the field channels. This method was useful to look into the different practices of the farmers in carrying out the irrigation activities.

Interviews
Interviews with the project officials, individual farmers and groups of farmers and contractors were the major source of information on different aspects of irrigation systems. A checklist was used for this purpose. However, some of the discussions were unstructured. The researcher however, was unable to talk to all the officials who were involved in the execution of the intervention due to the time lag between the intervention and the research study. Instead, the information collection was supplemented by talking to the officials who were involved in intervention in other schemes. Information was also obtained through key informants.

Water users' organisation (WUO)[5] and farmers
The members of WUO were the major source of information. Almost all the members of the users' group shared information, which centred on the interface situation between farmers and the government officials and among the farmers. The emphasis was on how these interfaces affected various aspects of decision making processes and decisions taken. The implication of these decisions on different aspects of management of irrigation systems was also looked into. Their knowledge about government policy and the processes applied in the intervention, who started intervention, their interest in the intervention, what was their intention in having intervention, when the intervention took place and their view on the situation after intervention were assessed. Besides, the farmers from head, middle and tail-end gave their opinion, which was useful in cross-checking information provided by various actors. Also, other respondents who did not have a direct stake in the irrigation system but could provide valuable information were also interviewed.

Group interview
Group interviews of the farmers were also held to cross-check the information provided by individual farmers and to generate additional information.

Interviews with officials
Government officials at different levels viz. Department of Irrigation, Regional Directorate and at district level provided information on the policy and objectives of

intervention, selection criteria used for choosing of FMIS for intervention, processes followed in intervention, and their personal observation or reaction to the situation after the intervention.

Rapid appraisal
This method was used to generate background information about the system. This method was helpful in selecting appropriate irrigation systems for the study. This technique was used again but in more detail for the generation of background information after the site selection. The following information was collected using this rapid appraisal technique (Pradhan and Yoder 1987).
- Area overview
- History of the system
- Description of the system
- Operation and maintenance of the system
- Institutions and project environment

Process documentation of information
The informal discussions and observations during field visits were recorded in the field diary. The information recorded were farmers' accounts of intervention processes and irrigation management tasks. That included water acquisition, water allocation/ distribution at different reaches of the system, resource mobilisation, operation and maintenance, conflict management and interaction pattern among the groups of farmers, as this information may not be available through the checklist.

Histories
The past history of irrigation systems was recorded through informal discussions with the knowledgeable persons in the community by taking their life history. Key informants in the community were identified to collect information on or about the system.

2.7 Method of analysis

The analysis is mainly qualitative because the purpose of the study is to look into the complexities of human interaction at different levels, which requires interpretation of meaning assigned by different actors to a set of activities and its resultant effect in their daily and community life. The compilation of information is at two levels for the analysis. The first level analysis is at the canal reach (head, middle and tail) of individual systems and groups of farmers within that reach. Because of differences in agro-ecological conditions, the physical system and their requirements, the arrangement may be different at various levels. The second level analysis is at the system level. Special attention is paid to decision-making processes at various levels

Denzin and Lincoln (1994) have argued that the qualitative research, emphasises the processes and meanings that are not examined, or measured (if measured at all), in terms of quantity, amount, intensity, or frequency. Whereas quantitative study

emphasises the measurement and analysis of casual relationships between variables but not processes.

2.8 Selection of study area and sites

The irrigation systems for the study were selected in the Western Development Region (WDR) of Nepal. The hills in the WDR have the second highest potential for the irrigation development (Table 2. 1) in the country (DOI, 1997a) and have a high incidence of FMIS. This region has received the second highest priority for agency investment in relation to the total irrigated area also. Because of this, potential various intervention programmes such as The Hill Irrigation Project (HIP) of Asian Development Bank, Hill Food Production Project (HFPP), Irrigation Line of Credit (ILC) and National Irrigation Sector Project (NISP) of the World Bank were implemented in this area. This enabled to look into the intervention strategies of various programmes.

Table 2. 1: Irrigation in the hills by development regions (area in ha)

Development Region	Total irrigable	Total irrigated	Agency assistance
Eastern	72,325 (19)	40,893 (56)	13,653 (33)
Central	110,014 (30)	46,465 (42)	22,058 (47)
Western	99,084 (27)	40,695 (41)	16,847 (41)
Mid-western	50,962 (14)	24,919 (48)	6,331 (25)
Far-western	36,156 (10)	10,993 (30)	4,256 (38)
Total	368,541 (100)	163,965 (44)	63,145 (39)

Other reasons for selecting this region were:

a) This part of the country is relatively accessible.
b) The topographical and environmental conditions of this area are suitable for the study of farmer-managed hill irrigation systems as many indigenously developed systems of varying sizes are found. There were examples of systems, which had been transformed from FMIS to AMIS by intervention.
c) This region is not neglected in terms of government investment. Therefore, the effects of interventions could be observed.

Based on the outcome of the Rapid Appraisal of ten irrigation systems, three FMIS and one AMIS were selected for the study. An agency system was selected as its development had incorporated part of one of these FMIS: thus AMIS also had an increasing level of farmer management. Of these four systems, two were river valley systems, and two were slope off-takes[6]. The river valley systems were close to the town and the main market centre of the districts. Whereas, the slope off-takes were within a distance of two hours from the market. Besides, the following criteria were applied in order to have a comparative analysis of systems having different management.

Each of the sites had a history of receiving government assistance besides the intervention from major programmes. Besides, both agency-managed irrigation system (AMIS) and the FMIS are operating in the region. The scheme selected under HIP is an AMIS, whereas other three are FMIS. This enabled the researcher to select at from the irrigation systems implemented and rehabilitated under each of these different programmes (see table 2). The intervention strategies applied were also different. The irrigation schemes under HIP were bigger in terms of command area (more than 200 ha). The scheme selected *Annapurna,* was a new construction implemented by DOI by taking over part of the FMIS and its management is under DOI. However, the users of the schemes are taking interest in its management since 1992. The improvement of minor irrigation schemes on a participatory basis was part of the project under HFPP along with other agricultural support services. Thus, the selected scheme was small and the farmers played greater role during its improvement. The other two schemes were less than two hundred ha and modernisation works were implemented under more participatory approach in the programmes. Thus, the region was ideal for the study to look into the variation in the intervention strategies of different programmes.

a) The schemes selected for the study were less than 40 ha and more than 200 ha.
b) The most recent technical intervention of the irrigation systems was different, which can be due to the differences in the agro-ecology, indigenous knowledge and intervention strategies. These can be stated as follows:
   - Improvement of the system with a participatory approach of intervention – *Tarkughat* (HFPP).
   - Rehabilitation of the system and its management with a participatory approach – *Ghachowk* (ILC) and *Chaurasi* (NISP).
   - Completely new construction with a higher level of technology without a participatory Approach- *Annapurna* (HIP).
c) All the sites were close to the motorable road for reason of accessibility.

An overview of the cases are presented below in Table 2. 2 and the locations of study are presented in Figure 2. 1.

Table 2. 2: An overview of the irrigation systems

Name of the system	Location VDC/ district	Irrigated area (ha)	System type	Management type	Most recent intervention	Cost in NRs (US$) million	Most recent intervention Programme
Chaurasi	Hemja/ Kaski	154	River valley	FMIS	1998*	9.284 (0.136)	NISP
Annapurna	Hemja/ Kaski	300	River valley	AMIS	1983	10.41 (0.147)	HIP
Ghachowk	*Ghachowk*/ Kaski	60	Slope off-take	FMIS	1991	3.368 (0.049)	ILC
Tarkughat (Dhand and Birta Kulo)	*Tarkughat*/ Lamjung	6.0	Slope off-take	FMIS	1987 and 1989	0.715 (0.010)	HFP

Note: The costs of the projects are converted into 1999 prices in US $ (exchange rate: US $ 1 = NRs 68.3).
*The intervention in this irrigation system was going on in December 1998.

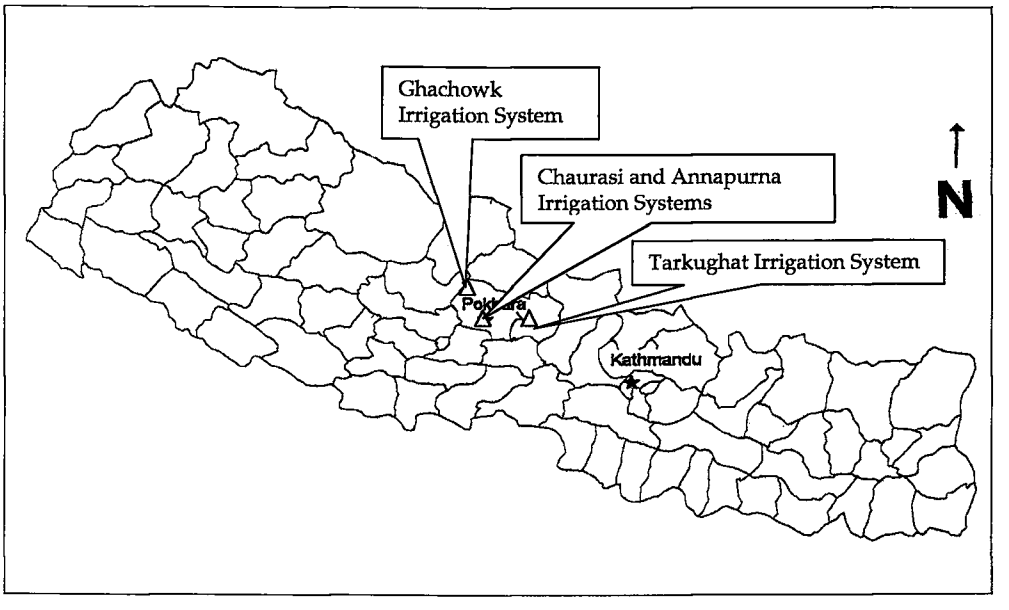


Figure 2. 1: Location of irrigation systems selected for the detailed study

2.9 Execution of the Research

The field study was conducted during the period April 1996 to June 1998 including several follow-up visits after the intitial information collection. At first the researcher visited the area to identify the potential irrigation systems. Two systems were selected initially. The studies in two systems were carried out simultaneously as they were at a distance of one hour. During the study period the researcher made frequent visits to the area and stayed at least fifteen days in each visit. The period when the researcher was not staying in the area was used in Kathmandu for processing the information in the computer and the collection of the secondary information from the agencies concerned. The draft write up of the case studies for the two systems was completed before the selection of the other two systems. The same processes were followed in the study of the remaining two systems also. After the completion of the field study, the draft case study reports were revised and work on other chapters were completed during the period May 1998 to January 1999.

Notes

1 Is defined as the aspects of the structure of relationships between individuals that enable them to create new values (Coleman, 1988 cited by Ostrom, 1992: 13).
2 These include conferred tenure and claimed tenure.
3 For a detailed discussion on 'Legal pluralism' see Franz von Benda-Beckmann (1997).
4 External conflict refers to the conflict with people, groups and institutions outside the irrigation system.
5 They are also known as Water Users Association, Water Users Society and Users Committee (UC). Usually there is more than one organisation in large irrigation systems. The federation of these organisations is called Water Users Association or Water Users Organisation, which refers to the higher level of organisation. Only one organisation is found in most of small irrigation systems. They are called UC. The use of these terms is presented according to their use in official documents and research reports cited in this study. However, the government recognises them as UC.
6 The former has the entire command area within the same valley as off-take, whereas the water is conveyed from the streams at a distance across and down slope in the latter.

3. An overview of the country and its development policies

3.1 The country and the study area

An overview of the country in general with a focus on geographical and socio-economic characteristics is presented in this chapter. An attempt is also made to provide a glimpse of the two districts where the case studies were conducted. The purpose is to provide the reader macro- and meso-level information that has relevance to the cases. Besides, a review of the various development policies with emphasis on agriculture and irrigation development is presented in this chapter.

3.1.1 Location

Agro-ecologically the country is divided into three regions namely, the mountain region, hills and the terai. The resource availability and their uses are different in these regions, which dominate the production regime and the livelihood of the people (Metz, 1989). The land use pattern of the country is presented in the Table 3. 1.

Table 3. 1: Distribution of land use in Nepal

Land use	Area (%)
1. Agricultural land (cultivated)	20.1
2. Agricultural land (uncultivated)	6.7
3. Forest (including Shrub)	42.8
4. Pasture land	11.9
5. Others	18.5

Source: Ministry of Agriculture, 1997

The elevation of the country varies between 60 m in the south-east corner and about 8,848 m high, at Mt Everest, locally known as Sagarmatha, in the North. As a result of the wide altitudinal variations within such a small area, the country has extreme variations in physiography and agro-ecology.

In Nepal, climatic conditions vary from freezing cold in the high Himalayas to sweltering heat in the Terai. Mainly altitude and its resulting aspects are responsible for such a wide range of climatic conditions. Shrestha (1992) notes that the mean temperature decreases by 5.5 degree Celsius for every 1,000 m rise in altitude. Based on altitude, Carson et al (1986a) categorised Nepal into five climatic zones (Table 3. 2).

Table 3. 2: Relationship between elevation and climatic zones in Nepal

Altitude from mean sea level (metres)	Climatic zone	Mean annual air temp (in degrees Celsius)
Less than 1000	Sub-tropical	20 – 25
1000 – 2000	Warm temperate	15 – 20
2000 – 3000	Cool temperate	10 – 15
3000 – 4500	Sub-alpine, alpine	3 – 10
Greater than 4500	Arctic-like	less than 3

About 80 per cent of the annual rainfall in the county occurs during four months (June-September) due to the summer monsoon. The summer monsoon advances from east to west and withdraws west to east. Thus the duration and the amount of the summer rainfall decreases from east to west. The average annual rainfall in the eastern parts of the country is about 1,736 millimetres (mm), while its value in the west is about 1,440 mm.

The east-west aligned mountains also create localised effects on the annual rainfall. In some parts of the country, slight rain shadows occur in the North of the Mahabharat mountain range, while the high Himalayas obstruct the entire monsoon and create complete rain shadows to their north. Three of the case study sites were in sub-tropical climatic zone and one site was on warm temperate climatic zone.

3.1.2 Population, ethnicity and religion

The population of Nepal for 1998 was estimated at 21.84 million. Out of this, 90.8 percent live in the rural areas. The population distribution over the regions are 7.8 percent, 45.5 percent and 46.7 percent in the mountains, hills and the terai regions respectively (CBS, 1998). The average annual growth rate of the population during the period 1981 to 1991 was 2.5 percent.

The majority of the populations (86.5 percent) are Hindu followed by Buddhist (7.8 percent). Other religions practised in the country are Islam, Christian, Jain and others. The country is multi-racial with various ethnic groups and languages. The caste structure in the country is based on the Hindu mythology, according to which the population is divided into four caste groups. They are Brahmins, Chhetri, Vaisya and Sudra. Originally the caste division was based on the occupation. Later on it became hereditary and the caste structure is rigid, although formally abolished by the Muluki Ain (civil code) of the 1963. The rigidity is more prevalent in the rural areas. The upper castes' control over the economic resources has placed them higher in the power structure. The unequal opportunity for the use of economic resources has also constrained social mobility.

The ethnic origin of the population can be divided into two: the Tibeto-Burmans and the Indo-Aryans. The Tibeto-Burman ethnic group consists of Gurung, Tamang, Rai, Limbu and others. The ethnic origin has influenced the settlement pattern and the religious beliefs as well. The people of Tibeto-Burman origin are the earlier settlers in the hills and mountains and practise both Hinduism and Buddhism. The majority of them are found in the high hills. Livestock rearing is the main occupation

of these ethnic groups, besides agriculture. In the later years, some of the families have resettled in the river valleys.

The Indo-Aryans was the latest settlers in the hills, and this ethnic group consists of the Brahmin, Chhetri, Newar and the occupational castes. The majority of them are Hindus. The late settlers are settled in the lower hills and river valleys. The people of this ethnic origin are more involved in the irrigated agriculture. The settlement pattern in the hills and mountains are clustered with a majority of one caste group due to inheritance of paternal property by the brothers. The kinship relationship is very strong among the people. The strong kinship relation is also the dominating factor in economic and political relationships. In a mixed community, usually one caste group is in the majority. The caste group in majority usually holds most of the productive resources. The same is the case with the representation in the local institutions such as the VDC and UC.

3.1.3 The economy

The economy of the country is predominantly agricultural. A little over 80 percent (81.1 percent) of the total population in the country is engaged in subsistence farming. About 20.1 percent of the total land are under cultivation. The agricultural sector contributes 42 percent of the Gross Domestic Product (GDP) and 80 percent of the total export comes from the agricultural sector. Nepal is one of the poorest countries in the world with a per capita income of $ 200 per annum. According to the National Planning Commission (NPC), 42 percent of the population are below the poverty line. During the period 1990-1995, the average annual growth rate of the Gross Domestic Product (GDP) was estimated at 5.1 percent and the average annual growth rate of agriculture during this period remained 1.5 percent (World Bank, 1997a).

Seasonal migration from the hills to the cities and nearby towns for wage employment is a common phenomenon. The off-farm seasonal and permanent employment contributes considerably to the household income of the people in the hills. The employment opportunities available in the industrial sector are limited due to the weak industrial base.

There has been a gradual decline in the rate of increase of grain production, whereas the population growth rate remains increasing. The revised estimates of the average annual growth rate of food grain was 2.3 percent and the population growth rate was 2.5 percent during the period 1980/81 to 1991/1992 (NPC, 1994a cited in APROSC and John Mellor Associates Inc. 1995:33). The discrepancy in the growth rate has a serious implication in the overall development of the country. The Ministry of Agriculture estimate shows that the annual food grain deficit in the country is 34,351 metric tonnes. (Ministry of Agriculture (MOA), unpublished data). This is one of the reasons that the country was importing food grains in recent years in contrast to being an exporter of food grains in the past. This suggests that serious efforts are required to boost agricultural production in the country. Small-scale traditional farming dependent on the climatic conditions is considered to be one of the reasons for low productivity. The application of modern techniques of farming is lacking due to inadequate irrigation facilities and constraints in the availability of agricultural

inputs in time. The development of irrigation systems therefore would contribute in meeting the demand for food. The importance of irrigation is more important in the hills where an acute food shortage is prevalent. The development of irrigation in the hills is challenging due to the rough terrain incurring high investment costs. Nevertheless, it is all the more important for the livelihood of the people in the area where the opportunities for off-farm activities are very limited.

3.1.4 The landownership, land tenure and water rights

Landownership

The farm sizes have been declining overtime. The agricultural census of 1991/1992 reported that over a period of 30 years the agricultural holdings in the country increased to 2.74 million from 1.54 million holdings in 1961/1962. Of the total holdings, 2.70 million holdings were with land and the rest without land[1]. The average size of a holding in 1961/62 was 1.11 hectare. In 1991/92, the average size of a holding decreased to 0.96 ha due to the law of inheritance (CBS, 1994:11). Thus, the cultivated land is fragmented into smallholdings and the majority of the farming population has less than one hectare. The national average shows that the per hectare cultivated land will have to support 6.45 persons. For the hills, the figure is 9.5 persons. In 1991/92, the average holding size for the mountains was 0.68 ha, for the hills it was 0.77 ha while the holding size for the terai was 1.26 ha (ibid: 11).

Land tenure

The majority of the holdings are owner-operated. The owner-operated holdings constitute 83 percent of the total. Likewise, 15 percent of the land were partly owned and partly rented, whereas 2 percent of the holdings were under full tenancy (CBS, ibid)[2]. The Land Reform Act of 1964 established the right of the tenants to one fourth of the land ownership they cultivated. This dual ownership is more prevalent in the terai than in the hills and the mountains. Further, the Land Reform Act was instrumental in the abolishment of the right of the *Jimmawals*[3] who were the village heads and the representatives of the government for maintaining the land records and collecting land taxes. The *Jimmawal* however, continued to function in some places until the cadastral survey was completed, which was implemented in phases.

Three types of renting are prevalent in the country, according to the agricultural census of 991/92 (CBS, 1997). Share cropping (47%) is the most common form of renting followed by fixed quantity of produce (30%) and mortgage arrangement (18%). Share cropping is more common in the *terai* than in the hills and mountains. The agricultural census notes that mortgage arrangements along with share cropping are the common forms of renting in the hills and mountains as compared to fixed quantity of produce. The small size of holdings in the hills is one of the reasons for the smaller numbers of tenants in the hills. In addition, the land is used as capital for taking loans to meet the expenses for emergency and social events as the informal sector provides nearly 80 percent of the credit in the rural areas. In the mortgage agreement the lender keeps the produce as interest.

Water rights

The Water Resources Act of 1992 and its by-laws in 1993 was introduced to regulate the use of water resources in the country. According to the act, the ownership of all the water resources in the country is vested in the government. A government license is required for the development of the water resources other than the water resources on the land of a landowner. Consequently, it rejects the customary right of the citizen to use the water resources but the Muluki Ain[4] has recognised the prior appropriation and customary right (Khadka, 1996; Pradhan, 1994). It does not however, say any thing about the control and uses of already developed water resources such as for irrigation, drinking water and watermills. It is presumed that previous legal rules and principles for the control and use of water resources are still valid (Benda-Beckmann et al, op cit.). The other prevailing practices of customary rights are: water share based on investment, water right purchased from others (Pradhan, 1989a:21) and water rights proportionate to the land in irrigated area (Pradhan, 1989a).

The Act sets priority for the use of water in which drinking water received the first priority and irrigation was second. The Act envisaged the formation of water users' committees for the implementation of irrigation programmes in the country. The irrigation policy of 1992 categorised the irrigation schemes into small, medium and large. It also defined the role of the DOI and the farmers for the new construction and rehabilitation of schemes. The official registration of users' committees was required as it provides a legal entity. It can make its own rules, which have to be submitted to the government at the time of the registration. The government policy is to turn-over the management of the irrigation schemes to the users' committee in the hills where the system size is under 500 ha.

3.2 The hill farming system

The hill agriculture is mainly based on subsistence farming. Crop production, livestock raising and off-farm employment are the major sources of income for the household. The farming system varies with altitude due to variation in the climatic conditions in the different agro-ecological zones. The farming system is rice-based in the terraces in the lower hills and the river valleys. Both rainfed and irrigated agriculture are present. Maize is the main crop in the high hills where irrigation is not available. Barley and buckwheat are the main crops in the mountains. Livestock raising is an important activity in the mountains. Rice and other cash crops are the main produce of the terai.

The share of each region in agricultural production shows that the contribution of the hill region in food production is significant. The hill region has 40 percent of the total area of holdings in the country, as compared to the 53 percent in the terai (CBS, 1998).

Table 3. 3: Agricultural Gross Domestic Product (AGDP) share by region and product group, 1991/1992 (percent)

Product group	Mountains	Hills	Terai	Total
Food crops	3.4	18.8	23.6	45.8
Horticulture crops	1.1	5.3	6.5	12.9
Livestock	2.8	16.7	12.0	31.5
Forestry	0.7	4.1	4.0	8.8
Fisheries	0.0	0.0	1.0	1.0
Total	8.0	44.9	47.1	100.0

Source: Based on NPC revised estimates of AGDP. Adapted from APROSC & J. Mellor Ass. Inc. 1995:42

3.3 The hill irrigation systems

The main challenge of the hill agriculture is to increase the food production to feed the growing population and to absorb the increasing labour force in the country for many years to come. In this perspective, hill irrigation can significantly contribute to the agricultural production. The following table shows the status of the hill irrigation in the country.

Table 3. 4: The contribution of FMIS in the hills

Total area (ha) '000	Total irrigable area (ha) '000	Irrigated area (ha) '000	
		FMIS	AMIS
7,250	428	188.8	21.03

Source: Land System Report, Land Resources Mapping Project (LRMP), prepared by Carson *et al.* (1986b) Canadian International Water and Energy Consultants (CIWEC, 1990). Database for irrigation development in Nepal (DOI, 1997a)

The table indicates the potential for hill irrigation and the importance of FMIS in the hills. It is evident that the existing potentials have not been fully harnessed and it could be doubled. Therefore, the development of the hill irrigation is important for sustaining the hill economy.

3.3.1 Classification of hill irrigation systems

Various authors have proposed different typologies of irrigation systems. The hill irrigation systems have been categorised by Pradhan (1989a) into two and they are river valley and hill irrigation. The typology is based on the physical characteristics of the irrigation systems. Vincent (1995:37) categorised hill irrigation systems into eight different forms. Among them the river valley off-take and slope off-take are more applicable in classifying the hill irrigation systems in Nepal. The former has the entire command area within the same valley as off-take, whereas the water is conveyed from the streams at a distance across and down slope in the latter. Parajuli (1999) categorised the hill irrigation systems into three: a) foot-hill irrigation; b)

slope-hill irrigation and; c) river-valley irrigation. This definition argues that the foot-hill irrigation is different from the slope off-take. The foot-hill irrigation consists of small systems with a small command area, which are scattered along the riverside. These types of systems are generally away from the settlement. Therefore, the cropping intensity and its pattern are different from the slope off-take, which has implications in terms of management practices. Further, from the management point of view there are two types of irrigation system operating in the hills. They are agency managed irrigation system (AMIS) and the farmer managed irrigation system (FMIS). The AMIS are constructed, and operated by the DOI through its employees. The FMIS are built and operated by the farmers themselves.

3.4 The districts of research sites

3.4.1 Area, population and ethnicity

Both the districts Kaski and Lamjung are hill districts in terms of agro-ecological regions. The Pokhara municipality in Kaski district is also the regional headquarters and an important tourist centre in the country. It has a good road network connection with other major towns and the district head quarters, including Kathmandu. The road to Lamjung was under construction and it was not in all-weather condition during the study period. The area, population and ethnicity of the districts are presented in table 7. The population of Kaski district is higher than that of the Lamjung district. The male to female ratio of population in both the districts is almost equal. The distribution indicates that in the Kaski district the Brahmin and Chhetri constitute the majority, whereas the Gurungs form the majority in Lamjung. The average family size, is higher (5.9) in Lamjung than in Kaski (4.8). The population density is higher in the southern part of the district as compared to the northern part. The availability of arable land and access to other services are the reasons for this type of population distribution. The distribution of the ethnic and caste groups varies between the VDCs.

However, The Brahmin and Chhetri are mostly settled on the lower hills, which occupy the southern part of the district whereas the Gurungs are settled on the high hills in the northern part of the district. The other caste groups are found to be scattered all over the district. In some cases, one particular settlement contains the majority of one caste group. Thus, one particular caste or ethnic group could constitute the majority within the VDC or village.

Table 3. 5: Area, population and ethnicity

Districts	Area (km^2)	Household	Population	Ethnicity			
				Brahmin	Chhetri	Gurung	Others
Kaski	2,017	60,505	293,009	90,759 (31.0)[c]	43,148 (14.7)	55,744 (19.0)	103,294 (35.3)
Lamjung	1,692	29, 955	177,265	28,704 (16.2)	27,928 (15.7)	60,349 (34.0)	60,284 (34.1)

a) The population figures are based on the District profile of DDC, Kaski 1995 and the ethnic distribution is derived from the annual report, District Agricultural Development Office (DADO), Kaski 1996.
b) Figures based on the GIS report, Integrated Centre for International Mountain Development (ICIMOD), 1995.
c) The figures in the parentheses are percentages.

3.4.2 Labour use pattern

The agricultural census of 1991 (CBS, 1998) shows that 71 percent of the economically active population in Kaski district are engaged in agriculture, whereas for the Lamjung district, the figure is a little over 90 percent. This indicates that more employment opportunities in other sectors are available in the Kaski district as compared to the Lamjung district due to the development of towns. This could be attributed to several factors. First of all, more employment opportunities in the tourism sector are available in the Kaski district. Besides, there are several industries in this district, which provide employment. Being a regional head-quarter, several government and semi-government offices are providing employment to the local people. The Lamjung district does not have that advantage. Therefore, only limited employment opportunities are available in other sectors in the district. However, seasonal migration for the wage employment is a common phenomenon for both the districts.

3.4.3 Land ownership and land tenure

The district's average holding size for the study area in 1991 was 0.68 ha and 0.57 ha (CBS, 1998:49) for Lamjung and Kaski respectively. These figures are less than the national average (0.96) and the average for the hill (0.77) as well. The reason for the decline in the holding size is due to the increase in the population and fragmentation of the land. The average number of parcels per holding is an indication in this respect, which are 2.9 and 4.6 for Kaski and Lamjung respectively. The majority of the farmers hold 2 to 3 parcels of land per holding, in both the districts (CBS, 1997).

The tenure status for the districts (CBS, 1997) shows that 89 percent and 95 percent of the total land holdings are owner-operated for Lamjung and Kaski respectively. The higher number of parcels per holding in Lamjung district could be one of the reasons for the higher number of renting. The most prevalent form of renting for both the districts is share cropping. Share cropping is a contractual arrangement between the owner and the cultivator to cultivate the land on 50/50 share basis, in which the owner provides the land and the cultivator provides the labour. However, the owner and the cultivator share other inputs equally. The cultivator however, does not have the legal tenancy right over the land. There are mortgage arrangements also.

3.4.4 Food grain production

The major cropping patterns in the districts for the land with perennial irrigation are rice-wheat-rice, rice-vegetable-fallow, rice-wheat-maize. For the rainfed area the cropping pattern is rice-maize-fallow. According to the estimate of the DAO, both the

districts are food deficient. Only one quarter of the total number of households are food sufficient for the whole year. The average crop yield for the paddy is 2.5 and 2.09 mt. per hectare for Lamjung and Kaski respectively (DADO, Kaski and Lamjung, 1995: 32 and 16).

3.5 The institutional landscape

3.5.1 The politico-administrative structure

There were small kingdoms before the unification of the country some 200 years ago by the late Prithivi Narayan Shah. The Rana family took the secular power from the shah and ruled the country autocratically for 104 years since 1846. The king was the titular head and the power was with the Rana Prime minister. This regime was overthrown in 1950 and a multi party democracy was established in the country. Between 1951-56 an effort was made to create different ministries in the country. The first elected government of 1958 under the multi-party system was overthrown in 1960 through the royal take-over and a Partyless Panchayat System was introduced through the constitution of 1962[5]. The Local Administration Act of 1965 divided the country into 14 zones, 75 districts and villages at the lower level. The Act envisaged involving the District and Village panchayats in planning and implementing development programmes and the Chief District Officer was made the member secretary of the District Panchayat. The rationale was to bring co-ordination between the administration and the local elected body. The government amended the Local Administration Act in 1972 and the Chief District Officer was relieved from the post of the member secretary of the District Panchayat. The local panchayats were made responsible for carrying out small-scale development works in their districts and villages with financial support from the government. District and Village Panchayats were also responsible to look after the management of the public property (see chapter 4 and 5 for discussion on irrigation system management by Village Panchayats). However, the government used to implement development programmes through the ministry or department, when it was beyond the capacity of the local panchayats.

The District Administration Plan of 1974 was more bureaucratic in nature, which placed the district level offices of line ministries under the office of chief district officer for integrated planning and co-ordination of the various development activities. The District Panchayats received grants from the government for the village level projects. This effort towards decentralisation could not work due to a lack of support from the line ministries to delegate authority to the Chief District Officer. Nevertheless, the District Panchayats were providing financial assistance to Village Panchayats in carrying out small projects, which were quite successful (see chapter 5 for first irrigation intervention by District Panchayat).

In 1978 the government introduced yet another document called 'Integrated Panchayat Development Design', which aimed at promoting the sustained advancement of the economic and social well-being of the people on the basis of their felt needs and participation through the development of the Village and District

Panchayats. This step also failed due to a lack of strong commitment both by the politicians and bureaucrats for decentralised and co-ordinated activities at the local level.

The Decentralisation Act of 1982 assigned a key role to the District Panchayats (DP) for the formulation and co-ordination of the development plans in the district. All the offices of the line ministry at the district level were made sections of the district panchayats. The approval of the District Panchayat was mandatory for the submission of the annual plan to the planning commission. However, the line agency offices at the district level were to implement the programme. Adequate attention was not paid to strengthening the planning and co-ordinating capabilities of the District Panchayats. Consequently, the Decentralisation Act did not work as envisaged. In a study, Paudyal (1992) noted that the decentralisation act was more a political rhetoric because the final decisions pertaining to the selection of the programmes and allocation of funds for the districts level programmes were made in Kathmandu. Besides, the DP used to receive an annual lumpsum grant from the government to implement the small-scale village level projects such as track and trails, irrigation and drinking water. These projects were selected and approved by the DP on the request from the village panchayats. The DP overseers and sub-overseers used to provide technical support for these projects under the guidance of the DP engineer. The users were responsible for the implementation of these projects under the supervision of DP overseers. The users implemented these projects through the Users' Committee (UC). The projects were implemented reasonably well, as UC's activities were transparent and they were accountable to the users (See second intervention in Chapter 5).

All these efforts in decentralising the development functions to the local level however, did not affect the big new projects in different sectors like roads, irrigation and agriculture. The big projects in terms of investment, which were time bound, were generally categorised as the central level projects[6]. These projects were implemented under the direction of the Ministry or the Department through the Regional Directorate/ District offices or through a separate project office. The irrigation systems presented in the case studies (chapter 4-5) were implemented as central level projects and the case study (chapter 6) as district level project by Department of Agriculture (DOA).

The multi party democratic system with a constitutional monarch was reinstated in the country, following the popular movement of 1990. The first elected government was sworn in 1992. There are now four major parties in the country - the Nepali Congress, the United Marxist-Leninist, Marxists-Leninists and two Rastriya Prajatantra parties. There are other smaller parties also. The various parties at the centre have an influence on village level politics also. Four coalition governments have already been formed since the mid term election of 1993 due to a hung parliament. However, the Nepali Congress party formed a majority government after the general election in May 1999. The elected parliament and the cabinet are the important decision making institutions at the centre.

The National Planning Commission (NPC) is the lead institution for the formulation of the periodic development plans in the country, besides monitoring

and evaluation of the programmes. The annual programmes of the government are classified into central level programmes and district level programmes.

The line ministries at the central level are the important institutions for formulation of sectoral policies and the implementation of development activities. Some of the sectoral ministries have regional offices at each of the regions for the co-ordination of development activities at the regional level. Their district level offices are responsible for the implementation of the district level development programmes. The office of the Chief District Officer at the district level is for maintaining law and order.

Following the restoration of the multi-party system in the country, the Village Panchayat and District Panchayat were dissolved and renamed Village Development Committee (VDC) and District Development Committee (DDC). The first election of the VDC and DDC took place in 1992 and the new office bearers assumed the office. The change in the political system was conducive for undertaking various activities, as there was no political restrictions. This helped to shape development of new local organisation (see chapter 4 for the formation of WUS by the farmers of *Annapurna Kulo*). The districts are the centres of development activities. The District Development Committee (DDC) is an elected representative body. The first elected government after the restoration of democracy amended the decentralisation act of 1982 in 1992. The Decentralisation Act has assigned a key role to the DDC in the formulation, co-ordination and monitoring of the development activities in the district. The line agencies at the district level have to assist the DDC in the formulation of annual plans based on the guidelines provided by the NPC at the centre. The district annual plans have to be approved by the DDC before submitting them to the NPC. The DDC is also implementing small-scale activities from its own resources. For these small projects, the formation of users' committees is compulsory. The resources of the DDC consist of the annual grant from the government, share of the land taxes collected by the government and the local taxes as authorised under the Decentralisation Act. The selection and implementation of programmes by the DDC is rather poor in absence of competent technical staff in adequate numbers. The parliament in 1998 enacted the Local Self-Governance Act with a view to delegate more power to the local bodies to enhance local autonomy.

The Village Development Committees (VDCs) were poor in financial resources, until the government began to provide annual grants to them since 1994. For the first year the annual grant was NRs. 300,000 (US$ 4392). The following year it was increased to NRs. 500,000 (US$ 7320). Before, the VDCs had to depend on the annual grant provided by the DDC, now they receive direct grants from the government. They used to receive small amounts from the DDC, which was not sufficient to cover even their administrative expenses. The annual grants have been particularly beneficial to the VDCs in the hills and mountains, since generating cash locally is not possible for them. The annual grant has enabled them to implement small-scale projects like construction, improvement and maintenance of small irrigation schemes, drinking water schemes and trails. Some of the VDCs have spent them as matching funds for the new projects assisted by the donors. Thus, the grant has enhanced the possibility of starting new projects, which was not likely in the absence of matching funds. Besides, the member of parliaments also receive NRs. 500,000 for

implementing small-scale development projects in their constituency, which they distribute in their constituencies for repair and maintenance of small projects like irrigation, trail and drinking water. The influence of these small funds can also be seen in the case studies.

The increasing role of NGOs in the implementation of development programmes has been witnessed since the beginning of the eighth plan when the government acknowledged the importance of these Non-Governmental Organisations (NGOs). A large number of national levels NGOs are working in different parts of the country. The target groups are the poor in the villages who are deprived of meaningful participation in the development programmes launched by the government agencies. These NGOs receive funds from International Non-Governmental Organisations (INGOs)[7] and other donors. In recent years, the activities of these NGOs are in expansion, as donors have also preferred to work through the NGOs. The strength of the NGOs is that they work directly with the farmers. Group formation for various activities is the strategy employed by the motivators stationed in the village. The activities of NGOs in this respect are important for social capital formation.

3.5.2 Agencies and programmes directly involved in irrigation support

Until 1987, there were four agencies working in the development of irrigation in the country. They were: The Department of Irrigation, Hydrology and Meteorology (DIHM), Farm Irrigation and Water Utilisation Division (FIWUD) of the Ministry of Agriculture and the Ministry of Panchayat and Local Development (MPLD). DIHM implemented medium and large-scale irrigation projects (500 ha to 2000 ha). The medium-scale projects were largely constructed using Government resources while large-scale projects mostly through external funding. Farmers' involvement in planning, design and construction of irrigation projects was lacking. As a result, the operation and maintenance cost had to be borne by the government and there was no cost recovery mechanism.

FIWUD was involved in the development of small-scale irrigation schemes and 70 per cent of these schemes were located in the hills and the remainder in the terai. Most of the schemes developed by FIWUD were generally identified and implemented by the potential users. They were handed over to the users for operation and maintenance after completion of the schemes. The users would contribute about 25 per cent of the total cost, 5 per cent of which was in cash and 20 per cent in terms of labour. The average costs of FIWUD schemes were low (about NRs. 6,600/ha as compared to the unit construction cost of DIHM schemes estimated at between NRs. 40,000 to NRs. 80, 000/ha).

ADBN has been involved in financing the development of small-scale gravity irrigation schemes under the Small Farmer Development Programme (SFDP) through their own technical staff. The SFDP received financial assistance from CARE/Nepal and other donors. There is 50 per cent grant assistance while farmers contribute the remaining costs of the schemes in the form of a loan from ADBN (30 per cent), which they had to repay, and labour (20 per cent). The farmers under the supervision of Bank's technical staff implemented the small-scale irrigation schemes.

MPLD was involved in the development of small-scale gravity irrigation schemes at the district level under the decentralisation policy. Under this policy District Panchayats were given a lump sum grant by the government to undertake various development programmes including the construction and rehabilitation of small-scale irrigation schemes. The irrigation development programme was also undertaken with the financial and technical support of the International Labour Organisation (ILO) under the Special Public Work Programme (SPWP) through District Technical Offices (DTO) attached to the District Panchayats. The Programme aimed at promoting employment of unskilled labour in rural areas, particularly in remote areas. The users' contribution toward the capital cost was only 15 per cent in the form of labour (no cash contribution involved) as compared to 25 per cent in the FIWUD-assisted schemes. The average size of the schemes was less than 50 ha, while the average unit cost of construction was about NRs. 26,000/ha, which was higher than the average cost of the schemes implemented by FIWUD and ADBN, probably because the MPLD schemes were located in the remote areas.

In December 1987 the government reorganised DIHM. Consequently, the Department of Irrigation (DOI) was created and the activities and staffs of FIWUD and the MPLD were merged into DOI. The DOI has five divisions at the centre, five Regional Irrigation Directorates (RID) and District Irrigation Offices (DIO) in each districts. The DOI is responsible for policy making, programme formulation, directing and supervising the work of RID and DIO. The RID is responsible for approving the programmes within its jurisdiction, supervising and co-ordinating the activities of DIO. The DIO is responsible for project formulation and implementation at the district level. Besides, there are project offices at the centre to co-ordinate the project activities funded by multilateral agencies. The involvement of ADBN in irrigation development was confined to the construction of Shallow Tube-Wells (STW) and small-scale community gravity irrigation schemes. The second major decision taken by the Government was that the development of small and medium-scale irrigation schemes including STW was given higher priority than the development of large-scale irrigation. The main feature of the development strategy was farmers' participation.

The change in the institutional structure was the result of a change in the policy focus from large and medium scale to small irrigation schemes. The donor influence in this respect was quite obvious as the donors funded most of the irrigation schemes. The following statement clarifies this:

"Given the limited resources of the Government and the heavy burden of the operation and maintenance (O and M)[8] budget, the most logical and effective approach in irrigation development is to work together for a common objective of increasing agricultural productivity and farm incomes. In the past there were too many agencies involved in irrigation development, each of them using different participatory approaches and cost-sharing arrangements. The bulk of the resources for irrigation development was given to DOI for the development of large-scale irrigation schemes; and very little attention and resources were given to activities and programmes to build up the farmers' capability to operate and maintain the completed irrigation schemes" (Asian Development Bank (ADB/M), 1988)

Irrigation Management Project (IMP) (1986-1994)
The project came into effect with the technical and financial assistance of the USAID. The main objective of the project was to improve the institutional capability of the DOI, other line agencies and the farmers for efficient irrigation management practices. Two institutions were created under this project. The System Management Division (SMD) was responsible for initiating operation and maintenance procedures, formation of Water Users Associations (WUA) in DOI-managed irrigation systems and monitoring and evaluation of the activities. The Irrigation Management Centre (IMC) was responsible for conducting training for agency personnel and the farmers. It was responsible also for conducting action research in DOI and farmers-managed irrigation systems.

Irrigation Management Transfer Project (IMTP) (1995-2002)
The Asian Development Bank financed the project. The project came into effect to translate the government policy of transferring the management of public irrigation schemes to the users.

The project has three components:
- Establishment of 14 sustainable and effective WUAs through formal and informal training courses:
- Rehabilitation and improvement of irrigation and drainage facilities in about 67,800 ha in 11 schemes including emergency maintenance, flood damage repair, essential structural maintenance and system improvement works:
- System calibration, improvements of canal service roads and farm to market roads and repair and procurement of equipment and vehicles (IMTP, Project Administration Memorandum 1995).

3.5.3 Internationally funded research programmes

Various institutions for example IIMI[9], the Ford Foundation, Winrock International, Institute of Agriculture and Animal Sciences (IAAS) and ICIMOD have been engaged in funding and conducting fundamental research, action research and training programmes in the country. They have been supporting national and international institutes for conducting research and training in various aspects of irrigation in the country. Besides, they have been supporting individuals through grants to conduct research on irrigation. The IAAS has also undertaken research supported by international universities and agencies. These studies have generated wide interest among the researchers and government officials involved in irrigation management. Action research (WECS and IIMI, 1990) has helped to increase understanding of FMIS and AMIS, their organisation and appropriate technology for the hills. Besides it helped the government to identify the issues and to design an appropriate intervention strategy in the FMIS. The Ford Foundation support for debate on policy, design and legal issues (Shivakoti et al, 1997) is expected to contribute to appropriate policy reforms. Importantly, these organisations are facilitating the interaction between professionals from various disciplines to contribute to the knowledge and understanding of irrigation issues in Nepal. A

number of bilateral organisations have also assisted in irrigation as part of wider development programmes, which are outlined in the following section.

3.6 The planned development policies and programme approaches

3.6.1 Development plans (1956-1975)

The First five-year plan (1956-60) introduced the Village Development Programme. The programme was well conceived as various activities were implemented in an integrated manner to address the issues at the village level. Besides, land tax at local level was an important mechanism for local resource mobilisation (Pradhan, 1982). However, it was based on a top-down approach since the government agencies took a leading role in the planning, design and implementation of the programmes without much consultation of the people.

The approach adopted in the first plan was discarded during the second plan and the development plans followed a sectoral approach with the introduction of a Panchayat sector for local development. The third and fourth plan also followed the sectoral approach with emphasis on the development of infrastructure. The focus was on the consolidation of the local panchayats, which came into being as a result of the new political system in the country.

3.6.2 The Fifth Five-year plan (1975-80)

Agriculture

There was a major policy shift during this plan, which prioritised agriculture and the social sector for investment. Besides, this plan emphasised co-ordinated action in three sectors viz. forest, agriculture and irrigation through the active involvement of the farmers. The plan emphasised farming based on agro-ecological zones by promoting horticulture in the hills, livestock farming in the mountains and food grain production in the terai (NPC, 1975).

The Integrated Rural Development Projects (IRDPs) were also initiated during this plan period, as donors were interested in this approach. The IRDP projects were viewed as a package of actions, which covered a series of inter related activities aimed at resolving the various problems of rural life (MPLD, 1988). The main thrust of IRDP projects was to contribute to the household income through increased production and to extend other facilities to the people living in the rural areas. Hence, IRDP activities were concentrated on the hill districts. The service centre concept[10] was introduced to provide services to the farmers. The activities under IRDPs were implemented through the line agencies. Irrigation was one of the activities offered in the IRDP. One of the most serious problems encountered in the implementation of the IRDPs was the lack of vertical and horizontal co-ordination between the line agencies (Centre for Integrated Rural Development for Asia and Pacific (CIRDAP, 1982) which, in fact was the key to achieving IRDP objectives. IRDPs funded by the bilateral donors implemented some of the village level programmes directly as they had strong technical inputs due to the presence of

advisors in various fields (Pradhan, op cit.). This approach contributed to the development and transfer of technology needed by the farmers, which otherwise would not have reached the farmers.

Irrigation interventions

The main objective of irrigation intervention during this five-year plan was to remove the uncertainty in agriculture, which was based on the monsoon, by providing reliable irrigation facilities. The plan target was to extend irrigation facilities to an additional 146, 000 ha area with a total outlay of NRs. 910.44 million. The DIHM was mainly responsible for the implementation of medium and large projects (500 ha to 2000 ha) in the terai. However, DIHM also implemented projects of more than 50 ha in the hills, which were not under the jurisdiction of MPLD. With respect to the construction of new irrigation schemes in the hills, the fifth plan gave priority to extending irrigation facilities to the flat land in the river basins, small irrigation schemes in the hills and the mountains, and support to improvement of FMIS. The plan mainly aimed at the labour intensive technology (NPC, 1980).

Both multilateral agencies and bilateral donors were involved in the development of irrigation projects in the country. They provided technical and financial assistance to the study and the implementation of the projects. However, most of the financing from multilateral agencies was through loans. In addition there were a number of other agencies and countries that had been supporting the irrigation development in the country. Most of this assistance was for bilateral projects and implemented under grant assistance. Besides, the DP were providing small-scale support to the VP for the maintenance of the irrigation schemes (See chapter 5).

(Special Public Works Programme (SPWP) (1980-87))

During this plan period the International Labour Organisation (ILO) had been implementing SPWP in Nepal which continued until the middle of the sixth plan period. During this period it had been responsible for the construction and rehabilitation of small and medium-scale hill irrigation schemes. The SPWP emphasis was on establishing farmers' groups and developing users' participation in the irrigation sector. It used labour intensive technologies and the selection of the project was based on popular participation. The water users' committees played an important role in the construction, maintenance and operation of the irrigation system. The local labour was partially paid through voluntary labour (HMGN/ILO, 1989).

(Irrigation under Integrated Rural Developments (IRD) projects)

Both new construction and rehabilitation of irrigation schemes were implemented under the IRD projects. Various donors - Overseas Development Administration (ODA) of the British government, the United States Agency for International Development (USAID), Canadian International Development Agency (CIDA) of the Canadian government, SNV of the Dutch government, the European Economic Commission, the World Bank and the Asian Development Bank-supported the implementation of the projects. Two types of procedures were followed in the implementation of the irrigation schemes. The medium sized irrigation schemes were

implemented through the DOI (DOI, 1997a), which were based on DOI norms. The contractors were involved in the implementation of the schemes, which were identified during the appraisal of the project. The District Panchayats through the users committee implemented the small-scale construction and rehabilitation based on the request of the farmers. The DTO technician and the consultant employed by the project assisted the users for the planning and implementation of the project (Pradhan, 1982:26).

3.6.3 The Sixth Five-year plan (1980-85)

Agriculture

The main thrust during this plan was to improve the household consumption level through increase in the agricultural production. The plan envisaged to boost the cropping intensity to increase production and to decrease the under-employment in the hill regions by introducing the pocket programme[11] in the hill regions where irrigation facilities was available.

Irrigation interventions

The main objective of this plan was to develop irrigation facilities for the fulfilment of the agricultural production target. For the first time the plan emphasised to enlist maximum mass participation in the field of irrigation development. The plan gave priority in determining areas suitable for irrigation in the hilly regions, which had food supply problems. The preference was on the projects, which would benefit small and marginal peasants, and stressed the use of local skills and materials with local participation. It emphasised low cost projects with unit cost of NRs. 15,000 per hectare in the Terai and NRs. 25,000 in the hills.

The plan however, could only achieve 74 percent of the physical targets whereas the expenditure was 96 percent of the total budget. Various problems were identified in the implementation and the plan recommended to follow the basic procedures such as project targets to be based on financial resource allocation, and the preparation of feasibility studies by specifying the rate. Also analysis of on-going irrigation projects was emphasised to identify the constraints (NPC, 1985).

(Hill Food Production Programme (HFPP) (1982-90))

This project was launched with the assistance of the World Bank. The project was implemented to increase the food production in the four hill Districts - Gorkha, Lamjung, Syangja and Tanahu of the Western Development Region. Irrigation was one of the main components of the project along with construction of agricultural service centres, trails and bridges. The activities under the project suggest that there was recognition of other support services along with the development of the irrigation schemes. The FIWUD procedure was followed for the selection and the approval of the project since the Ministry of Food and Agriculture (MOFA) executed the project. A separate project office with one project co-ordinator was established and it had its own engineer, overseers and other administrative staffs from FIWUD who worked alongside the district agricultural office staff. A regional co-ordinating committee under the chairmanship of Regional Director of MOFA was constituted to

conduct planning and implementation of the projects. The members of the committee were Chief District Officers of four districts and representatives of MLD, Nepal Food Corporation, Agriculture Input Corporation (AIC), Department of co-operatives and ADB/N. This committee was also to ensure co-ordination of project activities with the annual District Development Plans (DDP) prepared by the respective District Panchayats. The activities selected under the project were part of the DDP, which was provisioned under the Decentralisation Act of 1982. In that respect this was a district level project. There was provision of the District Co-ordination Committee under the chairmanship of DDC president. The other members of the committee were the representatives of DADO, AIC, ADB/N and DTO.

Requests from the farmers were a pre-condition for the initiation of the project. Usually, the assistance was provided for headwork construction, lining the main canal and the construction of retaining wall to stabilise irrigation infrastructures (Shivakoti, 1992:14) in the hills. The project target was to develop and improve irrigation service to about 3000 ha of land. The project achievement was extension of irrigation facilities to 3,200 hectare. The total estimated project cost was US$ 9.7 million. Twenty eight percent of the total cost was for the development of minor irrigation projects.

The *Dhand* and *Birta Kulo* in *Tarkughat* irrigation scheme, which is one of the case studies (see chapter 6) was implemented under this programme.

(The Hill Irrigation Project (HIP) (1981-1989))

The project was implemented with the assistance from the Asian Development Bank to increase food production in food-deficit hill areas by improving the existing irrigation schemes and developing new ones with more stress on extension services and improved methods of water management.

The objectives of the project were:

- To increase the production of food-grains and other agricultural products through irrigation development.
- To improve agricultural support services, thereby raising the income and standard of living of the people in the project area.

Five irrigation systems in the Western Development Regions were included under the project with a total allocation of $16.7 million. All the five systems were completed under the project with a cost of $12.5 million. The reason for the lower expenditure than the allocation was due to the deletion of one irrigation system, which was appraised but rejected because of the high costs. The intervention had limited people's contribution as it was implemented by DOI as central level project. Farmers' participation and management turnover to the farmers were not envisaged during the execution of the project. However, the present policy of the government has stressed the management turnover to the farmers. The project continued till the last year of the seventh plan.

The *Annapurna Kulo* (Hemja), which is part of the case studies, was one of the schemes constructed under this project (The case study is presented in part III of chapter 4).

3.6.4 The Seventh Five-Year plan (1985-90)

Agriculture

The approach during this plan was to fulfil basic needs of the people through the increase in foodgrains and rural employment creation to increase the household income. The plan envisaged concentrating on the agricultural services in the areas receiving priority in production programmes. The reason was to maximise use of limited resources (NPC, 1985).

Irrigation interventions

The objective of the plan was to ensure certainty and permanency of agriculture, which depended only on the monsoon rainfall. In this connection it emphasised the implementation of hill irrigation projects with the assistance of the Asian Development Bank in order to fulfil self-sufficiency of food stuffs in these areas. The plan for the first time recognised the under-utilisation of the available irrigation facilities (which was estimated at 42 percent) and emphasised the use of their full capacity through improvements in the management and distribution of irrigation water.

The physical achievement was only 73 percent of the total target. The two agencies (FIWUD and ADB/N)[12] under ministry of Agriculture exceeded the target by 3 percent, whereas the DOI could achieve only 48 percent of the target (Source: DOI record). This shows the importance of the small-scale irrigation both in the terai and in the hills as FIWUD and ADB/N were implementing small irrigation projects. The expenditure however, was exceeded by 42 percent. This scenario reveals the management inefficiency of the DOI and it points to towards the structural problem in terms of implementation capability.

The major problems identified in the execution of the seventh plan were:

- Farmers' inability to derive the expected benefits from the projects owing to the technical deficiency in the project. This was caused by the government agency's lack of direct accountability towards the people.
- Unsustainability of the projects owing to the lack of necessary attention towards the institutional aspects during the execution of the programme by the government agency.

The mitigating measures proposed for the future were to complete the irrigation projects within the allocated time through the use of appropriate technology, including irrigation management improvement with farmers' participation (NPC, 1992).

(Irrigation Line Of Credit Project (ILC) Pilot Project (1988-1997))

The project was implemented with the financial assistance from the International Development Agency (IDA) of the World Bank. The activities included under the project were expansion or rehabilitation of existing irrigation systems, and improvement in the efficiency of existing irrigation facilities through effective operation and maintenance (O & M). Besides, it emphasised the provision of adequate agricultural support services and institutional development. Training of

DOI officials was an integral part of the project for organising water user groups. The farmers' participation in planning, construction, and management of the operation and maintenance of the irrigation projects was emphasised.

In the past, the bank lending was for large and medium projects. But construction and rehabilitation of new and existing small schemes were considered under this project. One of the objectives of this project was to learn lessons on 'participatory approach' in order to provide long-term support to small schemes. The selection criteria of the project were as follows:

- To be responsive to a specific request by a Farmer Irrigation Association
- To be economically viable with an economic rate of return of at least 10 % of project costs.
- To include a timetable for farmers' contribution.
- To include a written agreement of the Farmers' Irrigation Association benefiting from the project indicating that the Farmers' Irrigation Association shall be responsible for (1) the construction, operation and maintenance of the irrigation scheme under the project and (2) the requested contribution to the capital costs of the project (The World Bank, 1988).

The project covered all the districts of Western, Mid-Western and Far-Western Region except the Dhaulagiri Zone. The estimated total cost of the project was US$ 23 million, including the groundwater irrigation schemes aimed at providing irrigation water to an additional 15600 hectares. It was reported that the project extended additional irrigation facilities to 33,800 ha only from the surface schemes. However, it should be noted that the progress report might have included not only the extended area but the area under irrigation by old schemes also, which have been rehabilitated under the project.

The *Ghachowk* irrigation system, which was part of the case studies (see chapter 5) was implemented under this project.

(The Dhaulagiri Irrigation Development Project (DIDP) (1989-1996))

This project was supported by the ILO with the objective of ensuring security in basic foodstuffs, self-reliant irrigation systems, and generation of income in the project area. The project was targeted to benefit vulnerable groups such as landless people and women by increasing employment opportunities. The Project activities concentrated on development and rehabilitation of irrigation systems with emphasis on environmental aspects in the Dhaulagiri Zone of the Western Development Region. The project paid more attention to the development of organisational aspects such as institutionalisation of Water Users Groups and cost recovery for Organisation and Management (O and M) (HMGN/ILO, 1989:6,9,12). The project aimed at providing additional irrigation to about 2400 ha with total project costs of US$ 5,076,000. The project however, was able to provide additional irrigation facilities to 2271 ha only.

(Irrigation Sector Project (ISP) (1989-1997))

The objectives of the project were to support the government's basic needs programme in increasing food production to meet the growing domestic demand

through the development or improvement of irrigation facilities covering the total area of about 25000 hectares. Besides, the project aimed at increasing agricultural productivity creating rural employment opportunities and improving farm incomes. The focus of the project was on (i) rehabilitation and improvement of existing farmer-managed surface irrigation schemes, (ii) construction of new small and medium scale surface water schemes and (iii) strengthening of the regional and district irrigation offices of the DOI in the project area. The estimated total project cost was US$ 26.468 million aimed at providing irrigation facilities to 64,000 ha of additional area. It is reported that the plan target was fully achieved.

3.6.5 The Eighth Five-year plan (1992-1997)[13]

Agriculture

The major objective of this plan was to increase agricultural production and productivity to meet the growing food demand based on geographical specification (NPC, 1992). Naturally, the focus was on strengthening hill agriculture, as it was the hill districts, which had a food deficit. The stress was on making extension services more effective by making them more accessible to the farmers. The policy also assigned priority to crop diversification.

The development of the agricultural sector was not encouraging despite the efforts made in the previous plans. The following were the main reasons for the lack of progress in this sector:

- Under-achievement in extending irrigation facilities.
- The lack of co-ordination among the agencies in this sector.
- The failure of agricultural research to address the need of the farmers (NPC, 1980-1985).
- The implementation of the priority programme was not effective.
- The extension services and the agricultural credit did not reach the farmers in time (NPC, 1985).
- The Programmes were not adapted to the need of agro-ecological zones (NPC, 1992).

These problems could be attributed to the frequent reorganisations within the Ministry of Agriculture and the failure of the farm research centres and extension services to cater for the need of the farmers (Basnyat, 1995). As compared to the government research stations, which concentrated on commodity-based research, however the two agricultural research stations in Lumle and Pakhribas funded by the ODA have been able to cater to the need of the farmers. Their approach of Samuhik Vraman (visit to the farmers' field by an interdisciplinary team) to identify the problems and farmers' field trials through out-reach sites (APROSC, 1982) have helped in the identification of an appropriate technology and encouraged farmers to adopt it. This was evidenced during the field study of *Annapurna Kulo* by this researcher.

Irrigation interventions

The five-year development document laid emphasis on decreasing government involvement and increasing farmers' participation in the planning, implementation, operation and maintenance of the irrigation schemes by using appropriate irrigation technologies suited to varying geo-physical and climatic conditions.

Farmers' request was made a pre-condition for the survey of potential projects, and projects with lower cost per hectare received priority for implementation. The policy was to promote small-scale irrigation systems with the increased participation of the farmers. Naturally, there was a policy shift from new construction to the rehabilitation of the existing schemes. The farmers' contribution in construction was obligatory and the policy was to turnover the completed systems to the farmers. For this purpose the formation of users' committees was a precondition for new construction and rehabilitation. A written agreement with the users was also made compulsory. The plan made detailed policy guidelines for the execution of the project. It stressed to make farmers more accountable for the management of the irrigation systems with a view to make them more sustainable, and also to reduce the government investments in annual maintenance.

The achievement however, was only 72.9 percent of the target.

(Nepal Irrigation Sector Project (NISP) (1997-2002))

This project was an extension of the ILC pilot project, which had been successful according the IDA. The objective of the project was to assist the Government in planning and utilising its water resources in a harmonised, effective and sustainable manner and to increase productivity and sustainability of irrigation systems in the selected districts of the three western regions (The World Bank, 1997b). Elaborate guidelines were prepared for the selection, implementation and monitoring of the projects. Among others farmers' request for survey had to be accompanied with up front cash deposit to ensure that the demand for intervention was genuine. The elaborate procedures seem to have been developed to ensure effective implementation of the project and also to overcome the shortcomings of the pilot phase of the project. The total estimated project cost was $103.02 million to extend the irrigation facilities to 59,600 ha, including system improvement and turnover of DOI-managed irrigation systems to the farmers. The *Chaurasi Kulo* (see part II of chapter 4) was rehabilitated under this project.

(Second Irrigation Sector Project (SISP) (1997-2002))

The project objectives were to contribute to the government's goals of raising the socio-economic status of small farmers, reducing poverty, and generating employment opportunities in rural areas. It emphasised the strengthening of Water Users' Associations (WUA), improvement and construction of Farmer-Managed Irrigation Systems (FMIS) and provision of agricultural extension service. The project covered all districts of the Eastern and Central region. The project aimed at providing irrigation to 41,000 ha of land through new projects and rehabilitation of old schemes. The total estimated cost was US$ 33.3 million.

3.6.6 The Ninth Five-Year plan and the Agricultural Perspective Plan (APP)

The major thrust of the ninth plan (1997/98-2002/2003) is on poverty alleviation. The government with the assistance from the Asian Development Bank/Manila has prepared a 20 year plan for the agricultural sector. The APP envisages reducing the poverty to 14.0 percent in 20 year time i.e. a 5 percent reduction in each year. The agricultural sector has to grow by 4 percent annually to achieve this target. However, the overall economic growth in the first year of the plan period was only 1.9 percent.

The plan has prioritised delivering packages of inputs in the terai, hills and mountains to increase agriculture production. The priority inputs identified are irrigation, road and agricultural technology. For the hills the APP admits that an increase in food crops alone will not be sufficient for the reduction of poverty. Thus, the priority is in the diversification of the hill agriculture. In this respect, the plan emphasises the production of high value crops. The plan notes that the irrigation investment in the hills needs to concentrate on improvement of small irrigation systems (APROSC and John Mellor Associates Inc. 1995:xv-xviii). The stress is on providing a year-round irrigation facility. However, the plan recognises that the achievement of the plan targets will depend on a better co-ordination among different agencies at all levels and decentralised delivery of the services according to the need of the farmers.

The target of this plan seems to be very ambitious in view of the past performance in the agricultural sector.

3.7 Summary

This chapter provided an overview of the socio-economic situation of the country and its districts, which shows that agriculture plays a dominant role in the economy of the country. The development of the agricultural sector is vital for the improvement of the majority of the farmers. For this, the development of the hill irrigation, which has great potential, could contribute substantially. The characteristics of the hill irrigation and farming systems reflect the nature of subsistence farming in the hills.

The discussion on the development strategies and the politico-administrative structures provides a picture of the intervention priorities, which have evolved over time, and showed how administrative structures were designed to meet the development priorities. It further shows that the desired results have not been achieved despite many experiments, due to poor project implementation because of the lack of administrative and political commitments. The discussions on the agriculture and irrigation policies indicate that despite the effort these two sectors lack co-ordinated efforts to achieve the plan targets due to sectoral orientation in the formulation and implementation of the plan. Besides, it also reflects their inability to address problems in financial and technical execution.

The various donors have applied different intervention strategies in the past. It was clear that multilateral agencies paid more attention to the development of medium and large-scale irrigation projects, which was heavily top-down. In contrast

to that, the bilateral agencies focused on the development of small irrigation systems in the hilly regions, through bottom-up approaches, and farmers actively participated in them. The government involvement in the irrigation sector has witnessed the major policy shift as more attention is paid to the development of small-scale irrigation in recent years. Besides, it is also reflected that the appropriate mechanism for the development of the irrigation systems is still evolving. This was evidenced through the emphasis placed on the involvement of District Panchayats (DP), Village Panchayats (VP), District Development Committees (DDC) and Village Development Committees (VDC) in the rehabilitation of small scale irrigation schemes. In recent years, technology transfer based on participatory approach aimed at institution strengthening at local level has been emphasised. In this respect, the interaction between agency staff and village representatives was important in determining changes in irrigation and shaped different kinds of project approaches. Nevertheless, the training to users, agency officials and preparation of manuals for participatory approach of irrigation development has not brought expected bureaucratic reform towards solving the existing problem.

The social cohesion in the villages is declining. Where in the past many villages in the hill areas were often isolated, now due to the improved road system they are drawn into the regional and national economy. This is partly due to the necessity of seasonal migrations needed to obtain additional income because the population has outgrown the carrying capacity of the land in the villages and pursued standard of living has increased. The changes in the local government structure and their functions in the past have affected the institutional practices carried out in the past in irrigation. Besides, the village populations are to some extent divided along political lines after the introduction of the multi party system. This has resulted in a decline of social control, essential for among other things- good management of small irrigation systems. Paudyal (1995: 146-163) observed that lack of social control will negatively affect the realisation of the benefit from the intervention. However, it has also given a number of political opportunities to local actors, which have also had an impact on linking loops to achieve intervention and on irrigation management. New powers and financial resources of VDCs are bringing new dynamics of action in FMIS.

Notes

1 The 1991 agriculture census defined 'holding with land' are those who cultivate more than 0.01ha of land and 'holding with no land' are those who have two or more heads of cattle.
2 Out of the total cultivated land two percent of the holdings were fully rented out i.e. owners did not cultivate any parts of the land themselves.
3 In some places they were called *Ditthawal* also.
4 'Muluki Ain' is the civil code of the country.
5 There were three tiers of Panchayats under the Partyless Panchayat system. The National Panchayat was the highest legislative body and District Panchayat at the district level and Villlage Panchayat at the lowest level.
6 The final selection, approval and financial allocation for the central level projects are done either at the department or the ministry level. However, the district offices can select and

recommend for the implementation of the projects at the district level. The DIOs are also involved in the implementation of the central level projects.

7 They are non-profit making organisations involved in wide range of activities-health, education and income generation in the developing countries. They receive fund from their respective government or they obtain fund from various international agencies.

8 O and M expenses are those expenses incurred by the DOI for the salary of the staff involved in the operation of the canals and in the repair of the canals annually to keep the canals operational.

9 This institute has been renamed into International Water Management Institute

10 The idea was to extend agriculture-related services in a package in a decentralised manner to make it more accessible to the farmers. For this the district was divided in Ilaka (areas) and service centres were established to provide services to the VDCs covered by the Ilaka.

11 The programme was to provide package of agricultural inputs and extension services in certain geographical area for intensive agriculture.

12 The ADB/N is under Ministry of Finance now.

13 The interim government after the restoration of multiparty democracy in the country in 1991 drafted the new constitution and held a general election. Thus, there was a gap of two years between the seventh and eighth Five-Year Plan. The subsequent elected government re-drafted the eighth Five-Year Plan.

4. *Chaurasi Kulo* and *Annapurna Kulo*

Part I
General description of the village

4.1 Introduction

The irrigation systems lie in the area administered by Hemja Village Development Committee (VDC)[1] of Kaski District in the Western Development Region. It was a single system before the construction of *Annapurna Kulo*. It was one of the oldest Farmers' Managed Irrigation System (FMIS) in the western region of the country, before the intervention. The management of the irrigation system over a period of time has changed. Now there are two irrigation systems and they are *Chaurasi Kulo* and *Annapurna Kulo*. The intake point of these two systems is also different. At present the *Chaurasi Kulo* is theoretically under the management of a VDC. But in fact, there are no operational rules i.e. no rules-in-use (Ostrom, op cit.) exist.

The *Annapurna Kulo* is still under the management of the Department of Irrigation. There are several overlaps between the two schemes that have effects on the overall management of these two systems. This aspect is important to look into the differences in management of these two systems. Further, the differences in the hydraulic structure of these two systems have major effects on the management of these two systems. It was also important to get a view of the farmers who are water users of both the systems and the farmers who are water users of only one scheme. These were the prominent reasons for the selection of these systems for the case study. Therefore, *Chaurasi Kulo* and *Annapurna Kulo* are presented separately in part II and III respectively.

The information for the case studies was collected from actors who were associated with the irrigation systems. They were: the past and present VDC officials, the User's Committee (UC) officials, the farmers from different reaches of the irrigation systems, the engineers from the District Irrigation Office (DIO), the contractor, the former *Ditthawal*[2], *Mukhiyas*[3] and the *Dhalpas*[4]. The information was collected through administering a check-list, personal observation and unstructured interviews[5]. The information from the secondary sources was collected from the official records, evaluation studies and findings of other studies in the area. It was not possible however, to locate the engineers who implemented the intervention of *Annapurna Kulo* due to the time lag between the intervention and this research.

4.2 The environment of the system and the context of the intervention

4.2.1 The general environment

The village

The Hemja VDC area of Kaski District is along the Pokhara-Baglung Highway, 10 km further north-west from Pokhara-the Regional Headquarters of the Western Development Region. The VDC is 827 metres above sea level and lies on 84°00' longitude and 28°13' latitude. The mean annual temperature in the area is 20.7°C and the annual rainfall is 3,306 mm. The moisture regime in the area is humid. The topography of the area is gently sloping from north to south. The settlement in the village is on the both sides of the highway. The total area under the VDC is 1734 hectares[6]. The land use pattern is as follows.

Table 4. 1: The land use distribution in the VDC area

Types of land	Area (hectare)
Khet	594.37
Pakho/Bari	272.91
Minaha	867.0
Total	1734.28

Source: District Development Committee (DDC), Kaski, 1995 Cadastral Survey Office, Kaski

The figure indicates that the irrigable area as indicated by Khet in the VDC area is substantial. It also shows the potential for irrigation development in the VDC area.

Population and ethnicity

The VDC area has 1528 households. The total population is 8468. The wardwise distribution of population is presented in table 4. 2. The female population is slightly higher than the male population. The table indicates that the average family size is 5.5. The economically active population (15-60 age group) is about 65.0 % of the total population (NPC/MLD/UNDP, 1997). By ethnicity the village is a mixed community. Ethnically, the upper two castes Brahmin (40%) and the Chhetri (30%) constitute the majority. Other castes are Newar (5%), Magar and occupational castes-*Kami*, Gandherba and Sarki make up 25 percent of the total. The settlement pattern is clustered among the ethnic groups.

Table 4. 2: The wardwise distribution of households and population with ethnicity

Ward no.	Households no.	Population	Male	Female	Major ethnic[a] groups
1	311	1689	830	859	Chhetri, Brahmin, Tibetan refugees
2	204	1101	542	559	Chhetri, Brahmin
3	142	857	417	440	Brahmin, Chhetri, Newar
4	111	677	319	358	Brahmin, Sarki,
5	81	490	230	260	*Kami*, Sarki, Chhetri
6	261	1357	701	656	Brahmin, Magar, Chhetri
7	120	613	311	302	Brahmin, Chhetri
8	132	872	451	421	Brahmin, Chhetri
9	166	812	396	416	Chhetri
Total	1528	8468	4197	4271	

Source: District Development Committee, Kaski, 1995 (info obtained from VDC)

Occupation

The main occupation of the people is agriculture. Almost 50 percent of the households however, are not food sufficient according to the VDC estimate. Nearly, 70 percent of the households draw income from other sources according to the VDC estimate. Maskey (1994) also noted that 74 percent of the total households draw income from the off-farm activities and that constitutes 53 percent and 75 percent of off-farm cash income in *Chaurasi* and *Annapurna Kulo* respectively. These include earnings from salaries, shops, wages, pensions and remittances. Poultry raising on a commercial scale is becoming an important source of income for some households. Those engaged in this activity are making a good profit according to the VDC vice chairperson. By being close to Pokhara there is no constraint on markets for the product. Besides, the farmers can obtain necessary technical advice from the technician in Pokhara. The information concerning the income from other sources are presented in the following table.

Table 4. 3: Household income from other sources

Categories	Percent of total household
1. Service	40
2. Wage earning	10
3. Remittances	10
4. Pension	5
5. Business	5

Almost two-third of the upper caste households has one member working in public offices, in India or overseas countries. The occupational caste people are working as wage labourers and are also engaged in other non-agricultural activities since the available land is not enough to support the family. The main agricultural and non-agricultural activities performed by the occupational castes are ploughing during the agricultural season, carpentry and stone masonry. A group of occupational caste people said that there is enough work for skilled and semi-skilled workers

throughout the year. Only seasonal work is available for unskilled workers. The skilled workers in construction work have to remain idle only for two months during the monsoon.

The land holdings and land tenure

Almost all the farmers are owner cultivators. The average size of a holding for the household according to the VDC record is about 0.49 ha, which is slightly less than the district average (see chapter 3). However, this could be less due to division of land among brothers, which is not officially registered. There is no legal tenancy in the village. Share cropping is also not prevalent in the command area of the *Chaurasi Kulo*. Interestingly, the lands that do not have good irrigation facilities are rented out for share cropping. The concern of both the parties is not on the grain crop production but the by-product, i.e., rice and maize straw that are important for livestock feed. In this arrangement the owner provides the land and the tenant provides the labour, seed and the fertiliser. The product sharing is on a fifty-fifty basis. The share cropping is a contractual agreement between the two parties and it is usually for one season. Nearly 3 ha of land is under share cropping by 12 families in *Annapurna Kulo* according to the VDC estimate. Share cropping is not very common due to the small holdings owned by the majority of the farmers. For the big owners also, it is more profitable to employ a wage labourer than to provide land for share cropping because the land is productive. The prevailing agricultural daily wage rate in the village is NRs. 35-40 with a meal.

Offering land as collateral for taking a loan is prevalent in the area. This is a contractual arrangement between the farmers and the creditor for some period of time. In that case the farmer who lends the money does not receive interest, instead the earning from the land is the interest.

The upper castes hold large portions of the irrigated land. However, some occupational castes also have small pieces of land in the irrigated area but the income from agriculture is not sufficient to support their family. Nearly 255 households in the whole VDC do not have agricultural land but they have a small piece of land for their homestead. These people are mostly from the occupational castes.

The farming system and the principal crops

The type of soil in the irrigated area is alluvial which is suitable for rice farming and vegetable production. The cropping pattern in the area is rice based. The cropping pattern for *Pakho/Bari* is different from that in the *Khet*. The crop grown in *Pakho* is *Khar* that is mainly used for roof thatching and as fodder for cattle. The crops grown in *Bari* are maize, pulses and millet. The farmers also plant different types of vegetable in the *Bari* land in order to generate cash income. The crops grown are cucumber, pumpkins and other leafy vegetables. The vegetables have been a good source of cash income for small land holders. *Pakho/Bari* is also suitable for growing fodder grasses as the availability of the fodder grasses is a constraint in the area due to the establishment of the community forests.

The main cropping patterns for *Khet* land in the *Chaurasi Kulo* are rice-wheat-maize, rice-wheat-fallow, rice-fallow-maize whereas for the *Annapurna Kulo* the

cropping pattern is rice-wheat-maize. rice-wheat-fallow, rice-vegetable-fallow, rice-vegetable-vegetable. The present cropping pattern practised is rice during the summer. Wheat covers 40 percent of the lands. Farmers plant both improved and traditional varieties of rice in the area[7]. The improved variety matures early as compared to the traditional variety. This means that farmers could plant it late if the monsoon is not early. This has implications in terms of irrigation water as the crop may require less water and lessens competition for water in spring when rivers are very low. Most of the farmers preferred the traditional variety for their own consumption although the yield is less in comparison to the improved variety. Besides, the rice straw of the traditional variety is long, which is important from the point of view of livestock feed.

Vegetables are grown on thirty percent of the land during the winter in the command area served by *Annapurna Kulo*. This means that the winter crop does not cover all the land. The farmers reported that they leave the land fallow because vegetable planting is labour intensive and it also requires more compost, which is not sufficiently available. Also some farmers were of the opinion that the soil fertility decreases if they have three crops in a year. However, vegetable is the main crop for the farmers with small holdings (0.05 to 0.25 ha). The availability of the irrigation water has been mostly beneficial to these farmers for off-season vegetables. Vegetable farming is most lucrative to the farmers and a good source of cash income. Marketing of the vegetables is not a problem as Pokhara is the main market. The main vegetables grown are potato, cauliflower, cabbage, radish, cucumber and other leafy vegetables.

In case of vegetables, farmers plant only the improved variety. The use of chemical fertilisers is mostly for the vegetables along with compost. The use of insecticides is common for vegetable crops. The availability of chemical fertilisers and insecticides is not a constraint due to the easy access to the market in Pokhara. Farmers do not consider these inputs costlier as they are using it for cash crops. However, the size of the farms, the extent of the use of compost and availability of the chemical fertilisers determine the use of these inputs.

Livestock plays an important role in the household. The use of livestock manure is important for crop production as it reduces the use of chemical fertilisers. Some of the households have a biogas installation. The slurry is used as fertiliser. However, the farmers reported that there is shortage of livestock feed. Some of the farmers buy the rice straw from the adjoining villages.

The service from the agricultural sub-centre of the government - although it has an office in the village - is minimal due to its limited capability in terms of personnel. The farmers requiring services will have to go to the office. Farmers were critical about the level of services provided by the office. Nevertheless, the farmers can avail the services from the office in Pokhara. The office of the Agricultural Service Centre in the VDC provides services to four adjacent VDCs as well.

Innovation in agricultural practices

The Lumle Agriculture Research Centre[8] played a crucial role in the development of the agriculture in the VDC area. Lumle had an out-reach station in the area for 17

years (1979-1996). It has imparted the knowledge on improved agricultural practices to the farmers. Farmers acknowledge that technical services provided by Lumle had a great impact in creating awareness among farmers. Consequently, farmers have been adopting improved agricultural technologies. The demonstration farm of Lumle was instrumental in introducing new crop varieties especially in horticulture -- vegetables, oranges, improved fodder varieties and agro-forestry.

A national level NGO with aid from SNV/Nepal is supporting farmers with vegetable growing to generate cash income. The response of the farmers is very positive towards the programme. The NGO is organising farmers into groups. The services rendered are technical advice on the production of off-season vegetables, seed distribution and establishing contacts between the farmers and government agencies.

Migration

According to the VDC, nearly 10 percent of the total households have one of their members gone for work to India and overseas countries. However, this figure does not include the seasonal migration. The people who have gone overseas are from the upper castes, as it involves large amounts of cash payment to the broker. The occupational caste people are seasonally migrating to Pokhara, Chitwan and other nearby towns for porterage and for working in shops and hotels during non-agricultural seasons. In recent years there is no permanent out-migration from the village. The local people attribute this to the construction of the Pokhara-Baglung Highway and the construction of the *Annapurna Kulo*, which enhanced the economic opportunities for the local people. The completion of the highway has encouraged some in-migration into the village for residential purposes. Also, for the establishment of petty shops by the people from adjoining villages.

Physical facilities

The VDC area is developing into a 'town' due to the availability of the necessary infrastructure. The completion of the Pokhara-Baglung highway in 1991 has contributed to this aspect. The road links the VDC with the nearby town of Pokhara. Economic activities especially trade is growing in the village centre along the highway. The shops in the centre are catering for the needs of the people from nearby villages.

There are one private campus, three high schools, five primary schools and three private boarding schools. A total of 2158 boys and girls are attending the school, which is 25 percent of the total population (DDC, op cit.). According to the VDC estimate, more than 90 percent of the school going age of children are attending the school. Most of the students from the upper caste families attend high schools and colleges. The drop out among the children from poor families and the occupational caste families is quite high.

All the wards in the VDC area have piped drinking water facilities. All the wards except some villages in ward 6 and 8 have electrical facilities. Also there is one health post. The health post provides primary health care. The people go to Pokhara for major treatment and in case of emergency. There is also one Post Office. The services

of the Small Farmer Development Programme[9] and the recently opened office of the *Grameen* (Rural) bank have been able, to some extent, to address the problems of marginal farmers and the women. There is one co-operative society formed by the farmers. It was rendering service, especially the supply of agricultural inputs to the farmers. During the time of this study in 1997 the co-operative was not functioning as it was incurring losses.

There is one Tibetan Refugee Camp. Nearly 165 households of these refugees are in the area. The villagers have mixed reactions towards the refugee camp. The refugee camp is providing employment to some of the women in the village in carpet weaving. At the same time the camp is occupying nearly 50 ha of land and there is pressure on other natural resources -- drinking water and forests as well.

Existing social relationships

The people in the VDC are satisfied with the relationship among various caste groups due to the interdependence among each other. The relationship between the people in the VDC can be classified into social relations, economic relations, political relations and caste relations. In the social relationship, kinship relation is the strongest one. The social and economic relationship between the descendants of the same family is based on close co-operation. The immediate help in any social event and economic matters comes from the family members, although the nuclear family is replacing the traditional extended family. At the same time the co-operation among various ethnic groups in any social event is the characteristic of the village life.

The caste system is still prevalent, although officially abolished by the *Muluki Ain*. It was evident from the separate places assigned to the upper caste and the occupational caste people in a local tea shop. The occupational castes will have to wash the dishes from which they eat or drink whereas upper caste people do not have to do this. Nevertheless, the occupational castes can also have tea in the local tea shop.

Higher castes are still dominant as exemplified in an event wherein one evening a *Kami* (occupational caste) was bitten by the dog of a Chhetri. The *Kami* hit the dog and in reply the owner hit the *Kami* with a stick. The *Kami* came to complain the VDC chairperson and the VDC chairperson had to settle the dispute by bringing together both the parties. The matter was settled when the man of the upper caste said that he will not repeat this sort of behaviour in future.

The people of the occupational castes feel dominated as narrated by one *Kami*. Once he was irrigating his field from the nearest outlet, when one Brahmin asked him 'Why are you irrigating from the lower outlet as the outlet assigned for your field is a little further'. According to him he did not argue at that time. He continued to divert water to his field when the Brahmin left. His argument was why should he comply with what the upper caste person said since there were no rules in that regard. He also feels that he has the right to the nearest outlet as it increases the water use efficiency and the time required to bring water to his land is also less. These examples however, indicate changes in the social relationship. The

occupational caste people are also feeling more powerful so that they can argue with the upper caste people and defy the norms set in the past.

The economic relation among various caste groups is based on the exchange of goods and services and borrowing money for social events and for the economic activities. This type of relation is more prevalent between the rich and the poor than among the people of same economic status. This economic interdependence is helping to maintain the ties among the various caste groups. Labour exchange, for example, which is known as *Parma* is common in the village. This is practised between all the people irrespective of their economic and social status. The exchange of a pair of oxen against the equivalent of four wage labourers is also in practice. However, during the time of planting the ratio is six wage labourers to one pair of oxen.

Political relationships were becoming more vivid after the restoration of multi-party democracy in 1990. It would be an exaggeration to say that all the people are active in party politics. The political relationship becomes more open during the local election, which is contested on party ideology. The educated and the identified party workers are more active in local politics. The general mass however, bases their selection of the candidate on merit basis and kinship relation. The elected representatives for the VDC are from high socio-economic strata. The representatives in the VDC at present, are 6 Brahmins, 4 Chhetris and one woman member from the Newar caste. The political representation in the VDC in fact does not reflect the social composition of the VDC as none of the occupational castes had their representation although, they constitute 25 percent of the population. The representation however, is an indication of the dominance of particular social groups in the decision making affairs of the VDC. The differences in the political ideology in general, have not affected other social and economic relationships between the communities according to the people. Nevertheless, in some cases the individual relations between the people are affected by the political affiliation. The political factor prevails also during the allocation of the VDC budgets for development programmes. The local leaders however, say that there is consensus among the representatives of the various parties in the selection of projects and the budget allocation for it.

On-going development activities in the VDC

The VDC is implementing other development projects through the development grant from the DDC and also through its own resources. The selection and investment in the projects (VDC record, 1997) suggest that great emphasis is put on the implementation and construction of village roads, culverts, drinking water improvements, construction of sub-health post buildings and maintenance of the schools. These projects are implemented through the Users' Committees (UC) formed by the VDC. The VDC provides partial expenses and the users will have to bear part of the costs. These small-scale projects are implemented on a wage basis. The contribution from the users ranges from 25 percent to 40 percent depending on the nature of the projects. The users' contribution is usually in the form of labour.

Part II
Chaurasi Kulo

4.3 Environment of the irrigation system

4.3.1 The irrigation system

This irrigation system is one of the oldest in Kaski district of the Gandaki Zone in Western Development Region. The Bagale Thapa family who migrated from another part to this region built this system almost 150 years ago. The forefathers of this family had a reputation for constructing canals in other parts of the country also. This family, according to the villagers, requested permission of the ruler of Nepal of that time for the construction of the canal since an irrigation facility was not available in the area.

This is a river valley irrigation system. The Yamdi *Khola* is the source for irrigation water and the discharge capacity of the temporary canal intake was 1.4 m^3/second. The length of the main canal is 4.30 km. There are 10 outlets at present, which delivers water to the field channels. There is no canal lining in the field channels. The field channels provide irrigation water to the terraced fields. The main canal has five foot bridges. There are 8 culverts, two drain inlets and four aqueducts (see figure 4.1). The headwork of the main canal is temporary. There is lining on some parts of the main canal. Farmers construct the temporary intake of stones, bushes and twigs on the left bank of the *Khola* near *Suikhet Bazaar*. People used to construct the headwork during the monsoon season. The place for headwork construction changes almost every year as the river changes its course. The type and magnitude of work by the villagers depended on the changes in the water course. Sometimes the villagers had to make more effort in headwork construction as the distance between the canal and the water course increased, while other times it was less. Thus, the labour contribution and the type of work varied from one season to another.

Until 1972 a goat was sacrificed before the start of headwork construction. The *Jhankri* (local healer) used to receive a goat to ensure the successful completion of the work and to protect the crop from inadequate rain in that year. Villagers contributed money to buy the goat. Worship was performed at the temple of 'Mai' (goddess) situated in the middle of the irrigation system in order to protect the crop from hail storms. However, this practice is discontinued now since villagers do not contribute and the Village Panchayat and VDC also were not interested in it anymore. The construction of a new irrigation system at the tail end of this scheme[10] in 1989/90 divided the scheme into two (see figure 4.2).

4.3.2 The irrigated land and its distribution by ethnicity

There were differences in the reported command area of the irrigation system. The previous study (Shivakoti, 1992) recorded that the command area was 100 ha and the number of farmers was 285 indicating that the average land holding would be 0.35

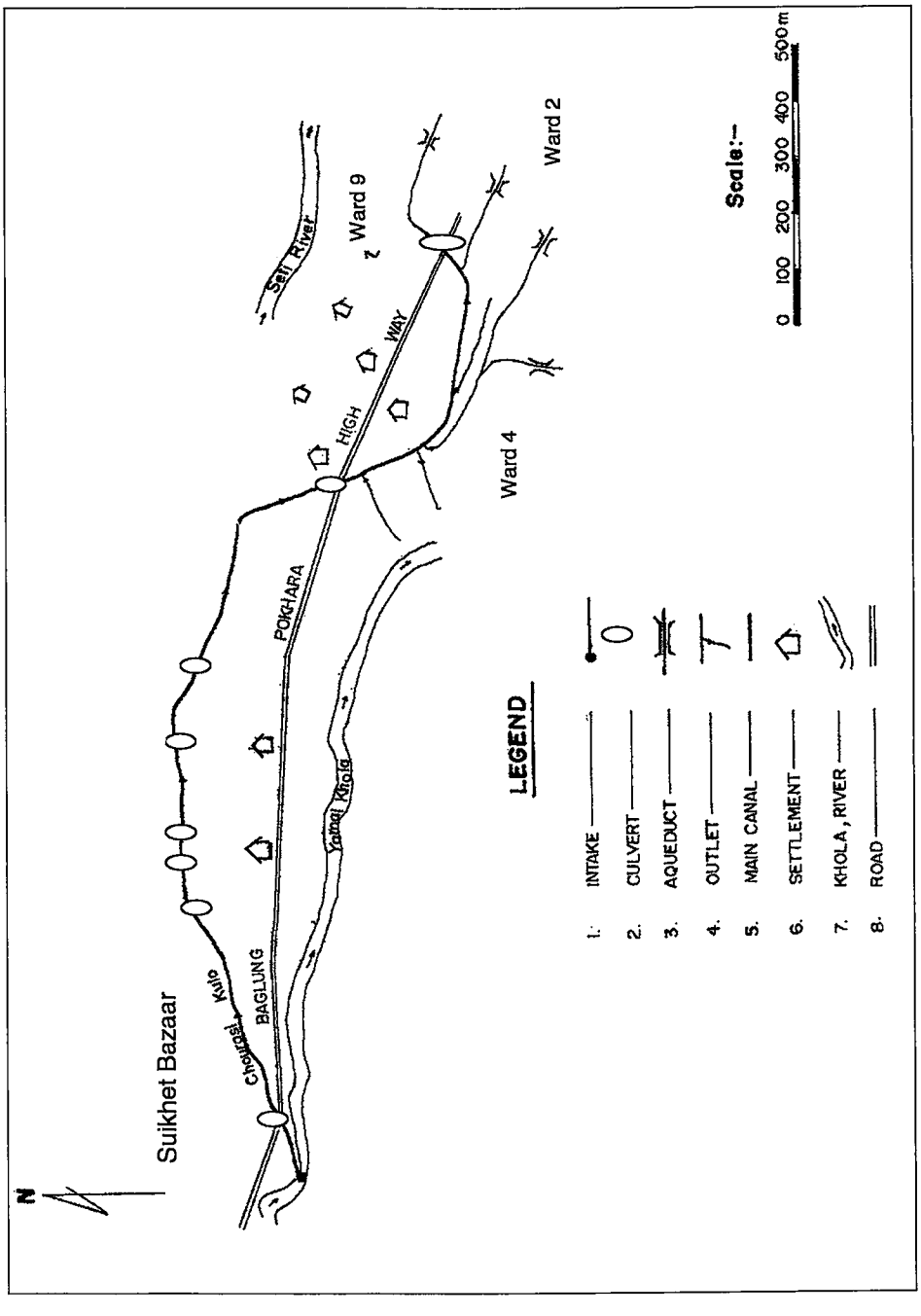


Figure 4.1: Layout of *Chaurasi Kulo* Irrigation System

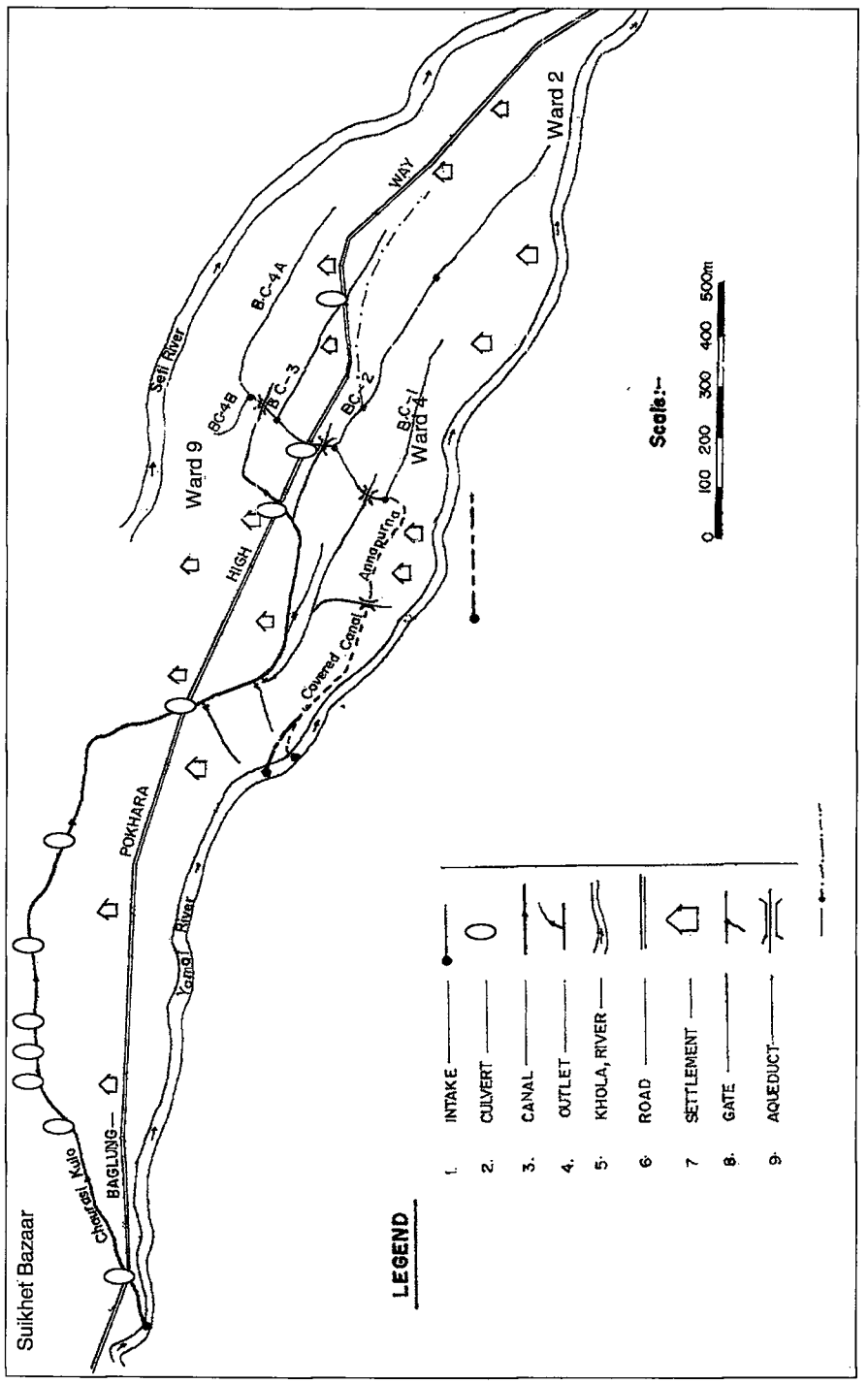


Figure 4.2: Layout of *Chaurasi* and *Annapurna Kulo* Irrigation System

ha per household. The survey by the District Irrigation Office (DIO) estimated that the gross command area was 205 ha and the net command area in 11 settlements was 187 hectares. The VDC in 1997 estimated that the user households from the irrigation system were 350 and the net command area was 154 hectares (12320 *mato muri).*

This indicates that the average size of holding within the command area would be 0.44 hectares (VDC, 1998)[11]. The VDC figure is considered more accurate as it collects land taxes also.

The VDC chairperson said that there has been a reduction in irrigated area by 8000 *mato muri* (100 ha) in *Chaurasi Kulo* and in the number of farmers by 250 after the construction of *Annapurna Kulo* (see figure 4.3 in part III). The PBME review report (GEOCE, 1991) however, indicated that only 4320 *mato muri* (54 ha) previously irrigated by the *Chaurasi Kulo* was within the command area of *Annapurna Kulo.* In this respect the PBME review report is more accurate as the previous command area of *Chaurasi Kulo* was around 1600 *mato muri* (200 ha) according to the villagers. The distribution of land and the size of holdings among the various ethnic groups are presented in the table 4. 4. The names of the farmers have been counted only once even if they had several parcels of land in different locations of the command area. The number of farmers having more than one parcel of land is 74.

Table 4. 4: The distribution of size of holding by ethnic group

		Ethnic group (numbers)					
S.no	Size of holding (hectare)	Brahmin	Chhetri	Newar	Gurung, Magar and other castes	Occupational castes	Total
1	<0.25	70 (62.5)	28 (25.0)	5 (4.5)	1 (.89)	8 (7.14)	112 (32.1)
2	0.3-0.5	89 (66.4)	37 (27.6)	4 (2.9)	3 (2.2)	1 (0.74)	134 (38.2)
3	0.55-1.0	46 (68.6)	20 (29.8)	1 (1.4)	-	-	67 (19.1)
4	>1.0	28 (75.6)	6 (16.2)	3 (8.1)	-	-	37 (10.6)
Total		233 (66.5)	91 (26.0)	13 (3.7)	4 (1.14)	9 (2.5)	350

Note: The figures in parentheses are percentages

The distribution of land holdings in the irrigated area is highly skewed in favour of the higher caste groups, mainly Brahmin. The occupational caste groups who constitute 25 percent of the village population hold only 2.5 percent of the irrigated land. The information also indicates that 90% of the farmers own less than one hectare of land. The majority of the farmers have between 0.3 and 0.5 hectare. Ethnically, the majority of the farmers holding more than one hectare are from the upper castes. Among this Brahmin caste group also, one particular clan group holds most of the land. This is because they are the descendants of the family who were the early settlers in the area. The poor families, who work as agricultural labourers, are economically dependent on them. Besides, they are also active in the local politics and other local affairs. They hold most of their land in the head and middle of the irrigation system. They are the ones who make most of the decisions related to the irrigation, since they hold most of the land in the command area. Thus, any decisions related to the irrigation cannot be implemented without their participation. The

present situation in the irrigation system is due to lack of their co-operation in devising the operational rules (see discussions on section 4.6). This shows the feudalistic characteristics of the village society. In this respect, this group of farmers has a key role over the irrigation water distribution.

4.4 The process of interventions and change

4.4.1 Irrigation under the *Ditthawal* up to 1960

The first person I met was a former *Ditthawal* who was a descendant of the family who constructed the irrigation canal. He described that the government appointed one *Ditthawal* from their family. The system of *Ditthawal* was hereditary. The *Ditthawal* also acted as the head of the village. The *Ditthawal* had the authority to keep the land record and collect land taxes from the people on behalf of the government. The *Ditthawal* was in-charge of collecting land revenues as well. If he failed to collect the revenue, he had to pay them by himself.

In earlier days the management system for the operation of the canal was hierarchical. There were 15 *Mukhiyas*[12] under him to supervise an area that was allocated to them. The *Mukhiya* had to collect the land revenue for the government for which they were paid NRs. 5 for every NRs. 105 deposited to the government. Under the *Mukhiya* there was a *Talukdar* for a specific area to assist him in the collection of land taxes and to mobilise the people for the operation and maintenance of the irrigation system.

The former *Ditthawal* told me that the government took over the management of the irrigation system from them. In fact the Land Reform Act of 1964 which took away the land tax collection function from the *Ditthawal* curtailed his power related to land administration. In other words he could enforce no sanctions with respect to land and water. Besides, the Panchayat System introduced a new politico-administrative structure in the country in 1962, which abolished the traditional system of local governance in which the *Ditthawal* had a key role in village administration. This was also the reason for the change in the management of the irrigation system. The Village Panchayat (VP) came into existence at the village level and this institution became responsible for managing public property at the local level. Nevertheless, the *Ditthawal* continued to administer the system as part of wider local administrative functions till 1966 under the supervision of the Village Panchayat[13].

The *Birta*[14] land of 2100 *mato muri* (26 ha) was kept as *Guthi*[15] for the maintenance of the canal according to the villagers. The earning from 300 *mato muri* (3.75 ha) of land was given to the *Ditthawal* to pay for his services. The *Birta* system was utilised to extend the agriculture land and to maximise the agricultural production in order to collect more revenue (Regmi, 1978) and in the past there were various kinds of *Birta* systems in the country. This was because the main source of the government revenue at that time was the land tax. Therefore, the maintenance of the irrigation system was necessary to increase the land revenue as collection of the taxes was on the basis of

production. In this respect, the primary function of *Ditthawal* was to operate the canal with the help of the farmers. Thus, basically the function of the *Ditthawal* was to manage resource base of the area including the proper management of the irrigation system.

The *Ditthawal* was receiving the earnings from the *Birta* land, which was for managing the irrigation system. At present the *Ditthawal* has got the legal entitlement of the land. There was contradiction in the opinion of the villagers with respect to this legal entitlement. Some were of the opinion that he obtained the legal entitlement of the land without the knowledge of the villagers. Some others were of the opinion that the Village Panchayat and the villagers recommended the legal entitlement in 1977. It seems that the second version is more valid than the first version. It is not possible that the registration of land will go unnoticed in the village, where everybody is aware of the smallest of events in the village. In fact most of the villagers did not like to discuss this matter as the chapter was already closed. The former *Ditthawal* also avoided the question about this and said he did not know anything about the *Birta* land converted into private ownership. It was not clear whether the land was kept as *Guthi* or *Birta.*

It was clear that the legal ownership of the land was not the reason for the *Ditthawal* to give up the management of the scheme as one of the *Mukhiya* at that time said. The abolition of the *Birta* system, the land reform designed to bring agrarian transformation in the country and politico-administrative changes were instrumental for the disintegration of their traditional institution. The issue of the legal ownership of the land and the problem in the management of the scheme at present was the result of these three interventions. There were no known serious management problems in irrigation when the position of *Ditthawal* was in existence.

4.4.2 The irrigation system under the Village Panchayat from 1964 up to 1990

The Village Panchayat (VP) took over the management in 1964 after the intervention by DIHM in 1962. The DIHM continued to provide funds for the operation and maintenance of the scheme for 7 years (1964-1971). The officials of the Village Panchayat, according to some of the farmers, were interested in the annual maintenance funds coming from the government and did not mobilise internal resources. Besides, people were not interested in contributing to the maintenance since they knew that the funds were coming from the government. Hence, the VP could not enforce the strict norms for mobilising the resources for operation and maintenance.

In 1980 the king called a referendum to choose between two political systems: Existing Partyless Panchayat System vs. a Multi-Party system. This affected the management of the irrigation system according to the former *Pradhan Pancha* (Chairman of VP). The VP could not enforce most of its decisions during the referendum period. Most of the educated people in the village persuaded other villagers not to obey the decision of the VP since they were in favour of the Multi Party System.

When asked about it, one farmer said that "why should they obey the Village Panchayat as it did not have legal authority to enforce any sanctions?" At this time the VP requested the DOI to take over the management of the irrigation system. In other words the VP wanted to transfer the ownership of the scheme to the government. This indicated the inability of the VP and its intention to get rid of the management of the system. However, the VP continued managing the irrigation system, when it could not persuade the DOI to take over the management.

The Village Panchayat formed a *Kulo Samiti* to manage the irrigation system consisting of Village Panchayat members according to the former *Pradhan Pancha,* after the Partyless Panchayat system won the election. The study conducted by Shivakoti (1992:18)[16] confirms this fact. The study indicated that the *Kulo Samiti* consisted of 11 executive members and 30 members at the branch level. A *Pale* was employed to allocate water to the branch canals (see section 4.6.2). He used to work under the direction of the *Kulo Samiti.* Besides, the *Kulo Samiti* used to look after the repair and maintenance of the canal. The committee used to make collective decisions for the type of work to be carried out. The nature and volume of work was determined through spot checking by these committee members. The effectiveness of the VP was gradually diminishing after the referendum as the village was politically divided, although the committee was functioning. Hence, the VP could not enforce the rules. However, it did manage the system till 1990. The introduction of the Multi-Party system in the country in 1990 brought changes in the local institution and the Village Development Committee (VDC) came into existence in 1992 in place of VP. The Kulo Samiti during the time of the VP dissolved with the abolition of Panchayat system, since majority of the members of it were VP officials.

4.4.3 The irrigation system under the VDC since 1992

The VDC is responsible for the management of the canal since 1992. It prepared a management plan for operating and maintaining the canals. The works for canal maintenance were divided among the wards[17], according to the former VDC chairman. The allocation of labour requirement was on the basis of the land to be irrigated in each ward. The plan did not work well in absence of necessary rules for the governance of the irrigation system. The reasons cited by the farmers were the following:

- The government had commissioned a preliminary study through local consultants in 1992 for the rehabilitation of the canal, and had assured to provide assistance. Farmers were hopeful that the rehabilitation would take place. Therefore they were not interested in contributing to the maintenance.
- Water availability for the farmers at the head and middle was sufficient at present. Because of this, they were not interested in any operational rules and they were also not interested in spending their resources for the maintenance of the canal. Only the farmers at the tail end who did not receive sufficient water wanted operational rules. Their efforts were not sufficient for carrying out maintenance activities. They do only occasional maintenance.

The farmers were of the opinion that the management under the VP was better, with an exception of the period during the referendum in which its authority was undermined, as compared to the management by VDC at present. This was because the people were afraid of the VP and used to report for *Jhara* (labour contribution)[18]. This was not strictly enforced during the time of VDC management. This shows that an authority of an institution was necessary to maintain social control, which could enforce necessary rules. This is important for the fair distribution of resources, which is important for maintaining the linking loop among the users.

One of the former *Mukhiyas* gave the following reasons for the break-down in traditional management practices.

- The conversion of *Birta* land into *Raikar* (individual ownership) land to the *Ditthawal*.
- The people did not like to contribute their resources, as they became dependent on government resources after the intervention in 1962.
- The VP expected voluntary labour contribution from the people, while the VP officials misused the money available from the government.
- Reduction in the number of users after the construction of the *Annapurna Kulo* at the tail end.

The tail enders cited following reasons for the break-down of the traditional institutional practices.

- The conversion of *Birta* land into *Raikar* land.
- The elected village representatives were concerned only with votes instead of mobilising and preserving public resources for the common benefit.
- The decline of *Jhara* practices.
- The respect for agricultural work was diminishing, in absence of education related to their vocation.
- The norms and values in the society were deteriorating due to the vices (alcoholism and cards playing) among some of the villagers.

4.5 The interventions in the irrigation system

4.5.1 The intervention of 1962

Parts of the canal were completely washed away due to a big landslide in 1960 according to the villagers. The villagers petitioned the king during his royal visit to the region for a complete rehabilitation of the system as it was beyond the capability of the villagers. The king directed the DIHM to assist with their rehabilitation. The DIHM assisted the farmers with the rehabilitation in 1962. This shows how the combined objective of the users helped to form a linking loop between the users and the agency. The objective of the assistance was to restore the operation of the main canal. Parts of the main canal in the head and middle were lined using stones. During the time of rehabilitation the DIHM was operating the main canal. The

rehabilitation was completed in two years time. After the completion of the rehabilitation of the system, the DIHM left the village because it did not construct the canal and it assisted in the rehabilitation only. This means the interface between the users and the DIHM lasted for two years. In other words the loop between the users and the DIHM disintegrated at this time.

Farmers however, wanted the DIHM to continue the operation and maintenance of the system because they did not have to contribute for its maintenance. TheVillage Panchayat took over from the DIHM. This means the organisational control of the irrigation system was transferred to the local institution. Thus, the management of the irrigation system at this time was in transition. This also indicates that the disintegration of the loop had an effect on the organisational of irrigation system. The VP, which came into existence in 1962, was not in a position to continue the old practices that were lost during the DIHM management. The *Ditthawal* also could not enforce the past norms as his position was not any more legally recognised. According to the opinion of some of the elders in the village, the traditional system of management was lost during this time. The changes in the interface between the existing institution and the users and the establishment of a new interface due to the emergence of new institutions were the causes for this situation.

The farmers constructed a checkdam at the headwork in 1997 through the financial assistance from DDC and the material support from the DIO. The construction of the checkdam became necessary to divert water to the canal as the headwork was washed away by the flash flood. This indicates that the farmers were quick to form a linking loop to obtain necessary external support. However, the formation of linking was temporary.

4.5.2 On-going Intervention in 1998-1999

The Government, at the request of the VDC did a detailed survey and prepared the cost estimate in 1994 for the rehabilitation of the scheme. The objective of the rehabilitation was to increase agricultural production through the increased and reliable supply of irrigation water. The survey estimate was revised in 1998. The estimated cost of the project is NRs. 9.284 million. The government will provide NRs. 7.934 million and the farmers will have to provide NRs. 1.114 million as labour contribution amounting to 12 percent of the total cost. The farmers will have to do earth excavation, collection and transportation of stones to the construction sites. Besides, farmers will have to contribute about NRs. 47,000 in cash which is 0.5% of the total cost. The farmers will have to deposit up-front money at the rate of NRs. 2.50 for each 0.05 ha of land[19] before the implementation of the intervention. This is a requirement for the rehabilitation under National Irrigation Sector Project (NISP) criteria. This is to ensure the users' participation and local involvement in the development programme as outlined in the eighth-five year plan.

The rehabilitation work began in September 1998. The rehabilitation includes construction of weir of gabion wires with random rubble (RR) masonry core walls. The intake at river will be 1.0 m^3/second with one head regulator and one escape. The intake capacity is less than the capacity of the temporary intake, as there will be

control of the leakage due to construction of permanent weir. The capacity of the intake was found to be sufficient for the area to be irrigated, which was 154 ha. This is the only major construction proposed in the rehabilitation scheme. The main canal will have a partial lining. The rehabilitation also includes repair of six existing culverts and there will be two drain inlets. The proposed intervention will benefit particularly the tail enders in ward 2, 4 and 9, who were complaining about insufficient availability of water. This is because the VDC is expected to devise operational rules.

The researcher visited the irrigation system in January 1998 to see the on-going rehabilitation work under NISP. It was learnt from the VDC officials including the chairman of the Users' Committee that the contract for the work was awarded for NRs. 7.2 million to a contractor from Pokhara. However, the main contractor had sub-contracted out the work to other contractors on a piece rate basis. This implies that the profit margin would be extended also to the sub-contractor. However, the sub-contract is for the labour only as the main contractor is providing the construction materials. During the visit the lining of the main canal was on going. Since there was no provision for the complete canal lining, the places for the lining were decided through discussion between the irrigation officials and the users. However, some resentment were observed during the talk with the users, as every farmer wanted to have the canal lined with a permanent outlet in his part of the land. Some farmers were exerting pressure on the contractor for lining. Besides, some of the users were putting polythene pipes on the outlet to their land at the time of lining to assure supply of irrigation water. Some of the farmers were demanding an additional outlet to their land. This was creating confusion for the contractor. According to the supervisor, who is a local person hired by the contractor, there was no unanimity among the UC members as some members tried to make some changes in canal lining whereas others wanted it according to the approved design. This made the task of the contractor difficult. The overseer at the site however said that he was trying to accommodate the users' demand as far as possible but only to the extent that it did not affect the original design substantially and the cost. For example he said that he had directed to the contractor to make additional provisions for the canal crossing for people and cattle also as was demanded by the farmers. The engineer in DIO confirmed this when he said that he had directed the contractor and the overseer to accommodate the farmers' need as far as possible. This indicates the flexible approach adopted by the officials, which would have a positive effect on accomplishing the task. There did not seem to be problems between the officials and the farmers but there were problems among the farmers as everyone was trying to pursue his own interest. This shows that the loop formed for the intervention was gradually disintegrating due to the desire to fulfil individual objective, as every one was trying to take control of the irrigation water. The irrigation officials have also compromised with the attitude of the users as their primary objective is to accomplish the task without any hindrances.

It was learnt from the engineer that they have maintained the transparency in their activities. For example they have notified the UC about the contract agreement in writing, which specifies the contract amount, responsibilities of the contractor, the

responsibilities of the users and the role expected from them with respect to the work performance of the contractor. This according to him would facilitate the communication between the contractor and the farmer, which is essential for the successful completion of the project. However, he expressed some scepticism with respect to the task that farmers would have to accomplish as they were lagging behind in fulfilling their part of the work.

The role of VDC and UC in the rehabilitation that began in 1998

The VDC on behalf of the farmers was taking the initiative for the rehabilitation of the scheme. The role played by VDC was encouraging as it was maintaining the momentum, which started in 1992, when the government did preliminary survey of the system. It became more active in interaction with the DIO engineers when the fund for rehabilitation was included in government annual budget. The VDC collected the information from the farmers and submitted it to the DIO, which is a prerequisite for the intervention. At the same time the VDC was informing the farmers. All the farmers reported that they were aware of the rehabilitation work. Thus, there was a good communication between the users and the VDC. Besides, the VDC provided the cash amount, which was required along with the farmers' demand. This exemplifies how keen the VDC is on the rehabilitation of the scheme. The VDC vice-chairman however, said that the VDC would collect the money from the farmers afterwards. This seems to be unlikely as the amount was from the annual development grant of NRs. 500,000 provided by the government. The farmers from ward 4, 5, 6, 7, 8 and 9 may have successfully negotiated with the VDC to provide the money for rehabilitation work. In return, they will not ask for other development projects in their wards.

One cannot overlook the initiative taken by the water users especially from the water scarce area of ward 4 and 9, and also the representatives from these wards were taking a keen interest. They seem to have persuaded the VDC for providing cash on behalf of the farmers, which was important for early initiation of the intervention. Whatever may be the case, the involvement of VDC to obtain resources for the rehabilitation of the irrigation system was significant. It also indicated how the intensive interface between the people and the VDC would facilitate the development work at local level.

The VDC in consultation with the farmers had constituted a Users' Committee (UC) in August 1998[20] comprising nine members. The UC comprised a chairperson, vice-chairperson, the secretary and six members. The nomination to the UC had ensured the representation from all the wards within the command area of the irrigation scheme. The composition of the UC showed that seven of the members are Brahmin and two were Chhetri. Besides, out of the total members, six were elected members of the VDC from wards 4, 5, 6, 7 and 9. The remaining three were not the elected members. The representation in the UC implied that the VDC was aware of the need to maintain close linkages both with the DIO and the farmers. Negotiations with the DIO officials would be easier for the elected officials. The representation from the farmers would help to ensure farmers' commitment towards the rehabilitation. Further, the representation from each ward would help in mobilising

farmers' labour contribution from the users in each ward. The UC had not yet become effective as the VDC was taking the lead. The VDC chairperson however, believed that UC would take over from the VDC by the time the construction work is finished. During the construction period also the UC members were not as active as was expected.

Farmers' contribution

The farmers as part of their labour contribution of 2.5 percent were to collect the stones and to do earth excavation, worth NRs. 180,000. The farmers were to provide 1100 square metre (sq.) of stone. The VDC vice-chairman told that they already provided 300 sq. m of the stone worth NRs. 60,000. He said that the farmers did not collect the stones but provided the money to buy. During the discussion with the users it was learnt that they did not contribute the money but the VDC paid for them. The VDC secretary confirmed this. The VDC vice-chairman further revealed that, since people would not like to contribute labour, they were thinking of negotiating with the contractor for the transportation of the stones from the nearby river, for which the UC would provide the money. The word 'negotiation' seems to have an underlying meaning, which is to request the contractor to bear partially the cost for stone collection. Besides, it seemed to be unlikely that the farmers would contribute the cash for stone collection. Instead, it is more likely that the VDC will have to contribute from its own resources as it paid 0.5 percent for the deposit also. This was adjusted from the savings made out of the fund made available by DDC for the emergency maintenance of the canal in 1997. The newly elected VDC officials were instrumental in securing the fund from the DDC, as majority of the members in VDC and DDC, including the chairperson are from the same political party. The labour mobilisation from the farmers for stone collection is unlikely for the following reasons.

- The stones are not available in the nearby river. They have to be collected from a distance of nearly 3-4 km.
- The availability of transportation facilities would not encourage the farmers to make labour contributions for stone collection and they will have to pay in cash for its collection and transportation.
- The farmers were able to avoid cash contribution before as they saw the opportunity.
- The VDC chairman has an interest in the completion of the project, as he comes from the area which is deprived of sufficient irrigation water since the construction of *Annapurna Kulo*. Besides, the completion of the project would be beneficial politically, and as such VDC is keen to accomplish the project.

The discussion above shows that the users did not have the complete and direct participation in the intervention. This was due to the differences in the 'project ideal', and 'users interest'. The 'project ideal' was to ensure users' commitment of cash contribution before the initiation of intervention whereas 'users interest' was to avoid it. Thus, the DOI-UC loop was not functioning. But UC-contractor-VDC loop was

functioning well. It reveals that the loop formed before the intervention is not functioning taking into consideration of the users' participation.

The intervention took place at the initiative of the VDC. It is important to note that the first VDC chairperson, who was elected in 1992, was able to persuade the DOI to conduct preliminary survey for the rehabilitation. The preliminary survey laid the ground work for the rehabilitation. However, the intervention did not materialise, as the government did not have the fund for the rehabilitation at that time. However, the government was committed for the rehabilitation, as it was holding discussion with the World Bank for the NISP. Because, of that it conducted the detailed survey in 1994. Thus, the link between the DOI and the VDC was maintained in the process of rehabilitation. The expected availability of the fund was important in this connection. The new officials of the VDC, who were elected in 1997 did play an important role in maintaining the link with DOI by fulfilling the obligation required for the rehabilitation. As a result of this, the rehabilitation began when the government obtained the fund from the World Bank. However, the users did not fulfil their part of contribute. It is a general tendency that users would not like to contribute to the government programme, as they feel that the government has an obligation to fulfil towards them. This is largely due to failure in following the processes required for the participatory approach of the development, in which the users and the implementing agency have a direct contact. The gap was fulfilled by the VDC as an intermediary between the DIO and the users. This shows that the loop was effective at local level to minimise direct costs to local people while getting work done. In this respect the outcome of the intervention was shaped through the role of the VDC.

4.6 Management of irrigation tasks

4.6.1 Water acquisition, system development and system water allocation

The irrigation system was developed long ago. The work related to water acquisition begins in middle of May every year. The villagers gather to collect materials to construct temporary head works. The users can receive the amount of water they require as the water available at the source (*Yamdi Khola)* during monsoon is sufficient and it does not affect the water availability to the *Annapurna Kulo* system down stream. There are no other systems operating nearby at the upstream. The materials include stones, twigs and sometimes gabion wire. The gabion wire is usually obtained from the DIO. The work is carried out under the supervision of the VDC. It takes 15 to 20 days for the construction of headwork. There have been some changes in the use of local materials in recent years. Previously, the boulders were used in sufficient quantity to construct the headwork. However, the use of boulders are declining due to lack of sufficient manpower as most of the farmers from the head and middle do not report for headwork construction. As a result the headwork used to be washed away by floods very frequently. Thus, the farmers have to construct it repeatedly in a year. This situation will be changed after the construction

of the permanent weir during the on-going intervention. However, this will lead to changes in administrative and political control, as the farmers may have to depend on government resources for its maintenance.

The canal is operated usually from the second of June after the first monsoon begins. The water to the fields is released through the outlets. The water release to the outlet depends on the volume of water available in the main canal. In the beginning of the monsoon the first three outlets receive irrigation water. With the increase in the water in the main canal, the other outlets also receive water one after another. In this respect, the fields near the canal receive irrigation water first. When the water is at full supply in the main canal, all the outlets receive water simultaneously. The water level in the canal goes on decreasing from the end of September. At present the canal is not operated during winter, as the water is not available for winter irrigation.

4.6.2 User allocation, system operation and water distribution

The Ditthawal period

Water allocation during the time of *Ditthawal*, was up to the outlet only, according to one of the *Mukhiyas*. In practice, according to another *Mukhiya*, there were no distribution rules at the head and middle of the canal. This was due to the sufficient availability of water in the canal as far as they were concerned. The allocation of irrigation water for each field channel at the tail end was proportionate to the irrigated area and the water distribution was on a rotation basis based on the *mato muri*.

The farmers from the tail end confirmed the allocation rules during the time of *Ditthawal*. The water allocation was based on *mato muri* only up to the branch level. For example, the land at the tail end in ward 4 (see figure 4.1), which has 4000 *mato muri* (50 ha) was divided into two parts of 2000 *mato muri* each. The irrigation water was provided to 2000 *mato muri* each on a 24 hour rotation basis from the two branch canals. The distribution at the field level was the responsibility of the farmers, which the farmers decided through mutual consultation. The user receiving irrigation water from that field channel used to decide the rotation collectively based on the *mato muri*. The rotation used to be generally for 24 hours according to the farmers. According to them, some of the users did not like to adhere to the rotation. Usually, the farmers from upper caste with big holding used to dominate other farmers. This was the reason for occasional disputes among the farmers also at that time, which did not have serious impact on the overall management of the irrigation scheme.

The VP period

During the management period of the VP, the water allocation was also up to the branch canal on a rotation basis, according to the former *Pradhan Pancha*. He said that the VP used to invite farmers from each outlet to prepare a water distribution schedule at the beginning of the irrigation season. If there was any disagreement, that was solved through discussion among the farmers in order to avoid any conflict afterwards. The VP initiated the position of *Pale* for water distribution, according to

the former *Pradhan Pancha.* There were three *Pales* working at that time. The VP paid the *Pale* for his services. The *Pale* used to monitor whether each farmer was complying with the rotation schedule.

One of the *Pales* who worked for 5 years (1966-1971) mentioned the following about the management at the time of VP. A proportioning weir of bamboo and wood was used to allocate water. O*ne Bitta* (6 inches) volume of water was provided to 200 *Mato Muri* when sufficient water was available. This volume of water was the maximum given when enough water was available in the canal. Thus, the water allocation was controlled according to its availability through the adjustment of the notches in the weir. The agreement between the members of different branch canals was required for the allocation. The *Pale* used to regulate the water from the main canal to the branch (distribution) canal and from branch canal to the field channels. He used to inform the farmers about their rotation schedule after allocating the water from the branch canal to field channels. *Angul* (the width of a finger) was the measurement for determining volume of water for each field channel based on the *mato muri.* One *angul* of water was provided to the 66 *mato muri* when sufficient water was available. Then the farmers used to prepare the rotation schedule collectively. The rotation was for 24 hours. The *Pale* system continued till 1990, when the multi party system was introduced in the country. According to this *Pale,* the water right was defined during the time of *Ditthawal* and for some time of the VP management also. The land at the tail end known as *Bais khet* received water for planting only during that time. They received water for a specific period of time and they had to finish their planting during that period. Those who could not finish the land preparation and transplanting by that time would have to leave their land fallow. This was the main reason for farmers to take initiatives for the construction of the *Annapurna Kulo* at the tail end. The discussion with them revealed that water allocation and distribution was based on the principle during the time of *Ditthawal* and for some time under the management of VP. The allocation to the branch canals and distribution from the field channels were according to the *mato muri.* There were no written rules, however. Nevertheless, the norms were established and farmers agreed to it.

The VDC period

Several narratives from local water users show the changes and presence of water management in the contemporary period. Water requirement for paddy is high during July to September. Usually, the land preparation begins at the end of March. Seed bed preparation begins in April. The transplanting starts at the beginning of June. Since the planting is dependent on the availability of irrigation water, it could be either earlier or delayed by one to two weeks due to the monsoon. There is water scarcity during this time at the tail end. The farmers at the tail end start their planting two weeks later as compared to the farmers at the head and the middle due to the insufficient availability of water. Regarding the allocation practice at present (during the time of the field study in 1996-97), one woman named Devi Sharma from the tail end said: "better not talk about this, who listens to us?" She was a widow and head of the household. She had a family of 6 with a land holding of 0.6 ha at the tail end of

the irrigated area. She had a married son who was away for employment and study as well. She was managing the household and farming with the help of her daughter-in-law. She was narrating how difficult it was to manage the farming in absence of able male members in the house. She continued saying that there were no allocation and distribution rules. Therefore, physical presence is necessary for getting water during the peak period. Males go to the field during the night but females cannot, even if there were problems in getting the water. Women do not go out from the house after dark. The strongest dominates the others. Sometimes the neighbours used to divert the water to their fields and she could not quarrel with them. The farmers at the beginning of the tail end use more water when there is an increase in the volume of water in the field channels. Others could not get the water that they needed. In the past she was saying, the kin used to help in irrigation at night but these days nobody cared. The traditional system of kinship relationship was also disintegrating. The need for irrigation water was so important that the kinship relation was becoming secondary.

The changes in the dimensions of the social relations were related also to the changes in the layout of the irrigation system. It was due to the construction of *Annapurna Kulo*. This part of the land used to be in the middle of the original *Chaurasi Kulo*. The water availability at the tail end at present is not sufficient for all the land in planting period. In that case it was natural that the farmers having land near the field channel would not allow it to flow to other fields unless there is enough for their land. Thus, the timely monsoon was very crucial for the farmers at the tail end. Besides, as the *Pale* said there were allocation rules in the past that do not exist now.

Ram Prashad with a family of 7 from the tail end also had the same view about the practices at present. He has 0.45 ha of land in the command area of *Chaurasi Kulo* and 0.15 ha of land in the command area of *Annapurna Kulo*. According to him, the farmers at the head unite to allocate water among themselves. They do not consider the needs of farmers at the tail end. He said that the farmers from the head and middle let the water flow from their field to the river. If they use it prudently more water would be available to the tail end. They were misusing the available water according to him. This was more acute in the middle of the irrigation system and these lands were inundated. The excess water then flowed to the river. The overflow occurs during the night as the farmers do not go to check the field in the night. One of the reasons for this was that the farmers from the middle used to block the canal in order to raise the water level so that the water flows to their fields, because the land at that place was higher than the canal. This meant the disruption of the normal flow of water to the tail end. He was also talking about water stealing at night especially during the planting season when the monsoon was late. As a consequence, last year he had to spend two nights in the field to irrigate his land. According to him there were no strict rules for water distribution at present as there were in the past. Those having able members in the house would divert more water to their fields. Thus, a good monsoon is a blessing to the tail ender. This year he did not have to spend the night in the field because, the monsoon was good.

The group of farmers from the tail end[21] was telling that there were no rules in allocating irrigation water. The tail enders had to satisfy themselves with the water

available in the canal. They complained that the farmers at the head and middle, whose lands were above the canal, used to construct temporary blockages of bush and mud to raise the water level. For the tail enders it was OK as long as they used the water for irrigating their land. Instead after flooding their fields they let the overflow from the field to the river.

The dismantling of the blockage after use would have increased the water volume in the lower reaches of the canal. During the field trip it was observed that some of the farmers at the middle reaches were using temporary blockages of tree trunks and bushes to raise the water level. The deposition of silt in the canal was also increasing for the last ten years due to these temporary blockages. Some of the farmers, whose land were higher than the canal level was levelling their fields to bring it to the canal level. Earth is in demand in Pokhara for filling up the building sites. By doing this they could earn the money and they also could access the irrigation water more easily.

The person who was helping me in my field study said that since every farmer needed water, nobody thought of others and there was no sanction for misusing the water. He had 1.5 ha of land in the middle reaches of the canal. The farmer did not get appreciation for not constructing a blockage, according to him. Instead he was considered to be a fool. He opined that the tail enders did not go to dismantle any blockage at present. He was recalling that in the past people from the tail end used to go several times in a week to dismantle the blockages. This sort of action would have made farmers from the middle reaches of the canal realise their incorrect behaviour. This was their weakness, according to him. The number of farmers using water at the tail end had decreased after the construction of the *Annapurna Kulo*. Therefore, they were not inclined to quarrel with the farmers at the head and middle[22] reaches. At the same time the water availability should have been sufficient for the rest of the land, as the command area of the *Chaurasi Kulo* also had decreased. But it is ironic that the available water is sufficient only for 1/3 (24 ha) of the presently irrigable land at the tail end during planting period according to the farmers estimate. Also, the water at the intake is less due to the temporary headwork. This affected the production also. Production was down by 2/5th due to unavailability of the water according to the others present at the tea shop. This is due to the excessive use of water by the farmers in the head and middle parts. These farmers are from one clan group and they would not like to devise any operational rules. In this connection it is important to note that the majority of the farmers from the middle come from one clan group from upper caste. Thus, they unite to fulfil their group need. The rules will restrict their unlimited access to the irrigation water.

Krishna Sharma from the head had a different opinion. He had 0.45 ha of land at the head of the irrigation command area. He had a family of three. Regarding water availability he said that water was adequate for his field. At the same time he opined that the VDC was not effective in formulating and implementing the allocation rules. He admitted that the farmers at the tail end had problems in absence of allocation rules.

According to the VDC vice chairperson there are possibilities of increasing the water availability from *Chaurasi Kulo* if properly managed. His definitions of proper management were:

- Control of water stealing by the farmers at the middle and the head end.
- Control of leakage by properly maintaining the canals and field channels.
- Control of wastage (by avoiding that water from the canal flows via the field to the river) by the farmers at the head and middle reaches.
- Proper allocation of the irrigation water on a rotational basis for, which there was no mechanism to enforce it at present.

The VDC chairperson said that it was natural to have conflicts when there was less water in the canal. There was no incentive to the farmers from the tail end to contribute to improvements in the scheme that will increase the water volume to the tail ender because, the first benefit from the increase of the water would go to the farmers at the head and middle. The farmers from the tail end requested the farmers from head and the middle in this respect but they were not willing to co-operate.

From the discussions it seems that the issues related to water allocation and distribution are complicated in the absence of authority to devise rules for it. This was also due to the lack of collective decision making processes, which are important in common property resource management.

Everyone, except the tail ender, would like to maintain the status quo, including the VDC members and local respected people. Clearly, the farmers from the head and the middle would not like to give up the benefit they were enjoying until now. The VDC was not co-operating in this respect for political reasons. The elected leaders did not like to make the voters unhappy. Evidently, both the former and the current VDC chairpersons opined that the allocation rules would be enforced after the rehabilitation. The current VDC chairperson who comes from the tail end in ward 4 is also waiting for the rehabilitation to take place. This suggests that devising rules was not an easy task without the co-operation of all the users. Also, the intervention creates special conditions when rules become abused or ignored. His expectation to solve the problem after the rehabilitation seems to be based on the following reasons:

- The constitution of the UC would be mandatory to all, as it will become a legal entity.
- The VDC would assert its role since it provided the cash from its funds for farmers' contribution.
- The water users from all the reaches would have an equal say if they contributed proportionately for the rehabilitation. In that case, the farmers from the tail end would be able to exert pressure on the farmers from the head and the middle reaches.
- The construction of the permanent headwork and partial canal lining would assure more water in the canal that would increase the water availability at the tail end.
- The grievances of the farmers at the tail end would reduce since they would not have to contribute for temporary headwork construction any more.

The proposed intervention would be beneficial to the farmers from ward 4 and 9 at the tail end of *Chaurasi Kulo*. This is because the permanent headwork will augument more water in the canal and also VDC is expected to devise the allocation rule. Nearly 30 ha of land are not receiving irrigation water at present after the construction of *Annapurna Kulo*. Previously, *Chaurasi Kulo* served these areas. Now they did not receive irrigation water either from the *Annapurna Kulo* or *Chaurasi Kulo*. These lands are at a higher level than the *Annapurna Kulo*. The water from *Chaurasi Kulo* does not reach these fields due to leakage in the head and middle reaches. The volume of water in the canal also was not sufficient due to absence of the annual canal cleaning and maintenance. This was because, the farmers at the head and middle were receiving enough water at their fields without any contribution. Thus, they did not like to get involved in the annual contributions for cleaning and maintenance for providing irrigation water to the users at the tail end. Furthermore, the farmers at the head and middle reaches did not allow the construction of separate canals to serve the lands at the tail end, which did not receive irrigation water.

The discussions above suggest that the principles of user allocation and distribution have undergone fundamental changes since the time of *Ditthawal*. This was due to the erosion of operational rules caused by changing institutional control. Besides, the farmers at the middle are in social control due to their higher position in the social structure, as well as their location in the system.

4.6.3 Conflict Management

The VP period

There was a problem in water distribution during the management by *VP* also. Some of the farmers used to steal water usually at night according to the *Pale*. Some used to remove the proportioning weir at the branch canals. Some of the farmers used to divert the water to their field from others' fields, even though it was not their turn. The blockage by farmers at the middle reaches of the canal could lead to fighting among the farmers. During the time of *Ditthawal* these very people used to carry water in a bamboo basket from the canal to the field, as the canal was 3-4 feet below the level of land. According to them the depth of the canal had reduced to half since 1960 due to the deposition of silt[23]. This had been an unexpected benefit to those whose lands were higher than that of the level of the canal. Now they did not have to put so much effort in irrigating their fields.

The *Pale* was authorised to detect where the water stealing was taking place and he had to report this to the VP. The farmers also could report to the VP, if someone did not comply with the rules for water allocation and distribution. If the information was true, the *VP* would penalise these concerned. The sanction procedure was to warn the offender for the first time. If he repeated the action again then the penalty inflicted was to cut off the water to his fields.

The VDC period

During the time of VDC the farmers at the head and middle used to divert all the water to their fields when the monsoon was not good, according to the view of a farmer from the middle. The farmers at the tail end used to quarrel with the farmers at the head and middle. This farmer mentioned an incident in 1993 when the farmers from the tail end went to remove the illegal blockage constructed by the farmers in the middle of the night. They were carrying shovels, axes, sticks and Khukris (native weapons). While they were trying to destroy the blockage, the farmers at the upper reaches of the canal came out to make trouble and a scuffle ensued between them. The farmers from the middle and head brought the farmers from the tail end with their weapons to the VDC chairperson's house. The farmers from the head and middle reported that people from the tail end came to destroy the canal and tried to hit them with their weapons while they were preventing it. The VDC chairperson did not believe it. He asked them to disperse and assured them to listen to their grievances when the VDC office opened.

The VDC chairperson at that time confirmed the incident. The following morning the VDC invited the local leaders and the farmers from the tail end and the middle to discuss the issue. The farmers from the middle agreed to the amount of water to the tail reaches by reducing the height of the blockage. According to him, this issue came up only once in the last four years. These showed that the farmers from the head and middle reaches were aware of their misbehaviour. This indicates that the social interface is important in applying social control. However, the episodic incident of this kind has not been effective for permanent solution of the disputes.

One of the old men who admired the old practice of canal operation and water allocation said that such a conflict occurred at present also. According to him the solution should be in line with the old norms in which the land holding is the basis for water allocation. This exemplifies how the disregard of the old norms results in disputes among the farmers. The conflict at present was also due to the change in the hydraulic configuration of the scheme after the construction of *Annapurna Kulo.*

4.6.4 Resource mobilisation

The Ditthawal period

The labour mobilisation during the time of *Ditthawal* was proportionate to the size of the land holding inside the irrigation scheme, that is, more land more labour contribution in mandays. The nature of the work determined the contribution. The *Mukhiya* in consultation with the farmers used to decide this. Annual canal cleaning was a regular activity. Each farmer irrespective of his caste and location of his land had to contribute labour. The *Ditthawal* used to fix the working days for the maintenance of the canal and the *Mukhiyas* and *Talukdar* were responsible for mobilising the people from their respective areas. Those not reporting to the work had to pay in cash (32 paisa for 0.05 ha, NRs 1=100 Paisa). This amount would double each day. The *Ditthawal* had the authority to confiscate the land if someone did not report for five days and he would report it to the land revenue office. There was a penalty for the *Talukdars* also if they could not mobilise people for the

maintenance. In extreme cases, it was physical torture. Some of the villagers told that the *Talukdar* used to be tied up at a tree in the sun for the whole day, which was known as *Choke*. It could be said that the labour mobilisation at the time of *Ditthawal* was based on strict sanctions. In other words it was a customary participation and not voluntary. People did participate for fear of losing their land.

The VP period

In 1962 the DIHM provided NRs 61,000[24] and farmers mobilised 18000 mandays of labour for the rehabilitation of the canal according to the former *Pradhan Pancha*. This means the cash contribution was NRs. 203 per hectare (300 ha) and the labour contribution was 6 mandays for one hectare. The water users contributed one manday of labour for four *mato muri* for the rehabilitation work according to the former *Pale*. According to this statement the labour contribution from the farmers becomes 6000 mandays. This figure provided by the *Pradhan Pancha* seems to be accurate given the magnitude of the damage as described by the people.

VP used to mobilise the labour contribution for the annual canal cleaning during February and March to get the canal ready for irrigation. The Village Panchayat used to make decisions and the *Katuwal*[25] had to inform the people. People had to report to the work and mark their presence by signing the Panchayat register. The nature and extent of tasks determined the work load. Each ward would have to clean certain lengths of the canal. The division of work was proportionate to the use of irrigation water by the wards and the irrigated land holding of each farmer in the ward. The ward members were responsible for mobilising the people for the work assigned to their ward. Mobilisation of 600 to 700 hundred persons was required for the annual maintenance according to the *Pale*. This means that a little more than two persons per ha were required for canal cleaning in the command area of 300 hectare. According to the villagers the *VP* was effective in carrying out necessary maintenance work but was not effective in the allocation and distribution of water. Farmers reported that the users from the *Chaurasi Kulo* had to contribute twice the amount for the construction of the headwork after the construction of *Annapurna Kulo* due to the decrease in the number of users because the maintenance requirement did not change. However, there was no cash contribution and there has been no change in the labour contribution for annual cleaning. Shivakoti (1992:19) however, reports that the labour contribution before the construction of *Annapurna Kulo* was 3 mandays for one hectare of land. That was equivalent to two persons from the household in a year. The differences in the figure could be due to the differences in the tasks accomplished each year. He also reported that the cash contribution had almost to be doubled and three times of the labour had to be mobilised for annual maintenance of *Chaurasi Kulo* after the construction of *Annapurna Kulo* due to the decrease in the number of users.

One of the *Mukhiyas* opined that some of the farmers at the middle reaches of the canal had no interest in canal cleaning in the past because their land did not receive irrigation water as it was higher than the canal level. He said only 10-15 people turned up at present, if you call for *Jhara*. It was because water availability was the concern of only the tail enders. Those who required water made efforts to extract

water from the river. Before, some of the people who used to command social respect also reported for *Jhara* because of the fear of "what others will say if they did not maintain the social norms", but now, the young educated did not like to do this work, which they considered menial. This attitude is a reflection of the influence of the towns and modern education. Moreover, some of them were working in the offices, which allowed them to pay for the wage of a labourer instead. Old people were not able to do heavy work and women are not asked to do heavy work. He believed that the traditional practice of labour mobilisation disappeared after the VDC took over the management. There was a penalty for those who did not report for work during the time of VP. The penalty was taking out the harrow from the plough. In his view leadership and control under one authority was lacking. According to him the *Ditthawal* system was effective for resource mobilisation and social work as they could enforce strict norms. This reflects the disintegration of the social fabric due to the break-down of social norms and preoccupation of farmers with other works. Plenty of stones were used in the construction of the headwork in the past according to him. Naturally, this required more labour. These day people diverted water by using tree branches and bushes only. This was an example of coping with challenges of labour shortage by adopting a new technology. But this technology was not very effective for water control and the water in the canal was declining because of the poor functioning of the headwork. This had affected especially the farmers at the tail end. That is why mainly farmers from the tail end were putting in more efforts. They also did most of the maintenance work such as repairing holes in the canal to reduce the leakage.

The VDC period

A woman from the tail end said that at present every one had to contribute labour for the head work construction. She complained that the male farmers came to quarrel with her for not contributing enough for the diversion of water at the headwork. They used to say "why are you irrigating without increasing the volume of water in the main canal"?. "I had to send someone to work on wage since I cannot work on my own". At present the *Katuwal* indicated the time and date for the work. The ward member noted the presence of all those who provide labour at the time of the construction of the headwork. Those who did not report for the work would have to pay NRs. 70 for the labour. The people from the head and middle reaches in fact did not work for water diversion according to her. It was only the people from the tail end who had to contribute and still it was difficult to get enough water in time. She complained that they expected equal contributions but sharing of benefits was not equal. This exemplifies that labour contribution is no longer considered an obligation to the proportion of water right.

A male farmer from the tail end said that previously all the farmers had to go for *Jhara* but these days only the people from the tail end made a contribution. In one season people should contribute 15 days of *Jhara* but not all the people from the tail end do this. Only 10-12 persons out of nearly 100 farmers at the tail end in ward 4 used to go for the construction of the headwork. These farmers used to say that "we brought the water therefore we have the right to get it." He said that he had been

going to *Jhara* for 40 years but he had never seen any body from the head and middle reaches of the canal. This seems to be an exaggeration as he himself contradicted his first statement "all the farmers used to go for *Jhara* during the management period of *Ditthawal* and in the beginning of VP management".

The farmers from the tail end requested the VDC to devise a new system for labour mobilisation. Their proposal was that the labour mobilisation should be proportionate to the land holding to make the contribution of labour more equitable. The VDC chairperson suggested that since the government support for rehabilitation was forthcoming, equitable solutions would be developed after the rehabilitation. There was no sanction imposed on those who did not report for work. Now the contribution is 'voluntary' unlike in the past when there was compulsion for contribution.

In the planting season of 1997 the farmers had to put more labour for the construction of the headwork due to the damage caused by a flashflood. The VDC formed a UC to take necessary measures to operate the canal. The UC mobilised both external and internal resources to operate the canal. The district committee for natural calamities provided NRs. 150,000, the DIO provided 65 pieces of gabion wire and farmers contributed 2500 mandays of labour. The cash and the gabion wire were used to construct the checkdams near the head works. It indicates that the external resource mobilisation is an integral part for emergency maintenance.

4.6.5 System maintenance

The VP period

The committee formed by the VP during its period of management concentrated mainly on the maintenance work. The work included were the construction of the head work and annual canal cleaning. The VDC did not do major maintenance work during its management.

The VDC period

According to the version of one of the *Mukhiyas*, the water flow in the canal has deteriorated since there was no annual cleaning. Sufficient irrigation water would be available for all the land when the canal was maintained regularly. He thought that the farmers from the head and middle reaches lost interest in maintenance as they got sufficient water. He further said that the norms in the village deteriorated after the multi party system was introduced in the country in 1990. This was because the party politics were affecting every aspect of life in the village. These day village officials do not like to disappoint any one because of the votes. That is why they cannot enforce strict rules for fear of losing votes. He said that the people from the tail end requested the VDC to construct separate branch canals directly from the source but the VDC did not respond to it. However, the construction of separate branch canals is not an easy option since the farmers at the middle would not like to cede their land as the canal would have to pass through their land. This argument was supported by the fact that the on-going intervention was also not making changes in the existing layout as it entails the issues of land acquisition.

One farmer from the head reach said that the head works construction is regularly required because of the flash floods that wash away the intake. Sometimes the people from the settlement on the left side of the canal damaged the headwork. They were afraid that the flood in the river would wash away their settlement. In that case they had to repeat the task. There was no settlement near the head of the river before. The settlement was established after the construction of Pokhara-Baglung highway. This in fact was an unintended consequence of the development intervention. The farmer seemed to be frustrated and was worried about the lack of adequate attention for the maintenance of the canal. He was wondering what would happen if major rehabilitation work were required to operate the canal properly. But this problem is not likely to happen as the government is initiating the rehabilitation. People do not in fact realise the benefit of timely maintenance so that more water could go through the canal. Concerning the rules for the maintenance that the farmer also thought that the VDC was not effective in mobilising sufficient resources as in the time of *Ditthawal*. Further, he was saying that older people could not work as hard physically as in the past. The lack of interest amongst the young people with some education is also one of the reasons for the poor maintenance of the canal. Their interest is in finding a job in offices rather than staying in the village. This is because agricultural income is not sufficient to support the family.

The decrease in the number of people at the tail end, who now receive irrigation water from the *Annapurna Kulo*, is another reason for low participation for the maintenance work. Farmers restored part of the main canal near the headwork during the planting season of 1997. The farmers were able to change the course of the river and made it possible to construct the headwork. This indicates that the farmers with the help of the VDC will take necessary action in time of needs.

4.7 Governance and property rights

During the time of *Ditthawal* there were established operational rules in the irrigation system due to the presence of rewards and sanction procedure. Thus, the management of the irrigation system was continuing without any hindrance. Two types of property rights were in existence in the irrigated area. The farmers at the tail end had water rights for the planting only whereas the water rights of other users was based on *mato muri* in the irrigated area. The *Ditthawal* decided the allocation of water for each branch canal in consultation with the farmers. The water availability in the canal and the area to be irrigated by each of the branch canal was the main criteria for the allocation of water. At the field level the farmers from the outlet used to decide the water distribution, which was also based on *mato muri.* Annual maintenance of the canal was also strictly enforced. Thus, the water right of the farmer was tied up with the labour contribution. The intervention by the DIHM brought changes in the governance of the irrigation system and the collective choice rules were lost during this period as farmers did not have to contribute for the regular maintenance of the irrigation system. However, there was no change in the operational rules, as *Ditthawal* was working side by side. The VP took over the

management and enforced the operational rules for some time, which was based on the norms during the time of the *Ditthawal*. However, strict sanctions for those not conforming to the rules were not enforced. Thus, there was gradual decline in the enforcement of the rules, which was a pre condition for the successful management of the irrigation system. Annual labour contribution for the operation of the canal was not compulsory for receiving irrigation water. The water right of each of the farmer was not respected. As a result, the farmer from the tail end suffered most.

The governance during VDC management was not based on strict rules. The system was functioning but with greater inequity. The water rights based on *mato muri* were not strictly enforced in absence of the proper rules. Several conditions (shared cost and benefit, proper monitoring of the behaviour of the users and effective sanction procedure) for the successful operation of the irrigation scheme were violated. The water rights of the users at the tail end were not protected in absence of the operational rules. The users from the head and the middle continued to take benefit out of this situation. They draw the collective choice rules in the irrigation system for their benefit. This indicates how breaking of norms by some of the users could negatively affect the enforcement of rules. As a result the users lost the interest in the maintenance of the irrigation system.

There were various perceptions on the issue of ownership of the canal. An old person who served as one of the *Mukhiya* from the head was of the opinion that the canal is government property. He opined that the canal was developed with the consent of the government. The government had provided the support in time of need. According to him the government should officially take over the ownership and will have to undertake the maintenance responsibility as well, since the people in the village were lazy. However, another *Mukhiya* said that the ownership of the irrigation system was with the farmers. But he said that most of the people in the village would be happy with the improvement of the structure through government assistance.

On the same issue, one of the old farmers from the tail end said that the irrigation system is a government property. His reasoning was that they did not pay the taxes for the land occupied by the canal. Also, the group of farmers interviewed from the tail end was of the opinion that the irrigation system was public property. They expressed their worry about the deteriorating condition of the canal structure. The VDC should have looked into it but it was indifferent towards the situation.

The former VDC chairperson was of the opinion that the ownership of the irrigation system was with the people. In his view the ownership would continue to be with the people even after the government intervention. Also the present VDC chairperson had the same opinion. According to him people will have to take over the management of the canal after the rehabilitation. This showed that the local leaders were aware of their responsibility in managing the system. This was a very positive aspect in ensuring the farmers' participation in the management of the irrigation system. But the local leaders will have to convince the farmers.

4.8 Water control

The control structures in the irrigation system consist of temporary intake of stones, muds, twigs and gabion wire. There are no technical control structures like sluice gates. The irrigation water to the field channels is controlled through the outlets in the main canal. The adjustment in the volume of water to the outlets is through the use of mud and stones. At the field channels the distribution of irrigation water to different fields are also controlled through the use of mud and stones at the outlet of the field channels. The operation and maintenance of the control structures is done through the use of local skills and materials. However, the local people have to obtain some materials like the gabion wire from outside. There have been no major changes in the control structures since the construction of the irrigation system. However, the on-going rehabilitation will bring change in the control structure through the construction of permanent weir at the intake and permanent outlet in the main canal.

The organisational control in the irrigation system has undergone major changes since the time of the *Ditthawal* and VP, which were discussed in the previous sections. The formation of UC in the process of intervention is likely to bring new organisational control. However, it very much depends on the effectiveness of the UC. The effectiveness of the UC lies in the linkages it could maintain with the users for regular operation and maintenance besides the irrigation office for emergency maintenance.

The de facto hydraulic control in the irrigation system is deteriorating at present due to silt build up, and linked to the increased social control of mid-system users. The farmers at the tail end cannot effectively counter it due to lack of political control of the VDC, which was effective at the time of *Ditthawal* and for some period of VP. This is largely due to the dominance of one caste group with large land holding and their influence in local politics, which makes it difficult for the VDC to exercise real political control through the enforcement of effective sanctions as in the time of *Ditthawal* and VP.

4.9 Analysis and conclusions

This case is about the changes in the institutions due to the public interventions in various forms and their effect on the governance structure and irrigation practices. Up to 1962, the *Ditthawal* was working reasonably well as the irrigation system was under his administrative control. Besides there was a good organisational structure as the *Mukhiyas* and the *Talukdar* were helping him in discharging his duty. This was due to the then existing social control in the isolated village community and the possibility to apply sanctions when farmers were not following the unwritten rules. The abolition of the *Birta* system in 1959 provided the opportunity to the *Ditthawal* to claim ownership of the land, which was kept for the maintenance of the irrigation system. This was the beginning of the deterioration of the rules in the irrigation system. He was also not interested to perform, as he got the entitlement of land,

which before was his remuneration for the maintenance and management tasks of the irrigation system.

The introduction of VP in 1962 as a lower level of politico/administrative unit due to the political change in the country and the land reform in 1964 also weakened the institutional position of *Ditthawal.* This was largely due to the emergence of new loop between the institution at the local level and the government at the centre. Now VP was the state functionary at the local level instead of the *Ditthawal,* because his position was not recognised. This undermined his power to enforce the customary law as he could not enforce sanctions against those who did not follow the prevailing norms. Despite this, the adherence to the norms was voluntary and the management of the irrigation system was based on customary participation, as the village was isolated. Due to the erosion of the *Ditthawal* system, the already existing communal loop weakened.

The first intervention by the DIHM took place in 1962 due to the formation of new linking loop between the users, VP and the government. The intervention rehabilitated the irrigation system as the farmers could not cope with the situation brought about by the land slide. The existing linking loop was functioning for two years, as DIHM was providing resources and left the management to VP and *Ditthawal* in 1964. Thus, there was a change in the interface situation between the actors. Previously it was between the users, VP, DIHM and *Ditthawal.* Now it was between the users, VP and *Ditthawal.* This was an interim period when both VP and *Ditthawal* worked side by side, which continued till 1966 when the position of *Ditthawal* came to a definite end.

The traditional management system began to lose its importance during this period due to the changes in the interface situation. It is because VP was not well established to take control of the irrigation system and farmers did not like to continue the old practices under the *Ditthawal* as the interface between them was autocratic in nature as he was in control of land tax and could impose sanctions. It was natural for the farmers to look for new relationships due to changes brought about by the new political system and the government support in rehabilitating the irrigation system. Besides, the users were not prepared to contribute their resources for the operation and maintenance of the irrigation system, as the VP was successful in maintaining the loop with DIHM till 1971 to obtain the resources for the operation and maintenance of the system.

The political referendum of 1980 further undermined the position of VP and it also contributed to the social division among the farmers along political lines. This affected the interface situation between the farmers and the VP, which was basically based on a confrontation of power. This shows that not only the government interventions in the irrigation system but also other political and social interventions affected the irrigation institution due to the changes in the roles of individuals and the VP. However, the VDC effectively controlled the management till 1990, when Panchayat System won the election. This indicates that the political control is an important factor in strengthening the institutional capability for the management of irrigation system.

The irrigation system was from the beginning overstretched with the result that the *Bais Khet* at the tail end were receiving water for planting only. This aggravated the conflict between the farmers at the head and tail end, which made the collective action weak. Thus, the farmers at the tail end with the support from the VP were able to form a new loop. The new linking loop of the farmers was able to convince the DOI to implement the *Annapurna Kulo* in 1983 for the irrigation of the tail end of the *Chaurasi Kulo*. But it was not servicing the complete tail end. Thus, the formation of new linking loop for the intervention of 1983 had an effect on the existing weak equilibrium of the collective action in *Chaurasi Kulo*. The intervention further contributed to the disintegration of the social relationship existing between the old users due to changes in the interface situation.

A new linking loop emerged when the users in the *Chaurasi Kulo* with the support from the VDC succeeded for the survey for the rehabilitation in 1994, and its implementation in 1998. This indicates that the VDC performed well in establishing the linking loop to obtain external assistance, which was important for the management of the irrigation system.

The irrigation system was functioning well during the time of the *Ditthawal* in terms of management tasks. This was largely due to the existence of collective choice rules and his role in enforcing the operational rules. The allocation and distribution of the irrigation water was based on the *mato muri*. However, his administrative control in irrigation system was diminishing due to the lack of enforcement of operational rules during the intervention by the Irrigation Department.

The change in governance structure took place as VP took control of the system in 1964 from DIHM. The VP made an effort to develop the collective choice rule and the operational rule by involving the users. It maintained the organisational control for the allocation and distribution of the irrigation water through the employment of the *Pale*. The VP was successful in enforcing the rules for allocation and distribution as long as it had the authority. Its authority was in question when there was a referendum in 1980. This shows how different forms of interventions had an effect in the implementation of the operational rules. It tried to revive the operational rules through the formation of the *Kulo Samiti*. That was not successful as in the past due to social division along the political ideology, which brought the changes in the interface situation between the actors. However, it continued the management through *Kulo Samiti* and *Pale* till 1990. Besides, the users were not represented in this committee. Thus, there was a communication gap between the users and the committee. This indicates users' participation in decision making is an important aspect in the management. Due to lack of their participation in the decision making there was absence of proper communication between users and the VP. Because of this the VP lost the political control of the irrigation system. As a result the mid-system users increased their social control of the irrigation system.

The VP however was not effective in mobilising resources from the people for the maintenance of the system, since it was receiving funds for maintenance of the main canal from the government till 1971. Farmers became less interested in the resource mobilisation of their own when they were receiving the funds from the DOI, which also affected the ownership feeling. When the government provided maintenance

support, the farmers got the idea that if the government can provide support why should they maintain the main canal. That took away the motivation to maintain the main canal that undermined the ownership feeling towards the system, which weakened the existing communal linking loop between the users due to their dependence on external resources. This led to further deterioration of the operation and maintenance of the *Chaurasi Kulo.*

When in 1992 the VDC came into existence and replaced the VP, it also could not develop and implement the operational rules, as its position became weak due to being elected representatives. It shows the inherent weakness of the multi party system members who were not interested to take up unpleasant measures that may cost them votes. The farmers from the head and middle reaches continued to take benefits due to the weaker position of the farmers at the tail end. This was due to the decrease in the number of users of *Chaurasi Kulo* at the tail end as many of them were now in the command area of the *Annapurna Kulo.* In addition, the majority of the farmers at the head and middle are from one clan group, who has substantial influence in the village because they belong to higher socio-economic strata in the village. This is evident from the blockages they had put in the canal, which in the past led to conflicts between the farmers. The lower number of conflicts during the study period was due to a good monsoon.

The initiation of the rehabilitation in 1998 had a consequence that neither the VDC nor the farmers were willing to develop the operational rules for the operation of the system before the rehabilitation was finished. As a result the management was not effectively working.

There was no clear feeling among the farmers whether the government should take over the irrigation system or that farmers should manage it. There was a loss of feeling of ownership among the farmers as appeared by the lack of contributions to the on-going intervention in 1998. Farmers' lack of interest in contributing towards the rehabilitation at least during the time of this research poses a question whether they would take care of the future maintenance activities of the main canal, which is important for the sustainability of the system. The feeling among the users for not contributing is also due to availability of various sources of funding. The VDC has also shown greater maturity in obtaining the external funding in time of need, as evidenced by the fund received in 1997.

It exemplifies that farmers would not like to accept the operational rules and the resource mobilisation, which in the past was based on customary participation. The conditions for participation were not based on the collective choice rule but were enforced on by coercion. Insufficient political and social controls currently exist to achieve the real hydraulic control that would bring equitable distribution. This was also due to the absence of clear property rights, which existed in the time of *Ditthawal.*

There have not been major changes in the technical control of the irrigation system with respect to the water control. But there has been slow decline in hydraulic performance with siltation. The change in technical control is expected after the on-going rehabilitation. This is likely to bring changes in the organisational and administrative control, as was evidenced from the fact that the some of the farmers

are trying to maintain their control in water use through the use of polythene pipes. However, there have been changes in the organisational and administrative control in the past due to various forms of interventions as discussed above. This indicates that the interventions are likely to bring changes in various aspects of water control. Inability of the UC, formed for the intervention to take the organisational control at this stage could have implication in the management of irrigation in future, as some of the users may increase their social control. However, that very much depends on how much political control the VDC can exercise. The VDC is relatively in a better position in this respect, as farmers may depend on VDC fund for future maintenance. There is a difference in the perception of the government and the users on the role of the UC.

The opening of the village due to the construction of the road in 1992 provided new employment opportunities in Pokhara. This made it difficult to organise the farmer and their families for maintenance activities. It also eroded the social control related to the norms and values. Besides, lack of time among farmers owing to labour requirements for intensive cultivation, and disinterest of the youths in agricultural work had a negative effect on the maintenance of the communal linking loop activities needed for the management of the irrigation system. This indicates that the availability of alternative sources of income and dependence on external resources could negatively affect the investment in irrigation development.

The changing of attitudes among the farmers with regard to the maintenance of the main canal of the irrigation system has to be seen in a larger context. In the past most villages were isolated and had little or no contact with the central government except for the collection of land taxes. In the past decades the role of the government has changed considerably. Via the expansion of the road system villages were less isolated and drawn into the national economy. This also undermined the hierarchical social structure and the social control in the villages. The government became active in the provision of education and health services and in the provision of resources for the rehabilitation of irrigation systems. This changed the view of farmers with regard to the role of the government and they were quick to ask and expect the government to take over the task performed in the past by them. This growing dependency on the government affects in a negative way the mobilisation of local resources and diminished the sustainability of the FMIS that have been rehabilitated by the government assistance.

Timesheet - Chaurasi Kulo Irrigation System

Stakeholders / Time	Farmers/ *Ditthawal*	UC	VP/ VDC	Pale	DP/ DDC	DIHM/DIO	Remarks
1848 (Farmers were not sure of exact date)	Constructed the irrigation system						
1960	Farmers managed the system under *Ditthawal* and *Mukhiya*						Part of the canal washed away due to the landslide.
1962	Requested for the rehabilitation of the irrigation system		VP Came into existence			Rehabilitated the scheme. Operated irrigation system for two years till 1964	
1964	*Ditthawal* continued the management					Turned over the management to VP but continued to provide financial assistance.	
1966	*Ditthawal* ceased to function		Once in a year during March/April the canal cleaning was done by mobilising the farmers labour and materials.	VP introduced the *Kulo Samiti* and *Pale* for water			

				distribution and allocation.			
1971			VP continued the management through *Pale*	functioning		Continued to provide annual maintenance fund to the VP	
1971-1980			Continued to manage the system by mobilising the villagers			Stopped providing annual maintenance fund for maintenance in 1971	
1980	Did not obey the decisions of VP		Could not enforce its decisions as its authority was in question due to the referendum.	Ceased to function since the time of referendum.			The king called the referendum to choose between the partyless system and the multi party system.
1981-1982			Formed a *Kulo Samiti* of VP members to manage the irrigation system but was ineffective in enforcing its decision and gave up the management				
1982-1990	Farmers were responsible for the management of the						In 1983 the DIO started the construction of

	scheme but there were no rules. Hence, only the farmers from the tail end were contributing.						'Annapurna Kulo' at the tail end of this irrigation system.
1991-1994	not contributing to the maintenance of the canal	An UC formed for the rehabilitation of the system	VDC replaced VP after the introduction of multi party system and developed a management plan, which assigned operation maintenance responsibility to the wards, but it did not work. Persuaded government to undertake the survey for the rehabilitation			Government undertook the survey for the rehabilitation of the system in 1994.	
1997-1998	Contributed labour to repair the damage caused by the flashflood in 1997	A new UC formed for the rehabilitation.	Mobilised farmers' labour and external resources for the repair of the headwork. Liased with the DIO for the rehabilitation work and paid farmers contribution from its funds.		Provided NRs. 150,000 to the VDC for the repair of the headwork	Provided 65 pieces of gabion wire for headwork repair. Initiated action for the rehabilitation of the system	

Part III

Annapurna Kulo

4.10 Environment of the irrigation system and context of intervention

4.10.1 The irrigation system in 1997

This is a river valley irrigation system, and is jointly managed by the users and the DOI. Officially, this irrigation system is known as 'Hemja Irrigation System'. The farmers renamed it and now it is known as *Annapurna Kulo. Yamdi Khola,* a perennial one, is the source of irrigation water for this system. The headwork of the system is located at 2 km downstream from the temporary intake of *Chaurasi Kulo.* The head works comprises a 46 metres long weir with two under sluice gates and a head regulator. The height of the weir is 2.4 metres. The maximum design discharge of the head regulator is $2m^3/s$. However, the design capacity of the main canal is $1.5m^3/s$. This is because the higher capacity of the headwork allows the expansion of the main canal in future, if the need for increase in command area arises. A headwork is a massive structure and it is not easy to increase its capacity at low cost when required. The total length of the main canal is 1.94 km. The first 23 m is open canal and after that 841 metres of the main canal are constructed as a covered canal. In this section the canal bed is about 3-4 meter deep from the natural ground level. This happened due to local topography. Thus, it is not practical to have such a deep open canal from the perspective of land required. Accordingly, this portion is covered and back filled with the soil. The remaining part of the canal is open and the length is lined with stone masonry. In the main canal there are 5 branch canal off-takes and 10 field channel outlets. The design discharge of the main and branch canals with irrigated area are as follows[26].

Table 4. 5: The discharge of main canal and branch canals with area

Canals	Discharge	Chainage (km)	Canal bed width (m)	Water depth	Area planned (ha)	Area irrigated (ha)
Main canal	$1.5m^3/s$	-	2.00	0.85	50	30
Branch canal-1	$0.15m^3/s$	0.00-1.025	2.00	0.85	110	110[a]
Branch canal-2	$0.55m^3/s$	1.025-1.515	2.00	0.85	50	30
Branch canal-3	$0.30m^3/s$	1.515-1.875	1.00	0.80	60	35
Branch canal-4a	$0.35m^3/s$	1.875-1.940	1.00	0.80	30	15
Branch canal-4b	$0.15m^3/s$				300	220

[a] 50 ha receive adequate irrigation and the remaining 60 ha receive partial irrigation water according to WUS.

Note: The bifurcation of canal 1, 2, and 3 are at chainage 1.025, 1.515 and 1.875 respectively.

Table 4. 5 indicates that the capacity of the main canal reduces gradually towards tail end. The differences in the flow capacity of each of the branch canal are due to

differences in the area served by the branch canals as indicated in the above table. In the hills of Nepal, the water requirement for monsoon paddy is recommended at 3 lps per ha (Jacob, 1995; MacDonald and Hunting Technical Services, 1982 cited by Parajuli, 1999:128). Therefore, the flow capacity of the each branch canal is sufficient to irrigate the area.

The head works, except some leakage, is in good condition. The main canal is also in good condition. To maintain the design discharge on the branch canals, a cross regulator across the main canal and a head regulator on the off-taking canals have been provided at the off-take of each of the branch canals. The layout of the irrigation system is presented in figure 4.3

The command area of this system lies to the south of the *Chaurasi Kulo* System. The planned gross command area is 330 ha and the net command area is 300 ha. However, the farmers reported that only 170 ha did receive irrigation water in an adequate way. Due to the inadequate density of the field channels, field to field irrigation is widely practised, resulting in low irrigation efficiency. Therefore, the irrigated area is much lower than planned. This is one of the bottlenecks for the complete turnover of the management to the farmers.

The main canal provides irrigation water to the fields on its southern side only. However, some patches of lands on the southern side of the main canal between branch canal 1 and 3 do not receive irrigation water from this irrigation system. These lands receive water from old *Chaurasi Kulo*. Four RCC aqueducts have been constructed over the main canal of this system for this purpose (see Figure 4.2 in part II).

The lands on the northern side receive water directly from field channels of the *Chaurasi Kulo*. According to the farmers' opinion, the irrigation water availability is better in areas served by the field channels as compared to the fields irrigated through the aqueducts of old *Chaurasi Kulo*.

The irrigation system is under the management of the DOI and its employee known as *Dhalpa*[27] (gate operator) that operates it. In the beginning there were five *Dhalpas* and all were locals. The government trained them for canal operation after the completion of the project. There was only one *Dhalpa* since 1997. The reason for this was that the government curtailed its budget. This person happened to be from the village at the middle of the branch canal 2. He admitted that he was working in the irrigation field office previously, unlike the other four who were operating the canal. Now he was responsible for all canal operations. In the past he used to help his colleagues whenever they asked. Thus, he was less knowledgeable in canal operation compared to his colleagues. However, his smaller experience has not significantly affected the operation at present. This is because, in 1992 the farmers at the initiative of a local elected leader formed an UC[28]. The WUS decides on the allocation and distribution of irrigation water, and the *Dhalpa* follows the advice of the WUS. But he has to spend more time due to the reduction in the manpower. He faces difficulty during the summer when for distribution he has to open all the gates in the canal.

Branch canal 1

This canal off-takes at Chainage 1.025 km of the main canal. The reported length of this canal is 1 km, out of which the first 100 m is lined. This branch canal is aligned along the old field channels of the *Chaurasi Kulo*. There are 16 earthen field channels according to one of the farmers at the middle of this branch canal.

Branch canal 2

This branch canal off-takes at 490 metres downstream from the first one. A cross regulator was provided at about 500 m downstream for stopping the water delivery during the night because of the land subsidence problem as this canal passes through the settlement. The irrigation water is not adequately available to the tail-enders, although this canal has been lined throughout. This is due to poor maintenance of the sidewalls, which often collapse due to weak foundations. Besides, the canal has a long lined portion that is costly to maintain.

The WUS constructed a new sub-branch canal at about 50 m downstream from the off-take of canal 2. It provides irrigation water to 20 ha of the additional land belonging to 35 households lying on the eastern tail end of this branch canal. The length of this canal is 1400 metres. Besides, the WUS constructed another 90 metres of the field channels in the middle of this canal.

Branch canal 3

This branch canal off-takes at 360 metres downstream from the branch canal 2.

Branch canal 4a

This canal lies at the tail end of the main canal. The first half of this canal is also lined. However, this canal can use only 2/3 of the water and the remaining 1/3 goes to the canal 4a. The discharge in the main canal at the off-takes of branch canal 4 and 4a is proportionally divided into 2/3 and 1/3 respectively.

Branch canal 4b

This canal is the shortest of all the branch canals. About 50 percent of the canal length are lined. Both the canals 4 and 4a require maintenance in some places. There are some drop structures in these two branch canals. The physical features along with the number of households served by each branch canal have been provided in table 4. 6.

Table 4. 6: Physical features of the branch canals with households

Branch Canal	Length of the canal km	Lined Portion km	Households
1	1.0	0.1	120
2	2.2	2.2	230
3	1.5	0.75	150
4a	1.5	0.75	70
4b	0.5	0.25	30
Total	6.7	4.05	600

Source: WUS records and DOI information. However, the GEOCE (1991) stated that the ownership list prepared by the project office for the purpose of water tax collection had indicated 157 ha as the command area.

4.10.2 The irrigated land and its distribution by ethnicity

The land in the irrigated area is flat with a gentle slope from north-west to the south-east. The land holdings among various ethnic groups with farm sizes have been provided in the following table.

Table 4. 7: The distribution of size of holdings by ethnic groups

S.no	Size of holding (ha)	Number of household	Major ethnic group
1	< 0.5	420	Brahmin, Chhetri, Damai and Sarki
2	0.55 to 1.0	115	Brahmin, Chhetri, Newar and Gharti
3	1 to 2	50	Brahmin and Chhetri
4	2 to 5	15	Brahmin and Chhetri
	Total	600	

Source: DIO report on turnover programme and the information from WUS.

The above table provides an indication of the distribution of land holdings among various ethnic groups. The upper two castes Brahmin and Chhetris are the majority of the users, which is also evidenced by the composition of the WUS (see section 4.11). Also the large land holding also belongs to them. Most of the large land holding is in branch canals 1, 3 and 4. Thus, the large land holders are dominant in decision making related to irrigation management in these canals. However, majorities of the small holders are in the branch canal 2 according to the farmers. Thus, decisions related to the irrigation water are done through consensus. There was a variation in the number of users as reported by the DOI, WUS and the previous study by Shivakoti (1992:6)[29]. Six hundred households had land in the irrigated area according to the WUS estimate (table 4. 7). WUS estimated that the majority of farmers had land holdings between 1-10 ropani (0.05-0.5 ha). The average size of the holdings was 0.5 ha assuming that 300 ha is under irrigation. The Project Benefit Monitoring and Evaluation (PBME) review report also indicated that the average farm size was 0.57 ha (GEOCE, 1991.). According to the WUS estimate, 40

percent of the farmers had more than one parcel of land. Most of these lands were in branch canals 2 and 3.

4.11 The intervention in irrigation system

4.11.1 The first efforts of the farmers

The farmers at the tail end were not receiving sufficient irrigation water from *Chaurasi Kulo*. Therefore, they decided to construct the canal. First, they initiated the construction of the *Annapurna Kulo* in 1967, according to the Chairperson of the Water Users Society (WUS). One of the farmer who was an ex-serviceman took the initiative to convince the farmers to construct a separate canal for irrigation. The farmers received the help of a Peace Corps volunteer for the design of the project[30]. People tried to divert water from the river to the canal by constructing temporary headwork 20 metre upstream from the present weir. The farmers did not succeed in irrigating the field due to an inadequate amount of water in the canal. They abandoned the work due to a lack of technical and financial support from outside.

The farmers requested for technical and financial support from His Majesty's Government (HMG/N), through the Village Panchayat. The government provided NRs 15,000 in 1968 and NRs 245,000 in 1976. The farmers contributed the equivalent of NRs 45,000 in labour. Farmers were able to divert water to the canal but the full operation of the canal was not possible due to the lack of a permanent headwork.

Farmers kept on pressurising the government to undertake the construction, which the government could not refuse because of its involvement in the system. The then member of the *Rastriya Panchayat* (parliament) was instrumental in pursuing the government for this construction according to the farmers. Besides, the then *Pradhan Pancha (chairman of Village Panchayat)* also lobbied for the project as he had more land at the tail end than at the head and middle.

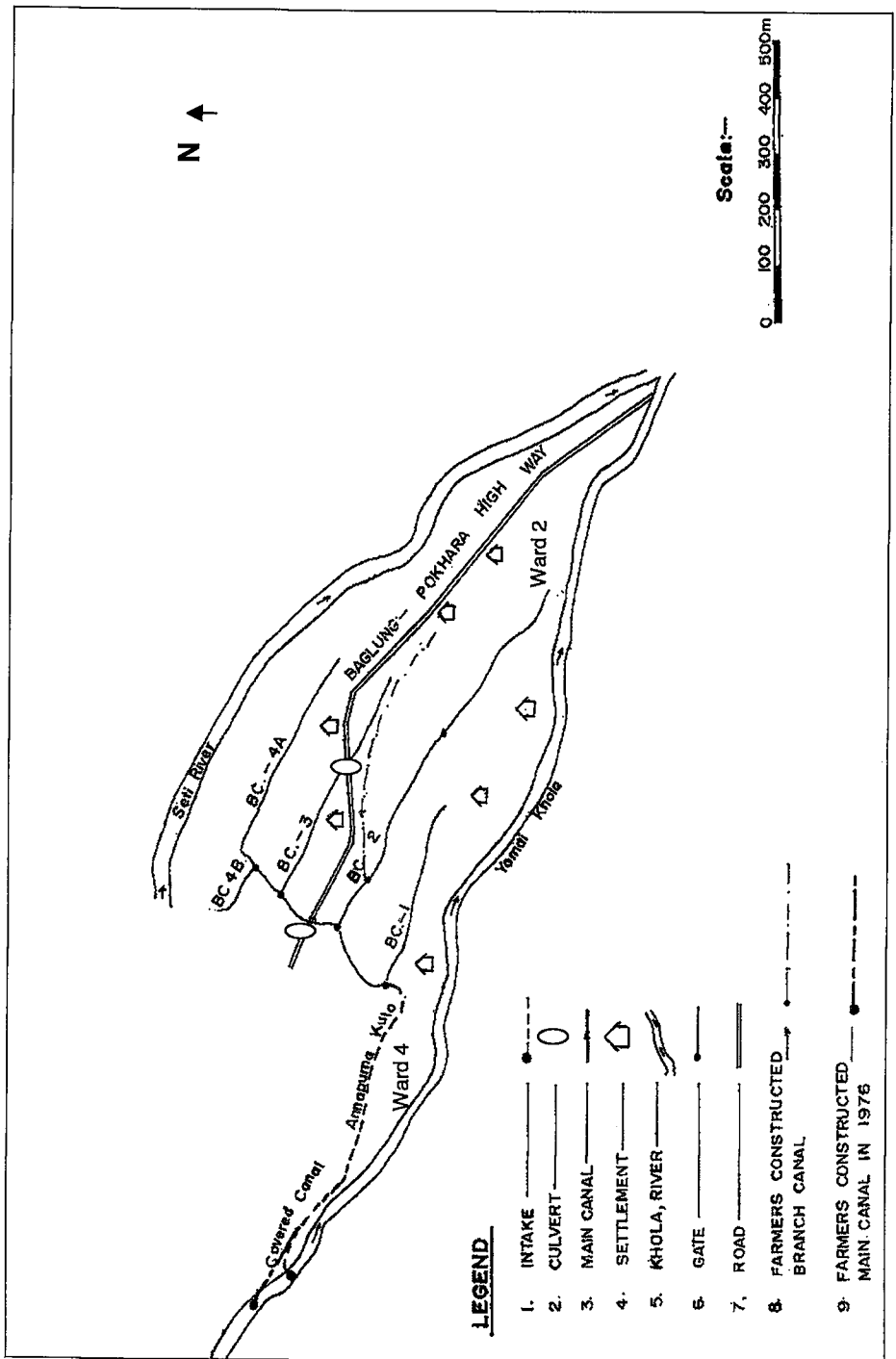


Figure 4.3: Layout of *Annapurna Kulo* Irrigation System

4.11.2 Intervention under the Hill Irrigation Project

Planning

The project objective was to increase the food grain production and to raise the standard of living of the people. The government initiated the project at the request of the farmers at the tail end of *Chaurasi Kulo*. These farmers were instrumental in forming the linking loop to get government assistance. Nevertheless, the VP backed their effort. In this respect, the VP was one of the main actors in the interface between the agency and the farmers. The Asian Development Bank in consultation with the DOI officials did the appraisal of the project. The National Planning Commission on the recommendation of the DOI and Ministry of Water Resources (MOWR) approved the project. The design of the project was completed in 1982. The detailed design of the project was done by the government engineers under the technical supervision of the expatriate consultant (GEOCE, 1990) provided by the Asian Development Bank. The Regional Director of DOI in western region at that time admitted that the detailed technical design was not discussed with the farmers. According to the farmers, the people were not satisfied with the new design, as it did not take into account the existing alignment of the canal during the discussion with the project officials. However, this was not true as the canal used the existing canal alignment. The farmers not satisfied with the design were the one whose land was not covered by the alignment.

KB, the former *Dhalpa,* who is a small farmer having only 4 ropani of land at the middle of the branch canal 2, said that the project was discussed with the farmers in a meeting. Farmers also said that the engineers from DOI had discussed the matter with them including the officials of the *Village Panchayat*. There were some changes in the alignment of the branch canals after the interface between the users and the irrigation officials. The farmers, who had to contribute the land for the canal but would not receive irrigation water for their land, were instrumental in incorporating the changes. Thus, the project took into consideration the farmers' demand and made necessary changes to accommodate their interests. The changes were also necessary to continue the use of the existing field channels of *Chaurasi Kulo*. The WUS chairman confirmed it during the discussion. A construction and supervision committee consisting of the then VP officials and farmers was constituted to oversee the implementation according to the DOI officials. This shows that the agency was aware of maintaining the interaction between the project officials and the farmers during the initiation of the project. However, the interaction confined to between the committee members and the agency. The committee could not maintain regular interaction with the farmers.

The government approved the tender for *Annapurna Kulo* in July 1983 under the Hill Irrigation Project. The project received a loan from the Asian Development Bank/Manila (ADB/M), according to the Western Regional Irrigation Directorate (WRIM). The project had agricultural components also. There were provisions for the construction of three warehouses, one training centre and the establishment of one agricultural demonstration farm of 0.4 ha The project had also the provision to

provide agricultural credit to the farmers through the Agricultural Development Bank/Nepal (ADB/N).

Implementation

Five separate project offices were established to implement five irrigation systems under this project. The project office consisted of one engineer and three overseers to supervise and guide the work of the contractor. The Western Region Irrigation Directorate (WRID) provided necessary technical back stopping to these offices. The government awarded the contract for the construction of the scheme to a contractor from Kathmandu. The contract was awarded through a Local Competitive Bidding (LCB) as per the financial regulation of the government. The PBME report states:

> *"The contractor sub-let most of the works to the petty contractor and the main contractor did not supervise the work of the sub-contractor*[31]*. As a result, the works were not up to the mark (GEOCE, 1990.)."*

The contractor, however, said that he implemented the project by establishing an office on the project site. According to him the project was implemented by hiring labourers. The labourers worked on a piece work basis i.e. the labourers were paid on the basis of the work, and not on a daily basis.

The farmers did not have any say in the implementation of the project, according to the WUS chairperson. The Regional Director at that time contradicted this. He told that the people in the project area were very conscious and actively participated in the implementation of the project. He opined that the supervision committee monitored every activity and it was very helpful to the WRID as there were no major complaints. The people complained about smaller details of the project implementation. For example, they used to complain about the sand quality and the WRID used to check it in their laboratory in Pokhara. Then the report was given to the farmers. Farmers used to monitor the use of cement and labourers every day. Later on it became the practice that the farmers used to certify the cement use and running bill of the contractor by signing the paper, which was to be submitted to the WRID by the project office. The project office did not have authority to pay directly to the contractor. The project office used to certify the work and running bills for payment to the WRID. Thus, WRID was responsible for the payment of the bills. He argued, because of this, no major repair is required in the irrigation system after more than a decade of its completion. It can be concluded that the project officials maintained required transparency during the implementation of the project. This was largely due to the pressure from the users. This suggests that the linking loop between the users and the project officials did function, as users tried to maintain organisational control during implementation.

Some of the farmers said that the contractor and the engineer did not made the changes suggested by the people. The contractor, however, said that the local people wanted to have one weir for both the *Chaurasi* and *Annapurna Kulo*. This was not possible due to the design. Besides, the contractor was bound by the contract. He said that he took the contract on basis of the approved design and his work was directed and supervised by the project office. He could not change any alignment

unless told by the project engineers. Therefore, the interface between the contractor and the users was minimal in respect to the implementation. According to him, the issues related to the design were a matter between the project officials and the farmers.

KB, the former *Dhalpa*[32], however, said that some of the farmers tried to change the alignment of the main canal in order to have irrigation for their lands. The engineer was under pressure from the local elite in this regard. According to the contractor, the engineers did not agree with their proposal and the main canal construction followed the alignment, which the farmers had already constructed. There was no extension of the length of the main canal. Only the existing canal was enlarged and lined according to the contractor. This shows that the powerful in the village could not influence the decision making due to the fact that the users have already constructed the alignment of the canal.

The construction of the covered canal was one of the major problems encountered during the execution of the project. According to the contractor, he completed the construction of the open canal but he did not have the skill to design an arch-type covering slab. For this work, the contractor sub-let the contract to the Chinese contractors, who were constructing an irrigation cum hydro-power system nearby. This is an indication of the lack of construction capability at local and national level, which could have major implications for future maintenance of the system by the farmers.

One of the issues that came up during the implementation was the compensation for the land needed for canal construction. The contractor said that, because of this, he had to stop the needed work occasionally as the farmers did not allow him to put construction material on their land. The farmers asked for rent for depositing the construction materials on their land. The engineer who assured the locals to request for the payment of compensation solved the problem. In his opinion, the engineer successfully negotiated with the farmers in this issue. Otherwise, the work would have been further delayed.

According to the WUS chairperson, originally there was no provision for compensation. The government acquired the land occupied by the canal and did provide compensation for the land later on. However, farmers argued that not all the owners received the compensation[33]. Nevertheless, the owners of lands occupied for the construction of the main canal did receive the compensation. This was confirmed during the field observation as DOI did mark the area under its control in the main canal. However, there was no question of compensation for the land occupied by the branch canals.

The system was completed in July 1986 at a cost of NRs 10.41 million. Farmers reported that they contributed 25 percent of the total cost. But the Project Completion Report (PCR) did not indicate that farmers made any contribution. Being a national level project it was selected, appraised, approved and implemented by the government (GEOCE, 1991.). Thus, it is unlikely that the farmers did contribute. The farmers' contribution could be accounted for in terms of labour contribution they did when they started the construction on their own and the land provided for branch

canal construction. Also, the time spent by the farmers during supervision of implementation work could be considered as farmers' contribution.

Evaluation of 1991 and 1993

The DOI engineers did the evaluation of the completion of the work. The status report (WRID, 1986) states the following:

> *"The whole construction of headwork, main canal and distribution system under the contract No. 490-VI has been completed by the contractor ...and the completion certificate has been issued to him. The maintenance period starts from 1st July 1986 and will be valid up to 30th June 1987".*

The word distribution system in the report indicated the branch canals but not the field channels. The contractor had to repair the faulty construction during the maintenance period. The project was to be completed in 1983 but the design of the project was delayed due to the late employment of the foreign consultants according to the PCR.

Regarding the evaluation of the project, many farmers neither knew about it, nor about the certification of the completion of work. However, some of the farmers reported that they were aware of the evaluation after the completion of the work. There was a clear distinction between the categories of the farmers who knew about the evaluation and those who did not know it. The then panchayat officials and local farmer leaders were aware of the evaluation. They reported that the focus of the evaluation was on the fact whether the canal became operational or not and whether all the lands received irrigation water according to the design. Some of those farmers said that they were not satisfied with the outcome of the evaluation, as it did not take into account the non-completion of the branch canals according to the design. The majority of the farmers also complained about the non-completion of the branch canals. They were mostly from branch canal 2, 3 and 4, who depend on field to field irrigation. The farmers reported that some of the powerful in the community did influence the construction of the branch canals by not providing the required land. This was due to the feudalistic social structure, as some large holders feared that the economic well being of small holders would threaten their status in the community. This was mainly between the users at the head reaches and the tail reach. The reported cases did occur in branch canal 3 and 4. In some cases, it was due to the family feud between the kins or with neighbours, especially at the tail end of branch canal 2. This shows that the linking loop became weak during the implementation due to non-cooperation among the farmers. This was largely due to the intention of some of the farmers to control irrigation water to their advantage.

Since the government designed and implemented the project through the contractor, it was quite possible that all the farmers did not take part in the evaluation of the project. If the farmers were truly involved in the evaluation, they would never have certified the completion of the project because they were still complaining about the incomplete structures. The contractor did complete the main canal according to the design but he did not complete some sections of the branch canals. The design however, did not include the construction of the field channels

which the farmers thought was included in the design. The Regional Director at that time confirmed that there was no provision for the construction of field channels. Therefore, farmers were responsible for this. Thus, there were differences on perception of farmers and the government regarding field channels. It clearly indicates that there was a communication gap between the government officials and the farmers due to lack of intensive interface during the design of the project.

The Asian Development Bank commissioned a Project Benefit and Monitoring Evaluation study through a local consulting firm in 1991. The report (GEOCE, 1991.) made the following observations. Key points from the study are now presented to show the changes anticipated by the intervention in water supply and a more systematic study of institutional changes follows later.

Command area and water availability

The targeted command area of 300 ha was not achieved. The area under perennial irrigation during the monsoon was only 161 ha whereas during the pre-monsoon and winter, the area under perennial irrigation was only 60 ha and 115 ha respectively. The District Irrigation Office (DIO) in its survey report estimated that only 200 ha and 150 ha of land received irrigation water for the monsoon crop and winter crop respectively. The User's Committee, however, estimated that only 100 ha receive irrigation water for the winter crop. The reasons for not achieving the targets are:

- The soil is coarse in texture and porous in nature thereby reducing the water retention capacity of the land;
- Most of the cultivated land adjacent to the canal remained unirrigated (GEOCE, 1991) due to lack of tertiary canals and field channels. However, some of these lands are at a higher elevation than the full supply level of the main canal.

According to the design, the farmers had to construct field channels, which were not constructed. This could be one of the reasons for the failure to provide irrigation water to all the lands as envisaged in the design of the project. The Project Completion Report (PCR), however, stated that the irrigation water was available for 300 ha. The farmers did not cooperate with each other for the construction of the field channels although, the neighbouring farmers were willing to pay for it. It reveals that linking loop became disintegrated, which had implications in achieving the objective of the intervention. This was due to the fact that the farmers did not like to lose the land, which became more productive after the intervention. Therefore, not all the farmers did have equal access to the irrigation water. In other words, the benefit was not equally distributed among the farmers due to the location of the land.

The farmers at branch canal 1 reported they receive sufficient irrigation water. The farmers from branch canal 2, who receive irrigation water through the outlet in the branch canal also reported that they did not have problem with the irrigation water. However, the farmers who have to depend on the field channels and the field to field irrigation reported that they have problem in receiving irrigation water during pre-monsoon and in winter. This problem is more acute in the middle and tail end of the branch canal 2. The farmers in branch canal 3 and 4 also reported the same. The problem is more acute at the tail end. The farmers attribute this to the insufficient

availability of water in the canal and lack of sufficient field channels. This should be looked at from the point of existing power relations between the users. Most of the farmers, who complain are from the tail end having smallholdings. They cannot confront the users at the head reaches. From the viewpoint of intervention, it could be said that had there been sufficient interaction between the users and the officials, this problem could have been sorted out during the intervention. This could have avoided the control of the irrigation water by a group of farmers.

Cropping pattern and cropping intensity

There has been significant change in the cropping pattern in the command area of the *Annapurna Kulo.* This was mainly due to the availability of irrigation water. The farmers used to plant rice-maize at the head and middle of the command area before *Annapurna Kulo.* which falls under branch canal 1 and two. Now with the availability of irrigation water rice has been the main crop in the head and middle of the command area. However, rice is planted in only small area of the land at the tail end. The main cropping pattern in branch canal 1 and 2 is rice-wheat-maize, rice-wheat-fallow, rice-vegetable-vegetable and rice-vegetable-fallow. However, the cropping pattern in branch 3 and 4 is rice-wheat-maize, rice-wheat-fallow and rice-fallow-maize. The farmers from the branch canal 3 and 4 reported that they have been able to grow rice in the field, which used to have only millet in the past. They indicated that this has helped in meeting household consumption need, as rice is the main staple food. However, they have not been able to grow cash crops as the farmers from branch 1 and 2.

The cropping intensity of *Khet* (the total cropped area divided by the cultivated area) was found to be 182 percent in *Annapurna Kulo,* which was higher than in the *Chaurasi Kulo'* (166 percent). The appraisal estimate however was 187 percent. The cultivated area increased by 43 and 36 hectares for paddy and wheat whereas the area under maize cultivation declined by 21 hectares. This shows a positive effect of the irrigation intervention. However, there has been no change in the cultivated area for vegetables and pulses in *Khet* (GEOCE, 1991).

The other two studies (Shivakoti, 1992:20-21) noted that the cropping intensity increased by 75 percent only however, Maskey (1994:130) reported that the cropping intensity in the area was 185 percent. The low cropping intensities are attributed to a lack of support by agricultural services. With respect to the agricultural components one warehouse cum training centre and one Junior Technician (JT) and Junior Technical Assistance (JTA) quarter were constructed. However, the demonstration farm was not established. The farmers said that they did not receive adequate agricultural extension services from the project. This suggests that agricultural support services under the project were not effectively delivered. This also exemplifies that the programmes as envisaged during the design of the project were not implemented. The lack of emphasis on agricultural services from the project could also be due to the presence of the Lumle Agricultural Research Centre (LARC) which was implementing its programmes in that area during that period.

Based on the information from the farmers the cropping intensity during the field study was found to be around 190 percent. However, this is not uniform within the

command area. The cropping intensity in the farms receiving irrigation water from branch canal 1 and 2 is higher than in farms served by branch canal 3 and 4 due to insufficient availability of winter irrigation. The farmers at the tail end of these canals reported cropping intensity of 150 percent. It was also observed that the cropping intensity is much higher among the small farmers than the large farmers because of intensive vegetable cultivation due to the availability of irrigation water during the winter season in branch canal 1 and 2. This had implications for household income as well. The farmers who cultivated seasonal vegetables and potato reported that annually they used to earn between NRs. 30,000 to NRs. 70,000. The farm size reported is 0.4 ha to 1.0 ha. This is an additional income they could earn due to irrigation water. However, availability of irrigation water was not the only factor for cash crop production. The construction of all-weather road to Pokhara in 1992 had significant effect in encouraging the farmers in vegetable cultivation due to an easy access to the market.

Crop yields

The crop yield has changed marginally from 'without project' to 'with project' situations according to the PBME report. The crop yield for the main crop paddy was higher (2.35 mt/ha) in *Annapurna Kulo* as compared to the *Chaurasi Kulo* (2.26 mt/ha). The study by Maskey (1993:140) found that the paddy yield for *Annapurna Kulo* was 2.48 mt/ha. Maskey (1993:138) found that the yield for paddy obtained from the crop cutting survey was higher than from the recall method. The expected output for *Annapurna Kulo*, which was included in the cost -benefit analysis, after the intervention however, was 3.4 mt/ha. The low production yield is attributed to the permeable nature of the soil resulting in a low water retention capacity. Besides, the farmers prefer to plant local varieties, which yield less than the improved varieties. Nevertheless, the irrigation water had positive effects on the crop yield. However, there is variation in the paddy output within the command area as reported by the farmers. The current production rate is about 2.5 mt/ha, which is close to the district average (DADO) at the head and middle of the branch canal 1, 2 and 3. The paddy yield reported by the farmers from the tail end and the branch canal 4 is about 2.0 mt/ha. The variation is attributed to the availability of irrigation water in time, which affects the use of chemical fertiliser also. In this connection the Project Performance Audit Report (PPAR) prepared by the Asian Development Bank noted that the crop production was lower than expected because the rainfed area did not receive very much irrigation water and non irrigation inputs were not implemented (ADB/M, 1993).

The yield of wheat and potato has declined which is attributed to the lack of adequate delivery of water and a decrease in the use of chemical fertilisers due to the high cost (GEOCE, 1991). This was in contrast to the findings of Maskey (1993) who stated that the yields of other crop wheat, maize and potato were higher in *Annapurna Kulo* as winter irrigation was available. It was found that potato is the major crop during winter and farmers are taking substantial benefit. Thus, the yield of potato has inceased in recent years. Farmers reported that they earn NRs 8000 net profit from potato cultivation in 0.25 ha of land.

Change in employment

The PBME report stated that only 9 percent of the households were employed during the construction period. This finding support the view expressed by the contractor. He mentioned that most of the labourers were from the adjoining VDCs and also from districts adjacent to Kathmandu[34]. The project policy, though, was to provide employment to the local people. The reason he gave for this was that the locals were not interested in working as wage labourers. Some of the locals wanted supervisory work, which the contractor could not provide. The attitude of the people could be attributed to the social structure of the community. Most of the people were from the higher caste group with some education, which did not permit them to work as a wage labourer. Economically they were also in a better position. Consequently, the low paying job was not attractive to them. The studies (GEOCE, 1991; Maskey, 1993:141) reported that after the intervention there had been an overall increase in the labour employment in agricultural activities as compared to the labour employment in the *Chaurasi Kulo.* The incremental labour however, did not substantially contribute to increase in the land productivity although there has been an increase in the total production due to the increase in the command area after the intervention.

Farmers' perception of the benefit

The most visible benefits after the construction of the *Annapurna Kulo* as reported by the farmers are :

- Availability of an increased supply of irrigation water has enabled them to plant different crops, which was not possible before. For example the rice plantation has increased, which is the staple food of majority of the farmers. Thus, the nutritional status of the household has increased.
- Possibility to grow winter crops and off-season vegetables has contributed to household cash income. The cash income of the small holders was almost negligible before the intervention. The small holders had to borrow from the money lenders for annual household expenses. Because of this there was greater dependency. Now it has been easy to support the family due to the increased household income along with some savings. Increased household income has contributed to the education of the children. The small and marginal farmers were always in debt. Now there has been decrease in their indebtedness.
- The changes in the economic status of the small holders have contributed to the social equality as they no longer have to depend on the large landholder. Besides, the assets have increased due to rise in the land value, which is NRs. 170,000 for 0.05 ha.
- Reductions in drudgery as they do not have to contribute labour annually. The extra time they can utilise on other economic activities.
- Reduction in disputes between the neighbours due to increased availability of the water.
- No more sleepless nights, as they do not have to go out in the night for irrigation water.

However, the benefits are not equal to all the households. This may vary between the farmers depending on the location of the land. It was mostly the farmers from the head and middle reaches have benefited most. On the whole, farmers have benefited from the irrigation scheme. Before this scheme was implemented the farmers had to depend on the monsoon for planting. The farmers having lands at the middle of the branch canals 2 and 3 at present have mostly benefitted from the irrigation water, because before they were at the very tail end of the poorly functioning *Chaurasi Kulo*. One of the farmers from branch canal 2 reported that people were thinking before of migrating to other places due to the hardship faced for survival. The construction of *Annapurana Kulo* has changed these feelings.

4.11.3 The issues of management transfer to the farmers after intervention

Farmers' view in 1991/1992

In the beginning the majority of the farmers reported that the Water User's Association (WUA)[35] would not be able to take care of the maintenance requirements (GEOCE, 1991). Similarly, the results of the opinion survey (DIO unpublished record, 1992) for the turnover of the Programme were as follows:

- The farmers from the head reaches from all branch canals expressed their inability to bear the expenses for all the maintenance required.
- The farmers at the tail end from all branch canals said that they could bear a certain percentage of the maintenance cost.
- The farmers from the middle reaches said, initially, that the government should provide funds for regular maintenance work.
- The large land holders said that the Farmers' Irrigation Association (FIA) should take the responsibility and they would extend their co-operation.
- The marginal farmers opined that FIA should do small maintenance work and the large works by the government.
- The potential new users (about 100 households) said that the FIA should share regular maintenance work with the government.
- The local leaders were of the opinion that operation responsibility of the canals should be with the FIA and the maintenance responsibility with the government.

These findings are interesting because the small, marginal farmers and potential users were positive towards bearing the maintenance cost, whereas the farmers at the head reaches and the big farmers did not like to take that responsibility. It could be argued that the maintenance cost is understood as labour contribution, which small farmers were prepared to provide. In that case, the large holders had to contribute cash, since they do not like to contribute labour. In the case of farmers at the head reaches, it could be said that since they have a reliable supply of water and less lined canals they do not like to contribute.

The DIO officials concluded that the farmers were able to implement the regular maintenance activities, but they were not willing to. This is because the farmers had the following preconditions before taking the maintenance responsibility:

- There should be a re-survey of the command area and the capacity of the canals should be increased.
- There should be desilting of the underground parts of the canals and complete repair in damaged sections of the irrigation system.
- Irrigation facility should be made available for all the re-surveyed command area. The survey report stated that only 200 ha in the summer and 150 ha of land in the winter received irrigation water.
- Branch canal 1, 4a and 4b should be fully lined canals.
- There should be an extension of branch canals 1,2,3 and 4 and their capacity should be increased.
- The boundary of the acquired land should be fixed.
- There should be control and maintenance of outlets.

The DIO officials during the discussion with the researcher accepted most of these demands in principal.

Maskey (1993:170-173), in his economic analysis of the operation and maintenance (O and M) cost, concluded that farmers would be able to pay NRs 100 per ha per crop. This was based on the water charge in other agency-managed irrigation systems, which are within a range of NRs 60 to 200 per ha. However, they would not be able to pay for the major maintenance cost.

Farmers' view in 1997

In 1997, the ownership of the irrigation system was with the government, although the farmers were also playing an important role in its management. The government had tried to turnover the irrigation systems to the farmers for its complete management, but the farmers were not ready to take-over the irrigation system. Farmers cited following reasons for not taking over the complete management.

- The government had not completed the construction of the structures as stipulated in the design. As a result the area stated in the design was not irrigated.
- There was water leakage in the headwork that should be checked.
- Some of the slabs of covered canal had fallen apart and needed replacement and also the damaged wall of the tunnel needed repair.
- The construction of the branch canals as per the design was not complete, which is essential to irrigate 300 ha
- The government should impart knowledge on water use practices for the efficient use of the water, so that farmer could derive maximum benefits.

According to the former *Dhalpa*, the construction of the branch canals was not complete and the construction of branch canals 2, 3 and 4 was short by 300, 900 and 300 metre respectively[36]. The farmers from the tail end of the branch canal 1 said that they expected a complete lining of the branch canal, which did not materialise. In the beginning when the canals became operational, they were happy with the availability of irrigation water and did not ask for a complete lining.

One of the farmers from the tail end of the branch canal 1 whose name is DB also said that the works, as agreed upon during the discussion, were not implemented. He blamed the contractor for not implementing the work according to the contract. But the blame does not go to the engineer and the contractor alone, as some of the farmers at the tail end in branch canal 2 did not provide the land to extend the canal for fear of damage to their houses due to land subsidence problems. In this respect, it could be said that the design did not take into account the soil texture of the area.

The contractor also confirmed that the branch canals were not completed. He said that the farmers, whose land could not be irrigated, did not provide the land for the construction of the branch canals. The project engineers tried to convince the farmers but they did not agree, according to him. Finally, the contractor was asked by the engineers to construct branch canals where there was no problem of land availability. That is why the completion report was issued while the project was not complete according to the design. Other reasons for the non-completion of the structures were as follows:

- The irrigation policy of that time did not emphasise the peoples' participation to involve them in the design of the project.
- Lack of awareness among farmers to extend co-operation to the government officials in the construction of field channels.
- Government officials did not foresee the problems during the design that would arise during implementation due to a lack of intensive interface between the farmers and the irrigation officials. This is because the construction of field channels was left to the farmers and it was assumed that the farmers would co-operate with each other for the construction. Besides, the contractor did not seek the active involvement of the farmers during the implementation.
- The Village Panchayat also could not play an effective role in establishing co-ordination between agency, contractor and the farmer, as its role in the national level project was not recognised. Besides, the supervision committee formed to look after the implementation maintained good links with the agency officials in quality control, but could not maintain the linking loop of users to complete their part of the work. This was largely due to their failure in seeking users role in decision making in absence of good communication with them.
- Lack of the feeling of ownership of the project on the part of the farmers.

These farmer demands and their implicit acknowledgement by the DIO officials suggest that the turn over of the irrigation system in the near future is unlikely.

4.12 The Water User's Society (WUS) of *Annapurna Kulo*

As this was a central level project, there was no provision for farmers' organisation during the planning and implementation of the project. However, there was supervision committee during the construction. The project envisaged to form a farmers' organisation towards the end of the project to take care of the operation and maintenance and one of the objectives was to encourage farmers to construct the field

channels. A committee was formed in 1990 at the initiative of DIO and VP and some of the members were active in solving the disputes between the farmers but it had become non-functional (GEOCE, 1991). The elected VP members dominated this committee and the VP selected the other members (Shivakoti, 1992:18). It could be argued that the top-down created committee could not function in absence of the representation from the actual users in decision making of the committee. The committee was effective in maintaining the link with the agency in pursuing it to carry out annual maintenance work. However, its link with users was weak. The committee never sought the user's participation in the decision making. Also, the users were not aware about the role of the committee. There was lack of communication between them according to the users. Thus, the committee failed to realise its objective and it did not exist any more.

However, of late, there has been a change in the farmers' view over a period of time. The benefit derived from the irrigation water could have motivated them to change their mind. This means the preparedness to bear maintenance cost is an indication of the importance one attaches to the irrigation water. In 1992 the farmers formed the WUS of *Annapurna Kulo* according to its chairperson, who is also the vice-chairperson of the VDC. He took the initiative in the formation of the WUS by convincing the farmers. He comes from ward 4 and has land in branch canal 2. Although, the VDC vice chairperson took the initiative, the committee has the representation from the users in all the branch canals. Because of this, this committee is more democratic. Further the activities related to the irrigation management is decentralised down to the canal level through the formation of Water Users Teams (WUT), which is discussed in the following sections. The name of the WUS is "Hemja Irrigation System Water Users' Society", which is registered at the District Administration Office for legal recognition[37]. This allows the WUS to approach government or other agencies for financial and material support. In absence of the registered WUS, the request to other agencies would be informal and would be considered individual. The organogram of the society is presented in figure 4.4. The objectives of the WUS are as follows:

- To provide reliable irrigation water to the farmers by developing a proper distribution mechanism and to supervise the operation and maintenance of the irrigation canals.
- To encourage farmers to increase agricultural production.
- To protect the water rights of the farmers and to overcome irrigation-related problems through the joint effort of the farmers.

All the water users and the future water users are members of the association. However, the tenants will be members of the association in case this land is rented or else the owner cultivator will be the member. The membership for all the farmers is compulsory. Nevertheless, not all the farmers have become members through the payment of the membership fee. Only 10 percent of the farmers have become a member. The organisation structure of the Society is discussed hereafter. The constitution of the society is presented in appendix I.

Farmers' Assembly

The highest level in the Organisation is the "Farmers' Assembly". All the farmers receiving irrigation water are members of the assembly. The duties and the responsibilities of the assembly are :

- To discuss and approve the annual report and the expenditure presented by the "Farmers' Association"
- To discuss and approve the programme and budget for each year.
- To discuss the problems faced by the farmers and to recommend necessary actions for implementation.

The meeting of the "Farmers' Assembly" is held twice a year before the summer and spring crop respectively. The presence of 50 percent of its members is necessary to hold the meeting.

Besides, 50 percent of the farmers of the "Water Users' Society" can call a general meeting. The decision of the majority is binding to all the farmers. Farmers reported that the meeting of this body was convened only once since the formation of WUS.

Water Users' Team (WUT)

The users from each branch canal can form a WUT consisting of 5 to 9 members from among themselves as provided in the constitution of the WUS. The tenure of the members is for two years. The *Dhalpa* will also be a member of the WUTs. One of its members is elected as the chairperson of the WUT. The responsibilities of the WUT are:

- To ensure efficient use of the available water through proper distribution.
- To operate and maintain the branch and sub-branch canals.
- To collect water taxes from the farmers.
- To help solve the problems among the water users.
- To facilitate acquisition of land required for the construction of new structures and help in its construction.
- To report to the "Water Users' Society", if any water users violated the constitution of the association.

At present there are five members in each WUT except for the branch canal 2 that has nine members since it has a larger command area. The farmers in the respective branch canals elect the WUT members. The usual procedure is that the farmers from the branch canals gather in one place. Then the farmers who want to be WUT member would express his desire or some other farmers propose the name. If the nomination is more than the required number the election will take place. As of now these members have been nominated in consensus. The main criteria to be a member is that he should be able to give enough time to irrigation management activities, he is respected by the fellow farmers and he is interested in social services. The person does not receive any remuneration, but the respect from the fellow farmers. Not all the WUTs are working effectively. WUTs of the branch canals having problems with water allocation, regular maintenance and construction, are more active than the WUTs where such problems do not exist. In that respect the WUT of the branch canal

2 is more active. This WUT have devised the allocation and distribution rule at the tail of this branch canal. The WUT of branch canal 1 is the least active one.

Representative Assembly
It consists of all the members of the WUTs. The primary tasks of this assembly are :

- To formulate necessary rules for operation and maintenance and implementation.
- To approve the auditors report for the "Water Users' Society"
- To prepare the annual programme of the "Water Users Society" and to present it to the "Farmers' Assembly".

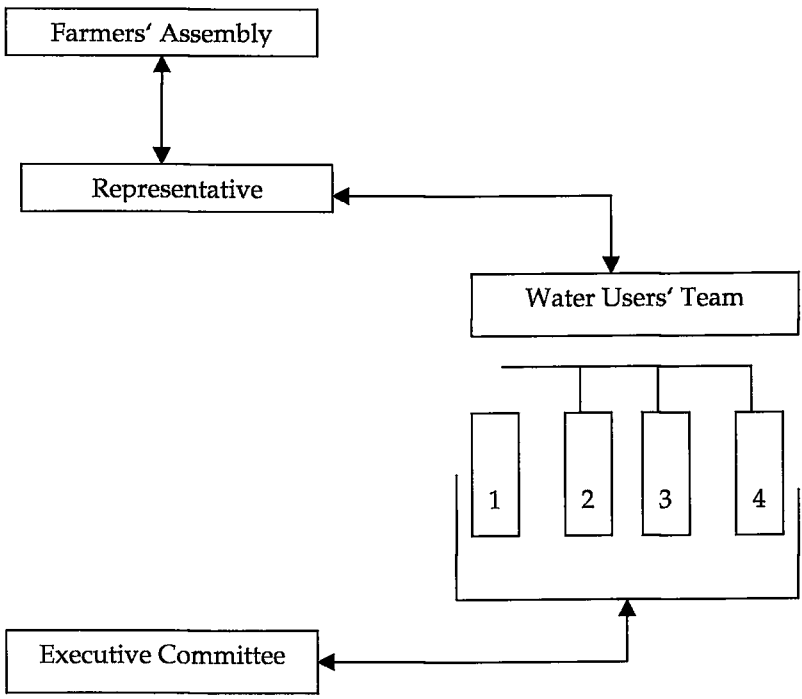
The executive body of the Society
This is the executive committee of the WUS. The executive committee consists of nine members with a chairperson, vice-chairperson, secretary and treasurer. Out of these nine members, the "Farmers' Assembly" elects five members, and the remaining four are the WUTs chairmen representing four branch canals. By ethnicity the committee had a representation of two Brahmins, six Chhetris and one Newar. This is also an indication of landholding distribution in the command area by ethnicity. The tasks of this society are:

- To co-ordinate the activities of the WUTs.
- To recommend and advise the *Dhalpas* for water allocation and distribution.
- To obtain financial and technical support from the DIO and help WUTs to implement necessary construction and maintenance works or execute the works on its own.
- To solve the problems of water allocation and distribution between the WUTs.
- To implement the plans and programmes approved by the "Farmers' Assembly" and the "Representative Assembly".
- To operate the funds of the assembly for construction, maintenance and other expenditures.
- To present the auditor's report to the "Farmers' Assembly" and the "Representatives' Assembly".

The executive committee of the WUS is the most powerful within the organisation. However, the provision of different tiers and the delineation of their work within the organisation indicate the democratic nature of the organisation. The role assigned to the WUTs is important for solving problems at the field level and it also reflects the decentralised nature of the organisation. However, only the executive committee of the WUS has the decision making role in financial matters within the policy framework accepted by the "Farmers' assembly".

Since its formation, the WUS is effective in mobilising internal as well as external resources for the maintenance of the canals. Most important of all, it has been trying hard in creating awareness among the farmers for the need to maintain the irrigation scheme for their benefit. Very recently (1998), the WUS has started collecting information on the irrigated area with farmers' name[38].

Figure 4. 4: Organogram of *Annapurna Kulo* Water Users' Society



One farmer from branch canal 1 said that he was aware of the formation of the WUS and as a farmer he was also member of the "Farmers' Assembly". However, he was not aware of the WUTs and its members nor about any meeting of the "Farmers' Assembly". He revealed that there was an Agriculture group and it consists of 31 members. The agriculture group is the executive body of the farmers' co-operative. He was also not aware of the constitution of the WUS. The reason for this could be the fact that there were no major problems in this branch canal. Thus, the interaction between the WUT and the farmers is less.

One of the WUTs members from the branch canal 1 reported that one of the frequently discussed matters in the executive committee is the non-completion of the structures according to the design. The WUS cannot solve this problem, as it does not have enough resources to complete the structures. DOI thinks that the project is completed and will not provide additional funds to complete it. The formation of the WUS shows that the users would like to maintain new links with the DOI and also the organisational control in irrigation system. This was evidenced through their

control of *Dhalpa* and carrying out of maintenance activities (see resource mobilisation in 4.13.4). This indicates that the users have been able to construct new linking loops, which were disintegrated during the intervention due to non-co-operation among users.

4.13 Management of irrigation tasks

4.13.1 Water acquisition, system development and system water allocation

As stated earlier, the *Yamdi Khola* supplies the water to the main canal. Since, the headwork has a permanent weir, the water to the canal is obtained throughout the year. However, the availability of water during the monsoon is high compared to the winter season. As noted earlier there is no shortage of water in the canal during the monsoon. The users do not have to put much effort and resources into system development, since the main canal and the branch canals also have a permanent structure. The activities related to the system development are confined to the field channels only.

System water allocation varies with the cropping season. During the monsoon it is dictated by the system design as explained later. Availability of water in the main canal dictates the allocation during winter, spring and paddy transplanting period. The *Dhalpa* of DOI mainly does allocation and distribution. He controls the flow only at the head of branch canal. Farmers manage themselves within the branch canal. The availability of water in the main canal is the basis for the allocation of the water. The *Dhalpa* on the advice of WUS controls the water delivery in each of the canals according to the opening of the spindle gate. The WUS had developed an elaborate procedure in 1995 for the allocation and distribution of the water for paddy crops. There were two procedures developed separately for the planting season and after the completion of the planting. The following paragraphs describe and discuss them separately for each cropping season.

Allocation during the period of paddy transplanting

The number of ploughs employed in an area is the basis for the allocation of water for each branch canal for the planting season (June 4-July 16), but not the area. For example, if the number of ploughs employed is higher in branch canal 1 than in other canals, then it receives more water. If all the branch canals have more or less an equal demand, then the allocation is on a rotation basis. The rotation is followed only if water supply is low and canal is not at full supply, which is usually the case during the planting season. This is important because, the availability of water in the main canal governs the allocation of water. This also implies the scheduling of planting in each of the areas. The duration of this period is from the end of May to end of June. This period is just before the onset of the monsoon. The water in the main canal at this time is not sufficient to allow planting simultaneously in all the areas. The rotation usually is for 48 hours to 72 hours.

Farmers demand more water at the time of planting. Thus, the demand should coincide with the availability of water. This requires scheduling of planting in each of the areas before water allocation. This is to ensure that all the farmers have access to enough water for planting. This means that no particular branch canal receives the water continuously.

However, the water is not the only factor for the scheduling of the planting. The availability of labour and ploughs are also important in this respect. The farmers cannot start planting simultaneously even if they wanted. The exchange of labour and the plough or its hiring is the common practice in the village as all the households do not have enough labourers at that time. The farmers through consultation among themselves decide the area for planting. This was important in maintaining the social cohesion and it also had made the water allocation task of the WUS easier.

After the paddy transplantation

There is no shortage of water during the monsoon, after the completion of paddy transplanting. Hence, the system operates in its full capacity. The system design dictates its system level water allocation during this period. It is to be noted that the capacity of the main canal reduces gradually as it moves towards tail end (table 4.5). This means that even if farmers wanted to follow delivery of water on rotation, the system design does not allow it. Because, the entire flow is not supplied to the branch canal located at the tail of main canal due to the reduced capacity of the main canal. Therefore, all branch canals receive continuous flow more or less during daytime. During the night-time, however, adjusting the gate at the head reduces flow in the branch canal 2. This action also necessitates flow adjustment even at the headwork. However, if availability of water in the main canal suddenly drops by any reason, flow in all canals is adjusted by adjusting *Churi*[39]. The *Dhalpa* does the adjustment under the direction of WUS.

The procedure for the allocation of water after the planting (July 17-October 27) is also important, especially if the monsoon is not good. For this, the WUTs from each branch canal are responsible for collecting data on irrigated area from the farmers and they will have to send this to the executive committee by mid July. The executive committee will not be responsible for the allocation of water if the WUTs do not send their data in time. The allocation of water commences from mid July to end of October. The distribution to each of the branch canal is on a continuous basis. However, the area under irrigation governs the amount of water. If the group of farmers from a settlement area demands water in the night, the farmers and the WUTs should take the responsibility for any damage, due to the problem of land subsidence, likely to be caused by the irrigation water. Otherwise, the lands in the settlement area do not receive the irrigation water in the night. This case applies to the middle and tail end of the branch canal 2. For this reason these parts receive water only during the day.

Irrigation in winter

The WUS has developed the procedure for the allocation of water during the winter also. The farmer's demand and the availability of water in the canal determine the allocation. The demand from the farmer from each branch canals determines the volume of water delivery for the winter crop (mid November to mid February). The water allocation is supplied on a continuous basis as long as the availability of water is sufficient to meet the farmer's demand. The water allocation is on a rotational basis for each branch canal if the water supply is not sufficient. The cropped area and the type of the crop determine the duration of the rotation. The executive committee makes the final decisions concerning the rotation on basis of proposal made by the WUTs. The water allocation is mainly for the branch canal 1 and 2, as the farmers grow winter crops, especially the potato and other vegetables.

The water allocation to each branch canal from mid April to the end of May is on the basis of the type of crops planted in each block. The water level in the canal during this period goes on decreasing. Therefore, continuous allocation for each of the branch canals is not possible. Thus, water requirement for each crop was an important consideration for the distribution of the water. The demand for water in branch canals 1 and 2 is more in this period of time due to intensive vegetable cultivation as compared to the command area of other canals. The reasons for this are:

- The farmers live near the farm land that enables close supervision of the farm.
- The easy access to water by being at the head of the main canal.

The *Dhalpa* reported that usually the gate is only opened by one to four *churi* of the gate for branch canal 1. However, there is a higher demand from the branch canal 2, where it is six *churi* openings of the gate.

4.13.2 User allocation, system operation and water distribution

Hereafter water allocation and distribution from the branch canal will be discussed. The allocation and distribution in branch canals will be discussed in detail. In branch canal 1, all the field channels of the *Chaurasi Kulo* in the command area of *Annapurna Kulo* are in use and none of the old structures are abandoned. The lands receiving field to field irrigation are very few in this canal because of the use of old field channels. One of the farmers from the middle of this canal who has 20 ropani of the land, of which 12 ropani is under irrigation, said that irrigation water was not a problem. He is planting paddy in all the fields during the summer. This person said that continuous irrigation is available in his field channel. He is planting wheat, mustard, vegetables and improved grass on 10 ropani of land during the winter. The farmers from the 16 field channels divide the irrigation water proportionate to the area under irrigation *(mato muri)* from the field channels, when the supply is limited.

According to the *Dhalpa* the excess water from the field channels of branch canal 1 on the western side flows to the river. Thus, they have to monitor the water allocation in this branch canal and they have to check the over flow to the river by closing the gate in the branch canal. The heavy flow of the water during the monsoon

destroys the bunds in the field and because of this, the farmers let the water flow to the river. One of the farmers at the middle of the branch canal 1 confirmed this. He was of the opinion that if there were enough field channels and had a complete lining, this problem would not have occurred. This would have helped in increasing the water delivery at the tail end of this canal.

The distribution of the water during the winter is based on the cropped area and the type of crop. Each of the farmers gather together to distribute the water among themselves. Farmers receive water on a rotational basis based on the cropped area and the type of crop. The distribution of irrigation water is not a problem. This is because all the fields do not have the winter crop. One of the farmers from this branch canal said that he has winter crops only on 0.04 ha out of 1 ha. The availability of irrigation water, the compost manure and the labour requirement are the constraining factor for the winter crop cultivation.

As in the main canal the capacity of the branch canal 2 reduces gradually towards its tail end. From the point of view of actual system operation this branch canal is divided into two sections. In the head reach it has two sub-branch canals off-taking from the branch canal. The first sub-branch canal is ungated. However, a cross regulator (vertical slide gate) has been installed in the branch canal immediately downstream of the bifurcation of second sub-branch canal. Farmers constructed the second sub-branch canal. The reason for the cross regulator is that there is a small village towards the tail end of this canal. This area does not receive water during the night due to land subsidence problems. In the second sub-branch canal there are several turn outs (locally known as *Pyan*), which provides irrigation water directly to the terraces. These terraces belong to either single farmer or the terraces belong to two to three farmers. At the tail end there are three sub-branch canals, which receive irrigation water from this branch canal.

Allocation during the period of paddy transplanting

The number of ploughs employed in an area is the basis for the allocation of water for each field channels for the planting season (June 4-July 16), but not the area. For example, if the number of ploughs employed is higher in sub-branch canal 1 at the head reach than in other canals, then it receives more water. If all the sub-branch canals have more or less an equal demand, then the allocation is on a rotation basis. The rotation usually is for 48 hours to 72 hours. This happens only if monsoon is late and the main canal cannot be operated in full supply. This is important because, the availability of water in the branch canal governs the distribution of water. This also implies the scheduling of planting in each of the areas. The duration of this period is from the end of May to end of June. This period is just before the onset of the monsoon. The water in the branch canal at this time is not sufficient to allow planting simultaneously in all the areas.

Farmers demand more water at the time of planting. Thus, the demand should coincide with the availability of water. This requires scheduling of planting in each of the areas before water distribution. This is to ensure that all the farmers have access to enough water for planting. This means that no particular sub-branch canal receives the water continuously. During this period the sub-branch canals do not

receive water, as the flow capacity is not enough to reach to the tail reach. The users start planting when the branch canal have full supply during the monsoon

After the paddy transplantation

There is no shortage of water during the monsoon, after the completion of paddy transplanting. Hence, system operates in its full capacity. The system design dictates its sub-branch level water distribution during third period. It is to be noted that the capacity of the branch canal reduces gradually as it moves towards tail end. This means that even if farmers wanted to follow delivery of water on rotation, the system design does not allow it. Because, the entire flow cannot be delivered to the to the tail end due to the reduced capacity of the branch canal. Therefore, all sub-branch canals at the head reach receive continuous flow more of less during daytime. During the nighttime, however, adjusting the gate at the head reduces flow to the tail end.

The procedure for the allocation of water after the planting (July 17-October 27) is also important, especially if the monsoon is not good. For this, the WUT from branch canal 2 is responsible for the allocation of water. The allocation of water commences from mid July to end of October. The allocation to sub-branch canal at the head reach is on a continuous basis. However, there is rotation at the tail end. The total area receiving water on a rotation basis is 9 ha belonging to 66 users. The land is divided into 4 plots consisting of two plots of 3 ha each and 1.5 ha of two plots each. The rotation is for 24 hours. Thus, the two plots of 3 ha each receive irrigation water for 24 hours. The remaining two plots of 1.5 ha receive irrigation water for 12 hours each. Four field channels serve these areas. Two field channels serve 3 ha each whereas other two field channels serve 1.5 ha each. Thus, each of the fields receives irrigation water once in three days. The users themselves at the initiative of WUT member from that branch canal however, worked out this arrangement. He himself is a user in this rotation system. This shows that organisational control is necessary if there is scarcity of water. This arrangement however, was possible due to effective social collaboration. Further, the necessity for this arrangement was also caused by the technical design of the system. Because, the farmers cannot bring more water even when the branch canal has a full supply due to reduced capacity of the canal at the tail reach. Nevertheless, the farmers at the head reach do no object if these farmers divert more water by blocking the flow to the sub-branch canal at the head reach.

Irrigation in winter

The demand from the farmer from sub-branch canals determines the volume of water delivery for the winter crop (mid November to mid February). The water distribution is on a continuous basis as long as the availability of water is sufficient to meet the farmer's demand. The water distribution is on a rotational basis for each terrace if the water supply is not sufficient. The cropped area and the type of the crop determine the duration of the rotation. Farmers however reported there are no problem of water distribution, as winter crops do not require continuous irrigation. Besides, winter crop is not planted in all the areas.

The flow of the water in the canal is hampered due to the deposition of silt in the covered canal, which is difficult for the farmers to clean. The problem is more acute in the siphon structure in this canal. Especially, the farmers were talking about the deposition of silt and also the garbage left by the farmers which was difficult to remove.

The branch canal 3 could also be divided into two sections. They are head and tail reaches. The processes followed in the allocation and distribution of water is the same as described in branch canal 2. The lands at the head reaches have more or less continuous flow whereas there is rotation at the tail end. For example, if the area is 10 ha and water is sufficient for 2.5 ha, then the land is divided into 4 parcels and each parcel receives water for 24 hours. The rotation could extend to 24, 48 and 72 hours, depending on the availability of water. This means the rotation varies from 1 to 3 days. The water delivery at the tail end in this canal is dependent on the wishes of the farmers at the head reaches. Farmers reported that the relationship between the farmers at the head reach and the tail end is not good. The farmers at the head dominate the farmers due to their socio-economic position in the community. The farmers at the tail end cannot quarrel with them. According to the farmers more water allocation in this canal affects the water delivery in the branch canals 4a and 4b.

The lands in the canals 4a and 4b also receive the continuous irrigation during the summer in the head reaches but there is also a rotation at the tail end. Farmers distribute available irrigation water in proportion to their land holding. The land is divided into 4 to parcels and each parcel receives irrigation water for 24 hours. Farmers at the tail end of the canal complain that they do not receive sufficient irrigation water during the planting season.

Field to field irrigation is common in all the branch canals, since not all the fields are connected to field channels. The farmers from the adjacent fields decide themselves on the distribution of water. Providing irrigation water for field to field irrigation is through *samaha. Samaha* is also essential for the land, which provides irrigation water to the lower fields. The benefits of *samaha* as reported by the farmer in branch canal 2 are as follows.

- It checks water logging in the upper terrace.
- It checks the destruction of the bunds caused by water logging.

Providing irrigation water to the lower field for planting is customary. The lower field receives irrigation water after the completion of planting in the upper field. Thus, the field adjacent to the canal has the first right to use the water. This suggests that a farmer depending on the field to field irrigation received irrigation water only when the upper terrace is full. None of the farmers who depend on field to field irrigation, reported that they had problems in getting irrigation water from their neighbours. This is indicative of the good social relationship existing between the farmers. In some instances, the farmers with the consent of the owner dig out temporary field channels from the adjacent field for bringing water to their field. This practice applies to the winter crops only. This is because all the fields do not plant

winter crops. The WUS however does not have any influence on this matter. This was an informal arrangement among the farmers.

4.13.3 Conflict management

Farmers told of some cases of disputes during the discussion. The reported cases of disputes are:

- The farmers at the tail end complain that the farmers at the head are using more water than required.
- Some farmers from branch canal 1 and 2 let the water flow to the river when they do not need it.
- The farmers from the head claim that they should get sufficient water first before distributing it to the tail end.
- The farmers who had *Khet* before the intervention and were receiving irrigation water from *Chaurasi Kulo* argue that they should have the first right to use the water. Only then the farmers, who converted *Bari* land after the construction of the *Annapurna Kulo* should receive irrigation water.

There were some disputes between the farmers and the *Dhalpa* before the formation of the WUS in 1992 regarding the water allocation from the main canal. Now there is no problem between farmer and the *Dhalpa* since the WUS decides on the allocation from the main canal. Beside, any disputes arising among the farmers and between the farmers and *Dhalpa* are referred to the WUS. Despite this there are disputes between the farmers at the head and tail in branch canal 3 with respect to the water distribution. But the WUS is not taking any initiative in this respect. The water users themselves should resolve the disputes according to the farmers. This was largely due to less availability of the irrigation water. The inequal social status between the farmers has also contributed to the disputes. However, the intensity of the conflict is not great due to the effective role played by the WUS in the allocation and distribution of water. Secondly, the farmers did not have free access to the operation of the main and the branch canals, as *Dhalpa* is responsible for it. Finally, the field channels do not extend to all the fields that have made the farmers dependent on each other for field to field irrigation. The farmers in this respect would have to co-operate and promote coexistence among each other in order to take benefit from irrigation water.

The constitution of the WUS has the provision of various sanctions with respect to the wilful damage of various structures that could hamper the efficient operation of the canals. The provision of sanctions in the constitution is an implicit acknowledgement of the likely disputes among the farmers. It was mentioned in the constitution that any individuals and the water users would be charged for any wilful damage of any of the structures. The penalty for such damages will be the cost for its reconstruction or maintenance. Besides, an extra 5 percent of the cost of such damages will be charged and that will be kept in the maintenance fund of the WUS. Apart from the cash compensation, for the first time those involved will be warned

depending upon the nature of the fault. The person will not be allowed to use irrigation water, if he commits the fault repeatedly.

The enforcement of the sanctions is decentralised. The WUTs can enforce the sanction under their jurisdiction. If the WUTs could not enforce them, then they will have to refer to the executive committee. In case the executive committee becomes unable to enforce the sanction, then it would seek the help from VDC, the District Administration and the District Water Users Committee. The case will be reported to the District Administration for necessary action along with the compensation in cash, if the offender is not a water user. The WUTs can spend the money collected from the penalty for repair and maintenance of branch canals, if it is under their jurisdiction.

According to the chairman of WUS no cases of wilful damage have occurred as of now. However, there are many instances of damages inflicted on the structures due to negligence of the farmers. During the field visit near the tail end of the branch canal 2, there were depositions of silt and the garbage. This could be due to their dissatisfaction with the lack of sufficient irrigation water. There are no sanctions specified in the constitution for this kind of offence, about which the WUS chairperson was of the opinion that farmers should be aware of what they should do.

It was clear that the WUS was helpless in this respect, although, it was effective in addressing the broader issue of management. Nevertheless, it was unable to check some of the acts of individual farmers that could have adverse effect in the long run. It may be because the full ownership is still with the government, and also the government provides funds for maintenance.

4.13.4 Resource mobilisation

When the farmers initiated the construction of the main canal in 1967, each of the households contributed four persons for one ropani of the land. The wage rate at that time was NRs 15. That meant the contribution was NRs 60 per ropani. In 1968 the government provided NRs 15,000 to continue the work.

After the *Annapurna Kulo* was constructed the DOI provided NRs. 652,151 during the period 1988-1990 (GEOCE, 1991:19), out of which NRs. 302,651 was for the construction and maintenance. This means only 46 percent of the total budget were for the maintenance and the rest was for salary and miscellaneous expenses. This amount was insufficient to carry out necessary construction and maintenance as more construction work was required and the repairs of the structures were also pending (GEOCE, 1991:19). Thus, it can be argued that the insufficient allocation for maintenance ultimately would lead to further deterioration of the physical structures requiring major investments in future. This was evident during the field study in 1997 as major maintenance of the main canal was required.

In 1992 the WUS has made provisions for the mobilisation of the resources form different sources. They are:

- Fee and penalty collected from the farmers.
- Loans taken from financial institutions.
- Donations and grants received from other agencies.
- Funds provided by the HMG/N.

- Cash mobilised from the farmers.
- Labour contribution from the farmers.

It has provision for the mobilisation of farmer's cash and labour contribution along with the money obtained from the DOI to implement the construction and maintenance activities. However, the farmers have not contributed any cash or labour for the maintenance as of now. The farmers from all the branch canals said that they did not contribute any amount and labour for maintenance work. The WUS officials admit, that they have not yet mobilised cash and labour from farmers for maintenance work. The *Dhalpa* said that people used to contribute labour for canal cleaning before the construction of *Annapurna Kulo*. The farmers were contributing two mandays of labour per household (three mandays per ha) for the annual maintenance of the canal before the intervention. After the intervention people do not contribute for the annual maintenance (Shivakoti, 1992:19). People are not willing to contribute since the government is providing funds for maintenance.

There were differences in the opinion among the farmers with respect to the contribution for the maintenance work. The farmers who said they would like to contribute were the ones who were receiving assured irrigation water. They were the farmers mainly from the head and middle of branch canal 1, 2, 3, and most of the farmers from a tertiary canal of branch canal 2. The farmers who were receiving field to field irrigation water and the farmers at the tail end said they would not like to contribute unless they had separate distributary canals since, they did not like dependency on other farmers. This shows that the lack of distributary canals has hampered the mobilisation of resources for the maintenance. This was deterring the resource contribution from other farmers also who were receiving the irrigation water. This is largely due to the non involvement of the farmers during the design and implementation of the project. Besides, at present the people have to contribute cash instead of labour, which they do not like to do. Nevertheless, it seems that farmers with the help of the WUS will take care of the simple maintenance even if the government did not provide the support to the farmers. Because, they do not like to lose the benefits they are receiving. However, the maintenance work of the weir, the covered canal and repair of large portions of the lined canals is beyond the capacity of the farmers.

The incomes and expenditures of the WUS are presented in Table 4. 8. The resources from the DOI is decreasing over the period except for the year 1997/98, which was slightly higher than the previous year. But in the second year there was a deficit in the total accounts of the WUS because of the increased maintenance work. There is a positive correlation between the wage payment and the expenses for the maintenance work in this year. The government contributions have also declined in successive years as compared to 1994/95. It seems that the government is intending to hand over the management to the farmers through gradual disengagement. The WUS is aware of this and was managing the fund prudently. Evidently, the WUS was saving from the resources obtained from the government. This was important with respect to maintaining continuity for regular maintenance. Nevertheless, from the sustainability point of view this was not encouraging. There should have been a

gradual increase in the internal resource mobilisation for operation and maintenance. But some of the farmers think that they should not contribute as the government was providing the money. The WUS raises money from among the farmers at present for the construction only. The construction of the sub-branch canal in branch 2 is an example in this respect. The farmers who were to become the water users contributed 50 percent of the costs for the construction and the remaining 50 percent were paid by the WUS from the government contribution. The WUS raised the cash contribution on the basis of the land holding from the farmers. However, the amount of contribution is dependent on the type of work. The construction has been continuing for the last three years. It can be observed from the table that the expenses for the construction work are higher in the year when the users' contribution is also higher. The same applies to the case with the wage payment. Part of the farmers' contribution is for the bid money to get contracts from the government. The bid money under the heading 'deposit return' goes to the WUS saving fund after the completion of the work.

According to the WUS chairperson, the mobilisation of the resources from farmers and DIO for the construction of sub-branch canals has been effective. There was no profit making intention. This is because, no outside contractor is employed and the farmers do the work on their own. This enables them to carry out more work with less money. It enabled the WUS to save money received from the government and that was kept in the maintenance fund. Besides, the farmers received the employment opportunity to earn cash income during the off-season.

The WUS, according to its chairperson does not raise money from the farmers on a regular basis. Farmers contribute occasionally for repair and construction. The WUS is thinking of collecting water taxes from the farmers on a regular basis. This would help in creating a maintenance fund. The situation however, is deteriorating as contribution of the users is declining and stopped in 1997/98. Those farmers who have access only to field to field irrigation and those who have difficulty in receiving water do not like to pay regularly.

Table 4. 8: The income and expenditure statement of the WUS

Income (NRs.)						Expenditure (NRs.)						
FY	HMG/N	Users	Bank interest	Deposit return	Total income	Maintenance	Construction	Wages	Office supplies	Misc.	Total expenses	Balance
1994/95	449,171	33,246	3,516	-	485,933	89,565	115,305	5,650	1,859	4,000	216,379	269,554
1995/96	175,289	6,215	-	-	181,504	200,223	4,250	-	643	200	205,316	- 23,812
1996/97	115,143	1,800	15,0 89	-	132,032	83,258	-	-	-	500	83,758	48,274
1997/98	142,061	-	-	10,890	152,951	121,899	-	41,363	-	2,383	165,645	- 12,694
Total	881,664	41,261	18,605	10,890	952,420	494,945	119,555	47,013	2,502	7,083	671,098	281,322

Source: Audit report of WUS

Note:

- The maintenance expenses in FY 1997/98 also includes some expenses on the construction of the sub-branch canal from canal 2, according to WUS chairman.
- The maintenance cost includes both materials and wages for the skilled labourers.
- The wage expenses include only the wages paid to the unskilled labourers and the supervisor.

4.13.5 System maintenance

Before the formation of WUS, the DOI was carrying out the maintenance work through the contractor. Now the WUS prioritises the works for annual maintenance in consultation with the WUTs and farmers and recommends this to the DOI. Afterwards it holds discussions with the irrigation officials on behalf of the farmers for determining the works to be implemented in a particular year. For the implementation of the works it enters into agreement with the DIO and undertakes the implementation of the activities as agreed upon.

The WUS implements the work on wage basis through the local villagers. The constitution of the WUS stipulates that the WUS is responsible for the regular maintenance of the main canal in consultation with the farmers. However, the subcommittees for each of the branch canals can carry out necessary maintenance work in their respective branch canals.

The WUS constitution specifies that the emergency maintenance of intake, covered canal and the main canal will be carried out immediately by the executive committee, even when government support is not available. The executive committee would mobilise cash and labour contribution from the farmers for immediate maintenance. At the same time, the executive committee would approach the DIO for the required finance of these activities.

The maintenance provisions for the branch canals are also the same as above. But the WUTs are responsible for the immediate maintenance and will refer it to the executive committee for long-term maintenance. The provision to undertake immediate maintenance by the farmers themselves is significant and reflects the importance attached to the irrigation scheme. Further, it also shows farmers' awareness that government support will not come as and when required.

The maintenance activities are fixed on priorities. The processes followed for undertaking maintenance activities were as follows.

- The farmers request for the required maintenance activities to the WUTs.
- The WUTs and the *Dhalpa* do the necessary inspection and recommend to the executive committee.
- The executive committee decides on the issues.

The first priority is for maintaining the main canal and after that the branch canals. The extent of the loss (crop damage) occurred and expected loss in crop production were the main criteria for prioritising the maintenance work in the branch canals. The WUS did the maintenance of the gabion structure[40] that was important to divert water to the canal according to the WUS chairperson. Most of the branch canals and also some sections of the main canal require repair.

4.14 Governance and property rights

The governance structure in the irrigation system has gone through major changes over a period of time. When there was one irrigation system, before the construction of the *Annapurna Kulo*, the governance structure was as discussed in *Chaurasi Kulo*.

The governance of the irrigation system is under the DOI as this new construction was implemented as an AMIS. The irrigation system was managed by the DOI through its employee *Dhalpa.* The *Dhalpas* under the direction of the DOI were responsible for drawing the operational rules. This was one of the reasons for disputes among the users and the *Dhalpas,* as users were not involved in the operation and maintenance of the canal. The fund for annual maintenance was also provided by DOI and annual maintenance work was carried out through the local contractor. The farmers through the formation of UC in 1992 partially took over the operation and maintenance of the irrigation system. The number of *Dhalpa* has been reduced from 4 to one, which prompted the farmers to take over the management of the irrigation system. This is a very positive development in the sense that the farmers are taking initiative in the governance of the irrigation system as indicated by the development of the operational rule by the farmers themselves. At present the role of DOI in the management of the irrigation system is limited to the annual maintenance fund and the salary of the *Dhalpa.* The presence of all three forms of rules – operational rules, collective choice rules and the constitutive choice rule are present.

The water right of the users across the branch canal is dictated by the design structure as discussed earlier. In principle the water delivery is based on irrigated area. However, there were differences in the water access among the users due to the location of land. This is due to the fact that field channels are not in adequate density. The users were supposed to construct the field channels but the users having their land near to the branch canal did provide the land. The users at the head reaches and near to the branch canal have unrestricted access when the canal is on full supply. The users at the tail end however, have to follow a rotation. The water right is not proportionate to the land holding in the command area because they do not receive adequate water to irrigate all their land. The water right among the farmers was agreed on the basis of the designated command area of the irrigation system during the design of the project. Because of this, the farmers who had land within the command area of the irrigation system but who were not receiving irrigation water are taking the initiative to extend sub-branch canals. However, these farmers have to make investments in establishing their right on the irrigation water as indicated by the construction of the sub-branch canal. So, there is a mix of customary right and the right obtained through investment.

4.15 Water control

There have been major changes in the water control technology after the new construction. The construction of a permanent weir with sluice gates has enabled the farmers to regulate the water allocation and distribution in desired way. Further, it has reduced the annual labour required for the construction of the temporary weir. This has implications in terms of the social relations among the farmers as indicated by reduction in the labour force required for the construction of headwork of the *Chaurasi Kulo.* The provision of the gates in the branch canals has enabled new

control mechanisms in the allocation and distribution of the irrigation water. As the *Dhalpa* operates these gates, the involvement of the farmers in devising appropriate control mechanisms to distribute the water has been reduced. However, there has been no change in the traditional control structures at the field channels.

The intervention brought new administrative control as the irrigation system is under the management of the DOI. This has developed a new relationship between the farmers and the agency (DOI). This enabled the farmers to obtain and mobilise the external resources for the upkeep of the irrigation system. However, lately there have been changes in the organisational control due to the emergence of new organisation of the farmers. The WUT with adequate ethnic representation have been effective in maintaining social and political control among the users, as evidenced by the implementation of rotation at the water scarce area. This is likely to increase the social control of the irrigation system besides, the changes in the relationship between the agency and the farmers. This has been reflected in declining role of the DOI in the management of the irrigation system. Nevertheless, the lack of the mobilisation of internal resources by the farmers for the maintenance may deter complete user control of the irrigation system.

But a group of users at the head reaches in some branch canals are effectively controlling the irrigation water due to their social and political influence and also poor social relations with the users at tail reaches. Lack of adequate density of field channels is also contributing to this situation. In this respect, the farmers near to the branch canals are in control of the irrigation water due to the weak organisational control of the WUS. Enforcement of effective social and organisational control is also lacking because all the farmers have not become the members of the WUS.

4.16 Analysis and conclusions: *Annapurna Kulo*

This case is an example of the major government intervention generated by the local initiatives taken by the farmers. The people at the tail end of the *Chaurasi Kulo* were unhappy due to inadequate irrigation facilities and initiated in 1967 the building of a new canal, with the help of peace corps volunteer, that should take water from the river. But they could not complete this canal even with the initial help of DOI. This reflects that external support is required when the technology and other resources available with the farmers are inadequate to implement major works. During the period 1983-86, a scheme using new technology with modern RCC structures such as the sluice gate, covered canal, main canal, aqueducts and the branch canals were constructed by DOI through a contractor. The government intervention was the result of the links between the farmers and the local institution (VP) and the one between the VP and the government. This shows that how the farmers were able to form a loop in accessing the external resources in order to take control of the water in their hand. This relieved them from their dependence on *Chaurasi Kulo.* However, it is remarkable that the design was not extensively discussed with all the farmers although it involved the constructing of a new irrigation system over the existing system of *Chaurasi Kulo.*

The lack of communication led to several misunderstandings between the farmers, the DOI officials and contractor as reflected by the incomplete construction of branch canals and construction of field channels by the farmers. The farmers thought the work was to be accomplished by the DOI. But the DOI officials failed to communicate in convincing that it was farmers' work. As one farmer put it "he thought that the engineers will come back to complete the work" since he was not aware of the agreement on the design between the DOI and the contractor. As a result, the farmers were not willing to take over the irrigation system. This clearly shows that there was lack of clear planning, transparency and accountability during the design of the project. There was lack of required interface between farmers-VP-government, which hindered the communication between the social actors involved. In this interaction the role of actual users were minimised which led to the minimal participation of the farmers in terms of material contribution. The lack of involvement of the farmers could be attributed to the fact that the policy of the government in this period did not emphasise the farmers' participation, which is one of the flaws inherent in the blue print approach of development interventions at that time. The local elite and the VP officials were more influential during the implementation of the intervention. Nevertheless, the other users were also active in the implementation through their involvement during the construction. This indicates that the users were aware of their role in accomplishing the quality work. Further, their involvement was instrumental in making government officials more accountable.

The allocation of the irrigation water to different branch canals is dictated by the technical design. Thus, there is less flexibility in changing the allocation through the organisational control. This indicates that the technical aspect was given more importance during the design than to its organisational aspect. Nevertheless the elaborate procedures developed by the WUS for the management of irrigation tasks shows its commitment towards the successful operation of the scheme through appropriate organisational control. The allocation and distribution of irrigation water for the planting season to different branch canals was a step towards minimising the likely disputes, which used to occur between users and *Dhalpa* before the WUS was formed. This was possible due to the flexibility in water control technology. This was crucial for obtaining the support of all the farmers. In this respect the *Dhalpa* is an important link between the WUS and the farmers because of his role in implementation of the decisions. The informal arrangement for field to field irrigation developed by the farmers for water distribution is noteworthy as it has contained the likely conflict that could have occurred due to the lack of field channels.

The irrigation system is seen by the farmers as government property and therefore they expect adequate and timely water supply. But they are not willing to contribute cash and labour for the maintenance of the major structure since it was a complete new technology not known by the farmers until now. Remarkably, the farmers were willing to contribute to the construction of a sub-branch canal in branch canal 2 to get water supplies to the unirrigated land. The constraint in mobilising the internal resources for other maintenance activities is because the benefit distribution to all the

farmers is not equitable. For example, the benefit derived by the farmer near to the branch canal and the one receiving field to field irrigation and through rotation is not the same.

Nevertheless, the WUS was successful in maintaining the loop with the DOI in obtaining the resources for maintenance. At the same time the saving of money could be taken as the tacit acceptance of the future maintenance responsibility by the WUS. Regardless of its involvement in operation and maintenance, the maintenance of the covered canal and part of the main canal is difficult if not impossible for the WUS. The prioritisation of maintenance work reflects the realisation by WUS of its limitation in undertaking maintenance activities. In essence, the focus is on immediate maintenance so as to make canals operational.

Due to the new technology the farmers cannot do all the maintenance with local labour only. For this they would have to hire a local contractor, which requires considerable amounts of cash. The expected gain from the irrigation system is so low as indicated by the PBME report that the farmers are not able to pay for its complete maintenance. As the increase in income of the farmers has not materialised as expected, it is questionable whether all the resources required for the future maintenance could be mobilised from the farmers. This means either the irrigation system should be fully maintained by the government or the farmers should raise money through water taxes as much as they can afford and government should provide the remaining balance for the upkeep of the irrigation system. Given the type of work required for maintenance, it seems more logical that all the farmers contribute in cash on a regular basis to create the maintenance fund and the WUS should implement the work through the contractor.

The effort by the government to form a WUO at the end of the project reflects the government concern towards the sustainability of the project. However, the WUO did not produce the desired result. This is largely due to the two reasons. Firstly, the DOI had employed the *Dhalpas* for the operation of the irrigation system, besides, providing annual budget for the maintenance. As a result farmers were not interested in WUO. Secondly the WUO, which was dominated by the elected officials, could not involve the users in the decision making due to lack of proper communication. This indicates that the representation of actual users is an important factor for the sustainability of the institution.

The formation of the WUS by the farmers from *Annapurna Kulo* in 1992 reflects their effort towards developing a governance structure for irrigation independent of other institutions and activities. Moreover it suggests that the development of an institution is a process which could be initiated by the people themselves who have a common interest in the preservation of irrigation systems. The gradual disengagement of DOI, as evident from the reduction in annual budgetary allocation, was a push factor for the formation of the WUS.

One of the important implications of the intervention is the change in the access of the water users. Thus the access of the farmers at the tail end is not the same as the farmers at head reach. Firstly, the changes were brought by the government investment, which increased the command area along with the number of farmers, as reflected by the farmers who have converted *Bari* land to *Khet* land. Theoretically, the

farmers at the head and middle should have easy access to the water. But the farmers at the middle of the command area who depend on field to field irrigation lack easy access to irrigation water due to the low density of field channels. Finally, the farmers at the tail end of branch canal 2 have been able to increase their access to water. They established their right through investment by constructing a sub-branch canal through partial contribution of their own resources. This implies that there is flexibility in including new users as long as they are willing to invest. However, the technology and the supply are affecting the access to irrigation water to some of the users. As a result some have unrestricted access where as other receive irrigation water through rotation. This was due to the technical design of the project and partly due to non-cooperation between the farmers. This shows that the linking loop formed by the users during the intervention became weak afterwards due to changes in the power relation between the users.

The technology transformation was more prominent in the intervention, which contributed towards changes in the social and organisational aspect of the irrigation systems. The intervention brought substantial change in the various aspects of the control. The changes in the physical infrastructure of the irrigation system through new technology brought in new administrative control by the DOI. However, the administrative control of the DOI is declining as evidenced by the reduction of the *Dhalpas.* This in effect led the users to initiate new organisational control. This shows the formation of a new linking loop between the DOI and the users as there has been a change in the objectives of these actors in relation to the irrigation management. Thus, the contacts between the users and the DOI will not be that intensive as they were in the past. However, the links between the users will be intensive due to the collective action for the operation and maintenance of the irrigation system. The social and political control is consistent with organisational control but not sufficient to ensure full technical control (it could not get all canals laid in as hoped).

Timesheet - Annapurna Irrigation System

Stakeholders / Time	Farmers	WUS	VP/ VDC	Dhalpa	DOI/WRID/DIO	Contractor	Remarks
1967	Initiated the construction of the irrigation system		Initiated the construction of the irrigation system				
1968					Provided NRs. 15,000 for the construction of the canal		
1976	Requested the VP for the construction of the irrigation system		VP requested the government for financial and technical assistance		Provided NRs. 245,000 for the construction		
1983	Forced some changes in the official design during the discussion with government officials				Awarded the contract for NRs 10.41million for the construction under HIP (Asian Development Bank fund)	Started construction of the irrigation system	

1986	Complained that the structures are incomplete as per the design				WRID certified the completion of the work	Completed the construction of the irrigation system	
1986	Co-operated with the Dhalpa for the operation of the system			Started operating the system	Took over the management of the system. Operating the canal through the four Dhalpas. Besides, spends for canal maintenance.		
1992	Formed an WUS, which is officially registered.	Came into existence and is maintaining close contact with the DIO		Functioning	Continuing to manage the system and provides funds for annual maintenance		
1994-1995	All the farmers have not become the member of WUS	Developed an elaborate plan for the allocation and distribution of irrigation water. Besides, it also negotiated with the DIO to provide the maintenance fund through it. It		Functioning	Continuing to manage the system. Provides annual maintenance fund to the WUS.		

		is carrying out maintenance work through the farmers.					
1996	Farmers are co-operating with the WUS for the management of the irrigation system	Continuing its function. Besides, it constructed 1400 meter of sub branch canal in branch canal 2 and 90 meters of field channel.			Continuing its earlier function however, it reduced the annual maintenance fund		
1997-1998	Becoming interested in the work of WUS. Co-operating WUS for the collection of users' list. However, reluctant to contribute cash	Preparing the list of users for raising annual contribution from the them		Only one person is working in contrast to the four working until last year.	Reduced the number of *Dhalpa* to one. It is continuing annual financial support to the WUS		

Notes

1 VDC is an elected representative body consisting of 11 members. The VDC has nine wards which elect one representative to the VDC and the other two members are the VDC chairperson and vice-chairperson.
2 A local functionary who collected land taxes only on the *Khet* and oversaw the management of irrigation system.
3 A local functionary who collected taxes only on *Bari* land.
4 A government employee who operates the irrigation system.
5 The purpose of my first visit to the village was to have first hand knowledge of the system and to understand the dynamics of irrigation management along with the existing status of the main canal. It was in the afternoon when the researcher arrived in the village. With the help of a local resident who was a high school graduate the researcher made a walk-through of the irrigation system. On the way I was inquiring about the prevailing practices of irrigation management. He was satisfied with the existing arrangement. He asked me to see village elders to know about the past management practices. He helped me in finding a place to live and eat. In the evening while I was having tea in a local tea shop, the villagers were inquiring about the purpose of my visit. Most of them asked if the researcher was a government officer from Department of Irrigation and the researcher explained the reason of his visit. That was a good opportunity to interact with farmers having different status and it was observed that they were enthusiastic in narrating what they knew about the irrigation systems. Interestingly, all asked me to see the Village Development Committee (VDC) Chairperson since the VDC was responsible for managing the irrigation system at present. The discussion also gave an opportunity to identify and collect the information about knowledgeable persons who could share information on the management practices over a period of time. I left the village after some time with a promise to come back again for an extended period. The second time I visited the village was for an extended period for a fully fledged study.
6 There was some variation in the information published by the Cadastral Survey office, Kaski. The information shows that 501 ha is *Khet*, 284 ha is *Pakho/Bari*, 626 ha is *Minaha*-is the land covered by forest, foot trails, river and other public land. 185 ha is still to be registered with the office. *Khet* is irrigated land suitable for rice cultivation. *Pakho/Bari* is the upland, which is not suitable for irrigated agriculture.
7 The local varieties are *Pahele, Jadhan* and *Gurdi* whereas the improved varieties are *Khumal 4, Khumal* 9 and *Radha 7*.
8 The research centre was established with the assistance from the British Government to support government of Nepal in agricultural research and extension.
9 It is a national level programme directed towards the small and marginal farmers. The primary objective of the project is to increase farmers' access to the institutional credit through the group and to encourage them to undertake activities directly benefiting them.

10 The scheme *Annapurna Kulo* is presented as a separate case in part III.
11 The figure is based on the list prepared by the VDC, which was submitted to the District Irrigation Office (DIO), Kaski for the purpose of intervention in irrigation system. The VDC secretary admits that there could be some cases of under reporting as the farmers will have to contribute to the rehabilitation according to the size of their land holding.
12 The existence of large number of *Mukhiyas* was for facilitating the collection of land taxes, since they had to cover larger areas.

13 Some villagers opined that the *Ditthawal* ceased to function after 1977 only when the cadastral survey was carried out in the district and the villagers started to pay the land taxes to the Land Revenue Office. Thus, he continued to work until then beside the VP.
14 The Birta system was abolished in 1959 through the Birta Abolition Act. With the abolition of the Birta the ownership of the land was vested in the government (Regmi, 1978: 27). However, Birta abolition was not a land reform measure and the Birta holders were allowed to retain the land, but they had to pay land taxes (Regmi 1978:361), which was not required before the Act. In this context, it seems natural for the Ditthawal to claim the ownership of the land as he was entitled to the proceeds from it for a long time (see next page).
15 The *Guthi* is a trust for the maintenance of public property like irrigation canals and temples. See Regmi (ibid) for the details of *Guthi* system in Nepal.
16 The study might have been conducted before the restoration of the multi party system in 1990, but the report was published in 1992.
17 At present each of the wards have five members including a woman since the amendment in local election by-laws in 1997.
18 People still call it *Jhara*, which in the past was compulsory labour contribution as demanded by the state. In Nepal three forms of compulsory labour - *Jhara*, *Beth* and *Begari* existed in the past. The labour was used for the public works such as maintenance of roads and bridges, reclamation of waste land and maintenance of irrigation canals. *Jhara* meant requisition of labourers from each family in the village for a certain number of days for public works. *Beth* meant the exaction of unpaid labour on a customary basis, while *Begari* denoted the requisition of casual labourers for emergency requirements (Regmi, 1978:504).
19 If the scheme is not feasible for rehabilitation the DIO returns the deposit money to the farmers. The cash deposit is also returned to the farmers after the completion of the construction.
20 The first UC was formed during the detailed survey in 1994 under the chairmanship of the then VDC chairman. That committee was dissolved after the VDC election in 1997.
21 During a visit to a village at the tail end these people were not around. Later on I met one of them in the main bazaar and we had a brief chat. He already knew the purpose of my visit from others. He happened to be one of the persons referred to by the farmers at the head also and he was the local leader of one of the political parties. In the VDC election in 1997 he became the chairperson of the VDC. Some farmers from the head and middle were also present. I informed them on the purpose of my visit.

After listening to me he smiled looking towards the farmers from the head and middle "may be you already got the answer from these people. everything is all right. What else do the farmers from the tail end have to say. We are surviving at their mercy." The reaction from the farmers of the head and the middle was only a 'smile.' I asked for the right time to see the farmers at the tail end. It was around 6:0 p.m. in the evening. He said 'Namaste'(Nepalese word for greeting) and he left for his village after we decided to see each other the following morning.

The following morning I went to their village. I saw him going to a nearby tea shop with four fellow farmers. In the village usually it is the practice that for morning tea they go to the teashop. During this morning meeting the discussion among the villagers covers a wide range of topics, from national politics to the important events in the village that sometimes include very personal matters. He proposed to have the discussion in the tea shop with a cup of tea. After a brief introduction with other fellow farmers and having briefed them about my visit the discussion started. I asked them to tell me about the past and present

management practices of the irrigation system. The discussion was unstructured. There was truth in what the tail ender said. The researcher during the field visit observed the blockages at the middle reach of the irrigation system, which caused excess water flowing to the river.

22 While the discussion was continuing two people in the group were slowly talking to each other in low voice. They were saying "we have been deprived of our rights by our kin." Some of the people at the head and middle parts had kinship relations with the people at the tail end. It showed their dissatisfaction towards the people at the head and the middle reaches but they did not like to criticize them openly. At present the behaviour of the people at the head and the middle reaches is considered normal and there is no basis to challenge it because a rule for allocating water does not exist. In my opinion the explanation for their present behaviour is that recently, they had good monsoons. Therefore the need for water from the canal is not great as it was during the bad monsoon in earlier years.

23 According to the estimate of the farmer the depth of the canal was 2.2 metre but now it is only 1 metre.

24 Shivakoti (1992: 16) reported that the total cost of rehabilitation by DIHM was NRs. 680/ha. This means the rehabilitation cost becomes NRs. 204,000 for 300 ha. He reported that there was no farmers' contribution. However, the farmers said DIHM provided only NRs. 61,000 and farmers made a contribution in labour. The figure mentioned by the farmers seems to be accurate because that is a good amount of money and it had more value in 1961.

25 He is a messenger paid by the VDC and the farmers for his services. He communicates the VDC instructions by announcing them in a loud voice in main places in the village so that every one will know this.

26 The information was obtained from the hill irrigation status report published by Western Region Irrigation Directorate in 1986 and water management sythesis report of University of Colorado. The actual irrigated area was obtained through farmers

27 The *Dhalpas* were operating the canal since DOI completed the construction.

28 Officially known as Water Users Society (WUS). Here after it will be called WUS.

29 The DOI report is not consistent in its presentation. In the turn over report there are 585 users households. The Regional Irrigation Directorate (1990: 5) estimated the total users at 620 households. The total number of households as reported by Shivakoti is 545 households. The figure provided by the Water Users Society is also an estimate, as it is compiling the complete list of the farmers. However, there is not much variation. The increase in number of users could be attributed to the changes in the ownership pattern over a period of time due to the law of inheritance. In this respect the figure provided by the UC is more appropriate in the present context, as it has extended the branch canals to serve more area which have added new users.

30 Personal communication from Dr. Prachanda Pradhan

31 The PBME report also included assessment of five other irrigation systems implemented under the Hill Irrigation Project.

32 AMIS is under the management of DOI. The position of *Dhalpa* began immediately after the commissioning of the irrigation system. The *Dhalpa* is a DOI employee working under the supervision of DIO. The *Annapurna Kulo* was a new construction and its management was under DOI. Thus, the *Dhalpas* were employed to operate the canals.

33 I met only one farmer who said that he did not receive the compensation. He had land adjacent to the main canal near branch 3 and he also complained that he received irrigation water only for planting.

34 The contractor is from Nuwakot, the adjacent district to Kathmandu. It is likely that he brought workers from his district.
35 The evaluation report and DIO report used the terminology WUA and FIA respectively to denote the farmers user group. Officially the farmers group was registered as a Water Users Society (WUS).
36 He was the only person who could confidently give the figure. Others said about the shortcomings but could not give the figure.
37 The general condition and the format for the registration of the UC can be obtained from the District Administration Office. Accordingly, the users prepare the constitution in conformity with the objective for which the UC or society is formed. In this case the VDC vice chairman with the help from one of the persons in the village who is a legal practitioner drafted the constitution for the WUS.
38 The WUS at present does not have a list of the farmers' names and their land holding. The process was initiated to raise membership charge to all the farmers and to provide membership certificates. The names and landholding of 350 farmers have been collected so far. The work is not going on satisfactorily as farmers reduced their landholding in their reporting. This is because, the farmers suspect that the preparation is for the collection of water taxes on the basis of land holding.
39 The control structure has a threaded spindle gate. One full rotation of the wheel raises/lowers the gate by a certain height. Thus, the gap between each thread is used as an estimate to release the water. In local term the gap between each thread is called *Churi*
40 Gabion structure is constructed to divert water to the canal.

5. Ghachowk irrigation system

5.1 Introduction

This irrigation system is one of the oldest irrigation systems managed by the farmers. This system was considered ideal for the study as it provided an opportunity to look into the management practices, which evolved over a period of time. It made possible to compare traditional and state-introduced management practices, which were institutionalised for a given period of time, until replaced by others. Each of the institutionalised practices had its own characteristics in maintaining the continuity of the management of the system. Further, the system was included in the first phase of intervention by the government in 1990, under the Irrigation Line of Credit (ILC) pilot project of the World Bank. The objectives (World Bank, 1990) of the project were to:

- Establish a "sub-sector Programme" approach for future investment in the small irrigation schemes.
- Apply the "demand driven" approach in the selection and implementation of the project.
- Increase the farmers' participation to cover full operation and maintenance and share of the capital cost.

The intervention included the rehabilitation of the scheme for improving the irrigation structures.

The system was selected out of the list of irrigation systems supported by the government under the ILC programme in the Western Development Region of the Country. The first visit to the site was made before the initiation of the field study in order to get acquainted with the system and to get the opinion of the villagers on the proposed study. The information for the study was gathered by using a checklist that was followed by the focus group discussions and information from the key informants. The past and present VDC officials, the User's Committee (UC) officials, the farmers from different reaches of the irrigation system were interviewed. Also the engineers from the District Irrigation Office (DIO) and the contractor provided information. The information gathered from the field was supplemented by the information from official records and other studies.

5.2 The environment of the system and context of the intervention

5.2.1 The general environment

The village

The village lies in the hill region of the country. According to the villagers, the settlement in the village started before the unification of the country in 1769. The forefathers of one of the present inhabitants of the village, who was from the

Brahmin caste received the land, which is known as *Birta*, by pleasing the then rulers. The village is a two hours climb to the North of the Pokhara - Baglung highway, which is at a distance of 10 km. from Regional Headquarters of the Region.

The VDC area is 1070 metres asl and lies at 83° 59′ longitude and 28° 16′ latitude. The mean annual temperature in the area is 20.8° Celsius and the annual rainfall is 3849 mm. The moisture regime in the area is humid. The topography of the area is gently sloping and the village is stretched from north to south. The settlement pattern is clustered in 20 small hamlets having their own name. The total area administered by the Village Development Committee (VDC) is 2079 hectares[1]. The land use pattern in the VDC area is as presented in table 5.1.

Table 5. 1: The land use distribution in the VDC area

Types of land	Area (hectare)
Khet	255.0
Pakho/Bari	268.0
Minaha	1496.0
Total	2079.0

Source: Cadastral Survey Office, Kaski

The table indicates that the cultivable land in the VDC area is limited, but the potential for irrigation development is high. It is likely that the area irrigated by the spring source is registered as *Pakho/Bari*. Thus, the *khet* land should be higher than reported. However, year round irrigation is not available in the village.

Population and ethnicity

There are 439 households in the village with a total population of 2710. The wardwise distribution of the household with ethnicity is presented in table 5.2.

The average family size of the households is 6.17, which is slightly higher than the national average of 5.6 (Central Bureau of Statistics, 1998: 5). The male population (1418) is slightly higher than the female population (1292). The ethnic composition of the village is mixed. The Brahmins are in the majority (50 percent) followed by the Sarki (cobbler) (25 percent), Chhetris (15 percent) and others (10 percent).

Table 5. 2: The wardwise distribution of households and population with ethnicity

Ward no.	Households no.	Population	Male	Female	Major ethnic[a] groups
1	53	347	198	149	Brahmin, Chhetri
2	34	213	115	98	Brahmin, Chhetri, Magar
3	55	292	153	139	Brahmin, Magar
4	37	264	131	133	Brahmin, Magar, Newar
5	51	317	157	160	Brahmin, Chhetri, Magar, Damai
6	72	373	197	176	Sarki, Chhetri, Brahmin
7	23	207	112	95	Sarki, Chhetri, Brahmin
8	78	444	226	218	Sarki, Chhetri, Gurung
9	36	253	129	124	Gurung, Magar
Total	439	2710	1418	1292	

Source: District Development Committee, Kaski (1995:99); and information obtained from the VDC.

Occupation

Agriculture is the main occupation of the people in the village according to the VDC information. Nearly 288 households are not food sufficient from agriculture according to the VDC estimate. The majority of the population is engaged in agriculture. However, 27 percent of the population has additional sources of income. Income from other sources include petty shops, government service, wage earning, remittances and pensions. The information of income from other sources is presented in the following table.

Table 5. 3: Household income from other sources

Categories	Percent of total household
1. Service	5.0
2. Wage earning	10.0
3. Pension and remittances	10.0
4. Business	2.0

Source: VDC records, 1998

Some upper caste people are in government service, which is mainly teaching in the local school. A few of them are working in the government offices in the nearby town. Both the skilled and unskilled labourers earn income through wages. The skilled labour includes carpentry, blacksmithing, stone masonry and tailoring. The unskilled workers are working as wage labourer during the agricultural season and a few of them are working in nearby towns.

Land holding and land tenure

Most of the farmers are owner cultivators and households use hired labour if there are no able members. There is no legal tenancy in the village and share cropping is also not common. In share cropping the owner provides the land and the tenant provides the labour, seed and the fertiliser. The product sharing is on a fifty-fifty basis. The share cropping is a contractual agreement between the two parties and it is usually for one season. Share cropping is rather rare also due to the small-holdings owned by the majority of the farmers. For the big owners it is more profitable to employ wage labourers than to provide land for share cropping because the land is productive. The prevailing agricultural daily wage rate in the village is NRs. 35-40 with a meal.

Putting land as collateral for taking a loan is prevalent in the area. This is a contractual arrangement between the farmers for some period of time. Interest in cash is not paid on the collateral land instead the earnings from the land is the interest.

The upper castes hold a large portion of the irrigated land. Most of the lands within the command area belong to the Brahmins and Gurungs. The maximum holding is 20 ropani and the minimum is 1 ropani. However, some occupational caste farmers also have small pieces of land in the irrigated area, but this income from agriculture is not sufficient to support their family. There are only three landless families, out of which one is headed by a woman.

The farming system and the principal crops

The main crops grown in the area are paddy, wheat, maize and some potatoes. The main crop receiving irrigation water is paddy. There is a rice crop only during monsoon (June-October) because irrigation water is not available for planting early rice (February-May)[2]. Farmers plant both traditional and improved varieties of rice and wheat. The cropping pattern in the *Khet* is rice-wheat-fallow, and rice-fallow-maize. The cropping pattern for the *Bari* land is maize-millet- fallow. The cropping intensity was 175 percent at the time of this study. The production of improved variety of rice was 2.5 mt/ha whereas for wheat it was 1.8 mt/ha Vegetable cultivation is only for household consumption. The use of chemical fertilisers is limited to the wheat crop only. Livestock manure and the slurry from biogas is used as fertilisers.

Livestock raising for milk is common among the households. Livestock farming on a commercial basis is not practised due to the distance from the market. However, some of the households are raising improved cattle. A few households are selling 30-40 litre of milk to the government owned Dairy Development Corporation, since 1996. The porters transport the milk to the motorable road daily. The milk selling is not profitable to them according to villagers. They are selling it, because the milk production is in excess to their household consumption.

It is interesting that the farmers do not work in the field on the day of the full moon and the dark moon and also on the days regarded as inauspicious according to the Nepalese calendar. If there is no rain in time, usually during late June the practice is to sacrifice a goat at the source of a canal. One of the ethnic groups namely Gurungs do not do any work on the day when there is a hailstorm, believing that it

will prevent another hailstorm. Also, farmers do not work at the field during the Hindu and Buddhist festival days following their religion.

Migration

Temporary migration for employment to India and foreign countries is prevalent in the village as evidenced by the pensions and remittances. Some of the households have their members working in the Indian and British army. Seasonal migration to India and other towns of Nepal to work as wage labourer is found among the lower caste group. There is no in-migration and out-migration in recent years. However, nearly 50 households of Gurung and Magar families in-migrated from other districts 10-15 years before and have settled in the VDC.

Physical facilities

The District Development Committee (DDC) has been constructing a motorable road to another adjacent VDC. This has facilitated the accessibility to the VDC as the distance to the motorable road is now reduced. The villagers believe that the economic activity in the village would increase once public transportation is introduced on the road. This may encourage the people for vegetable production, as the transportation to the nearby town-Pokhara becomes easier according to the VDC chairman. The villagers believe that the completion of the road will also bring down the prices of the consumable goods brought from Pokhara.

The VDC has 23 drinking water taps. However, some women in the village reported that there was shortage of drinking water as more water was diverted for irrigation. This is because the same source is being used both for irrigation and drinking water. Six wards (ward no. 4-9) receive their drinking water facility from the source of irrigation water. Villagers agree that the supply is not sufficient to these wards. On the other hand, it was observed that many tapstands were flowing for 24 hours in ward no. 1-3. As a result there has been a tremendous wastage of drinking water.

There are two Primary Schools and one Secondary School in the VDC. Twenty four percent of the total population are going to the school. The VDC estimates that 90 percent of the children of school going age are attending school. However, only the students from higher economic groups complete the high school education.

The village has an agriculture and livestock sub-centre but it is not functioning due to lack of government budget and staff. The agricultural services to the farmers from the sub-centre are minimal. The Agricultural Development Bank/Nepal (ADB/N) is providing credit on a group basis to the small farmers through its Small Farmers Development Project Office.

The village has one sub-health post, which provides primary health care. However, for major treatments, the villagers have to go to Pokhara. The VDC has also one Post Office. In September 1997 the people from ward 1 and 2 received electricity through the financial assistance of Annapurna Conservation Area Project (ACAP)[3], and some contributions were raised from among the villagers. The people from this ward had to contribute in cash for the installation of the electricity. For this, they negotiated with the VDC to provide RS. 700,000 out of its development fund.

Because of this , they would not receive any further assistance for other development works for the coming two years according to the VDC secretary.

Existing social relationship

The people in the village are satisfied with the relationship among the various caste groups owing to the interdependence in a small village society. The relationship between the people in the village can be classified into social relations, economic relations and political relations. In the social relationship ethnicity and kinship is the strongest one. The different ethnic groups are settled in clusters. This settlement pattern is indicative of the existing social and economic relationship among the ethnic groups, which is based on close co-operation. The immediate help in any social event and economic matters comes from the family members, although the nuclear family is replacing the traditional extended family. At the same time the co-operation among various ethnic groups in any social event is the speciality of the village life.

The caste system is still prevalent, although abolished by the *Muluki Ain*. It was evident from the separate places assigned for the higher caste and the lower caste people in a local tea shop. The lower castes have to wash the dishes from which they eat or drink whereas upper caste does not have to do this. Nevertheless, the lower caste can also have tea at the local shop.

The economic relationship among various caste groups is based on the exchange of goods and services and borrowing money for social events and for economic activities. This type of relation is more prevalent between the rich and the poor than among the people of the same economic status. For example, all the households provide food grain on yearly basis to the tailor master and blacksmith[4]. In return, they provide the tailoring services and make agricultural implements for the households throughout the year. The dependence of an occupational caste group on a higher caste group is quite substantial in terms of financial matters. This economic interdependence is helping to maintain close ties among the various caste groups.

Labour exchange during the time of planting and harvesting is practised among people from different ethnic groups. Snacks are provided to those who provide labour on exchange. But due to prevalence of the caste system, the upper caste people do not accept food from the lower caste household. In that case, food is provided from the household from which it is acceptable to them.

Political relationships are becoming more active after the restoration of the multi-party democracy in 1990. The people in the VDC seem to be more active in the politics simply because there are no other activities in which to be engaged. The political relationship becomes more open during the local election, which is contested on party ideology. The educated and the recognised party workers are more active in local politics. The general mass however, bases their selection of the candidate on the merit basis and kinship relation. However, ethnicity and kinship relation is more dominant. The representation in the VDC is an indication of the dominance of a particular ethnic group. The elected persons are from the high socio-economic strata. The representatives in the VDC at present, are 7 Brahmins, 1 occupational caste, one Chhetri, one Gurung and one Newar. The large number of occupational caste groups has only one representative in the VDC. Consequently,

they do not have a major say in the implementation of the development programmes. However people believe that the differences in the political ideology have not affected the social and economic relationships between the communities. Yet, in some cases the individual relations between the people are affected by the political faith. The political factor prevails also during the allocation of the VDC budgets for development programmes[5].

On-going development activities in the VDC area

The VDC is implementing other development projects through the development grant from the DDC and also through its own resources. The selection and investment in the projects (VDC, 1997) suggests that the priority is for implementing infrastructure projects. These include construction of village roads, construction of sub-health post buildings, VDC building, electricity extension in wards 1 and 2 and maintenance of the irrigation canal. These projects are implemented through the Users' Committee (UC) formed by the VDC. The VDC provides partial expenses and the Users' will have to bear partial costs. These small-scale projects are executed on a wage basis. The contribution from the users is only for trail construction, which ranges from 15 percent to 25 percent. The users' contribution is usually in the form of labour.

5.3 The environment of the irrigation system

5.3.1 The irrigation system

This is a slope off-take irrigation system, and it is one of the oldest systems in Kaski district, in western Nepal. The villagers cannot say exactly when the irrigation system was constructed. But they are of the opinion, that the system was constructed before the unification of Nepal. The main source of water is *Lasti Khola*, which is spring fed. The command area expands from north to the south with a gentle slope. The water from this source is also used by the another irrigation system (*Lahachowk)* which is nearly 500 m downstream of this irrigation system.

The physical system consists of three levels of canals. The main canal, which is known as *Mul Kulo*, is 1.7 km in length where it crosses a natural drainage via an aqueduct (see figure 5.1). It is a contour canal and irrigates only its southern side. The intake consists of a sluice gate to regulate the flow in the main canal. The design discharge of the main canal is 1.25 m^3/s. The bed slope of the canal is approximately 1:200. The whole length of the main canal is lined. Besides, there are three foot bridges on the main canal.

There are five branch canals. The length of each branch canal is approximately 500 metres, except branch canal - 5. Some parts of these canals are lined. No gated regulators are provided at the off-takes of the branch canals. The flows in the branch canals are adjusted on an ad hoc basis with the help of stone and mud, which is called *ad hoc* adjustment (Parajuli, 1999:38). In this practice the individual farmers are not allowed to adjust the flow or else the dispute may arise. Thus someone is assigned to oversee the adjustment of the flow. Basically, this practice is

institutionalised. In this case the *Pales* are employed to adjust the flow in the canal and to the terraces. There are several field channels to provide irrigation water to the terraces. Field channels irrigate the individual plots. The existing field channels are not adequate in length and in number as exemplified by the practice of field to field irrigation. However, some outlets come directly from the main canal and the branch canals. The area irrigated by each of the branch canals is mentioned in the following table.

Table 5. 4: The branch canals and irrigated areas (ha)

S. N.	Branch Canal	Command Area (hectare)	No. of Users
1	Branch Canal - 1	6.0	50
2	Branch Canal – 2	27.0	90
3	Branch Canal – 3	18.0	72
4	Branch Canal – 4	4.5	29
5	Branch Canal – 5	4.5	25
Total		60.0	266

Source: VDC land record in the command area.

The table indicates that there is variation in the size of holding across the branch canals. However, the distribution of irrigation water is proportionate to the size of holding in the irrigated area. The farmers receive irrigation water on a rotation basis. Thus, the farmers do not have access to the fixed proportion of water on a continual basis. Rather the amounts of water to individual plots are determined by the availability of irrigation water in the main canal.

5.3.2 The distribution of irrigated land by ethnicity

The command area is 60 hectares. There are 266 users in the command area at present. However, 70 users have more than one parcel of land. In this respect, the average size of holding per household is 0.22 ha. The information prepared by the UC secretary after the approval of the project showed that the total number of users at the time of intervention were 220. This means there has been an increase of 46 users after the intervention. The increase in the number of users over a period of time was due to the fragmentation of holdings among the brothers on account of the inheritance law. The distribution of irrigated land among various ethnic groups is presented in table 5.5.

Table 5. 5: The distribution of size of holding by ethnic group

		Ethnic group (numbers)					
S.no	Size of holding (hectare)	Brahmin	Chhetri	Newar	Gurung, Magar and other castes	Occupational castes	Total
1	<0.25	36 (21.0)	26 (15.2)	6 (3.5)	73 (42.6)	30 (17.5)	171 (64.2)
2	0.3-0.5	35 (47.9)	5 (6.8)	2 (2.7)	28 (38.3)	3 (4.1)	73 (27.4)
3	0.55-1.0	9 (45.0)	3 (15.0)	1 (5.0)	7 (35.0)	-	20 (7.5)
4	>1.0	-	1 (50.0)	-	1 (50.0)	-	2 (0.75)
	Total	80 (30.0)	35 (13.1)	9 (3.3)	109 (40.9)	33 (12.4)	266 (100)

Source: VDC record, 1998. The figures in the parentheses are percentages.

The above table indicates that the majority of the Gurung and Brahmin households have land in the command area. Previously, all the land in the command area belonged to the Brahmins. In terms of users, the Gurungs are in the majority at present. The Gurungs bought the lands from the Brahmins[6]. However, the majority of the Brahmin households have larger holdings as compared to other castes In terms of distribution of the land, the Gurungs have land in the head reaches of the irrigation system. The Brahmins have land at the head reaches and also at the middle and tail end. Nevertheless, one clan group from the Brahmin ethnic group, who was the early settler are most dominant in the local politics and other decision making in the village. The Gurungs feel that the Brahmins also dominate the decision related to the irrigation management. This was one of the reasons for the disputes between these two groups with respect to the irrigation management. The occupational castes have less irrigated land as compared to their number of households in the VDC. This shows that their access to the productive assets is limited.

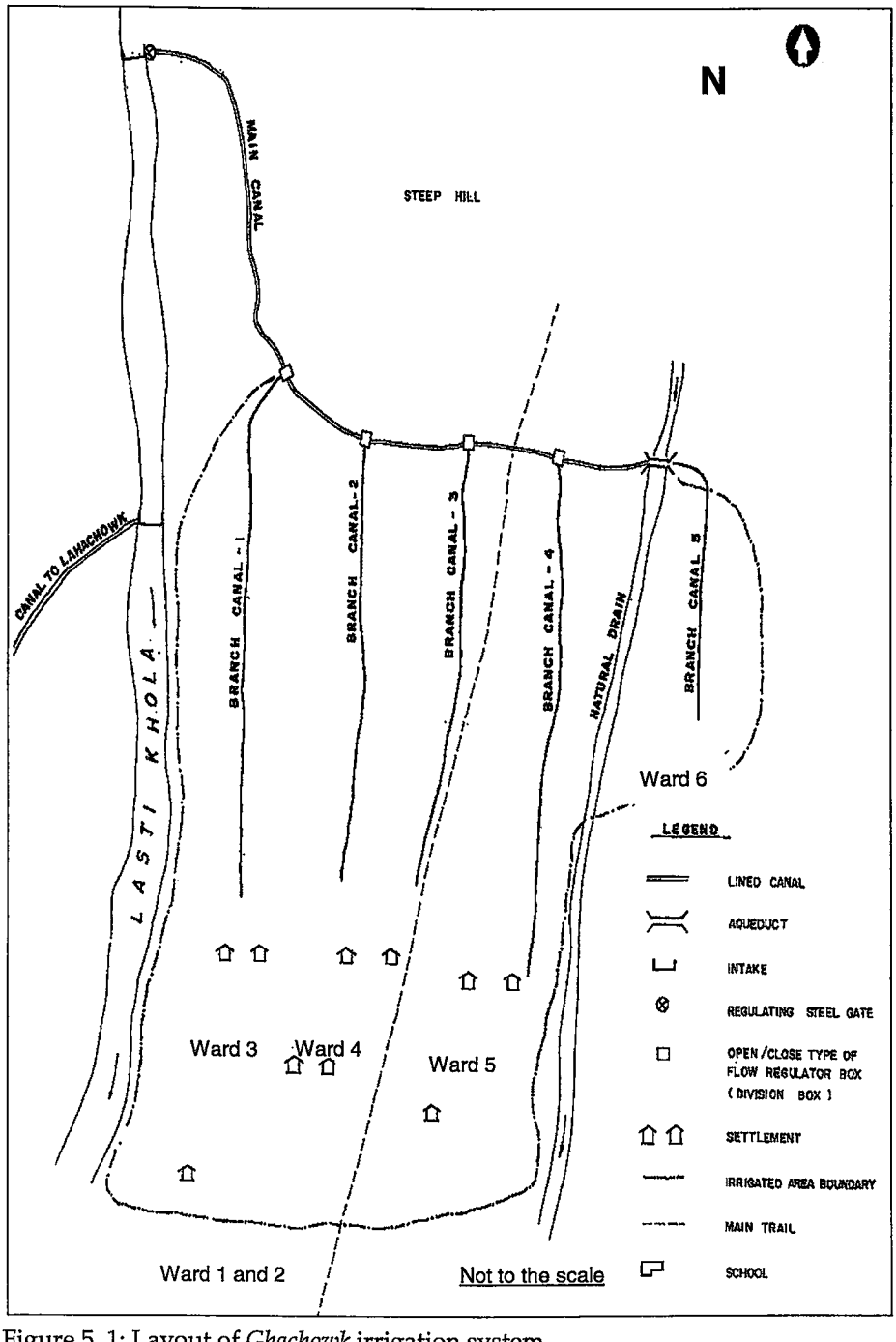


Figure 5. 1: Layout of *Ghachowk* irrigation system

5.4 Process of intervention and change

5.4.1 The traditional management system up to 1960

The management of the irrigation scheme in the past was under the *Jimmawal*[7] and *Mukhiya*. In the past demand for irrigation water was less according to the villagers. The cultivated land in the area was called *Trisale* and *Panchsale*. That meant each parcel of land was cultivated either in three years or in five years respectively. It was because, the demand for food was less because there were less people. The available irrigation water was sufficient at that time due to the small size of the area under cultivation. Besides, the people at that time used to keep large numbers of livestock for which more grazing land was necessary. This practice continued till 1960.

5.4.2 The management by the Village Panchayat (1960-1990)

The village Panchayat, which came into existence in 1960, took over the management of the irrigation system. The VP introduced a new system of management in 1976 by employing four *Pales*[8] (watchmen) co-ordinated by the *Kulo Samiti*[9] *of* VP to regulate the allocation and distribution of water to the farmers' fields on a rotation basis. The reason for the introduction of this system was to establish congruence between the irrigated land and the volume of water available in the canal. As stated earlier, some of the land, which were cultivated in 3 or 5 years were brought under cultivation. Thus, there was more demand for water. The farmers were not receiving irrigation water proportionate to their land holding in absence of any governing rule. Thus, the allocation rule was essential to resolve conflicts between farmers relating to water distribution to their respective fields. The allocation was based on the area each canal had to irrigate and the distribution was proportionate to the land holding after the introduction of the *Pales*. The *Pales* were responsible for water distribution to the fields as well. According to the *Pale* they were more effective when management was under the VP. This was because, people were afraid of the VP and *Pales* were given the authority to carry out sanctions such as cutting the bunds of terraces.

The *Pales* became less effective during the intervention by ILC in 1990 because the construction activities were disrupting the water rotation practices. Nevertheless, *Pales* were functional during this time also. The political change in the country during the same time had rendered the VP non-functional. The VP was dissolved and the VDC was not yet formed. This created a vacuum in the local leadership which should have carried out the work and enforced the sanctions. It was not possible for the *Pales* to do so without any institutional backing. They continued to work under the guidance of the Users Committee formed under ILC. During the time of intervention, the UC meeting divided the land into 4 sections and assigned each section to one *Pale*. Presumably, the institution of *Pale* would have been abandoned, if the UC had not been in existence to guide them[10].

5.4.3 The management by the Village Development Committee (VDC) since 1992-1997

The VDC replaced the VP after the general election under the new political system and continued the *Pale* system of management. Each year the VDC advertises the *Pale* positions. Anybody in the village can apply for this position. Usually, the person who does not have enough land of his own applies for the position. They command social respect as long as they maintain their integrity by being impartial in their job. Besides, the *pale* should be capable of arguing with the farmers who steal water and to report this to the VDC.

VDC in its selection gives priority to the person who possesses these qualities. Those interested for the posts discuss among themselves and only four candidates apply for the work. There is an understanding that two *Pales* apply representing 4 wards and the remaining two from other 5 wards as there are 9 wards in a VDC. The *Pales* mostly come from wards 3, 4, 5 and 6 since the command area of the irrigation lies in these wards.

The *Pale* system is fixed for duration of three months each year i.e. from mid July to mid September because from mid September the water at the source decreases and only the farmers at the head reaches receive water. The VDC forms a *Kulo samiti* of four members from among the farmers and one VDC representative to supervise the work of the *Pales* and to receive the complaints from the farmers with respect to water disputes.

One *Pale* has been continuing for the last 5 years. According to him he did not like to continue but the farmers requested him to continue because of his credibility. The reason behind his disliking of the job is that he had to quarrel with the farmers who are stealing water. Furthermore, he also had to argue at the time of collecting the wages.

In one of the decisions of the UC, the *Pales* were asked to work from 6.00 in the morning to 6.00 in the evening. There is a variation in the working hours of the *Pales*. The change in irrigation rotation for each field determines their presence in the field. That is, more water in the canal means an early change of the rotation. The *Pales* usually would have to work two to three hours three times a day. They have to give more time during the planting season because the farmers demand adequate water at this time. Their job becomes difficult if the monsoon is not good. In that case the water in the canal would not be adequate to meet the demand of all the farmers. However, it becomes easier for them from the beginning of September. The water level in the canal decreases and they no longer have to serve the farmers at the middle and tail reaches. They can work on other activities as long as they fulfil their duty of *Pale*. The job is a contractual agreement between the VDC and the *Pale*.

All the farmers except a few from the head reach, expressed their satisfaction with the work of the *Pale*. Further the decision for the continuation of the same *Pale* for another year is dependent on the recommendation of the farmers. *Pales* are aware of this and would not like to receive any complaint from the farmers. Sometimes, farmers complained that *Pale* did not check the water stealing. The *Pales* have been able to divide the water on a rotation basis depending on the volume of water in the

canal. The continuation of the *Pale* system without interruption for a long time indicates that the farmers do not have serious complaints against them.

5.5 The irrigation interventions since 1977-1997

5.5.1 First intervention by District Panchayat (DP)[11] in 1977

Flood damaged the main canal at the head in 1977. The VP requested the DP to restore the canal. The procedure followed was the submission of request in writing to the DP by VP at the request of the people. Upon submission of the request, the DP sought clarification from the VP. The VP chairman and the VP secretary provided necessary clarifications to the DP. When the DP president was convinced it provided NRs. 4,000 out of its development fund budget[12] through the Village Panchayat for repair work. The VP carried out the repair work through villagers. DP technicians were not involved in repair work, as the villagers were able to do the work on their own. This amount was spent on clearing the landslides, which had a damaging effect on the inlet of the main canal. Besides, culverts to divert rain water, between branch canals 2 and 3 were also constructed. The amount was spent on buying cement and paying wages to the skilled labourer and also to the unskilled workers who did stone crushing. The farmers provided labour for collection of stones, sand and clearing the debris deposited by the landslide. The VP supervised the work. The financial assistance sought from the DP reveals that farmers do not like to make cash contributions but only labour contributions. There had been no change in the command area as the major work was only to clear the debris and some repair works in the canal.

This shows that the formation of local linking loop became easier as it was an affair within local government. The DP, which received lump sum grant from the central government had major role to play in local development as provisioned under District Administration Plan (DAP). Thus it provided resources as a lumpsum grant to the VP to carry out repair work. The VDC, *Kulo Samiti, Pale* UC and users successfully implemented the intervention due to strong loop existing between them besides the social, political and organisational control excersised by these actors.

5.5.2 Second intervention of 1985

Again in 1985 the government provided NRs. 600,000 in cash for major rehabilitation works. The processes followed were that the VP made the decision to request for the fund from the government. All the VP members were present at the meeting. The decision was made keeping in view of the inability of the villagers to raise funds from among themselves. The VP requested in writing for the fund through the DP and received the money on the recommendation of the DP. The DP had to recommend to the government for the fund as the VP had to maintain the link with the central government through the DP. The VP members took the initiatives for the rehabilitation. The then VP chairman told that he had to make several trips to the district headquarters to get the funding approved. It took three months to get the

fund approved according to him. The government provided the money through the DP to the VP. In this respect the DP played an active role in maintaining the link between the users and the central government. The funding was approved before the design for rehabilitation. The DP was required to provide technical support for the rehabilitation, as the VP did not have its own technician. The Overseer[13] from the DP did the survey and design in two days once the funding was approved. This shows that decentralised planning process was not properly followed. The reason for this is that the DP did not like to send the overseer for survey without becoming sure that the fund will be available as it had limited technical manpower.

The VP called farmers meeting to form the Users Committee (UC), which was a precondition for receiving the money. This in fact was a construction committee because it was dissolved after the completion of the work. The Decentralisation Act of 1982 had the provision to form a committee for the implementation of projects by the VP and DP. The Act called such a committee Users' Committee (UC). But the UC should be permanent with a mandate to devise the working rules of its own and to maintain the system. The farmers nominated the members of the UC. There was consensus among the farmers as the members were nominated by maintaining the balance among the ethnic groups and the social respect they commanded. The meeting formed a UC consisting of 11 members. The main responsibilities of the UC were to mobilise the farmers' contribution and to inspect the contractor's work. The same meeting discussed the Overseer's report and accepted the work for rehabilitation. The UC prioritised the work for rehabilitation, keeping in view the available resources. The work started six months after the completion of the survey. The Overseer and the farmers agreed to the work for rehabilitation, according to the UC chairperson.

The tasks accomplished then were the widening and deepening of the main canal and the canal lining at the beginning of the main canal. Besides, stone paving in some portions of the main canal and one culvert, required to cross the canal, was constructed. The types of work selected suggest that farmers give priority to the main canal. Their focus was on controlling the leakage, which is essential for increasing the water delivery to the fields.

Initially, the UC decided to carry out the work on a wage basis. Due to the lack of skilled workers in the village the competency of the UC to execute the work was questioned by the DP and also by the villagers who were in favour of quality work. In the mean time, the 'would be' contractor, who was from the adjoining VP requested the UC for the work, since he had already received an assurance from the DP that he would get the work. According to a villager, no competitive bidding was called for the work. The contractor assured the UC on the quality of work. The DP played a decisive role in the selection of the contractor and implementation of the work. This shows how the political connection the contractor had with DP officials was important in establishing the linking loop to get the contract. Thus he was able to establish link both with the VP and DP officials.

The contractor received the contract from the DP on the condition that he would pay the cash contribution on behalf of the farmers. It seems that the farmers could negotiate with him, as they were familiar with him as he was from the adjacent village. This familiarity to some extent contributed in awarding the contract also. It

was a general tendency in the village that the farmers would not like to make cash contributions. Farmers' opinion was that since the government had provided the money, they should not be making any contribution in cash. This reflects the negotiation and compromise between the contractor and the users through which both tried to take advantage of the intervention. Thus, the interface between them shaped the implementation of the intervention.

They believe that the contractor should pay because he will be making a profit from the work. The farmers' understanding is that the cost estimate in the design is always too high. So, the contractor should share some of the profit with the farmers since, he got the job on the recommendation of the farmers. Some other reasons for not making cash contribution are that not all the farmers could pay in cash. Besides, there is a general feeling among the farmers that the cash should be kept for other activities like children's education, medicines and marriage. There was satisfaction among farmers as they did not have to make cash contributions.

To implement the project, skilled workers were brought from outside and unskilled workers were hired from within the village. It took six months to complete the work and there were no major constraints during the implementation. The Overseer from the DP did the evaluation of the contractor's work, which included quality checking of the materials and if the work was accomplished according to the design. The Overseer consulted with the villagers about the work and they were satisfied with the work according to the UC chairman. This was due to the fact that UC members supervised the work on rotation basis. They even checked the ratio of sand and cement, as told by one of the members of that UC. As he put it 'we were conscious of what happens if something went wrong. What will our children say if we do not supervise properly and we will be cursed for our deeds'. The contractor also must be aware for doing good work since the villagers knew him as he was from the adjacent village. This indicates that the acquaintance between the villagers and the contractor is an important factor, as it will put moral pressure on him. The Overseer certified the completion of work based on technical measurement, which was also agreed by the UC and the villagers. The DP engineer approved the work on the recommendation of the overseer. After that the contractor received the payment for his work. This UC was dissolved once the rehabilitation work was completed since the UC in the opinion of the farmers was formed only to supervise the implementation work. The linking loop for this intervention was effective, as the people involved were local.

5.5.3 Third intervention by the government under ILC programme

This was the major rehabilitation of the irrigation system by the government in 1991 under the financing from the World Bank, which is known as Irrigation Line of Credit (ILC). Various FMIS were supported for rehabilitation under this programme. The objectives were to raise agricultural production and farm incomes and increase food security; and increase farmers' participation to turn irrigation development into a demand driven process. This was sought by expanding area coverage and efficient use of irrigation water. Besides, the objective was also to improve the management efficiency of FMIS for sustained use of the irrigation scheme. This project emphasised

the participatory approach through the provision of farmers' involvement in planning, construction, operation and management of the irrigation system.

The ILC implementation procedures envisaged to follow the 'project cycle' approach comprising of:

- Reconnaissance and identification
- Preparation and feasibility study
- Farmer agreement
- Appraisal and approval
- Implementation, and development; and
- Commissioning

The direct participation of the farmers was envisaged in all phases of the project cycle except appraisal and approval. The overall implementation of the programme was entrusted to the WRID by DOI[14]. There was provision for appropriate institutional back up through the set up of the mobile team in WRID comprising of Divisional Engineer from WRID, the supervisor organiser from WRID and representatives from Regional Directorate of the DOA and ADB/N to oversee the implementation of the project. The inclusion of the representative from the DOA and the ADB/N was to ensure that necessary extension services and the credit would be extended to facilitate the irrigated agriculture. The DOA through its district offices were expected to intensify extension services in the areas where ILC projects were implemented. The mobile team was expected to provide technical support, guidance and training to the DIO staffs comprising one engineer, two overseers, one association organiser and some administrative personnel. The DIO staffs were entrusted to collection of basic data for rapid appraisal; preparation and implementation of minor rehabilitation. In terms of the role played by agencies it could be said that DIO in consultation with the farmers was mainly responsible for the identification to the commissioning of the project. However, the appraisal was the responsibility of the Regional Appraisal Committee (RAC). The Regional Director of the WRID chaired the committee. The other members of the committee were the Regional Directorate of the DOA and ADB/N. This committee was to scrutinise the field reports for the rehabilitation or new construction of the irrigation schemes and recommend for their approval to the Approval and Co-ordination Committee (ACC). The Secretary of MOWR chaired the ACC. The other members of the committee were the Director Generals of the DIO, DOA, representatives from NPC and Ministry of Finance (MOF). The organisational structure of the ILC suggests that the approval of the project was centralised. In that respect, there were chances of influencing the decisions by the politicians and the high officials. Nevertheless, the identification to implementation of the project was decentralised from DOI to the DIO with the technical and administrative support from the WRID.

The farmers were required to agree on all the detailed features of rehabilitation. However, three alternatives were proposed for the farmers' involvement during the construction, which were to be agreed by the farmers during the signing of the contract. The followings were the alternatives:

- Construction under the direct responsibility of the farmers' UC assisted by DIO staff;
- Construction under the direct responsibility of the DIO, with farmers' responsibility to construction specified for their contribution in the agreement between UC and the DIO;
- Construction under DIO with farmers' contribution as a direct input into it.

The farmers had to bear part of the capital cost for the rehabilitation and new construction. They could decide on how they would like to spend their contribution as provided by above alternatives. The formation of a UC was mandatory for the planning and implementation of the project. The UC was required to register with the government office to receive formal status. Group organiser was assigned in the village to mobilise and ensure farmers participation for the successful implementation of the project.

The information published by the Western Regional Directorate of Irrigation[15] (WRID, 1990) shows that the estimated design cost of the *Ghachowk* irrigation scheme was NRs. 3,904,625. Out of this NRs. 3,318,931 was to be covered by HMG/N and World Bank, which is 85% of the total cost. The farmers were supposed to provide 15% of the total cost, which is NRs. 585,694. Out of this 12.5 % was in the form of labour contribution and 2.5 percent in the form of cash which was NRs. 97,616. The cost per hectare for the rehabilitation is NRs. 19,523. The economic rate of return was estimated at 25 percent. The work was contracted out for NRs. 3,500,000[16]. However the total amount spent was NRs 3,368,000 (DOI, 1997b).

The works under the rehabilitation programme were the construction of a side intake, extension and widening of the main canal, which was 1.7 km and construction of 3.9 km branch canals. Besides, there was a provision for the construction of one aqueduct, one super passage, one escape and three foot bridges. However, farmers estimate that along with the intake with gate, only 500 metres of main canal, 750 metres of four branch canals were lined and one foot bridge with aqueduct was constructed. The rehabilitation work was expected to increase the volume of irrigation water during the monsoon. However, the rehabilitation did not increase the irrigation water for a winter crop.

The construction of a permanent intake, extension and lining of the canals was supposed to increase the water availability through control of leakage and seepage. The headwork of the canal was temporary before the intervention of ILC. The design was changed before the implementation to include a head regulator, which was not in the original design. The provision of head regulator was made to control the silt flowing to the canal due to construction of permanent weir. During the field visit it was observed that the head regulator had not been operated for a long time. It was left open during the whole year.

The design estimated that 200 ha of land in total in ward no. 3, 4, 5 and 6 of *Ghachowk* VDC would receive irrigation water benefiting 300 farmers.

Planning

The government published a notice to collect farmers' demand for rehabilitation work. According to the User committee members, the VP submitted the request for

rehabilitation to DIO through the District Panchayat (DP). The DIO forwarded the application to the WRID. The VP officials contacted the WRID who sent the survey team. The survey team consisted of engineers and overseers. The team contacted the Village Panchayat in January 1988 to discuss the survey. The Village Panchayat organised farmers' meetings with the survey team. According to the farmers 90 percent of the villagers were present. The irrigation officials explained about the programme and the discussion continued. According to those who were present in the meeting, the main issue raised by the farmers was the insufficient availability of water for the area to be irrigated. However, the engineer who was involved in the survey recommended that the rehabilitation was feasible. This shows that the farmers' view was not taken seriously. As a result, the actual irrigated area is much lower than the planned one. This will be discussed later. The major works included were:

- Excavation in the main canal;
- Canal lining as per requirement and;
- Construction of an aqueduct via a polythene pipe.

The survey took place in March 1988. The Regional Appraisal Committee (RAC), which was formed for analysing the engineers' reports and to make recommendations for the approval of the project, recommended for the financing of the project. The RAC had representation from Regional Agricultural Directorate (RAD) and Regional office of Agricultural Development Bank. Their representation in the committee was to ensure agricultural support programme in the areas where rehabilitation of irrigation systems took place. However, the agricultural support programme was not extended as envisaged. The Approval and Co-ordination Committee of DOI based on the recommendation of the appraisal committee approved the project in November 1989.

The engineer who was involved in the survey and the recommendation of the project admitted that there was social and political pressure to include the project for ILC intervention. The social pressure was from the farmers and the political pressure was from the elected Panchayat officials, including the Rastriya Panchayat member[17] from that area. He was asked to recommend the intervention and was assured that the Panchayat leaders would persuade the higher officials for the approval of the intervention.

According to the secretary of the second UC, the design cost for rehabilitation was increased during the survey. There was no provision for a permanent intake and gate when the first initial survey team came to the village. But the farmers from the head argued that if they had to contribute, the intake should be permanent. He said that he convinced the irrigation officials on behalf of the farmers and successfully negotiated with other UC officials for the inclusion of a permanent intake with a gate.

The insistence on the gate by the farmers at the head could be used for checking the flood water and the debris, which could have a damaging, effect on the canal. The provision of the gate could ensure the required flow of water and excess water would flow to the river. One of the important aspects in this respect is the water dispute between the *Ghachowk* and the *Lahachowk*. Thus, the permanent intake was also necessary to divide the irrigation water between *Ghachowk* and *Lahachowk*.

The Role of the Group Organiser (GO)

The implementation of the project under the ILC Programme was on a participatory basis. To fulfil this requirement the government placed one group organiser in the village. He started his work in December 1990. His main tasks were to:

- Orient farmers' group on the conditions and the procedures for applying for rehabilitation.
- Assisting farmers' group in preparing the request.
- Facilitating farmer in transforming the ad hoc UC into a formal UC.
- Discussing rehabilitation details with the farmers and negotiating farmers' participation and cost sharing agreement with them; and
- Training and preparing UC for operation and maintenance of the completed projects.

The GO was a DOI employee. According to farmers, the GO had good social relations with the farmers. There were some farmers who did not like to give up their land for canal construction, as they were not convinced of getting irrigation water. But the GO convinced these farmers to give their land and was able to receive their co-operation for canal construction. But in these two years, he was not able to convince the farmers to contribute their labour, nor was he able to convince some of the farmers at the head end to contribute their cash[18]. The potential problem likely to occur out of this situation was solved by an agreement between the UC and the contractor. The GO could have any role to play, had there not been the agreement between the UC and the contractor. His role was limited to facilitation of project implementation. Also, he could not prepare the farmers for the operation and maintenance tasks after the intervention. The GO stayed for two years in the village after the formation of the UC to complete the rehabilitation and extension. But he could not influence the implementation of the project since he did not have any role in the decision-making processes. Thus, he was unable to check some of the anomalies, which is discussed below. However, he played an important role in maintaining the loop between the users, officials and the contractor to accomplish the work.

Implementation

The agreement between UC and DIO was signed in February 1991 for the implementation of the project, which started in April 1991. At the beginning, the UC insisted on implementing the work by the villagers on a wage basis. In view of the amount to be invested and the financial regulation of His Majesty's Government of Nepal (HMGN), the work had to be carried out on contract basis. As per the ILC provision, the approval of the UC was required to sign the contract. Thus, the UC yielded to the pressure from the agency, as they were afraid that the project might not be implemented. Besides, the contractor persuaded the VP chairman at the time of Panchayat system and the UC chairman to receive the approval, according to the farmers. The VP was dissolved in April 1990 but VDC was formed in 1992. Now the UC chairman feels that 'The UC would have been able to do the work and they

should have insisted on that'. This was just a pretext, as he was instrumental in giving the approval.

The rehabilitation and extension was assigned by to a contractor from the same district on a competitive bidding. The final approval of the contract was done by the DOI on the recommendation of the UC and the RAC. It could be expected that the contractor used his influence at the district level to get the recommendation from the RAC. The work was contracted out following the government's financial regulation. According to the UC chairman, the committee did not object to that as they thought the government rule had to be followed. Further, he thought the contractor would work according to the design otherwise it would not be certified afterwards.

The UC supervised the rehabilitation and extension work, according to its chairman. The UC meeting minuted that three members from each ward will supervise the contractor's work and will submit a written report to it. But this decision was never implemented, according to one of the UC members. The contractor sub-contracted the work. Only one person from the village got a petty contract for 200 metres of canal lining. Unskilled work was done by the villagers on wage basis and skilled workers were hired from outside. Some of the members of the UC felt that the contractor was using sub-standard materials (ratio of sand and cement) and the quality of work was being compromised by not properly following the design. They felt that the contractor had manipulated them.

One of the farmers known as IB from the head told that the time when the construction work started was not appropriate. He had 10 ropani of land in the irrigated area. The construction according to him commenced in April whereas the planting of the main rice crop starts in July. According to him the construction work should have been started during the winter so that farmers could supervise the work properly. So, everything was done in haste.

The project engineer and the mobile team of the WRID were not directly involved in the supervision of the work according to him. When asked he replied 'he was not aware how much money was obtained from the government and how much was spent'. It seems that most of the farmers did not care about the financial aspect. Instead they were more concerned about the planting. The contractor did not look after the concern of the farmers. Sometimes more labourers were brought for the work and sometimes very few did the work, according to him. This shows that after the first meeting of the farmers with the survey team, there was no communication between the UC officials and the users on the design and implementation of the intervention. In that respect, the decision making of the UC was not transparent, which was important for maintaining the linking loop.

According to the UC secretary, the whole contract was divided into two parts. The contract for the main canal and another branch canal was contracted out by the DIO to the contractor. The UC was given the work for constructing 4 branch canals on wage basis, which also included peoples' contribution of 12.5 percent. However, the UC's part of the work was also given in contract. He said that in fact some of the members of the UC put forward a contractor and worked themselves. According to him the earth work and canal lining to be done by the UC was carried out by others but it was not properly done.

During the construction, once again the design was changed to replace the planned polythene pipe by a concrete aqueduct to bring irrigation water to the extended area in ward number 6 as told by him. Since a concrete slab covered the aqueduct, it facilitated the movement of people from one village to the other. People asked for a concrete structure for which the DIO released additional money amounting to NRs. 248,000. However, officially there is no evidence of additional release of the fund.

According to some farmers, half of the aqueduct fell down during the construction and some people got injured. The contractor paid the medical expenses. In addition, the UC dismantled some of the works done by the sub-contractors, as the materials used were sub-standard. The dismantling of the work suggests that the majority of the UC members were expressing their anger against some of their colleagues in the UC who were said to have connived with the contractor. The main contractor did not object to the reaction of UC members and directed the sub-contractors to use standard materials and to carry out the work as indicated in the design. Sub-contractors also did not object to it. The repetition of the work suggests that the contractors were doing sub-standard work from the very beginning. Thus, they could not object to the dismantling of some of the works by the farmers.

The sub-contractors also did not follow the design properly, according to some of the UC members, even after the farmers dismantled the work. The farmers had little leverage to press them because, they did not provide their part of the contribution. This issue would have come forward had the farmers insisted in following the design. In essence, some sort of compromise was necessary in this respect.

The contractor was supposed to finish the work in one and half years time but it took two years to finish the work. It was because during the construction the work had to be terminated for a couple of months in order to use the not yet completely rehabilitated irrigation system for irrigating the main crop in 1991. Due to the delay of half a year, irrigation of the main crop in 1992 was also delayed by two weeks. The whole work was completed in April 1993.

The people from ward no. 1 and 2 who were expecting irrigation water after the rehabilitation and where the canal never reached, had a different story to tell. According to the farmers from these wards the land in their ward was surveyed. The survey team came to their ward, they were assured that round the year irrigation would be provided after the rehabilitation to the area as well. However, their view is contradicted by the report prepared by the Approval and Co-ordination Committee for the rehabilitation of *Ghachowk* Scheme. It is specified in the report that the ward 3, 4, 5 and 6 of *Ghachowk* VDC will receive the irrigation water. The request submitted by the farmers to the WRID also mentioned the lands in 3, 4 and 5 wards. The information published by the Regional Irrigation Directorate also does not say anything about the land to be irrigated in ward 1 and 2.

The likely explanation for this is that the farmers' expectation might have been raised by the visit of the survey team. Naturally, the survey team had discussions with the farmers and the farmers would have requested for the irrigation water to their wards. Besides, the farmers from these wards were also expecting some benefit from that large investment in the VDC. The survey by the ILC team in their area was done only to increase the hectares of the land to be irrigated. This was essential for

project financing according to the farmers from these wards. In this connection it is important to note that the ILC implementation guidelines specified that the cost of major rehabilitation would not exceed NRs. 45,000 per ha (World Bank, 1990: 80) and not more than NRs. 20,000 per ha for the minor rehabilitation. The estimated cost shows that the project was for major rehabilitation. In this respect, the system with such a small command area would not have justified that scale of investment as the per hectare cost would have far exceeded the expected costs. This would not have made the rehabilitation feasible according to the cost criteria. This was evident from the fact that the cost per hectare becomes NRs. 61,000 for the 60 ha command area whereas it would have been NRs. 18,000 for 200 ha taking into account the total expenditure of NRs. 3, 668,000

However, the people from ward 1 and 2 were also not convinced that they would receive irrigation water. The farmers from these wards never requested for the extension of the canal to their wards under the project, nor were they convinced that this would happen. This was because the water at the source was not sufficient. There was no provision in the rehabilitation to tap new sources for increasing the volume of water in the canal. Besides, the users at the head reach did not like to lose the control of the irrigation water by extending the canal to ward 1and 2.

Therefore the UC did not ask them to contribute after the survey. Because the contribution could have established their right to use water. That is the reason they thought that the available funds for the project were misused. At the very beginning the UC officials knew that the irrigation system was not to be extended to that area. The farmers from the presently irrigated command area claim that the canal was not extended due to insufficient availability of water. The implementation of the intervention suggest that the linking loop that was formed to bring the government intervention was disintegrated during the time of implementation. This was largely due to the formation of new loop between the influential UC officials and the government officials. The linking loop also became weak, as the VP was already dissolved and the VDC was not formed, which could have played effective role.

There was no canal previously going to wards 1 and 2 before the intervention also. The lands in these wards are being irrigated through a spring, which rises during the rainy season. If the monsoon is delayed then the planting of paddy is also delayed. According to them, the farmers from the up-stream area were from the beginning, not in favour of providing irrigation water to their area because the irrigation water was not even sufficient for the presently irrigated area.

But one of the decisions of the UC in 1992 stated that the lands in the ward 1 and 2 will receive irrigation water for five days for planting which was delayed due to the late monsoon. This decision was made at the request of the farmers from these wards. A village trail was used to provide water, as there was no canal going to these wards.

The UC, its role and farmers' perception

The officials of the DIO asked the farmers to form again a Users' Committee (UC) which was a requirement for the intervention. Then after a few days later the villagers held a meeting to form the UC at the initiative of the Village Panchayat. According to the UC chairman, he was elected unanimously. He was also Vice

Chairman of the VP at that time. Some of the farmers from the head reach of the canal did not want him to be the chairman of the UC. A heated discussion took place, but the majority of the farmers elected him. This could be largely due to the influence of his position in the VP.

As one teacher put it, the 'majority of the farmers did not actively participate in the discussion as they preferred to be indifferent, because it was dominated by the powerful VP officials in the village'. It did not make any difference to them who ever got elected, as they were not vying for the position. Basically, the argument was among those who were aspiring the position. Other members of the committee were elected on the basis of one representation from each ward (VP consisted of nine wards).

The representatives from each ward were elected unanimously, according to the villagers. The UC had eleven members along with chairman, vice chairman and the secretary and was formed in November 1990. The UC was formally registered with the District Administration in January 1991, which was three months before the construction work began. Five members of the old UC were also members of the new UC. They were the people mostly admired by the farmers. They had established their credibility by successfully implementing the second intervention. Farmers believed that their representation in the UC would check mismanagement by other members.

Mr. SS is one of the oldest members in the village. He is also economically better off which was evident during the visit to his house. He has land in the water abundant zone and also in water scarce area. He has 12 ropani of land in the middle of the irrigation command area. He was the Chairman of the first UC. The villagers appreciated his handling of the second intervention. He commanded the respect from fellow villagers as was evident during the talk with them. He told that the second UC did not provide adequate supervision of the contractor's work. The Chairman and the Secretary were not active and effective in providing leadership to the UC. In the past, the first UC co-operated with the villagers for supervising the work. This was not done by the UC under the ILC. He said involvement of the people would have prevented the sub-standard work by the contractor. Besides, he was of the opinion that the required technical supervision was lacking. The Engineer from the agency did not stay in the village but used to come only now and then. In essence he was not satisfied with the work done during the third intervention. According to him some of the members of the UC took sub-contracts during the third intervention which was not fair from his point of view. They were covering their illegal activity by bringing people from outside. He strongly believed that one of the reasons for sub-standard work was 'that the contractor paid the contribution on behalf of those farmers who did not pay'. As the contractor came to work for profit, he had to deliver sub-standard work to cover the expenses paid for farmer's contributions.

The Secretary of the UC Mr. BC was the former head of the village. Previously he worked as teacher. He was one of the knowledgeable and respected figures in the village. He has a small tea shop and also a rice mill. He has 5 ropani of irrigated land beside the homestead in the ward 6. He started saying that some of the UC members had a vested interest in the rehabilitation work and had the intention of obtaining undue benefits from the work. Interestingly, although he was the Secretary of the UC

he was not aware of how much money was paid to the contractor because the contractor was not paid on the recommendation of the UC. Only the then VP chairman, the UC chairman, the contractor and one Agricultural Junior Technician (JT) who came from that village knew about this. This indicates that the communication and decision making was not transparent. Further, the group of UC officials maintained the new linking loop with the contractor to increase their administrative control of the resources.

The JT also took a contract although, being a government official he was not supposed to do this. He said 'the JT was so influential that he manipulated the whole construction work in collusion with the contractor and with the help of the UC chairman. Some of the examples he gave was the spacing of the iron rods for RCC (Reinforced Concrete and Cement) work. According to the design the spacing should have been 6 inches but they made it 10 inches. Similarly, the sand used was from the stream while in fact it should have been collected from the river because these sands contain less clay particles. As secretary of the UC he protested but nobody listened to him.

It surprised him that the UC Chairman and the contractor were operating the account. He once raised the matter in the UC meeting and the UC decided that the UC Chairman and the Secretary would operate the accounts. At this the contractor threatened to withdraw from the work. Nobody said anything. There was also the question who would take-over his work, because the contractor had already agreed to waive the farmers' contribution in labour and accepted to pay for the contribution for some farmers at the head. He kept quiet, as other members of the UC did not support him. This shows that the interface between the users and the contractor ended in negotiation and compromise to maintain the existing linking loop.

It is more likely that he also took benefit by being the Secretary, although he did not mention it. This is because it is quite impossible that he kept quiet if others alone were taking benefit. The circumstances in which he became the UC Secretary also confirm this. Besides, he was the former *Pradhan Pancha* and one of the knowledgeable persons in the village.

Another UC member Mr. BG was one of the rich persons in the village with a big house. He was retired from the army and had a good pension. His children were in the town for their education. He was soft spoken. He was from the head reaches of the canal having 15 ropani of land. He was one of the five who was a UC member during the second intervention. He did not like to comment too harshly about others. In fact he seemed to be a man of integrity and honesty. He said that he even did not know the design and estimated cost and how much money came from the government. He asked for the details about costs in the UC meeting but that was not discussed. He was not even aware of the work the UC should do. He said that UC meeting had decided to implement its part of the work on wage basis. The decision of the UC was not fully implemented, according to him and 'no detailed discussion was ever held about payment and supervision of work done by the contractor'. He frankly said 'I did not know how these things were done'. He complained that since he was living far from the main centre of the village, sometimes he did not receive the information on UC meetings and knew the decisions only afterwards. Lack of

communication among the UC officials indicates that the decision making in the UC was manipulated to benefit some of the UC officials.

This UC member was also critical of the timing of the implementation, which was just before the main paddy planting season. People were quite busy and did not have time for supervision. He himself did not pay much attention on what engineers and overseers did. According to him the contractors, engineers and the overseers were not open in their dealings. "I did not know how they did prepare the completion report. I may have signed the UC decision for the completion of work but I do not remember detailed discussions after the contractor completed his work". He asked for a clear account after the completion of the work but the chairman never answered the question.

He also confirmed that some members of the UC had a vested interest in the construction work. He suspects that for this reason there was no detailed discussion on construction and payment to the contractor. This was evident in UC meetings as these members openly showed their interest in getting contracts according to him. He also said that the contractor paid the 12.5 % in labour contributions. He revealed to me that the design of the canal was modified. In the beginning the canal was dug out in a V shape but people did not like it because it required more land and they were not willing to provide so much of the land. When asked about the shortcoming in the area irrigated, he replied he was not aware that only 60 ha were currently being irrigated. It is amazing that farmers did not know what was going on in the village.

Another member of the UC, KU said that the project was included at the request of the people via the VP to the DOI. He is well off in the village with a good agricultural income as 15 ropani of his land is near to the main canal. He was soft spoken and he commanded respect from other villagers. He is also politically active as evidenced by the local election of 1997 in which he became the chairman of the VDC. The people present at the meeting that was held for establishing the UC elected the officials of the UC. According to him in contrast to what other informants told there was no conflict in electing the UC officials. He was also one of the UC members from the second intervention. He said that he was offered the post of the chairman of UC but he declined it as there was no one to be trusted. Immediately after the formation of the UC, a meeting was convened and the main discussion was on how to spend the money (3.5 million NRs). The Engineers and the Overseers briefed about the survey, design and the cost estimate of the project. Heated discussions took place regarding the implementation procedure. Some of the members were in favour of the committee doing all the work themselves and some were in favour of contracting out all the work. Ultimately the committee opted for the contract. Most likely, the opinion of the DIO, that the UC did not have the skill and the capability to complete the work in a satisfactory way also influenced the decision.

The researcher found that there were two contracts, while going through the minutes of the UC. One was for the contractor and one for the UC. The main contract was invited by the DOI. The UC also invited tenders for their part of the work. The reason, according to him, was that the committee felt that it would be difficult to mobilise peoples' contribution. Some of the people were saying 'why should we contribute when the government has already provided the money'. The work was

contracted out on the condition that the contractor would not ask for contributions from people.

KU said "I realise that we should not have contracted out". We could have done more work ourselves with that amount of money. "The committee was weak in supervision and made mistakes in regard to the control of quality". People afterwards complained that the contractor did not do the work as was indicated in the design. The length of the canal sections that were lined were shorter than specified in the design. This was to be expected, as the contractor had to make up for the shortage of farmers' contribution.

The question of farmers' contribution of 12.5% was the most important aspect in the decision of the UC. It was certain that the UC would not be able to mobilise this, as they were aware that farmers would not contribute to it. In that case there was the risk of non-completion of the work had UC decided to implement on its own. Thus, all the UC members agreed to the contract. This relieved them of the burden as the contractor had agreed to waive the farmers' contribution.

He was candid in saying that two of the committee members took sub-contracts from the main contractor, which came to be known afterwards. He was saying that one had to believe the others and accordingly he signed minutes of the meeting. He was sorry for not being able to discharge his responsibility properly. This was evident from his statement "I realise that one should not believe others when it comes to the financial aspect of this type of work". He had a different opinion from that of other members of UC regarding the functioning of the UC. He said that every matter of project implementation was discussed in the UC. The differences of the opinion could be due to his presence in all the meetings. The earlier respondent said that in many cases he did not know about the meeting.

However, he did not know how the UC certified the completion of work. He could not recall any discussions in the UC in that respect. He believed that certification was done in accordance with the prevailing rules. He contradicted his earlier statement by saying that he did not believe that any committee members benefited from the project. UC members believed in the contractor according to him. At the same time he opined that the villagers learned the lesson for the future when he said 'we people should be more conscious and aware what can happen in this type of construction work'.

He had difficulty in answering the question why the extended command area was 60 ha instead of 200 hectare, as mentioned in the design of the project. He in fact was unaware of this. He came with a different version and said 'in fact the technicians convinced the farmers by saying that it will be easier to include the project if the size of area is larger and there will be more money available from the government. And also, if the cost of the project is too small, the government may not be interested'. Thus, all the villagers agreed to increase the command area in order to include the project for government financing but did not know the intention of the technicians. He did not know what happened to that increased amount of money if the command area was only 60 hectare. He advised me to contact the Chairman and the Secretary of the UC and he also said 'I am sure that they will not be able to tell you about this'.

But finally he made a cautious remark 'Do not bring this thing out. It might create havoc in the village if people knew it'. All in the village were aware that there had

been manipulation in the implementation of the project but no one was prepared to question this openly. Presumably, they did not like to make it an issue, which was not possible to correct. Secondly, they did care about the harmony of the village, which could be disrupted. The UC members involved in the scam would not have been able to manipulate without the support from the technicians involved. The farmers now cannot take any action against these officials. However, one thing is sure that this would have been the major issue if farmers had contributed.

One of the members of the UC who was also an elected representative of the VP at the time of request for intervention, told that the Village Panchayat requested for the government support. He had 10 ropani of land in the middle of the irrigation command area. He revealed that the intention of the villagers was to receive support from the government. He said that it was the DOI, which awarded the contract in consultation with the UC. In the beginning he tried to evade my question on why the outside contractor got also the contract for NRs. 15,00,000 which, was supposed to be done by the UC. He maintained that the contract was awarded to UC for this work and not to the outsider. He said that people gave their contributions and the contractor waived some of the contributions. This was not true as revealed by other UC members. Later on in the course of our discussion he confessed that the contractor did all the work. The reason he gave for this was that the UC did not play an effective role and were not interested in implementing the project on their own.

He concurred with the views of the other members of the UC that the design and estimates were never discussed in the UC. The reason he gave for this was that the UC members did not have the technical knowledge. As for the completion report, he said that the UC accepted it on the basis of a technical report presented by the Engineers and the Overseers. He was saying that the UC members were aware that 200 ha would not be irrigated as was promised during the time of the survey and also during the discussions with the officials from DIO. They accepted the project for fear of losing it. At the same time he consoled himself by saying 'at least there has been an increase in the area after the intervention'.

The VDC vice chairman (at the time of this study) was not happy with the procedure of UC formation. He has 12 ropani of land in the head and middle of the irrigation system. He was of the opinion that the people from the head did not have an adequate representation as compared to their land holding. Those who were represented in the UC from the head reaches were also not active in defending their rights. According to him the farmers' meeting elected the chairman and the secretary and these officials proposed other members which the meeting accepted. This suggests that the UC chairman and the secretary proposed the persons, whom they thought could easily be manipulated. He was not aware that the contractor did not ask for people's contribution in labour. According to him, the farmer from the head paid their cash contribution and also provided their voluntary labour contribution. His statement regarding labour contribution is not true since all others said they did not contribute.

The Head Teacher of the local school was of the opinion that the Department of Irrigation imposed the project design. He had 9 ropani of land in the middle of the irrigation scheme. Some people including himself argued against the project during the mass meeting because there was no provision to increase the water volume at the

source. The issue of contribution also came up, according to him. He argued that it was not possible for farmers to contribute for the cost. The main argument was why should farmers contribute for the cost of 200 ha while the actual area for irrigation is only 60 hectares. Considering the length of the canal in the design and the water volume it was only enough for 60 ha. He raised the issue by saying that he would take the contract and he also would bear the local contribution as well. But some local people challenged how could a Head Teacher accept the contract. In fact his intention was to raise the issue on behalf of the people to relieve them of additional burden. His argument however forced the UC officials and the technicians to consider the contributions. This could be one of the reasons for waiving the farmers' contributions. This also indicates the importance of the personality who could express the view on behalf of the farmers and could influence the decisions.

The VDC chairman (at the time of this study) was very influential in the village because of his interest in the development work. He has nine ropani of the land in the middle of the irrigation scheme. He was a respected person. He said that he proposed for the formation of a supervision committee consisting of one representative from each ward. This committee was meant for the supervision of the implementation. The reason for this proposition was that this type of committee in the second intervention was able to check manipulations by the contractor. But the UC was not interested in his proposal. He said that the UC members were guided by self-interest by making some profit out of the project. This could be the reason for not accepting his proposal. Thus, the linking loop between the actors (UC-Kulo Samiti-User) was not effective as it was during the second intervention in 1985. However, the loop between some of the members of UC-VP and the contractor was strong, as it was guided by self-interest. Because of this some UC members were the sub-contractors for the work. That is why the UC did not regulate the sub-contracting. This indicates how the so called leaders manipulated the decision making to fulfil their own interest. This contributed to the weakening of the existing linking loop, which was fundamental to the accomplishment of the intervention objectives.

The completion report was prepared even before the work was accomplished, according to him. It was because the UC members who worked as contractors were in haste to get their final payment. He revealed that some of the UC members tried to take the main contract awarded by the DOI as well but could not succeed because they did not have the majority in the UC. According to him, the formation of the UC was also manipulated. A mass meeting was called and the whole day the discussion centred on other aspects, especially the benefits after the rehabilitation. The names of the future UC members were announced when it was already late in the evening and the people were in haste to conclude the meeting. 'People expressed their consent by clapping their hands and left the meeting'.

In general, people were not happy with the way UC and contractor implemented the project. As one villager put it "the Engineers and the Overseers listened to the villagers but afterwards they did what they wanted to". Some were of the opinion that the work done for NRs. 600,000 in the second intervention and the work done for NRs. 3,900,000 were the same. But this is an exaggeration. Nevertheless, it reflects the farmers' dissatisfaction. The work done was not according to the design such as construction/extension and lining of the branch canals as stipulated.

Another farmer said "the interests of the technicians and the contractor are the same and they always collaborate with each other to make a profit". Some villagers were not even aware who the UC members were. In one case in ward no. 6, the earthen canal was extended to cover some of the area within the command area but the canal was not lined. Instead they constructed a bridge with the covered aqueduct. This reflects the motives of UC member and the contractor.

As stated earlier, the fifth branch canal which was extended to include some lands under the command area in ward no. 6 was providing water for planting only. Some farmers in this ward claim that during the intervention the farmers from that area made the commitment that they would ask irrigation water for planting only. Now these very farmers were asking irrigation water on a rotational basis. From the planting season of 1997 the farmers from this ward are also getting water on rotational basis. The decision to this effect was taken by the VDC on the request from the farmers. This is an example how the farmers establish their right on irrigation water. This was possible with the lapse of the time in which people forgot about the conditions agreed between the farmers.

The above discussions suggest that the interface between the UC members was not intensive due to lack of communication. As a result the decision making was not transparent, which was made the linking loop weak.

Evaluations of 1992, 1993 and 1997

The ILC project office sent one engineer to check the quality and completion of work. The engineer evaluated the work along with the UC chairman and other members of the committee. The engineer had no critical remarks of his own but agreed with the UC members when they objected to the quality of work in some places. The engineer directed to repeat the work but did not come back to check it again. Some farmers complained about the under completion of the work but that was not taken seriously according to them. The under completion of the work was also due to the fact that farmers did not contribute the required labour. Nevertheless, some farmers said they contributed labour by collecting stones and by excavating the main canal.

Change in the command area and households

The cultivable command area of the irrigation system, as stipulated in the document published by the Western Region irrigation Directorate (WRID, 1990) is 200 hectare. Shivakoti (1992:6) also reported 200 hectares and the total number of households 650. The VDC record of 1975 indicates that 103 farmers had their land in the command area. The record of 1984 showed 139 owners in the command area. These households are from ward number 3, 4, 5 and 6. The area surveyed was 200 hectares. But the amount of cash contribution raised from the farmers shows that only 60 hectare could be covered. In the request letter for intervention in 1990, the total area mentioned by the farmers was 100 hectares and the total number of users were 310 households. The actual irrigated area during the time of study was 60 ha. In this connection, the VDC record is more authoritative as the land tax is collected on the basis of these records. The increase in the number of households was due to the fragmentation of holdings among the brothers due to the inheritance law.

When I asked the UC chairman "why only 60 ha was covered within the command area instead of 200 ha", he strongly reacted. He said "Since available funds were already expended, it was not possible to extend the canal to downstream areas" which were supposed to be the tail end of the command area surveyed. He did not have the answer for how it was expended. He asked me to see the UC Secretary for the details of the account. The Secretary could give only the minutes of the meetings and said he could not find the account register. The VDC secretary was unable to explain the large variation in the irrigated area and the number of households.

The actual increase in the irrigated area after the intervention from the Irrigation Line of Credit (ILC), was nearly 15 ha, as reported by the VDC secretary. The net increase, according to him, is from branch canal 2, 3 and 5, which provides irrigation to 6 ha, 4.5 and 4.5 hectare respectively. The VDC secretary however, believed that the area could be slightly higher due to the under reporting by the farmers in absence of actual measurement. The actual increase was an additional 20 ha irrigated by the extension of canals, conversion of *Bari* land and checking of leakage according to the farmers. The owners of these lands benefited by converting their *Bari* land to the *Khet* land.

Cropping intensity

There has been no substantial increase in the cropping intensity after the intervention. Shivakoti (1992: 22) reported that the cropping intensity has increased by 37 percent after the intervention. But the study report by Irrigation Management Project (DOI, 1993: 42) indicated a mere increase of 8 percent in the cropping intensity. The farmers reported that there has been no substantial increase in the cropping intensity after the intervention. The cropping intensity at the time of the study was 150 percent. The low level of increase in the cropping intensity was due to a lack of crop diversification as the increase in the irrigation water was supplementary to the monsoon irrigation for rice cultivation and wheat cultivation during the winter. The failure to provide the year round irrigation by the intervention did not encourage for additional cropping. Besides, the agricultural support services were also lacking, although the project envisaged intensive extension services.

Crop yields

There have been increases in the crop yield after the ILC intervention. Farmers reported up to 25 percent increase in the crop productivity of paddy after the intervention. The IMP report (DOI, 1993) mentioned that the crop yield had been double after the ILC intervention. It reported that the crop yield after the ILC intervention was 3.0, 2.0 and 2.5 mt/ha for paddy, wheat and maize respectively. During the interview with the farmers it was found that there has been increase in the crop yield but not as much as reported by the IMP. The farmers reported that the crop yield of paddy and wheat increased by 0.25 and 0.3 mt/ha respectively. The actual yield of paddy and wheat was 2.5 and 1.8 mt/ha respectively. Farmers did not find any change in the yield of maize crop however, after the intervention. There was a variation in the crop yield between the farmers from the head and the tail end. The tail enders reported that there had been a marginal increase in the crop yield of

paddy, which was 2.0 mt/ha after the ILC intervention, which is a mere increase of 0.10 mt/ha. However, they did not plant wheat due to unavailability of water.

View of irrigation officials and the consultants

The irrigation officials involved in the implementation of the ILC project admitted that there had been shortcomings in the implementation of the project. The detailed technical design was not as intensive since ILC project was a pilot project. The survey engineer and also one former official told me that the command area was not actually measured but was based on the discussion with the farmers. The area was inflated because of the political and social pressure for the inclusion of the project. This cost criteria in his view led to the increase in the area in order to make the project feasible for the rehabilitation. The farmers convinced the engineers to change the design and accordingly the engineer prepared the design and cost estimate to make it feasible. The survey engineer accepted this when he told that "he had to take into account the demand of the farmers as it was a participatory project. At the same time he had to ensure that the project is approved for the intervention" as there was political pressure to include the project. Because of this, the area was increased and farmers knew it, according to him. Thus, it was not fair for the farmers to blame the engineer as he was acting on the request of the farmers and the local politicians.

According to him, the objective in assisting the old schemes was to remove bottlenecks through the improvement in physical structures considered important by the farmer. The process followed was:

- Identification of constraints through discussions with the farmer.
- General survey of the scheme for the identification of activities to be undertaken.
- Project preparation based on the information collected from the field.
- Project approval.
- Formation of a UC.
- Discussion with the farmers for the construction of the activities.
- Commissioning of the project.

Monitoring and follow-up, which was one of the important aspects in project formulation and implementation, were missing in the whole process of the third intervention. The offices at the district and region could not provide adequate supervision because of the haste in the implementation of the project, according to him. This was due to the requirement to complete the project within the specified fiscal period. The mobile team of the WRID concentrated its attention in the areas where there were problems in the implementation. In this respect, the mobile team helped to resolve the conflict with the *Lahachowk* irrigation scheme. However, adequate supervision was lacking as exemplified by the lack of agricultural support services. Basically the project was target oriented and the achievement of the physical target was the primary concern of the officials involved, since evaluation of their performance was based on the achievement of the physical target. Thus there was a contradiction in the approach and the desired goal. This is because the participatory approach is process oriented, which requires constant dialogue between the users and the government officials to set the stage for the project intervention. The

emphasis on target achievement does not allow for closer interaction to prepare users for the project. As a result the design and estimates were also not done properly according to the engineer. Once approved, the project was left entirely in the hands of overseer in-charge and the concerned engineer who had to supervise the work. The WRID officials did not have any answer to the high cost of the project.

In that respect the required technical backstopping was missing. This was substantiated by one of the decisions made by the UC. The site-in-charge staff requested for necessary directives from the DIO with regard to the sand being used by the contractor, which was not of good quality. There was no reply from the DIO. There was no provision to turn over the management of the project in the FMIS.

He was of the opinion that the formation of the UC was a project requirement for the rehabilitation of the scheme. But the government was not concerned about the effectiveness of the UC after the rehabilitation. In his opinion most of the UC members did not know their actual role. It was because the project did not have provision for training and no training was provided to the UC members. This was one of the reasons why most of the UC's ceased to function after the implementation. According to his observation the schemes which had UCs before the intervention were still functioning effectively. The UC formed for fulfilling project conditions were not functioning in most of the cases. However, some farmers from this scheme were sent to other FMIS to observe the management practices. The UC secretary confirmed this. During the discussion he appreciated the management of one of the irrigation systems he had visited. Nevertheless, they did not introduce it.

The overseer who was involved in the implementation of the intervention of the *Ghachowk* scheme told that the pre-feasibility survey of the scheme did include the area from the ward one and two as well. Thus, the farmers from these wards complained during the implementation according to him. As the overseer was not involved in the design phase of the project, he was not in a position to answer the question of these farmers. The overseer justified the overestimate of the project cost by saying the amount was required for that type of work. This shows that the fulfilment of individual objectives by the local leaders and the government officials did weaken the existing communal linking loop, as the users did not take active participation in the implementation. Besides, some of the UC officials also did not actively participate in the decision making. This was largely due to the weak political control at this time.

The overseer told that there was no co-ordination between the UC members and also decision making was not always unanimous. He was of the opinion that some of the UC members tried to impose their view on others. As a result some of the members were more active compared to the others because of their interest in getting petty contracts. He confirmed that some of the UC members took the petty contracts from the contractor. But in his opinion they did not make the profit as they lacked the professionalism. They, according to him, complained that the technicians did not help them to make a profit. Besides, these UC officials were under criticism from the users for not supervising the work of the contractor properly.

The consultants (Sir William Halcrow and Partners Limited, 1997) studied 23 sub-projects to evaluate the system performance and impact of the irrigation systems under the ILC project. However, this irrigation scheme was not one of them. Out of

these 12 were rehabilitation sub-projects in the hills and they had come up with following conclusions:

- There had been a 33 percent overestimate in the design area for hill sub-projects.
- There were systems, which were receiving inadequate water supplies due to design and construction deficiencies.
- The average cost per ha for rehabilitation in the hills was NRs 59,000.
- Farmers' average contribution in cash and kind varied from 10 to 14%.
- UC's were active during the development works but now 5 out of 12 are dormant.
- Projects had not made significant impact in the improvement of water management practices.
- Main impact of the projects was on the reduction in the emergency maintenance cost which was halved for the hills.
- There has been a change in the cropping pattern after intervention; some 60% of hill sub-projects had an additional crop.
- Water availability has been increased.

According to the officials, in view of the lessons learned from the ILC intervention, government effort is directed towards lessening the shortcomings in the National Irrigation Sector Projects (NISP)[19]. In this respect attention is paid to the preparation of rigorous guidelines for the upcoming projects. However, the effectiveness depends on its implementation. The guidelines prepared for the ILC project were also elaborate but in practice they were not followed.

The Status of the UC in 1997

The UC constituted under the ILC was not functioning during the study period. It had not renewed its registration annually with the District Administration, which was required for official recognition. The official recognition is important to receive the government support for maintenance work. It may not be important for the operation of the canals since it is an internal arrangement between the farmers. Evidently, the operation of the canal has not stopped, as VDC is working well. The VDC has maintained the continuity of the operation of the canal through the *Pales* under the *Kulo Samiti*. Farmers say that the UC did not function since the completion of the rehabilitation work. In this respect, the committee formed for the third intervention was more a construction committee. However on paper, it is still known as UC due to its registration in the government office.

On the question why the UC was defunct, the UC chairman said " UC was formed to initiate and complete the construction work and that task was completed". Thus, his view on the role of the UC was limited to the completion of the construction work. All previous UC's had also been dissolved after the completion of the maintenance work.

The agreement between the DOI and the UC specified that the UC would co-operate with the DIO for the implementation of the project. Specifically, the UC would raise the farmers' contribution and supervise the implementation work. The UC would take over the management of the system after the completion of the project. Minor maintenance work would be done by the UC with the technical

assistance from the DIO if required. The DOI would provide technical and financial support for major rehabilitation if that is beyond the capacity of the UC. This shows that there were differences in the perception of the farmers and agency officials in viewing the role of the UC. The formation of the UC in the agency's view was to institutionalise the irrigation management practices in a sustained manner. The UC members on the other hand viewed the UC as a requirement for obtaining the government support and for supervising the construction work. Once it was complete there was no need of the UC. It also indicates that they did not like to take the responsibility of the operation and maintenance of the canal.

Some of the farmers requested the VDC for the formation of a new UC in order to get up front money deposited before the intervention. The VDC called the meeting of the farmers but a new UC could not be formed. This was because of the lack of convincing proposal from the VDC. Besides, farmers were unaware of the processes to be followed for the dissolution of the existing UC. On the question why the VDC was not taking any initiative, the VDC chairman replied "VDC did not have the power to dissolve the UC, but current UC members could pave the way for the formation of new UC by resigning from their post". The need for UC is also not felt by the VDC, as it forms *Kulo Samiti* every year to operate the canal.

The reaction of UC chairman to this was "we do not have any objection to the formation of a new UC". The irrigation policy also does not say anything about the dissolution of the UC if it becomes defunct. Some of the farmers were right in saying that "if the UC was dissolved the farmers would ask for the book of accounts of past expenditures, which was difficult for UC members to produce. In the same vein some farmers were joking that the "UC would be active if new funds became available".

One of the members of the UC who earlier said that the work of the UC was not transparent, said that, there was no co-operation between the UC, VDC and the farmers. It was because the UC, according to him did not present the accounts of expenditures, so people did not have faith in the UC. He was in favour of reorganising the UC and said that the members should be elected irrespective of their party politics. He was concerned about the deterioration of the irrigation structure. His interest in reviving the UC was for regular maintenance of the irrigation system. He blamed the VDC chairman and vice chairman for not taking any action to make the UC effective. The VDC at the moment was not taking any initiative for the regular maintenance. Nevertheless, it had obtained money from the Member of Parliament for maintenance, which was on an ad hoc basis.

Another important aspect in this respect was the VP/VDC's role in the management of the irrigation scheme, which had been continuous before the UC. The UC because of this, was not interested in asserting its role as specified in the agreement. If one looks at the current status of the UC no one in the village was concerned about it. The VDC was managing the canal through the *Pale* under *Kulo Samiti.* During the time of the rehabilitation also the *Pale* were working for the allocation and distribution of irrigation water. The farmers were more concerned about the availability of the irrigation water but not much concerned about who did it. It did not make any difference to them if the VDC or the UC looked after the scheme. Thus, due to the existence of traditional institutionalised practices, the UC

did not have role to play in the operation of the canal. However, it could have established the link with the *Kulo Samiti* and VDC for the mobilisation of the users' contrbution for the maintenance of the irrigation system.

According to the ILC procedure, the cash amount of NRs. 81,000 deposited by the farmers was to be returned to the UC as maintenance fund, but now no one knew where the fund was. The UC chairman said it was with the government. The UC could not get it released from the DIO because it did not take any initiative after the completion of rehabilitation.

Politics had to do something with the ineffectiveness of this UC. As one member of the UC confirmed that the party politics had made it ineffective. The previous UC was formed during Panchayat system in the country and the UC chairman was the vice-chairman of the VP at that time. Since he did not held any official position after the change to multi party democracy, he did not have any interest in the effective functioning of UC. The UC was not doing anything because there was no profit.

Women and their opinion about the project

Women felt that the irrigation project did not benefit the women. Only a few sub-contractors in the village made money from it. They did not know about the amount spent by the government. They were asked to contribute labour, which they did. They did not know that the contractor paid for farmers' contribution as well. Some UC members told them 'why do you need the details as we have kept the record for the contribution'.

One woman put it "we made labour contributions as we were assured that there will be more water available after the construction of canal and its lining. They said that the rehabilitation work was not as promised in the beginning. However, they were not aware of the work as specified in the design. They asked the men about this but did not receive a reply from them. They complained that the branch canal 5 was not extended as promised. Therefore, there were more weeds in the field because of reduced availability of water and this added to their work as they had to do the weeding according to them.

They were complaining that since some of the canals were close to the houses there was fear that water seepage might damage the foundation of their houses due to land subsidence. Thus, some farmers did not ask for water as their neighbour asked for assurances of compensation if the irrigation water damaged the house.

5.6 The fourth intervention

The Member of Parliament[20] from that constituency provided NRs. 15,000 to undertake minor maintenance work of the irrigation scheme in 1995. It is interesting to note that the VDC constituted a temporary UC to carry out maintenance work. SS who was the chairman of the first UC since the farmers liked the work under his supervision headed the UC. The reason given was that the UC constituted under the ILC project was not effective. The work completed was the repairing of the canal lining in the main canal near the head to check the leakage. Although the VDC gave

that committee the name UC, in fact it was only the 'construction committee'. This is because this committee did not continue after the completion of construction work.

5.7 Management of irrigation tasks

5.7.1 Water acquisition, system development and system water allocation

The farmers used to divert water by constructing temporary headwork of stone, mud and twigs prior to the construction of the permanent headwork by the intervention. Due to the temporary headwork the farmers could not divert adequate water to the canal. The water used to flow to the streams through the leakage's in the headwork to the stream, which was used by the *Lahachowk* irrigation scheme downstream. Leakage through the main canal was also a problem since it was partially lined. Thus, the farmers used to put more labour for the construction of the headwork. The main and branch canals had to be maintained every year before the operation of the canal. Thus, the headwork construction and maintenance of the branch canals were the primary tasks of the users.

A permanent headwork with gate has been constructed during the intervention of ILC. Besides, the main canal and the parts of the branch canals have been lined. This had made the water acquisition easier after the permanent headwork. However, the deposition of silt in the headwork is a problem. The silts used to flow to the stream before the permanent headwork. The provision of the spindle gate at the intake of main canal is also to check the incoming silts to the main canal during heavy floods. The activities related to the water acquisition and system development is not an important task for the users. This shows how the technology had an effect on the activities of the users. However, keeping the infrastructure in good condition for the operation of the canal has been the primary concern of the farmers. This is because, the use of materials purchased from outside could have serious effect on the operation of the canal if the users could not maintain the system.

The four *Pales* decided the allocation on the basis of the land to be irrigated from different branch canals. The *Pales* not only divided the water to different branch canals but also they were responsible for applying it to individual plots as well. The four *Pales* sit together and prepare the schedule for the allocation of water after the VDC selects them. The *Pales* were responsible for dividing the water from the main canal to different branch canals. The allocation is based on the *mato muri* (480, 2160, 1440, 360 and 360 in branch canals 1, 2, 3, 4 and 5 respectively). The *Pales* first take into account of the water available in the canal. Then they take into account of the land to be irrigated from each of the branch canals. More water is allocated to the branch canal 2 and 3, which have to serve larger areas. Accordingly the irrigation water is allocated to each of the branch canal. The water between the branch canals is divided using ad hoc structures of the mud and stone. The pales again sit together after 12 hours to see how much of the area has been irrigated by each of the branch canal. If they find for example, that certain area of branch canal 1 have not been irrigated but irrigation in terraces in branch canal 2 is about to be completed then the *Pales* adjust the flow to each branch canal. It is essential that all the terraces receive

adequate irrigation water. Thus, the allocation of irrigation water to the branch canals is frequently adjusted to meet the requirement of the area covered by that branch canals. However, the *Pales* adjust the flow to the branch canals during the day. The adjustment is either based on their experience or if they receive any complaints from the farmers. The *Pales* make an estimate of the water requirement of the area for the night. Based on their estimate they decide on the allocation to the branch canals. The following morning they take the stock of the situation and adjust the flows to each branch canal.

This VDC has a dispute with the neighbouring Lahachowk VDC over the water use right at the source. The dispute went to court during the time of the third rehabilitation of the *Ghachowk* scheme, because of the construction of the permanent headwork. The farmers from Lahachowk were afraid that the permanent headwork would restrict the flow of water to their canal. Finally, the Supreme Court, in 1991, gave its verdict that the available water would be divided between the two VDCs. It was because, Lahachowk had also the right since it was also using the irrigation water in the past. The Lahachowk VDC had been able to establish their rights because the government rehabilitated their irrigation system before the rehabilitation of *Ghachowk* system. The Lahachowk challenged the case on the ground that if they had no right to use the water, the government would not have invested in rehabilitating their irrigation system.

The court ruled that *Ghachowk* had the right to use two-thirds of the water at source, since it has 200 ha. (although actual command area is 60 ha.). The remaining one-third should go to Lahachowk VDC, which has 150[21] ha. An outlet was provided at the weir to divert one third of water to Lahachowk. The former *Pradhan Pancha* was of the opinion that during the construction of the headwork there was also a dispute between the two VDCs. The people from the Lahachowk VDC destroyed the headwork for fear of receiving less water. Later on the dispute was settled through the discussions between irrigation officials and farmers from the two VDCs. The farmers from *Ghachowk* agreed to provide irrigation water to Lahachowk, complying with the court ruling. This shows that the introduction of the new control technology was required to solve the dispute of water right.

5.7.2 User allocation, system operation and water distribution

The first level allocation was at the branch canal and the second level of allocation was to the field channels. The *Pales* estimate the area under irrigation by different field channels in *mato muri*. Based on the *mato muri* they divide the available water to different field channels. The primary concern of the *Pales* is to ensure that available water is allocated to each field channels in a way that is sufficient to provide irrigation water to that area. The water allocation to the field channels is also based on ad hoc adjustment. Usually, 24 hour rotation is practised. However, based on the field requirement the allocation to the field channels is adjusted daily. The *Pale* responsible for that branch canal decides on the allocation. However, if adjustment in the branch canal is required to augment more water or reduce the water flow, then he consults with the other *Pales*.

The water distribution to terraces is also based on *mato muri.* The area to be irrigated by field channels was divided into several sub-sections. Then an estimate of *mato muri* in that section is made along with the estimation of the water in the field channel. Based on the estimation the water from the field channels was distributed to the individual fields. The distribution of water was proportionate to the land holding. The important aspect in this respect is that the farmers compare the water situation in their field with their neighbours to see whether they have received equitable distribution. In local term it is known as *Bhijaune Palo* (meaning the turn to keep the terraces wet). The distribution from the field channels was on rotation. The rotation is usually for 12 to 24 hours. Water distribution was on the basis of water availability and dry areas were given priority during the plantation. The *Pales* not only distribute water but they apply to the field also. The farmers are not allowed to change the distribution. This was required to avoid the conflict among the farmers and all the farmers receive irrigation water based on the *mato muri.*

The farmers at the middle and tail end of the branch canals started seed bed preparation after the first monsoon rains in the beginning of July whereas farmers at the head start planting at this time. This was because they received water from the canal earlier and profited from the seepage from the upland area, which helped them for early seed bed preparation. The rotation schedule is enforced from the end of July when the main canal is full of water. The farmers from the head who had planted their field early demand a rotation from the beginning of July because their land would be deprived of water for one month. This was because the farmers from the head would not receive water unless all land gets a first irrigation to prepare planting. By this time the rice they had planted earlier was affected by drought.

As the volume of water in the canal decreases the irrigation water supply to the land in the tail end is discontinued and only the land in the head received water. This usually happens from the middle of September. Since many of the farmers have land both at the head and tail, they prefer irrigation water to the crop at the head because, high yielding varieties are planted at the head reaches, which require more water. Not all the fields received water from the field channels. Field to field irrigation is common in all reaches of the branch canals because all the fields are not reached by field channels. The distribution of water from field to field is through *Samaha.*

One of the practices was that no water was distributed to the fields close to the settlement area in the night for fear of land subsidence. As a result of porous soil there was the danger that the foundation of the houses would be affected. This was particularly the case for the lands which started receiving irrigation water after the intervention. These were the lands in the middle reaches of the canals where *Bari* lands had been converted into *Khet* lands and the lands in ward 6, which were in the settlement area. The *Bari* land, which was converted to the *khet* land started receiving water after rehabilitation only.

Those having land at the head did not want the *Pale* whereas the farmers at the middle and tail want the *Pale* to regulate the water distribution rotation. This was confirmed by one of the *Pales* when he said that the farmers at the head reach did not want *Pale.* Because there was enough water at the head reaches of the canal and some parcels of the land received water directly from the main canal. One former UC

member whose land was on the head reaches of the canal was complaining that the *Pales* were not discharging their duties properly.

He complained that the *Pales* divert most of the available irrigation water to the middle and tail reaches of the canal. Thus, they did not receive the required water. It was very natural for the farmers from the head reaches to complain about the *Pales*. In absence of *Pales* they would be receiving continuous irrigation at the cost of the middle and the tail reaches. This was confirmed by the *Pale* when he said that some influential farmers at the head wanted to have perennial water to their field and quarrelled with the *Pale*. However, the absence of *Pales* could contribute to an increase in the dispute among the farmers, as the norms would break down.

The benefit of the *Pale* system was important for the farmers from the tail end to get a fair distribution of water according to their needs. Some farmers from the middle and tail reaches try to influence the work of *Pale* by bribing him, according to one of the *Pales*. This happens usually when the monsoon is late and the need for water is great for all farmers. This was the major constraint for the *Pales* in operating the system. One former *Pale* said that he left the job because he could not check the water stealing by one influential person in the village. He threatened him if he reported it. He did not report it out of fear of being beaten. He felt that it was a sin. Every year the VDC forms a committee of some VDC members for the supervision of the water allocation and distribution. The committee is known as *Kulo Samiti*.

The *Pales* receive payment in kind. They collect paddy from the farmers after the harvest in November. Approximately, they collect 20 *muri* (1000 kg) paddy from the farmers with irrigated land, which they divide among themselves. The collection is 1 *ropani* = 3 *mana* (0.94 kg for 0.05 ha of land). One of the *Pales* complained that owners cheat in giving the remuneration in absence of up to date land records. Some farmers from the head do not pay, saying that they do not need *Pale* and as it is up to the *Pale* to collect their fee there is little they can do about it. They do not get any support either from the VDC or the *Kulo Samiti* in this respect.

Water availability has increased after the rehabilitation and some of the farmers at the head and middle reaches have been able to plant a wheat crop as well. This is because the leakage in the main canals has been controlled due to canal lining and also less time was required for irrigating the land as the water flow in the canal had increased. Since the water at the source itself is low, the farmers at the tail end were not able to derive the desired benefit as envisaged during the intervention. One of the UC members was saying that the water in the canal was available adequately for the last three years. This statement is very subjective, in the sense that it was determined by the location of land in the command area.

5.7.3 Conflict management

According to one of the *Pale*, water stealing often takes place. The villagers also confirmed this. The tail enders claim that the farmers from the head steal water. During my walk along one of the branch canals, one *Pale* was closing the outlet in the middle reaches of the canal from where the water stealing was taking place. The water stealing used to take place at night. Those who steal water do not divert water

to their field directly. Instead they divert it to an upper field and receive water through *Samaha* in order to protect their own field from the silt carried by the water.

The *Pale* informs the stealing of water he had observed to the *Kulo Samiti,* which settles the complaints from the farmers in this regard. The same committee also looked into the task of the *Pale* if they observed irregularities in discharging the duties. But in fact it was the VDC that settled the complaints, according to the *Pale* and also the farmers.

The committee first gives a warning to the farmers found guilty of stealing the water for the first time. If the same person commits the offence for the second time, he is penalised with a fine of NRs 150. The committee destroys 10 feet bunds of terrace of the field of those who do not pay the fine. It was becoming difficult for the *Pale* and the committee to implement this practice, as influential farmers in the village do not like to pay the penalty. This shows that the VDC was weak in enforcing the norms.

Recognising this in 1996, the VDC on the request of local youth club gave consent to penalise the water stealer. The youth club charged NRs. 50 for the first time when somebody was found guilty of water stealing. The cases of water stealing were better controlled since the local youths took the charge. However, the VDC withdrew the permission from the Youth Club as reported to the researcher during the visit in August 1997. It was because the youths did not properly utilise the money collected. The VDC expected the money to be spent on social work. Instead the youths spent the money on personal use.

5.7.4 Resource mobilisation

The *Jimmawal* used to mobilise the resources, usually labour, for the operation and maintenance of the system. The main tasks carried out at that time were the protection of canal through the required annual and periodic maintenance[22]. Canal cleaning was done once a year. The farmers contributed one man-day of labour for one ropani of land. Thus, the contribution was proportionate to the land holding. This level of annual contribution was sufficient for annual maintenance of the canal, according to the former VDC Chairman. The contribution was compulsory.

Also the VP mobilised labour which was called *Sithe Jhara* once in a year for canal cleaning and repair work. The labour contribution was proportionate to the land holding. *Sithe Jhara* continued until 1989 until the ILC formed the UC for the rehabilitation of the scheme. The *Sithe Jhara* was compulsory for all the villagers. After the ILC intervention, those who did not have land did not report for work. All used to come before, because the water in the canal was used for drinking as well when there was no piped drinking water in the village. Those who did not have land would have to contribute one day of labour at that time. Shivakoti (1992: 19) however, reported that the annual contribution was one person per household before the intervention, which meant 2.25 man days per hectares.

During the second intervention, farmers' contribution was in the form of labour based on the size of land holding. There were 139 users who did contribute in proportion to their land holding i.e. 6 labour days for 1 ropani of land. Besides, the farmers had to contribute NRs. 40,000 in cash[23]. The contractor paid the cash

contribution on behalf of the farmer according to the UC Chairman. The farmers' contribution was supposed to be 15 percent of the total cost. However, farmers did contribute some labour, which was mobilised for the collection of stones and sands.

The UC was able to raise only NRs. 81,000 in cash instead of NRs. 97, 616 from the farmers during the third intervention. NRs. 81 per ropani of land was raised from the farmers. The cash contribution shows that the amount supposed to be collected was from 60 ha of land. However, nearly 20-30 farmers did not pay NRs. 15,000 from the head reaches according to the UC members. The argument put forward by these farmers was that they were already getting sufficient water. After the extension of the canal they had to share the water which might affect the availability of water to their field. Thus, according to them sharing of water and also the cash contribution was not at all beneficial for them. The UC requested the contractor to pay the missing fund out of his own pocket as this was a small amount. Farmers had to contribute 3 labourers per ropani according to the UC chairman[24]. This meant labour contribution expected was from 135 ha of land. In my opinion, since the contractor managed to get the contract with sufficient margin he volunteered to bear the labour contribution as well.

After the intervention some ward members sometimes were active in mobilising manpower. This was only when maintenance work was to be done at the headwork. In that case at least one person from each household should report for the work but there was no penalty system for those who did not report. It can be said that there has been change in the pattern of labour contribution after the intervention. Now the contribution was not proportionate to the land holding, but to the household. But it was not necessary that all would come. One of the UC members said that the *Jhara* was on voluntary basis i.e. no organised resource mobilisation was practised for operation and maintenance. The resource mobilisation at the time of study was almost non-existent. Shivakoti (1992: 19) however, reported that the labour contribution after the intervention had decreased, which is 1.5 man days per hectare. Sometime even children were sent who cannot work. Only to show that some one from the household had reported for the work. Thus, the VDC made the decision that *Jhara* would not be called on Saturday as school was closed on this day.

5.7.5 System maintenance

The major problems faced by the *Pale* after five years of canal construction were the deposition of silt in the canals which made it difficult to deliver the water: also silt entered into the fields. The water users had to clean the canal. The *Pale* complained that the field channels were not cleaned and maintained properly. Due to this the flow carrying capacity of the channels was reduced. Because of this the farmers complain that they did not receive sufficient water and they blamed the *Pale*.

The condition of the main canal during field observation revealed that the canal lining was damaged in several places and leakage could be seen. The depth of the canal was reduced due to deposition of silt. Silt had been deposited in the paddy fields also. Before the construction of the permanent intake the silt used to flow into the stream. But now more silt entered the field because the level of intake was at par with canal level. This could be attributed to the change in the water control

technology. In some places the field channels had been damaged by the people in order to divert water to their fields.

The management of the system lies with the farmers after project commissioning. There were three types of maintenance. They were a) regular b) occasional and c) emergency. Regular maintenance was practised at the main canal only. Due to defunct UC the *Kulo Samiti* of VDC did the work to ensure that the water is available for irrigation.

Occasional maintenance of the canal was done when an outside fund was available. The maintenance done from NRs. 4,000 and 600,000 and 15,000 are the examples of this. It was interesting that the farmers were paying the *Pale* but were not mobilising resources for regular and occasional maintenance. Raising some contributions from the farmers on a regular basis was required for strengthening the canal structure such as repair of lining as it required capital costs. It could be argued that they were not doing this with the hope that the government will come forward again for its rehabilitation. Also because, the system was operating and no major rehabilitation work was required immediately.

5.8 Governance and property rights

The VP and the VDC via the *Kulo Samiti* have played a major role in the governance of the irrigation system. It was the VP, which was instrumental in drawing the operational rules through the introduction of the *Pale* system and *Kulo Samiti* in 1976. The reason for the VP to step in for the governance of the irrigation scheme was to avoid conflict among the users in head and tail reaches. The reason for the conflict was insufficient availability of irrigation water due to expansion of cultivated area, which were cultivated in three or five years. For that reason the VP drew a set of rules for the allocation and distribution of water. This is exemplified by the practice that tail enders do not receive irrigation water from September. Besides, the VP was able to mobilise DP resources by establishing linkages with the DP and Member of Parliament as evidenced by first and second interventions. The third intervention envisaged a new institution (UC) for the governance of the irrigation system. The UC was able to maintain the linkage with the external institution in obtaining the resources and the implementation of the rehabilitation. It continued the operational rules, which was in practice during the time of VP.

The property rights in relation to irrigation water in the irrigation system are proportionate to land holding. However, there have been changes in the constitutional choice rules during the intervention period due to establishment of property rights by new users. The owners of *Bari* land and also the lands at the tail end which were not receiving water before the intervention have been able to establish their right after the rehabilitation. The right was established through the investment for the rehabilitation. Some of the users had right for planting only as evidenced by the water allocation in the branch canal 5 for planting only. However, the situation has changed and they also have started receiving irrigation water based on *mato muri* since 1997. Hence, this could be seen as claimed property rights (Vincent, 1995). Beside, there has been a delineation of the property rights across the

system as a result of intervention. This could be considered as positive aspect of the intervention, as it lessened the likely conflict between the systems in future

A few of them at the middle reaches at the time of intervention did not make the required cash contribution. They told that they would not convert the *Bari* land into *Khet* land. But, at present they are also planting rice due to the availability of water. Their argument is that they should have a share in the government investment. The people at the head argue that they should have first right to use the water because before the intervention they were the main users of water. The issue becomes more apparent during the employment of the *Pale*. But they cannot influence the decision as they are from different ethnic group. It should be noted that one clan group dominates the decision making in village politics through their representation in the VDC. They were the first settlers in the village and own large land holdings. The rice planting in the head is one month earlier than at the middle and tail end. The farmers from the head want to employ the *Pale* when the planting time in the head reaches can start. However, the *Pales* are employed from the time when the farmers from the middle and tail end start planting. This indicates that defined governance of the irrigation system is effective due to the properly defined water rights.

Some of the UC members felt that the ownership of the system should belong to the government, because it had invested in it. Besides, they argue that the villagers do not take interest in maintenance, which became evident after the commissioning of the project. In their opinion, major maintenance like checking water leakage and improving canal lining should be a government affair and only the canal cleaning should be left to the people. This is happening at present, since they are obtaining cash from DDC and Member of Parliament for minor maintenance. It seems that the process of intervention might have discouraged the people for maintenance.

5.9 Water control

Traditional technology using locally available resources was in existence before the interventions. The third intervention brought major changes in the technical control of the irrigation scheme through the introduction of modern technology. The changes in the technical control brought changes in the pattern of social relationships at catchment and system level. This was evidenced by the inclusion of new users, which defined the new water rights among the users. Besides, the farmers no longer had to contribute their labour for temporary headwork construction. This had an effect in the user control of the technology as the users have to depend on the external resources for the upkeep of the system.

However, there have been no changes in the organisational control of the irrigation scheme except for the brief period of intervention. The VP/VDC as local institution have been able to maintain their organisational control in the irrigation system. Their organisational control has been facilitated by virtue of their ability to maintain linkage with other institutions for the mobilisation of the resources. In absence of their ability to mobilise outside resources, it is doubtful if they would be able to maintain organisational control. Nevertheless, the users have also been able to maintain organisational control by paying the remuneration of the *Pales*. This

indicates that the mobilisations of both external and internal resources are equally important for maintaining the social and organisational control. The political control was lost briefly during the multi party period. However, effective social control did contribute to the continuation of management practices.

5.10 Analysis and conclusions

This case is an example of how various types of interventions are shaped and how the processes followed in each intervention did affect the outcome. The formal institutions VP/VDC played an important role in the management of the irrigation system. Besides, they played the role of intermediary between the farmer and the outside agency in each of the interventions in obtaining the resources and its use. However, the type of support determined their institutional role in the maintenance of a communal linking loop, which affected the intervention processes. The first intervention, which took place in 1977, was small in terms of investment and was merely focused on the facilitation of the water flow in the canal by checking the leakage in some parts of the main canal. The existence of good local links with the DP facilitated in obtaining the resources for the intervention. The interface between the VP and the users helped in maintaining the strong linking loop in the implementation of the intervention and were able to achieve its objectives. This was due to the close interaction maintained between the users, VP and the UC members who facilitated in maintaining the transparency and accountability in the implementation of intervention. Besides, the UC was able to maintain the control on the available resources.

The second intervention of 1985 was larger in scale in terms of intervention and because of this the intervention was implemented through a contractor as was required by the DDC which was the funding agency. Nevertheless, the VP was able to monitor the work of the contractor effectively through the UC. The UC members acted responsibly by supervising the work of the contractor. However, there was negotiation and compromise between the UC and the contractor regarding the users' contribution. Nevertheless, it did not affect the quality of the work, as the contractor happened to be from the adjoining VP. This helped in maintaining the required social control. As a result the objective of the intervention was accomplished.

The users with the support from the VP and local politicians were able to form a linking loop to obtain government funding during the third intervention in 1989. It was a major intervention in terms of the investment. The design of the technology and construction were based on engineering norms. The provision of a steel spindle head regulator, construction of RCC aqueduct, and a permanent weir across the river are examples of this. Besides, the implementation of the intervention was based on rules and processes prescribed by the government and it was implemented through the contractor hired by the government. The users could not maintain the technical control on the resources available to them. This was exemplified by consent to contract out their part of the work also to the contractor.

Nevertheless, the processes outlined were not properly followed due to the fact that the majority of the farmers desire to obtain government funding and avoid

making contributions. Besides, the officials' interest to include the irrigation system in the government intervention programme could have overshadowed the detailed interaction usually required. This was evidenced when officials involved in the project admitted that there was lack of proper scrutiny of the design because of haste in project implementation. The important aspect was the increase in the size of the command area. The inflated command area, in order to bring the project within the category of subsidisable project, not only reflects ineffectiveness of the whole planning process of government programmes but also how the congruence of interest between a group of influential farmers and the officials affects the outcome of the project. However, the government officials were not made accountable for this. So, this was an example of the misplaced use of government resources.

The interest of some of the farmers in the group to attain their implicit objective i.e. to make money in collusion with the contractor enabled the contractor to manipulate the situation in his favour by waiving the farmers' contribution of 12.5 percent during construction.. This resulted into lack of communication among the UC members and the decision making of the UC was not transparent. This allowed the contractor to use substandard material due to inadequate supervision by the engineers and by the UC during the implementation. Importantly, it also shows how various users committee members behave in a particular situation. Thus, the lack of transparency and accountability in the activities of the UC and the contractor contributed to the users' apathy towards the intervention, which had a negative effect to the achievement of the intervention objectives. This shows that the linking loop was disintegrated during the implementation and the users' control on the use of resources was lost.

The formation of a Users' Committee in 1989 was envisaged in the government regulation to institutionalise the management of the irrigation system. This was assumed to be necessary to maintain the continuity of the benefit from the investment. This committee was also supposed to maintain the link with the agency after the implementation of the intervention. But there was a difference in the understanding between the users committee members and the government. The UC acted as 'construction committee' rather than 'users committee'. Because the committee ceased to function after the completion of the rehabilitation. The UC possibly never thought of continuing their role after the implementation since it did not develop any working rules for the management of the irrigation system during its period of two years. The discrepancy in the role expected from the UC and the actual performance could be due to the lack of a required educational process initiated before and during the intervention. Also a lack of monitoring of their performance and follow up action by the government, as the intervention focus was not on cost recovery from the investment. This could be largely due to the organisational control maintained by the VP in the management of irrigation system through the *Pales* under the *Kulo Samiti* of the VDC since 1976. Besides, it also shows that it is difficult to replace the role of existing institution by the new institution. In this respect, the government failed to take into account the existing irrigation management practices since the VP/VDC were involved in the management of the irrigation system for a long period and their role was more or less institutionalised. Therefore the UC became the duplication of the *Kulo Samiti* of the VP/VDC.

The small grant in 1997, which was not the formal intervention, had a cumulative effect on the better operation of the irrigation systems. The failure of the UC to take up its role led the VDC to constitute another UC for this fourth intervention, although the scale of work was small. This shows how the linking loop, which was disintegrated after the third intervention was reconstructed to get the external resource. This further shows that the VDC is becoming more competent to keep the canal operational.

The availability of external resources and also engineering biases determined the choice of technology and type of activities in each intervention. This was evident from the nature and type of activities carried out in each intervention, which were different from one another. It could be said that the more resources coming from outside the higher was the level of technological sophistication. If we compare the four interventions in terms of resource we can observe that the third intervention by ILC had a higher level of technological sophistication.

The continuation of management of the irrigation system by the locally elected institution (VP/VDC) shows that it is difficult to replace the traditional institution by a new one. This is due to the acceptability of its governance role by the people. Generally, the system is well managed in terms of water allocation and distribution. It was possible because of the development and application of a set of working rules acceptable to all. This was also made possible due to the *Pale* system which was introduced in 1976 and which has been proved effective for more than two decades and has wide acceptance. As a consequence, the intervention did not affect the role of *Pales*, which were institutionalised in the *Kulo Samiti* of VP/VDC. As a result, they were continuing their role during and after the intervention.

The appreciation of the *Pale* system by the farmers reflects their desire to avoid conflict among themselves. Further, it indicates that farmers are concerned for management cost. This is because the transaction cost involved in the replacement of the *Pale* system would be higher for the farmers. This system is time saving in terms of irrigating their fields. Because, the *Pale* determined the water allocation and if they were not there, the users would have to organise themselves for water allocation, which would have created all kinds of conflicts. And also it is convenient for the farmers, as they do not have to wake up at night to irrigate their field. In absence of the *Pale* system the farmers would have to come to an agreement for water distribution and implement it.

Another important implication brought about by the intervention is the establishment of property rights across the system and within the system. There has been a division of the water right between the two systems in different VDCs with the construction of the permanent intake. The farmers in the middle reaches who were able to convert their *Bari* land to *Khet* land derived the real benefits within the system. The farmers from ward 6 were also able to establish their right to use irrigation water on a rotation basis for rice planting from 1997. This is an example of claimed right acquired through the investment. The intervention of 1991 led to great disappointment of the farmers in ward 1 and 2. They were under the impression that they would also receive irrigation water. In the survey and design of the intervention a command area of 200 ha was mentioned. But as indicated earlier the irrigation officers did this to get a subsidy for the project.

The mobilisation and generation of resources on a regular basis for the maintenance of the irrigation system is lacking at present, which is essential for the continuity of the benefits. This is evident from the deteriorating condition of the main canal and some branch canals. Regular maintenance would have prevented this. This could also be attributed to the non-functioning of the UC as it was one of its mandates. Moreover, the lack of activity on the part of the UC has prevented the return of up-front money deposited in the DIO office, which could have been used for regular maintenance.

Regular and timely maintenance ensures the continued benefit from the technology used in the rehabilitation. But continuation of the increased benefit in the long-term is doubtful in absence of a maintenance fund as a result of an ineffective UC. At the same time VDC is also not effective in resource generation from the users. This shows that shared cost, which is one of the conditions for the successful operation of the canal is not in place, except for occasional canal cleaning. As a result, the users depend on the outside resource when it comes to the cash contribution. This is essential to avoid major maintenance, which require considerable financial investment. Some of the materials used are not locally available and farmers will have to buy them in cash. Farmers may not be able to generate the required resources in time of need. Since, resource generation on a regular basis is lacking at present farmers have already started talking about external funding for required maintenance. The resources obtained in 1997 for simple maintenance is the example of this.

In overall, the effect of first two interventions did not change the control technology, as the objective was to operate the canal with existing technology. However, the third intervention had effect in changing the control technology of the irrigation scheme. However, it did not change the organisational control, as the UC could not function to replace *Kulo Samiti*. The economic impact of the intervention was not great, as there has been marginal extension of the irrigated area. The intervention however, was expected to have substantial economic impact given the size of the investment. But the hidden objectives of the actors, mainly the government officials and the local elected representatives did affect the outcome. In that respect the third intervention was not successful in achieving its objectives. The intervention rather created dependency on external resources. This could be attributed to the lack of adequate attention given to increase users' control in the implementation of the intervention.

Timesheet - Ghachowk Irrigation System

Stakeholders / Time	Farmers	UC	VP/ VDC	Pale	DP/ DDC	DOI	Contractor
1785 (Farmers were not sure of exact date)	Constructed the irrigation system						
1958	Until this date farmers managed the system under *Jimmawal* and *Mukhiya*						
1962			Took over the management of the system				
1960-1988			Once in a year the canal cleaning was done by mobilising the farmers labour and materials. This was called *Sithe Jhara*	VP introduced the *Pale* in 1976 for water distribution and allocation which is continuing till to day			
1977 Intervention- 1		Implemented the construction work as contracted out by the DP		Functioning	Provided NRs. 4,000 for minor maintenance work		

1985 Intervention-2		Committee formed to oversee the rehabilitation work consisting of 11 members		functioning	Again provided NRs. 600,000 for major rehabilitation work. Survey was done by the overseer from DP		Implemented the rehabilitation work
1987 Intervention-3	Farmers requested for rehabilitation		Requested for the government support for rehabilitation	Functioning			
1988	Interacted with the survey team		Extended necessary support to the survey team			Sent survey team to the village for rehabilitation of the canal.	
1989	Gathered to form the UC	Formed a committee of 9 members with Chairman, vice-chairman and other members	Called a mass meeting of the villagers for the formation of the UC	Functioning		Came up with a design for 200 ha with an extension of fifth canal for the total cost of 3,904,625. Asked the farmers to constitute the UC	
1989-1991	Were supposed to contribute 2 and half % in cash and 12 and half % in labour contribution. But they did not	Helped DOI in contracting out the work and negotiated with the contractor to		Functioning		Contracted out the work in consultation with the UC	Carried out rehabilitation work which include construction of gate, canal lining and

	provide the labour contribution	waive farmers' contribution. Raised cash contribution but all did not pay and deposited NRs. 81,000 with the DOI					extension of the canal and also did not raise farmers contribution
1992	Some of the farmers benefited through the efficiency in the delivery of the water and some by converting *Bari* land into paddy due to the access to the irrigation water	Helped DOI in certification of the completion of work and ceased to exist after the completion of the rehabilitation work. Worked only during the construction of the scheme.	Replaced VP after the introduction of multi party system	Functioning	Replaced DP after the introduction of multi party system	Completed the final check of the work done by the contractor and issued certification for the completion of work in consultation with the UC	
1997	Not contributing cash to the maintenance of the canal	Officially not dissolved but defunct	The VDC obtained NRs. 15,000 for maintenance from parliament member	Functioning			

Notes

1 The information published by the District Development Committee (DDC), reports that the *khet* is 203.84 ha and Bari is 131.89. DDC, Kaski, 1995:34

2 Shivakoti (1992:22) reported planting of spring rice on 30 ha of land. However, none of the farmers reported about spring paddy. It is likely that some farmers at the head reaches of the irrigation system may have tried spring paddy immediately after the intervention.

3 It is a national level organization working in the area of nature conservation. There were three committees formed by this project in the VDC. The activities implemented by the project were plantation, forest conservation, environment conservation and small-scale infrastructure development through the participation of the farmers.

4 The rent is fixed, which is 45 kg. of paddy by the households having a pair of bullocks and 22.5 kg. by the household having a single bullock to the tailor master and for the blacksmith respectively. However, the household having a single bullock will have to pay 32 kg. of paddy. Thus, the payment is based on the economic status of the household, which is measured in terms of number of bullocks in the household.

5 One afternoon (in 1996), when I was talking to the VDC secretary at his office, some 100 villagers including some VDC members arrived to complain against the allocation of Development Funds of the VDC made available by HMG/N on an annual basis for this fiscal year. Some of the projects selected were not the people wanted. One could observe the manoeuvering between different groups. The VDC chairman was on a delegation that time to the capital to request the government for the electricity to the village. The representatives were protesting the unilateral decision of VDC to allocate the funds. They were not satisfied with the selection of the projects to be implemented from that fund. Their main complaint was that the composition of the committee for the selection of the projects was not well represented amongst all the major political parties. They were complaining that the VDC representatives were neglecting them in the development programme. The election in 1997 has changed the composition of the VDC, which has seven of its members from one party out of eleven members.

6 The former VDC chairman told the reason for selling land to the Gurungs. The Brahmins, according to him, were fond of milk. Because of this, they used to keep cows. In the earlier days the cows used to die of diseases, due to the non-availability of expert veterinary services. The Brahmins then would sell the land to buy a new cow. The Gurungs had a good income from the army services , which enabled them to purchase the land.

7 The government used to nominate *Jimmawal* and *Mukhiyas* under him to collect land taxes, before the land record survey in the hills. Three to five percent of the collected revenue was provided to them for their services. Usually, they used to be the farmers with a large holding. Naturally, they would have greater interest in the maintenance of the canal. Besides, the *Jimmawal* also used to work as village head in settling disputes at the local level. In some places they were also called *Ditthawal.*

8 *Pales* are locally employed whereas the government employee, who operates the canal in AMIS is known as *Dhalpa.*

9 This is a committee constituted by the VDC annually to supervise the work of *Pales.* However, this committee is different from other UCs, which were constituted during the time of intervention. The primary objective of the constituting of *Kulo Samiti* is to ensure water allocation and distribution in that season based on existing rules. It receives the complaints from farmer for any irregularity in water allocation and distribution. This committee also settles the disputes if there are any. The committee had 10 members for the season 1997. The number of committee members is not fixed. It varies from season to season.

The farmers' complaints and effectiveness of the previous committee affects the number of representations. Some of the farmers would like to be in the committee if they felt that their grievances in the past were not addressed. However, the larger the size of the committee, the stronger it becomes in enforcing the norms.

10 The VP was dissolved after the restoration of multi-party system in 1990 and the VDC came to existence only in 1992. Thus, during this period only the UC was formally in existence, which guided the work of the *Pale.*

11 It is now known as District Development Committee (DDC) after the restoration of the Multi-party Democracy in the country in 1990.

12 There was no direct financial grant to the VP from the government at that time. The government used to provide annual lumpsum grant to the DP to carry out small-scale development projects in the villages. These funds were distributed to the VPs on an annual basis. Besides, the VP had to request the DP for additional fund for emergency maintenance.

13 Overseer is a junior engineer who assists the DP engineer in survey and design of the village level projects. Since the DP had only one engineer, it is not possible for him to visit all the sites. However, his approval of the design is necessary for the release of the funds. The DP engineer based on the field report of the overseer approved the final design. There are sub-overseers (junior level technician) also in DP, who provide necessary technical support for small-scale village level projects.

14 The WRID and the DIO is the regional and district level functionary of the DOI. Their main tasks are to implement the policy decisions of the DOI besides, implementing activities as directed by the DOI.

15 The report contains lists of irrigation projects financed under the various programmes including ILC in the Western Development Regions.

16 The UC secretary gave this figure for the contracted amount. This could not be verified, as officially the contract amount was not available.

17 The Rastriya Panchayat was the highest legislative body during the Panchayat system.

18 The document of WRID dated February 1990, which reported the field implementation of the project noted that the farmers from the head reaches were not happy with the extension of the command area as they feared that there would be less water available to them. They felt they took the initiative for the rehabilitation but the benefit was going to the tail enders. Thus they were not extending necessary co-operation to the project. It is important to note here that the most of the farmers from the head reaches are from the Gurung ethnic community and at the time of intervention the Chairman of the VP was also a Gurung. Thus, it is more likely that they took the initiative for intervention with an objective of lining the main canal. The majority of the farmers from the middle and the tail reaches are Brahmin and Chhetri who constitute the majority in the villages. This exemplifies the network of social relations in which each of the community would like to further their interest.

19 The rehabilitation under NISP is discussed in part II of chapter 4.

20 The members of parliament were provided with NRs. 500,000 to implement small projects in their constituency. The money is basically, for maintaining his hold in the constituency for election. The VDC members who have direct contact with the people could help him in maintaining his influence. Since, election constituency consists of 6-7 VDC areas, he can spend the money wherever he likes. Thus, money provided was out of the discretionary fund of the Member of Parliament.

21 The court decision was based on the command area mentioned in the DOI survey of the schemes.

22 One old record available at the VDC shows that farmers contributed NRs. 222.00 in 1920 for stone cutting for the construction of canal.

23 The VDC record shows that initially, NRs. 3, 629.00 were collected from the farmers. Some of the farmers resisted the collection so, contribution from all the farmers were not collected. Consequently, the contractor was requested to waive the farmers contribution, which he agreed to. The already collected money was returned to the farmers.

24 Based on the actual expenditure of NRs. 3,368,000, the 15 percent contribution made by farmers in monetary value becomes NRs. 505, 200. Only the cash contribution, which is 2.5 percent becomes NRs. 84,200. The 12.5 percent of labour contribution become 7016 labour days at the rate of NRs. 60.00 wage per day. In monetary value the amount becomes NRs. 421,000. Thus, the actual labour contribution expected was for 117 ha, if we take three labour days per ropani. Shivakoti (1992:16) however, reported NRs. 19523.00 per ha contribution from the farmers as part of 15 percent contribution.

6. *Tarkughat* Irrigation Systems

6.1 Introduction

The irrigation systems are in *Tarkughat* VDC area in Lamjung district. This is one of the oldest systems developed and managed by the farmers in the district. The irrigation systems have variations in their governance and management practices. The systems were selected for the study to look into the differences in the management style and to see the effects of minor interventions in the physical system. These systems had minimal outside interventions in the distant past and were also important, as the intervention did not have major impacts on their management.

It would have been useful to study a system fully managed by the farmers without any outside intervention. However, it was difficult to find such a system due to the involvement of several agencies in providing various types of assistance to Farmer Managed Irrigation Systems (FMIS). The districts considered for the study were Parbat, Tanahu and Lamjung. The first step in this connection was the review of official documents. The inventory of FMIS prepared by the Water and Energy Commission Secretariat was useful in this connection. A visit to Lamjung district for preliminary information collection on potential sites was useful in this respect. This helped in narrowing down the list of potential sites.

Discussions with the DDC officials and other officials from various agencies working in the district helped in knowing the actual status of various FMIS in the district and helped in selecting five FMIS for preliminary field visits. Discussions with local people during the visit of five FMIS centred mainly on the historical development of the systems and different management practices evolved over time and the management practice at present. Accessibility, command area of the system, level of outside support received in the past, prevailing management practices and farmers' views on it were the criteria used for the final selection of the site.

In his first visit to the *Tarkughat* VDC, the researcher explained the purpose of his visit to the local leaders and farmers. The farmers and the local leaders had different levels of interest and understanding about the work of the researcher. These differences in the understanding were due to the socio-economic position of the person, his education, his political inclination and whether he held an official position or not. Their initial understanding was that some agency was taking the initiative to provide financial and technical support for the rehabilitation of the irrigation system. Some groups of farmers thought the research on the irrigation system was only a pretext, but that the researcher was working for some political party. Maintaining political neutrality was necessary, as party politics had affected many activities at local level. This meant not taking active interest in local politics as the researcher had to get support from all people in the village, but sometimes it was difficult.

6.2 The environment of the system and context of intervention

6.2.1 The general environment

The Village

The village lies along the banks of Marsyangdi river. The village stretches from West to East. The settlement pattern in the village is clustered. One can reach the village in 45 minutes from Kalimati on the way to Besisahar, the district headquarters of Lamjung. It takes two hours by bus from Dumre, which is on the way to Pokhara in Prithivi Highway, to Kalimati. The VDC area has ten settlements. The VDC area is at 855 metre asl and lies at the 84° 21′ longitude and 28° 08′ latitude.

The irrigable area of the VDC is only 16 percent of the total area. However, year round irrigation is not available. This shows the potential for the development of the irrigation for increasing the production and productivity.

The average annual rainfall in the area is 2508 mm. The moisture regime in the area is humid. The total area of the *Tarkughat* VDC is 721.89 hectare. The land use distribution in the VDC area is presented in Table 6.1.

Table 6.1: The land use distribution in the VDC area

Types of land	Area (hectare)
Khet	121
Pakho/Bari	259
Forest	74.89
Minaha[1]	267
Total	721.89

[1] *Minaha* is the land covered by foot trails, river and grazing land etc.
Source: Cadastral Survey Office, Lamjung

Population and ethnicity

The VDC has 532 households with a total population of 3174, of which 1586 (49.9%) are female. The wardwise distribution of the VDC is presented in Table 6. 2.

The average family size of the household is approximately 6.0. Ethnically, the VDC is a mixed community. Chhetris are the dominant ethnic group (24.8%) followed by the Newar (22.2%) and Brahmin (13.9%). From the occupational caste group the presence of Sarki (cobbler) is significant (12.4). Other caste groups in the VDC are Gurung, Magar, Damai (tailor master), Miyan (Muslim), Dura, Tamang, Gharti, Sanyasi and Gandharb (singer). Forty three percent of the total population is within the age group of 15-60, which constitutes active labour force. Thirty percent of the population is less than 15 years of age.

Table 6. 2: The wardwise distribution of households and population with ethnicity

Ward no.	Households no.	Population	Male	Female	Major ethnic groups
1	56	314	167	147	Mixed community except Muslims
2	55	286	144	142	Chhetri, Brahmins and cobblers
3	61	357	182	175	Brahmin, Chhetri, Muslims and Newar, Gurung
4	56	312	147	165	Newar, Cobbler, tailormaster and Muslims
5	70	379	183	196	Brahmin, Chhetri, Newar and Cobbler
6	66	351	188	163	Brahmin, Chhetri, Newar and Blacksmith
7	51	358	171	187	Brahmin, Chhetri, Cobbler and Gandharb
8	67	511	234	277	Chhetri, Newar and Blacksmith
9	50	306	172	134	Brahmin, Chhetri, Newar and Gurung
Total	532	3174	1588	1586	

Source: Village profile of *Tarkughat* VDC, Rural Development through self-help promotion, Lamjung. HMG/GTZ, 1995:6

Occupation

The main occupation of the people is agriculture. Seventy five percent of the households however, are not food sufficient for twelve months (ICIMOD, 1996: 126). These households draw income from other sources. Wages, salaries, income from petty shops and remittances are other sources of income. The distribution of households earning from other sources according to the VDC estimate is presented in the following table.

Table 6. 3: Household income by other sources

Categories	Percent of total households
1. Service	2.5
2. Wage earning	30.0
3. Pension and remittances	10.0
4. Business	5.0

The wage earning is through working in the village during the agricultural season and outside the village in nearby towns within Nepal and India during the non-agricultural season. The pension and remittances are mainly from people working in

India. The semi-skilled workers in the village are engaged in the construction work during the non agricultural season.

Landholding and land tenure

Out of the total of 532 households nearly 85% belong to the category of marginal to medium farmers. The numbers of marginal (< 0.25 ha), small (0.25-0.5 ha) and medium (0.55-1.0 ha) is almost equal (27 to 28%). Only 64 (12%) households have more than 1.0 ha of land. The number of landless households in the village is 24 (5%). The land holding includes both *Khet* and *Pakho/Bari*. The household distribution with size of landholding is presented in Table 6. 4.

Table 6. 4: Household distribution with size of holding

S no.	Size of holding (ha)	Number of households
1	< 0.25	152
2	0.25-0.5	148
3	0.55-1.0	144
4	> 1.0	64
5	landless	24
Total		532

Source: field survey

There are no legal tenants in the village. However, *Adhiya*[1] is prevalent in the village. Share cropping occupies nearly 15 percent of the land. Only the *Khet* lands are rented. The contractual arrangement for share cropping is for one year or two. The renewal of the agreement depends on the wishes of both parties. This means the owners have the right to evict the share cropper and can rent out to other farmers. The terms and conditions for sharecropping are that the owner provides land whereas the sharecropper contributes labour. The owner and the tenant share the cost of the chemical fertiliser and seeds equally. The owner and the tenant share the product 50/50 basis. The reasons for renting out and renting in as described by the farmers are as follows:

- Those having big holdings rent out, as they cannot supervise the farming on their own because of their engagement in other activities.
- The households having less able members also rent out.
- Those having insufficient land to feed their families rent in.
- Those having large families rent in although they themselves have sufficient land to feed their families.

The first two reasons are most common. Hiring of wage labourers is common for those having fewer able members at home to do the job. In most of the cases the able member is working outside which enables them to pay for the wages.

The farming system and principal crops

The cropping pattern in the area is paddy based. The cropping pattern is different for *Pakho, Bari* and *Khet. Pakho* is for planting *Khar*, which is mainly used for roof thatching and as fodder. *Bari* is for homestead and for cattle raising. The crops grown

in *Bari* are maize, millet, pulses and vegetables for household consumption. Maize is an important crop for household consumption as well as for livestock feed. The cropping pattern in the *Khet* is rice-fallow-maize, rice-vegetable-maize and rice-wheat-maize. However, the last two cropping patterns cover only 10% of the total land. The cropping intensity is 160 percent.

Rice is the principal crop in the area. Farmers are planting traditional and improved both varieties of rice[2]. The size of holding was found to be an important factor in the choice of the variety. Because, planting of traditional varieties involved some risk taking. The traditional variety has to be planted early in order to harvest it early (beginning of July-mid November), because of its susceptibility to the cold weather. This means an early monsoon is required for its planting.

The planting of traditional varieties of rice are usually for household consumption as it tastes good and gives more strength, according to the farmers. It has also long straw, which is important as livestock feed. The yield of traditional varieties, however, is less than the improved varieties. Therefore, the choice of improved varieties is due to their high yielding capacity.

Also, the improved varieties of rice are planted late and they mature early. Therefore, the farmers with big holdings have both traditional and improved varieties planted as they could take some risks. The farmers with smallholdings having large families preferred the improved varieties, which is important to meet the food need of the household. According to the farmers, the improved variety of rice, however, is labour intensive because more weeding is required. Also, it requires more manure and irrigation water at the early stage of planting.

The District Agricultural Office introduced improved varieties of rice12-15 years before. In individual plots the programme was not successful, as it was prone to insect attacks. It became successful when introduced in a block (7-8 ha). Since then, the farmers are planting improved varieties along with the traditional varieties. The average yield of the paddy in the area is 1.5 mt/ha and 2.0 mt/ha for the traditional and modern varieties respectively.

The majority of the farmers were of the opinion that the use of chemical fertilisers is almost constant for the last 5 years, in the sense that its application is not increasing progressively every year. They cited the following reasons for not increasing its application:

- There has been an increase in the acidity of the soil due to the use of chemical fertilisers.
- Farmers lack knowledge in the use of appropriate combinations of various fertilisers.
- It is not available in time as required.
- The cost of the chemical fertiliser is increasing.
- The increased use of livestock manure has reduced the application of chemical fertiliser.

Farmers, however, admit that the use of chemical fertiliser for wheat is a must.

Livestock has played an important role in the farming system of the village. The use of livestock manure as fertiliser is most common in the village. One of the

reasons for the reduced use of chemical fertilisers is the sufficient availability of livestock manure. Most of the owners having 10-20 ropani of land have bio-gas installed in their houses. Its slurry is also being used as fertiliser. The installation of bio-gas has helped in lighting the houses and reduced the use of firewood in the household. The use of firewood is only for preparing livestock feed. Stall feeding is most common in the village because cattle is not allowed in the community managed forest.

With respect to the agricultural services, the farmers will have to go to Sunderbazaar, Bhotewodar and Chakratirtha that are at a distance of 1-2 hours. The present policy of the government is that one agricultural sub-centre will serve 3-5 VDCs. The sub-centre in Chakratirtha provides services to the farmers of the *Tarkughat* VDC. The District agriculture office in Besisahar informed that the sub-centre has one JT, one livestock assistant and two messengers. The farmers can avail the services in two ways. The first is technical advice from the technicians at the office and secondly, technical advice during their visits to the village.

The services for agricultural credit are also not very different. The office of the Agricultural Development Bank is in Chakratirtha VDC. However, the services of the bank are not satisfactory, according to the farmers. The major constraint for credit was the collateral, especially for the poor farmers who cannot offer collateral. For this reason, taking up loans from the rich in the village is more common, because the farmers do not require a collateral for small loans and these are easy to get. However, collateral is necessary for big loans. Usually, land serves as collateral for loans. On the side of the institutional credit a national level NGO is also working in the village with the support from the GTZ[3].

Before, there was no labour shortage in the village for agricultural work but the availability of labour is becoming a problem in recent years. This is mainly due to the *Adhiya* practice that came into effect in the last 10-15 years. Those having *Adhiya* first would like to finish their own work. Only those not having enough land are working as wage labourer. The prevailing wage rate for agricultural work in the village is NRs. 50 for the male and NRs. 34 for the female. For the non-agricultural work, it ranges from NRs 50-90.

The contribution of women in agricultural work is significant. Except for ploughing, women are equally involved in all other agricultural work. Bringing compost to the fields and weeding are exclusively women jobs. The women who are also the household head have to take decisions related to the agricultural activities. But in male headed households, it is the men who take most of the decisions.

There are two community forests managed by the villagers in which no fodder can be collected. The households have to collect the required fodder from the personal farm land and public lands.

The community decides on the use of the forest products. The farmers get wood for agricultural tools and other forest products once in a year from the community forests. However, payment of cash is necessary for buying timber[4]. The users have a set of rules for the management and use of forest products. The forests are divided into four blocks. One block of the forest is pruned once in four years. This was necessary to preserve the forest. The forest is well managed due to the enforcement of the rules and adherence to it by the villagers. The farmers have a committee to

look after the management of the forest. The committee, through the public notices, informs the farmers about the set of rules and about the use of forest products. The total numbers of users in the community forests are 120 households.

Migration

According to the estimate 38 percent of the male population are working outside the VDC area (ICIMOD, 1996: 127). Working outside the country is mostly in India. The number of people working outside for longer periods is much less as compared to the people going for seasonal work. Usually people go out for seasonal work in December after the paddy harvest and come back for the next planting season of paddy that begins at the end of June. Thus, the wages and the salaries make significant contributions to the households.

Physical facilities

Almost 98 percent of the households have access to drinking water facilities. Most of the drinking water systems are community owned. Installation of drinking water facilities has been a priority of the local people. The government and also the VDC supported local initiatives for its implementation. The villagers are contributing more than 50 percent for the installations of the drinking water and the rest was provided by the VDC. The contribution of the individual household is not large as six to ten households contribute for the installations of the drinking water. Some of the households however, have invested on their own to have their private connection. One of the reasons for the rapid expansion of the drinking water facility is that the Water Resources Act of 1997 accorded first priority for drinking water in the use of water resources. Secondly, the installation of drinking water is possible with small budgets due to the use of polythene pipes.

The VDC has five primary schools, one lower secondary school, one secondary school and one 10+2 education since 1997. The students from the adjoining VDCs also attend these schools. Forty five percent of the children of the school going age in the village are enrolled in the primary classes (ICIMOD, 1996: 131). The enrolment in the secondary classes however, is mostly from the upper castes. This means the dropouts among the children from the poor and occupational caste families are quite high. Also there are two sub-health posts and one police post in the VDC. There are no other government offices.

There are two suspension bridges planned for the construction in the VDC. A suspension bridge is under construction with the technical and material support from the Swiss and German projects. The construction of the suspension bridge would benefit the villagers from ward number 2 and 3. The villagers are to contribute labour and some payment for the skilled labourers. Accordingly, villagers were collecting financial contributions locally. The contribution was voluntary. People contributed according to their socio-economic position in the village[5]. In the opinion of those engaged in collecting the contribution, some villagers are not able to contribute as they are very poor and some can contribute more. The villagers received an assurance from the VDC for a financial contribution of NRs. 45,000. The villagers had to collect NRs. 54,000 besides the financial contribution from the VDC.

Existing social relationships

The existing social relationships among the people from different caste groups are good. *Parma*[6], which is common in the village, has helped to mobilise the required labour. There is the practice of exchanging the use of oxen for ploughing for rice straw. This is particularly beneficial to the big owners who used to have more straw than required for their household. During the planting season the wage rate for a pair of oxen with a person for ploughing is NRs. 120 per day.

There was some division among people due to party politics. The division was especially among and between the local leaders and the educated people. This becomes more open during the local election. In terms of ethnic representation the VDC have representatives from all the caste groups. The composition of the VDC shows that the Newars have 4 representatives followed by the Brahmins and Chhetri with two representatives each. Other representatives are one each from the Gurung, Miya and the occupational castes. This shows that the higher caste groups are still dominant due to their higher socio-economic position.

The people from all walks of life in the village however, were unanimous that local politics should not constrain the development activities in the village. However, the villagers from different wards compete for the resources available from the VDC and like to protect their interests. For example, the villagers from ward 4 thought that the old market in the VDC will loose its importance after the construction of a suspension bridge. Thus, the villagers from that ward were not positive towards the construction of this bridge. One teacher from ward number 2 was saying that the villagers from ward 3 should contribute more as compared to the villagers from ward 2. He argued that the villagers from ward 2 will have to make contributions for the suspension bridge being constructed in ward 1 as well. They are in the middle of these two wards (1 and 3) and both bridges are equally important to them.

On-going development activities in the VDC

The allocation of the VDC resources for various development activities indicates that the focus is on infrastructure development, education and the health services. Installations of drinking water and construction of bridges had the highest allocation followed by the salary for the teachers and the scholarships for the students from the occupational castes. This allocation exemplifies the priority attached to education in the VDC. Besides, awareness creation about the community health and family planning had also received an allocation of VDC resources. The villagers had to contribute 25 to 50 percent of the costs for the development of infrastructures. The contribution includes both labour and cash in case of drinking water and bridges.

6.3 The environment of the irrigation systems

6.3.1 The irrigation system

Irrigated land in *Tarkughat* is supplied by a total of 16 small local canals, which are slope-offtake systems. The users tend to discuss this area as if it were one system and

there is only one committee managing all these small sources. For canals 1-9 the source of the irrigation is the *Dhand Khola* flowing from north to south. The water source for canals 10-15 are springs and canal 16 receives its water from a river (the Dumre *Khola*). The farmers do not recall the time of their construction. Some older members of the community were of the opinion that the first settlers in the area constructed the systems. That was nearly 300 years ago. These irrigation systems have their specific command area. But the excess water from some systems supplement the irrigation water to other systems. Thus, the command area for the purpose of the study is defined as the total area irrigated by each sub-system. Two lined canals and 14 earthen canals carry irrigation water to the fields. Field to field irrigation is also in practice (see figure 6.1). All the canals were constructed at the same time. However, the difference is that some of the canals divert water directly from the stream and some were constructed to tap irrigation water from spring sources.

The canals 1 and 2 have different headworks, and have been assisted by intervention. One is on the eastern (left) side of the river and another on the western (right) side of the river. After providing water for these two canals, the same river provides irrigation water for seven earthen canals to the lands further downstream to the south.

The Canal 1

This canal, named *Dhand Kulo*, lies on the eastern side of the *Dhand Khola* river. The water in the canal flows, via a gentle slope, from north to south. Before the present permanent intake was made the people constructed a temporary headwork to divert water from the river to the canal. They used materials that were locally available such as stone, mud and twigs. Now there is a permanent headwork of cement due to the intervention that will be discussed in section 6.4. At the outlet of this headwork, in the beginning of the canal, there is an iron mesh that must check the debris brought in by the river, which otherwise will block the canal, in which there are no other control structures.

Near to the headwork there is a silt trap box for the deposition of the silt that passes through the iron mesh of the headwork. There is an escape for the overflow of the water after the silt trap box. The silt trap box and an escape are for checking flood water from fast flowing monsoon that can damage the canal. The water could affect the canal. The length of the lined canal is approximately 400 metres. The unused water from this canal goes to the field through an earthen canal. The irrigation water moves from field to field after that.

There are 15 outlets on each side of the canal. However, the sizes of the outlets are not equal. The first outlet from the head to the field is at a distance of 100 metres. The distance between each of the outlets varies from one metre to ten metres. There are 20 water users who have the exclusive right to irrigate their land from the lined portion of the canal, which comes to 2.5 ha.

The Canal 2

This canal, named *Birta Kulo*, lies on the western side of the *Dhand Khola* river. This canal also had a temporary headwork before the construction of the present permanent headwork. The present cement headwork was constructed 2 years after the construction of headwork in canal 1. The headwork of this canal is nearly 300 metres down from canal 1. In this canal there is also a silt trap box and an escape. The lined portion of the canal is about 300 metres. Another difference between the two canals is that this canal delivers irrigation water to the field directly from the canal and also through traditional *Kulos*. There are 11 water users who have the exclusive right to use the water from this canal. It irrigates an area of 3.5 ha. After the end of the canal the irrigation water is distributed from field to field.

At the time of the visit to this area during the period November- March 1998, the canals were operational. The farmers at the head and middle of the canal were irrigating wheat and vegetable crops. The iron meshes at the headwork of both the canals were not visible due to the deposition of silts. Farmers said that they cleaned it before the monsoon planting. Farmers do not clean the canal for winter crops since not all the farmers do plant winter crops and the requirement for water is less. Thus, there was no need to increase the volume of water as long as it was sufficient for the small area of winter crops. Maintenance of canal lining was required in some sections of the canal. Farmers seem to have maintained the canal well when considering the time they have been operating it.

The earthen canals

The remaining irrigated land receives irrigation water either through earthen canals or through field to field irrigation. There are three types of source from where earthen canals receive water. The first is from the streams called *Dhand Khola* and *Dumre Khola*, the second is the excess water from the lined canals, and the third are the three springs that originate in the fields. There are 14 earthen canals for irrigating the land not covered by the lined canals 1 and 2. Earthen canals irrigate a total of 26 ha of land. The remaining 3.25 ha receive water by field to field irrigation. The excess water from the lined and earthen canals is the irrigation water available for field to field irrigation. The areas irrigated by different canals are presented in the following table.

Table 6. 5: Irrigated area from different canals

Name of the canal	Irrigated area (ha)	Number of farmers	Allocation method
1. *Dhand Kulo*	2.5	20	Rotation
2. *Birta Kulo*	3.5	11	Rotation
3-9. Earthen *Kulo*	14.0	55	Rotation
10-16. Earthen *Kulo*	12.0	63	No enforced allocation
Field to field	3.25	22	No enforced allocation
Total	35.25	171	

Source: Field study. The 1, 2, 3-9 and 10-16 are the numbers of canals as shown on the Figure 6.1

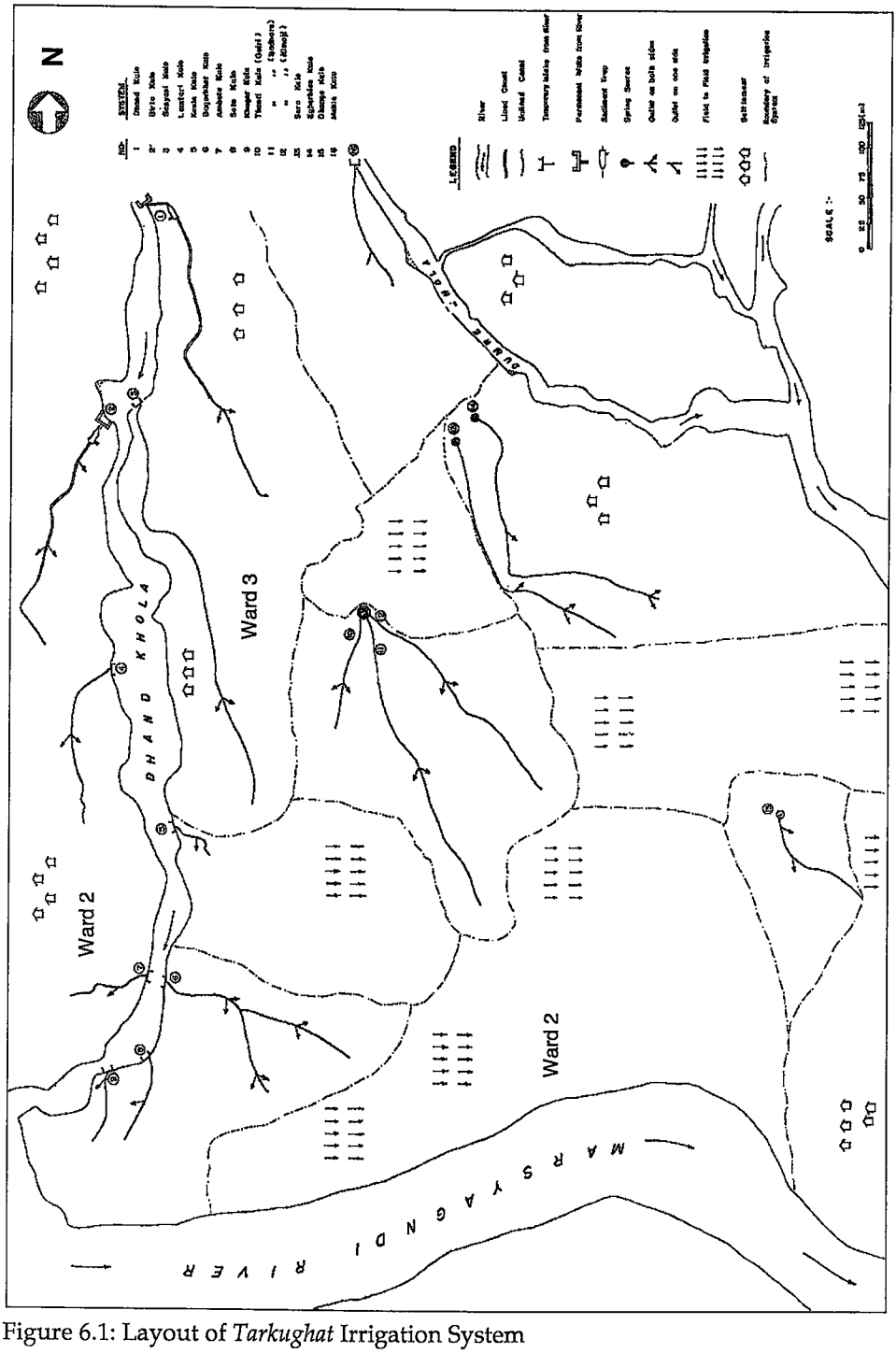


Figure 6.1: Layout of *Tarkughat* Irrigation System

6.3.2 The irrigated land and its distribution by ethnicity

The total area of land within the command areas of the irrigation systems, which lies in Ward number 2 and 3 is 35.25 ha The irrigated land is along the Marsyangdi River. It has a gentle slope from north to south. The land in the irrigated area belongs to 171 households. According to the farmers there are 20 farmers who have their land located in more than one place. Some of the farmers are cultivating 2.75 ha of land in the irrigated area as tenants, that is *Guthi* land[7]. Most of the farmers have their houses outside the farm land (*Khet*).
This has implications for irrigating their land during the night. Those who lived in the farmland can take the advantage of night irrigation. The distribution of land holding among various ethnic groups is presented in Table 6. 6.

The table indicates that the majority of the farmers have very small size of holdings. The Brahmin and Chhetri have a larger size of holding as compared to other castes. The upper caste is the dominant group in the village, as described earlier and distribution of landholding is indicative of that.

Table 6. 6: The distribution of irrigated land by ethnicity

S.no	Size of holding (ha)	Number of farmers	Major ethnic group
1	< 0.5	160	Brahmin, Chhetri, Newar, occupational castes and Miya
2	0.55 to 1.0	8	Brahmin and Chhetri,
3	> 1	3	Brahmin and Chhetri
Total		171	

Source: Users of irrigation system.

6.4 The intervention in the irrigation system

6.4.1 Rehabilitation by the Hill Food Irrigation Programme

Planning
The Hill Food Programme of His Majesty's Government of Nepal rehabilitated both the *Dhand Kulo* and *Birta Kulo* in 1987 and 1989 respectively. This was implemented as district level project. The District Panchayat (DP) was involved in the selection approval and implementation of the project. However, the government officials appraised the project. The objective of the rehabilitation was to increase the food production in the hill areas. Thus, the project made provisions for improved agricultural support services along with improvement of irrigation systems for the reliable supply of irrigation water. In addition, the construction of trails and bridges were the important components of the project.

During the discussion with one of the District Agricultural Officers, who was involved in the implementation of the Hill Food Project in another district, he told me that the objective of the project was to overcome bottlenecks through the improvements of the physical system. The Regional Agricultural Directorate (RAD)

was responsible for the co-ordination of the project. A separate Project Office was established to co-ordinate its implementation. The District Co-ordination Committee (DCC) chaired by the DP president was to review the project plans, assign priorities for implementation and assist the DADO in the procurement of goods and services. The DADO was to co-ordinate the implementation of the project activities at the district level and submits its reports to the District Co-ordination Committee. The procedure followed for the selection and implementation of the project was:

- The DADO published the notice about the project.
- The users applied for the rehabilitation through the VP.
- The DP[8] received the application from the VP.
- The DP presented the project plans to DCC.
- The DCC with its recommendation presented the plans to the DP.
- The DP with its recommendation presented the project plans to the District Assembly (DA)[9] for the inclusion in the Annual District Development Plan.
- The DA discussed and approved the project plans. It submitted the plan to the Regional Co-ordination Committee (RCC) of HFPP.
- The RCC approved the project for implementation.

Once the project was approved the project office sent an overseer for the survey of the scheme. The influence of the village level leaders and their rapport with the District Agricultural Development Officer was important for sending the overseer for the preliminary survey. The selection of the systems was based on the site reports of the overseer. He said that in most of the cases, the project was approved once the overseer made the survey. Besides, the influence of the village leaders on the district level leaders also played a crucial role in the approval of the project. According to him, the District Agricultural Officer had no other role, than to accept the project, if the report by the overseer was positive. This was because the District Agricultural Development Officer had limited knowledge of the technical details of the project. Besides, it was difficult to reject a project as the DP initially approved it. In addition, the local leaders could influence the members of the Co-ordination Committee. Since, the local elected representatives were responsible for the approval of the plans it was natural for some of them to influence the decision of the DA.

The rehabilitation of *Dhand Kulo* and the *Birta Kulo* took place in 1987 and 1989 respectively. Unavailability of funds was the main reason for the difference in time of two years for their implementation. Separate Users' Committees were established in 1987 and 1989 because this was a requirement before the project got the finances. The Users' Committee consisted of seven members. The then Users Committee chairman also briefed the processes followed for the execution of the programme. This person belongs to the upper caste. He is also active in local politics. He is a respected person in the local community and was also influential at the District level as well, due to his active involvement in politics. In case of this rehabilitation also, it he did use his influence to get the project approved, which he admitted in course of discussion.

According to him, the District Agricultural Office (DAO) was the executing agency for the rehabilitation of these irrigation systems. The villagers requested the

DAO for the rehabilitation through the District Panchayat (now it is District Development Committee). The DAO sent an overseer for the survey of the systems. The overseer prepared the cost estimate after surveying the system. The estimated contribution from the people was 20 percent of the rehabilitation cost. The overseer and the people discussed the design and the cost for rehabilitation. The overseer submitted the design and the cost estimate to the DAO, which approved the project.

The costs estimated for *Dhand Kulo* amounted to NRs. 415,000 according to the design. The cost estimate was obtained from the then UC chairman. However, the UC chairman said he could not find the design and cost estimate for *Birta Kulo.* He estimated that the cost for the *Birta Kulo* was about NRs. 300,000. The records were also not available in the DAO. The DAO officials told me that there was a separate office created for the rehabilitation and that was dissolved after the completion of the project.

Implementation

The work began after the DCC and RCC approved the design and the cost estimate. The works accomplished under the rehabilitation were the construction of the permanent head works of cement, canal lining of 700 metres, silt trap boxes; and the escapes in both *Kulos.* Also gabion work in one place was implemented to protect the *Kulos.*

Another member of the UC, who is currently the VDC vice-chairman confirmed this. This fellow is rich by village standards and also very active in social work. He commands good respect from the villagers, not only because he is rich and a local leader, but also because he is helping to solve individual as well as community problems. According to him the UC entrusted the implementation of the rehabilitation work to its chairman. This was because the people did not like to contribute voluntary labour. People thought the approved amount would be sufficient for the completion of the work. The District Agricultural Officer confirmed that in most of the cases the villagers did not make their contribution. As the farmers provided no labour, the project was completed without their contribution. Obviously, the cost was over estimated or the contractor took the losses.

The UC chairman frankly said that the water users wanted him to implement the work with the technical supervision of the overseer. He agreed that the people did not contribute their share. According to him "people are always reluctant when they have to make contributions in government projects"[10]. He did his best to do a good job with the available funds. The whole work was implemented with the funds provided by the government. In his opinion the project would not have been implemented if he or some one had not taken the responsibility.

In the opinion of some villagers, that were not the water users, the UC chairman took the contract himself and profited from it. Thus, the exact role of the UC chairman was not clear. It is an example of village gossip that often blames the local leader. However, it is unlikely that he made a profit in view of his reputation in the village. The work accomplished was quite good given the present status of the irrigation system. The water users are also satisfied with the work done at that time. This was evident also from the fact that no maintenance work was required for 6 years after the completion of the rehabilitation work.

The UC for the Dhand and Birta Kulos

The UC of the irrigation systems does not formally exist at present. The former UC chairman said it is not required. In his opinion the UC was for fulfilling the requirement of the rehabilitation. After the completion of the rehabilitation, the UC, which was registered, did not develop any procedures for the operation and maintenance of the system. This, however, had not constrained the operation of the system. At the moment officially there is no UC, because they have not renewed the registration. The mandate of the UC expires after one year unless they renew the registration.

The water users are collectively managing the system in the absence of a formal UC. Farmers told me that resources required for the maintenance of the system are collected from internal and external sources. The collective decision of the users is very important in this respect. The collective decision making procedure was to invite the farmers in one place and to discuss the problems and solution, which was to be agreed upon by the majority of the farmers. The decision to convene a meeting usually takes place through their informal discussions among some of the farmers, who inform other farmers about the meeting. The resource mobilisation at present is being done on an ad hoc basis. Farmers cited following reasons for not having a formal UC:

- The group size of the water users served by the lined portion of the canal is small.
- They can discuss among themselves, whenever required due to small size of the group.
- Farmers have been able to mobilise the resources required for simple maintenance.
- The rehabilitation did not change the area under irrigation and the number of users, which would have affected the right of the users.
- Major maintenance works requiring substantial external support have not been undertaken because it was not yet needed.

In the opinion of the farmers, the need for the formation of an UC may arise when it would be a precondition for getting external support. There is a valid reason for saying so, because the envisaged role of the UC is for taking care of the operational and maintenance aspects of the irrigation system. In case of this system, the farmers are taking care of the operational and maintenance aspects by themselves and there are no serious problems in that respect.

6.5 Management of irrigation tasks

6.5.1 Water acquisition, system development and system water allocation

The irrigation water to the two canals is diverted through the permanent headwork, which was constructed during the rehabilitation of the schemes more than a decade ago. The users used to divert water through temporary headwork before the

construction of the permanent headwork. There are three main sources of water for irrigating the entire fields. they are:
a) *Dhand Khola* with two lined canals and seven earthen canals
b) *Dumre Khola* with one earthen canal
c) Spring sources with five earthen canals

Two different kinds of canal provide irrigation water from these sources. They are:
a) Lined canals
b) Earthen canals

The other irrigated areas receive field to field irrigation.

6.5.2 User allocation, system operation and water distribution

The discussions hereafter will focus on the allocation procedures. There are three allocation procedures. However, allocation procedures from these canals are different. The users themselves distribute the water to their fields. There are no *Pale* or *Dhalpa* to allocate and distribute the water in this system. However, the users organise themselves to distribute water among themselves.

Rotation
Dhand Kulo
The total area served by the *Dhand Kulo* is 2.5 ha belonging to 20 farmers. The farmers receive water on a rotation basis. One of the farmers who had 0.4 ha land in *Dhand Kulo* said that the land on both flanks of the *Dhand Kulo* is almost equally divided i.e. 1.25 ha on each side. According to him these lands had the first right to use the water from the river, which is diverted through the cement headwork Only the excess water from the canal was delivered to the earthen canal at the end of the lined canal. However, another farmer who had 0.15 ha of land served by the earthen canal contradicted this. According to him, there were no such rules that the user of earthen canal would receive the irrigation water only after the land at the lined canal received sufficient water. The owners of the land, which received irrigation water from the lined canal, imposed this rule. He said that because of this arrangement, his rice planting was delayed. He had to suffer more if the rainfall was not sufficient and in time.

All the irrigated plots receive water through separate outlets in the lined canal. If an owner does not have contiguous plots, separate outlets were provided to irrigate his land in different locations. The local measurement of land for irrigation is in *mato muri.* The water allocation for each parcel is according to *mato muri* .

The owners on both sides of the canal decide on the allocation of the water. The allocation however, is based on the volume of the water in the canal and area to be served. Based on this principle, the water in the canal is divided equally over the two sides of the canal. This is because the land on the both sides of the canal is equal. The water for both sides of the canal is allocated on a rotational basis of 24 hours. This is the first level of allocation.

The second level of allocation is between the owners of the land on each side. The size of the holding (*mato muri*) and the water availability is the criterion for the allocation. The allocation of available water among the water users is proportionate to their land holding. The rotation is usually for 24 hours (5 p.m. to 5 p.m.). But this time can be adjusted depending on the availability of the water specially, during the planting season, when water requirement is high. In that case, the farmers divide the land in two blocks and each block receives water for 48 hours.

In some seasons, the land to be irrigated used to be further divided into two blocks on each side of the canal, in order to increase the volume of irrigation water for each parcel of land. In that case the rotation was for more than 24 hours. This situation arose when the volume of water in the canal was not sufficient to irrigate the total land in 24 hours due to inadequate rainfall. The rotation is extended for 48 hours. This sort of arrangement evolved especially for the paddy crop. This was essential to get all the fields wet in order to make them ready for transplanting. This flexibility was possible due to the small size of the group.

Birta Kulo

The area under irrigation by *Birta Kulo* is 3.5 ha and the owners are 11. The area under irrigation is not divided on the both sides of the canal like in *Dhand Kulo*. The canal passes along the foot trail and the irrigated lands are on both sides of the canal. Some parcels of the land receive irrigation water directly from the canal and some lands receive irrigation water through earthen field channels. The allocation of irrigation water is on a time share basis proportional to their land holding. The rotation is usually for 24 hours.

The owners of the land decide on the allocation of water for each parcel of the land keeping in view the amount of water available in the canal. Not all the plots do receive water directly from the canal. The conveyance loss in this canal was also a little higher as compared to the *Dhand Kulo* as some of the plots received water through earthen field channels. The allocation principle is based on *mato muri*. The available water is divided among the water users proportionate to their land holding. There is less flexibility in the allocation of water in this *Kulo* as compared to the *Dhand Kulo* due to the fact that there are no separate outlets for each plot to be irrigated. However, water allocation is through ad hoc adjustment, in which the users decide the amount of water for each field and increase or decrease the flow through the use of stone and mud. Thus, the water flow is adjusted keeping in view of the rotation of each user. The criteria used to estimate whether all the fields received water in proportion to their *mato muri* is to look at the level of water in each terraces. If some terraces have more water than the others, then more water is diverted to the field which is less wet. They adjust water allocation by using stone and mud. The rotation is usually for 24 hours.

Earthen canals

Another 14 ha of land in the irrigated areas belonging to 55 farmers also has the allocation practice based on the principle of time share proportional to their holding. The sources of irrigation water for these lands are spring sources and overflow from

Dhand Khola and *Dumre Khola*. The excess water supplemented the water from the spring sources. These lands receive irrigation water through 14 earthen *Kulos*. The area under irrigation from each of the *Kulo* varies. There is a minimum of 0.5 ha belonging to two users and 2.5 ha belonging to eleven users. For the rotation, 2 to 4 parcels of the land were grouped together into one plot and each plot received water in a 24 hour turn according to one of the farmers, who had 0.25 ha of land and was among the 11 users.

The area to be irrigated determined the size of plot. The *mato muris* are divided in even numbers. As for example if the land to be irrigated is 60 *mato muri* then it was divided into 3 plots of 20 *mato muri* each. Each of the plots had a 24 hour rotation (5 p.m. to 5 p.m.). The irrigation water within the plot was divided on a time share basis proportional to their holding. Interestingly, if the irrigation water is to be divided to 70 *mato muri*, the 10 *mato muri* is given water continuously which is known as *Surate Palo*, since it is not possible to allocate the water evenly on 24 hours rotation basis. The users decide how much of water is required to irrigate the land and accordingly they distribute the water.

In all the *Kulos* each water user has the responsibility to bring water to his field in his turn. Stones and mud are used in the outlet in order to ensure proportional allocation of water for each field.

Unregulated allocation

Twelve hectares of land belonging to 63 water users served by the canals 3, 5 and 10-15 did not have allocation rules. These lands received too little water from *Kulos* that are spring fed and from excess water from the field to field irrigation. These lands are at the middle and tail end of irrigation system. These farmers were more dependent on the monsoon rain compared to the farmers served by the *Kulos*, which have a rotational allocation.

If the monsoon was good they received more water from the spring source and the excess water from the upstream canals as well. The lands that are near to the spring source and received water for field to field irrigation do get more water. Thus, the location of the land was an important factor in determining the availability of water. Some parcels of the land have to depend only on the spring source whereas some get water from field to field irrigation as well. Further, those having houses on those farmlands have a comparative advantage when no allocation rules exist. They would be able to divert water to their field in the night. However, the irrigation water meant for one particular field from a specific *Kulo* was not allowed to divert to another field. This means that there is established water right of each of the owners to obtain a certain amount of water based on its availability.

In some cases water users sit together to divide the water to each of the fields according to the size of the plots. This is possible only when the water in the *Kulo* is abundant according to the water users. This does not apply to all the *Kulos*. The case reported was for 0.375 ha of land belonging to three water users. This indicates that group size and irrigated area were important for devising the allocation rules. In that case the equity aspect was better addressed, which was a precondition for application of rules.

The women who were also the household head had to face a lot of problems when there was unrestricted allocation according to one of the farmers. She was assured of irrigation water in case of rotation.

Field to field irrigation

There were lands that received irrigation water from field to field only. The total land in this category is 3.25 ha belonging to 22 farmers. These lands get excess water from lined canal when the canal has full supply and field to field irrigation from the terrace irrigated by earthen *Kulos* and spring sources. This is because these terraces are not connected to the field channels. However, there existed definite rules to provide irrigation water from one specific terrace to the others. The owner from whose land the water is flowing was not allowed to divert the water to other fields on his discretion. He was not allowed to divert the water to his own terrace even if he has land just below his upper field. This provision has protected the right of the farmer who did not have any means to receive water from other fields and *Kulos*. Another practice was that some of the terraces has to divide overflow water equally to downward fields, where field channels did not exist.

All the farmers agree that the water availability increased after the rehabilitation of canals 1 and 2 due to the control of seepage loss through canal lining. The farmers who received irrigation water from the lined canals benefited directly. Nevertheless, the farmers who were receiving water through earthen canals and field to field has also benefited from the rehabilitation due to the seepage control, which increase irrigation water in the lined canal. This contributed in increasing the water flow in the earthen canal and also made more water available for field to field irrigation. This had been particularly beneficial to the farmers at the middle reach.

The increase in water volume due to decrease in conveyance loss and seepage control was not equitably distributed to the farms in the middle and the tail end. This was due to the strict rule for allocation and distribution of the water for the fields from each of the canals. Further some of the lands received water from the canal and also overflow from another field. In that case these types of land were receiving more water as compared to other fields which had only one source.

The winter crops planted in the area are wheat and vegetables. Only the land, which has an assured supply of irrigation water, is considered for these crops. The lands at the head of the two lined canals and land receiving water directly from the *Dhand Khola* have a winter crop. The lands served by the spring source and the field to field irrigation do not have winter crops. Unavailability of the irrigation water is the main reason for not planting winter crops. The vegetables planted are mainly onion and garlic for own consumption.

6.5.3 Conflict management

Farmers reported very few cases of dispute. The reported cases of dispute were from the areas where an enforced allocation rule does not exist and field to field irrigation is practised. In most of the cases water stealing was the source of conflict. Those living near to their farms used to steal water. According to the farmer who had his

home near to his field, water stealing occurred mostly at night. As a result of this, some of the farmers used to stay in the field during the night to ensure that the irrigation water is not diverted elsewhere. The farmers make an arrangement for the distribution of the water when there is the presence of more than one farmer. The intensity of the dispute is not great. People used to solve the problem through consultation. In some cases other water users had to mediate between the two quarrelling farmers.

Some cases of water stealing had also occurred in areas where the allocation rule does exist. The nature of the problem is the same. In that case one who had stolen the water had to lose his turn for irrigation and the farmer from whom the water was stolen used that. In the past (10-12 years before) the penalty for water stealing was to destroy one foot of the bunds of the field. This indicates that the frequency of conflict was high in the past and also the penalty was strict. But now the penalty was abolished due to less occurrence of dispute. The lower number of reported cases of dispute at present suggested that the water availability has increased over a period of 10 years. This coincides with the time when rehabilitation took place.

6.5.4 Resource mobilisation

There was a varying degree of resource mobilisation for the irrigation system. That was dependent on the nature of the *Kulos* and their maintenance requirement. The rehabilitated portion of the canal was costly to maintain because of the materials used. The cost for cement and the skilled labour require cash. This meant water users had to contribute cash as well if maintenance work was required. In that case they had to depend on external support as well. Other earthen *Kulos* could be maintained with materials and skill available locally. In essence the scale of resource mobilisation is dependent on the type and extent of maintenance work required.

The farmers receiving water from the lined canals have mobilised resources both from external and internal sources. The farmers received NRs. 10,000 from the District Irrigation Office in 1994. Likewise, they received NRs. 3,000 and NRs. 2,000 from the VDC in 1994 and 1996 respectively. The money was expended on the maintenance of the lined portion of the two canals. The resources mobilised internally are labour contribution from the water users. According to one farmer debris cleaning at the headwork was required annually. Sometime the work had to be repeated two or three times a year. All the farmers had to contribute to it. Usually, one person from each household reports for the work. However, not all the farmers do report. About 60-70 farmers report for work and one day is sufficient to clean the debris. Farmers were of the opinion that use of the cement made it difficult to maintain the system. In most of the cases the farmers are ready to contribute their labour but it is difficult for them to contribute in cash.

It was clear that financial resources were mobilised from external sources and non-cash resources were mobilised internally. Farmers felt that the cash component in resource mobilisation has increased after the rehabilitation of the system whereas the labour contribution has decreased. This was because, the farmers did not have to construct the temporary headwork annually as a result of permanent headwork construction. The labour contribution for temporary headwork construction was 10-

12 days by 35-40 farmers. Some time the floods used to wash away the temporary headwork. In that case people would have to reconstruct it.

There has been no change in labour contribution for canal cleaning and seepage control. The water users from respective *Kulos* contribute one day labour annually for canal cleaning. The labour contribution is on the basis of one person from each household whatever may be their size of holding. The explanation for this arrangement was that there is no significant difference in the size of holding served by each *Kulo*. Secondly, the work is not huge. The type of work determined the number of days for labour contribution. The person who has more land in a particular block takes the lead for the mobilisation of the resources required for the operation and maintenance of the *Kulo*. Cash contribution however, was in proportion to the size of holding.

Water users said that contribution was equal from each household, but some variation was found. The water users from different *Kulos* had set the norms for labour contribution. Two sets of norms were prevailing. In some *Kulos*, all the water users will have to work for cleaning from the beginning of the *Kulo* to the end. In other *Kulos*, each of the water users works from the beginning of the *Kulo* up to the end of his land. This meant the water user who had the land at the end of *Kulo* was required to contribute more than his fellow who has land at the beginning of *Kulo*.

6.5.5 System maintenance

Farmers in canal 1 and 2 had to contribute their labour for the construction of the headwork before the rehabilitation of the canal. The construction of the permanent headwork and silt trap box had made the operation and maintenance of the canal easier. Farmers are regularly contributing for canal cleaning to make it functional. The external resources were used in repairing the canal lining and the canal bed. This was required to keep the canal operational and to increase water volume by checking conveyance loss. Among the external sources the DIO and VDC provided occasional financial support but not other agencies. The VDC had a regular development budget for nine wards and the representatives from this ward could opt for investing their part of allocation for canal maintenance.

The lined portion of the canal, as described earlier is maintained on an ad hoc basis and is functioning well. The routine maintenance of the lined canal however is lacking. In absence of this, maintenance requirement will go on increasing as the canal becomes worn out year after year. Farmers do not seem to be interested in raising cash on a regular basis. They hope that external support can be availed through the influence of local leaders. Secondly, they think that maintaining the canal structure is expensive and that is not possible from the meagre cash contributions of 31 farmers who have the first right to use the irrigation water. Other farmers who received irrigation water from different other sources including the excess water from the lined canal did not like to make cash contribution. This may be one of the reasons that these 31 also did not like to pay.

6.6 Governance and property rights

The governance of the irrigation system was with the users. The intervention envisaged the UC for the governance of the irrigation system. Nevertheless, the UC is not functioning after the intervention. In that respect there has been no change in the governance structure of the irrigation system. The three sets of rule (as discussed in chapter 2) which are essential for the functioning of the irrigation system is working well in this irrigation system. This was possible due to the defined water right of each of the users. There has been no change in the water right of the users, since no new users were included after the intervention. The users are mobilising their own resources for the operation of the system, which is not based on the water share but based on customary practices. This shows that changes in the water right could have affected the governance of the system as new rules had to be developed.

6.7 Water control

The users were using locally available materials for the construction of the temporary headworks before the intervention. There has been a change in the technical control of the irrigation scheme through the construction of permanent headworks. However, the technical control did not affect the organisational control. But it did create new linking loops between the user and the external agencies for the mobilisation of external resources for maintenance. The users receiving irrigation water through the lined canal join together to obtain and mobilise external resources required for the maintenance of the irrigation scheme. In the past however, the operation of the canal was the concern of all the users as they used to assemble for the headwork construction.

6.8 Analysis and conclusions

This case was an example of farmers built irrigation systems with small interventions in 1987 and 1989 in two systems, which did not have significant effects on the existing governance structure. The intervention was successfully implemented due to intensive contacts between the government officials and the users and also the main work was the headworks construction. This was due to the fact that this was a district level project, which was implemented with the active involvement of the local institutions like DP VP and Department of Agriculture. Therefore, the formation of linking loop was strong due to the smooth good contacts in the interface between the actors. Besides, it was relatively easy to maintain the communal linking loop due to the small number of users receiving water from the lined portion of the canal. The intervention did not follow the processes as envisaged because the UC was formed only to obtain the resources from the government. As a result the management take-over of the irrigation system by the UC after its rehabilitation has not happened. Thus, it was clear that the establishment of water users association alone is not important to maintain the linking loop. Because of this the formation of

the linking loop of the UC disintegrated after the completion of the intervention. But its task were performed by the original communal linking loop of the farmers.

The intervention created artefacts through new materials and strengthened transformative capacities (concrete headwork and concrete lined canals),which played an important role in the increase in the volume of water after the intervention. This has been particularly beneficial to the farmers at the tail end. Another positive effect was that the farmers at the head and middle of the two lined canals have been able to cultivate winter crops although in a small area. However, it did not affect the existing rules of the water allocation as the present users are continuing with the rules that were developed long ago by those who constructed the system. The improvement in the traditional technology had effects in redistribution of resource (water). It is not only the farmers at the lined canal but also those receiving excess water from the lined canal at the tail end have benefited due to increase in the volume of water in the lined canals of the two systems, which was essential to address the equity issue. The redistribution of the resource has a positive effect in maintaining communal harmony and social cohesion in that respect.

The construction of a permanent headwork contributed in lessening the annual labour contribution required for the construction of the temporary headwork. The construction of the permanent headwork and canal lining however has increased the need for cash for the maintenance of two systems. At present the irrigation system is well maintained and managed by the farmers and farmers are aware of the need of future maintenance. The maintenance of the irrigation systems after the introduction of the new technology is not beyond the capacity of the local knowledge, skills and resources. However, it is not the ability of the farmers but their unwillingness to contribute, especially in cash, which is the important aspect in this respect. This is partly due to the fact that in the past cash contributions were mobilised from outside for the maintenance of lined canals. Another important issue in this respect is the ownership of the irrigation system. However, farmers' feeling that the external resources should be mobilised for future maintenance requirement indicates that they feel less responsible.

The governance system developed in the past was not disrupted by the intervention since, there has been no change in the water rights after the intervention. This suggests that there will be little effect on traditional management practices if the existing water rights are not affected by the intervention. The differences in the management within the various irrigation systems were the result of delineation of water rights of every user due to the differences in water availability in the various systems. As a result there are fewer disputes. The fact that traditional management practices could be continued is due to the smallness and simplicity of the irrigation systems (short main canals), which causes less disputes among head and tail users.

Timesheet - *Tarkughat* Irrigation System

Stakeholders / Time	Farmers	UC	VP/ VDC	DAO/DIO	Contractor	Remarks
The farmers could not say when the system was constructed but opined that it could be 300 years before	Constructed the irrigation system					
1987-1989	Requested the government for the rehabilitation of the canal. Participated in the discussion for the survey of the system. They did not contribute the 20% share	Formed a seven member committee for the rehabilitation of Kulos.	Forwarded peoples request to the DDC	Sent overseer for the survey of the system. Rehabilitation of *Dhand* and *Birta Kulos* with permanent intake at the cost of 300,000 and 415,000 respectively.	The chairman of the UC implemented the rehabilitation on contract basis at the request of the people. Completed the work.	
1989	Collectively managing the system and annual labour contribution for canal cleaning	Was dissolved after the completion of the rehabilitation work				
1994	Continued the management of the system and obtained the fund		Provided NRs. 3,000 for the repair of the lined portion of	Provided NRs. 10,000 for the repair of the lined portion of the		

	from VDC and the DIO for the repair of lined portion of the canal.		the canal	canal.		
1996-1997	Requested VDC for financial support for the repair of the lined canal		Provided NRs. 2,000 for the repair of the lined canal			

Notes

1 *Adhiya* means share cropping in local terms.
2 The traditional varieties of rice are *Jhinuwa, Kamal jira, Madhesi* and *Mansara*. However, *Madhesi* and *Mansara* are most common. The improved varieties are *Gokule, Bindeswori, Mansuli* and *Beeji*. The *Gokule* variety is popular among the farmers as it can be planted late and this does not affect its yield because it requires less irrigation water.
3 Its target group are the poorest and socially backward in the village. However, the farmers from the upper caste group with good economic positions have also joined the groups. It works through the group and the main activity is mobilization of saving on a monthly basis from the group members and providing small credit to the group members. The group members decide on monthly savings and it's lending to the group members. This programme seems to have been beneficial to the poor farmers. However, the coverage of the programme is too small to have substantial impact on village economy.
4 The members pay NRs. 30. 0 per cubic feet whereas the non member pay NRs. 60.0 for the same.
5 The size of land holding and income from other sources, besides agriculture are the indicators applied by the villagers to determine the status of a family in the village.
6 Labour exchange among the villagers is very common. It is practised among all the farmers. There is no ethnic barrier to it. The farmers who cannot go on their own will have to send hired wage labourers for labour exchange.
7 The trust is in the name of local temple.
8 The DP had eleven members representing 9 Ilaka (constituency) and one president and one vice president.
9 All the chairman and vice-chairman of the VP in the district are the members of the District Assembly.
10 He opined that the people comply with the conditions as agreed upon in NGO implemented project for fear of losing support. That is not the case with the government implemented projects. The NGOs are very strict in enforcing the terms and conditions as agreed upon before the implementation of the project. The people have a greater feeling of ownership in the NGO implemented programmes because of their contributions to in it according to him.

7. Major findings and conclusions

The objective of the present study was to understand social, administrative and political processes shaping development interventions through a study of programmes to assist FMIS in the hills of Nepal and to understand social and institutional changes brought about through these interventions, with special reference to water management practices. Understanding these processes was seen as essential for future effective and sustainable institution building at local level. In this respect three FMIS and one Agency managed irrigation system were selected for the case studies, which were discussed in chapter 4 to 6. The Agency managed system was evolving as a Jointly managed system. The research questions examined the forms of interventions, and the processes followed in the design and execution of the public interventions in irrigation systems. Other equally important questions involved the participation of actors at various levels and the interface between them, which shaped the outcomes of these interventions. Finally, the scope of the study included the effects of the intervention in terms of changes in the institutional arrangements after the intervention and its implications for water management practices.

An attempt in this chapter is made to integrate the findings of the four cases keeping in view the theoretical concepts and the research questions presented in chapter 2.

7.1 Intervention processes

The processes followed in the initiation of the intervention were conditioned by the policy of the agency, which provided the assistance. Various strategies were applied in providing assistance to the FMIS as discussed in chapter 3. The government policy of seeking user participation in the decision making of project design and implementation was mixed during the 1980s, as indicated by the intervention under different programmes. For example, small-scale financial support for the improvement of the FMIS under SPWP, IRDPs and HFPP (*Tarkughat*) were implemented more or less on a participatory approach. The intervention of *Tarkughat* was implemented under the Department of Agriculture through its regional office. The irrigation scheme was implemented following the FIWUD policy, which recognised the role of the potential users and the DP/VP. Thus, the users obtained the support through their links to the VP/VDC. Besides, the direct financial and material support from the DP to the VP as indicated by the first and second intervention of *Ghachowk* was also implemented under a participatory approach. This was also largely due to the requirement for the preparation of District Development Plan and implementation of the decentralisation programme in the country in 1982, in which the role of local elected bodies was recognised in the government reforms. The processes followed in new constructions, like the *Annapurna Kulo* (HIP), were not based on a participatory approach. Thus, the project was appraised, designed and implemented by the DOI and is under its management since the completion of the

scheme. The users were not required to make contribution in its construction. Thus, the VP/VDC and the local users did not have direct role in its management. However, users are playing some role in its management since 1992. Users' participation in the decision making since the early 1990s was a precondition for the initiation of intervention processes as indicated by the third intervention in the *Ghachowk* irrigation system and *Chaurasi Kulo* under ILC and NISP respectively. Nevertheless, the DOI/DIO engineers played crucial role in the design of the project. The requirement for the UC before the construction and the farmers' contribution in the capital cost of the project were visible aspects of the participatory approach. However, monitoring of these were lacking. In case of *Ghachowk*, the UC played an important role during the implementation of third intervention due to the effect of broader political change in the country on the VP/VDC. However, the VDC played an important role in maintaining the link between the users, UC and the agency in case of *Chaurasi Kulo*. This shows that the VDC at present has much greater role to play in local affairs than the committee formed by the government agencies. The differences in the policy requirement did affect the interface between the various actors, who were directly or indirectly involved in the intervention. The close contact between the actors contributed towards the positive outcome of the intervention, whereas the minimal contact between the actors had negative effect in the outcome of agency interventions.

The intervention processes under various programmes indicate that the intervention was to be demand driven. The conditions were set to ensure genuine demand through the provision of signature of all the users and the deposits of up front cash in the later interventions. Theoretically, it was rigorously implemented in NISP, although users avoided it. Since the intervention in the *Ghachowk* was implemented as a 'pilot project' the provision was not strictly followed as reflected by the fact that the signature of all the users for the initiation of the project was not included in the application form. Also, the cash deposit was not included with the application. The cases indicate although the government made strict provisions for implementing intervention, it is not strictly followed (Table 7.1).

7.1.1 The initiation of interventions

The origin of interventions is often rather opaque. This is due to the different objectives of the various actors, which has to be harmonised before an intervention can be effectively started and will be sustainable. Important actors are: the users, local leaders, local and regional institutions, government agencies, and external donors. Hereafter, the various objectives (sometimes hidden agendas) and the way interventions were initiated will be discussed.

The interventions in the irrigation systems have to be seen within the broader policy framework of the HMG/N. The main objective of these policies was to increase agricultural production that could lead to an improvement in the livelihood of the rural population and make the country less dependent on the import of food grains. Another objective of providing small-scale support was also to generate local employment. However, a hidden objective was to maintain political control or extend new political links and controls in local affairs.

Table 7. 1: Differences in intervention processes under various programmes

Irrigation systems / Intervention Processes	Chaurasi Kulo (NISP)	Annapurna Kulo (HIP)	Ghachowk (ILC)	Tarkughat (HFPP)	Remarks
Initiation	Users/VDC requested for the project with signature of all the users and up front cash deposit	Users/VP requested for the project	Users/VP requested for the project with signature of some of the users	Users/VP requested for the project	Local elected institution played leading role in submitting the request.
Preliminary Survey	DOI with farmers	DOI with farmers	DOI with farmers	DADO with farmers	Local elected officials and influential person participated
Detailed survey	DOI with farmers	DOI	DOI	DADO	In NISP farmers participated during the during the detail survey
Design	DOI discussed the design in detail with the farmers	DOI discussed the design with some of the farmers	DOI held discussion with some of the UC members	Project office discussed the design with users	Users had little influence in changing the design and there was no major changes in the design prepared by the DOI
Approval of project	DOI	DOI	DOI	Project office	
Users participation	UC formed but VDC was active in liasing with the DOI		UC was active during the construction	UC was active during the construction	
Users' contribution	VDC paid the cash contribution on behalf of the user	Not required	Contractor and some new users paid the cash contribution	UC chairman implemented without users contribution	In all the cases the users did not made their part of the contribution
Implementation	Contractor implemented the project	Contractor	Contractor	Users' committee (UC)	UC gave contract to its chairman
Users Committee	Less active	Users formed UC	Not functioning	Not functioning	UCs acted as 'construction committee'

For the irrigation agencies and their officials in general the objective was also to achieve the annual target of the government. But for some of these officials the objective was to make profit. These underlying aims had an effect on the design of the intervention as some of the actors misrepresented the specific objective of intervention as reflected by the never achieved proposed new irrigated area in *Ghachowk*. This indicates the importance for the officials and their agencies to obtain as many interventions as possible. This will increase the workload for their agencies, the continuation of their jobs and the status of their organisation. This further reflects that the user had to compromise with the view of the officials to get access to the resources, which are controlled by the officials. Thus, the linking loop is formed to obtain and disburse the resources in which, the officials could influence the decision making because of their power to disburse the resources.

During the Panchayat political system period (1960-1990) the village panchayats received small-scale support from the District Panchayats, in the form of annual lump sum grants from the government for local development. The grant of the DP to VP was based on the request from the VP for the development programme that they thought relevant. In their turn the members of the VP listened to the request of their political followers. Nevertheless, each of the actors had their own hidden objectives in initiating the intervention. In this way the elected officials could use these grants to realise one of their hidden objectives for maintaining or improving their influence in their constituencies and for some of them the objective was to get the contract. This shows that the initiative for interventions started at the local level through users, local leaders and VP officials. The availability of resources from the DP induced the community to use their existing communal linking loops and to create links to attain their objectives. These actors could exercise their influence through the links they maintained with various other actors. For example, the contractor for the second intervention in *Ghachowk* used his link with the DP officials to influence the users to recommend for the contract by promising to waive the users' contribution. The users had genuine concern for this second intervention and there was negotiation and compromise in the interface between the users and the contractor. The acquaintance between the users and the contractor was crucial in forming the linking loop. The outcome of the linking loop was positive, as users were able to maintain organisational control on the activities of the contractor through proper supervision. At the same time, the contractor had administrative control over the users' labour.

What was described before indicates that the government was indirectly involved in the development activities at the local level via DP grants to VPs. But at the same time, the government was directly providing small-scale support to the FMIS through various projects for improvement as reflected by the case of *Tarkughat*. For this programme the DP/VP were used as a vehicle for channelling the resources from DOA. In this way the government had some political control on local affairs, but users maintained control on the use of resources. Thus, the DP/VP acted as intermediary between the users and the government agencies in the initiation process of the intervention. The interface between the users of the irrigation systems and the DP/VP facilitated the strengthening of the 'communal linking loops' for the initiation of the intervention. However, the interface between the VP and the

government agency was more intensive than between the users and agency in the initiation of the intervention.

During this period the government also initiated the construction of the new irrigation systems through the financial assistance from multilateral agencies as indicated by the *Annapurna Kulo*. The objective of these interventions was to expand irrigated areas to increase the food production in the hills. The initiation of these interventions was often based on requests of the potential users but further initiatives were mainly with the government in this type of projects. In this type of project the contacts in the interfaces between the government officials and the donor officials was more intensive in the pre-phase of designing the intervention than between the agencies and VP and the users. Thus, the initiation of the project was heavily top-down, as the government policy categorised this type of project as central level projects, which were to be controlled by the government agencies.

During the late 80's and in the beginning of 90's, there was a major shift in the irrigation policy of the government, which laid emphasis on the improvement of FMIS in contrast to the new construction of medium and large-scale irrigation systems. As a consequence various projects were implemented to assist the FMIS through the 'participatory approach', under which the farmers were to initiate the processes of intervention by seeking government assistance. With the publication of the notice for the upcoming interventions, the farmers were requested to send their request to the DIO/WRID. In this type of intervention the VP/VDC initiated the processes on basis of the request of the farmers. Thus, the VP/VDC played an important role in forming the linking loop between the users and the agency. Nevertheless, the VP/VDC had intensive contacts with the officials than between the users and officials. The government officials sometime helped them in administrative processes that had to be followed in order to obtain government support.

From the foregoing, it is clear that the initiation of interventions is complicated and not always very transparent due to the different and hidden agendas of all the actors involved. The official objectives of most irrigation projects were increasing of water supply in order to stimulate agricultural production and the improvement of the livelihoods of the farmers' families. Besides these objectives politicians at higher levels were interested to strengthen their influence on local affairs and, after the introduction of multiparty system, to support their followers in rural communities and so to improve their local power base. For the government agencies it was important to have as many projects as possible under their supervision because this made them more powerful in the governmental structure and secured jobs for their employees. For the members of the VP/VDC it was important to obtain government support for projects in their community in order to secure their status in the community and it also opened venues to obtain extra income via legal as well as illegal means. Finally the farmers were very much interested in a sufficient and secure supply of irrigation water for their crops. It made it also possible to obtain some extra income by making available their labour. After the intervention they also ventured to ask for government support for the maintenance of their irrigation systems, which in the past was done by themselves. The various contacts and interactions depended among others on the type and approach used by the various

actors in getting the intervention materialised. The influence of these overt as well as hidden agenda's on the interventions will be discussed hereafter.

7.1.2 The design of interventions

Once the initiative for the intervention is accepted in principle it moves into the phase of designing. The type of design depends very much on the type of interventions. The interventions in the AMIS/FMIS can be classified into: a) improvement of the existing situation through repair and maintenance, b) provision of more reliable supply of water through rehabilitation of the infrastructure; and c) expansion of the irrigated area through the new construction.

Per ha cost for rehabilitation is higher than for new construction if, we make a cost comparison. The highest among the case studies is NRs. 119,166 ($ 1744 ha) for *Tarkughat* in 1999 price ($1=NRs. 68.30) compared to the cost for *Annapurna*, which is NRs. 33470 ($490 ha). For *Ghachowk* and the *Chaurasi kulos*, the costs per ha are NRs. 56,133 ($ 821) and NRs. 60285 ($ 883) respectively. One of the reasons for the higher cost in case of the rehabilitated scheme is due to less irrigated area than the planned during the design of the rehabilitation. Thus, it lends support to the argument that the irrigated area is inflated during the design of the project in order to make it feasible for the rehabilitation in terms of cost per ha criteria. For example, the programme limit of the cost per ha for *Ghachowk* for minor rehabilitation was NRs. 20,000 ($ 292). However, there was no cost limit for other projects. If we take into account the cost limit for *Ghachowk*, the intervention cost for all the projects are quite high. In other words the expected benefit is much lower than the cost of the project, which farmers will never be able to repay back.

The cases suggest that the content of the design in the intervention was different in the government agency intervention that involved new construction (*Annapurna Kulo*) as compared to other interventions. The government intervention in *Annapurna* was the construction of a new weir with gate, an underground canal, aqueducts and the branch canals with gates for better water control in the irrigation system. Besides, the agency introduced new organisational control by appointing the *Dhalpa*. The designs that were aiming at rehabilitation as reflected by the third intervention in *Ghachowk* included the construction of a headwork with a gate, the lining of the canals without gate and the construction of an acqeduct. The works included in the improvement of the irrigation system were the construction of cemented headwork and lining of the two branch canals as indicated in *Tarkughat* irrigation systems and small improvements during the first and second intervention in *Ghachowk*.

The type of intervention conditioned the involvement of the users in the design of the intervention. The users had a greater role in the design in case of improvement in the irrigation system, as reflected by the second intervention in *Ghachowk* and the intervention in *Tarkughat*. This was because the users had some sort of control on available resources. They used their existing strong linking loop to influence the design. In case of a new construction and rehabilitation the government officials designed the interventions and great emphasis was placed on the financial and technical aspects, which were not discussed at length with the users. However, in the interfaces between the farmers and the designers there were interactions about the

choice of technology and use of resources in *Ghachowk*. However, by and large the involvement of users in the design of the intervention was limited.

The participation of various actors in the design of the interventions was varied due to the approaches followed in it. The Annapurna *Kulo* was designed by the government agency without complete participation of the future users, as the government policy at that time did not recognise the participatory approach in the design of the large-scale irrigation project. Therefore participation of the users in the design of the project was not sought. This had implications in the performance of linking loop during the construction, which affected the allocation and distribution of the irrigation water. As a result, some of the users have unlimited access to the irrigation water whereas other users did not have. This was largely due to the design technology and partly due to gradual disintegration of the linking loop during and after construction, as some of the users did not provide land for field channels.

However, the formation of the users' committees in the *Tarkughat* irrigation system and in the third intervention in *Ghachowk* irrigation system led to greater participation. But still the interventions were designed at the government offices and were not fully discussed with the farmers.

The cases suggest that the VP/VDC, UC and users were only partly consulted by the agency officials during the design of the intervention. As a result the knowledge of the users' was not fully utilised by the agency officials. In fear of losing the government support the users accepted in most cases what officials offered. There was dominance of outside knowledge over the knowledge of the farmers. The technical designs prepared by the agency officials however, were briefly discussed with other actors. The interface between the officials and UC members in the case of *Ghachowk* and the interface between the VP officials and the agency officials of the *Annapurna* systems led to some modification in the technical design. The users could influence the design to include a head regulator and the aqueduct in case of *Ghachowk*.

The *Tarkughat* case however, reflects that the small size of the group with only minor objectives and simple technical design facilitated a strong communal linking loop in the interfaces among the farmers and between the farmers and the officials. As a consequence the users had a greater role in the decision for the design of the technology, which was implemented by the users themselves. This shows that the intensive links between the users increase their participation in decision making and can lead to the greater sustainability of the intervention. As a result, the water management in *Tarkughat* is the best as compared to the other three systems. The task was also easier due to small size of the irrigation scheme.

The contacts between the agency and the donors and various actors during the design of the intervention were shaped by the requirement of the users participation in the decision making as outlined in the later policies of the government. The scope of approaches for users' participation was also varied, as outlined in the government policies in chapter 3. For example, the IRDPs and ILO projects for the small-scale infrastructure development were more participatory, in which the projects were implemented on the demand of the users. The users also shared some of the project cost. The users had greater control over the design. However, the cases indicate that the contacts in the interfaces between the users and the other actors were not so

intensive to reflect the 'participatory approach' as envisaged in the project document for *Ghachowk*, although the project was implemented on the demand of the users. The requirement of the formation of an UC before the intervention was to be implemented and its institutionalisation through official registration was to enhance the participation of the users in the decision making, especially for the governance of the irrigation system. However, the users avoided the required cash and labour contribution in later interventions. The contractor or the VDC paid on behalf of the users. In this respect, the participation of the users was absent in the interventions in *Tarkughat* and *Chaurasi Kulo*. Some of the new users paid their cash contribution in case of *Ghachowk*, whereas the old users did not pay and the contractor took the responsibility for it. In this respect the UC was not successful in ensuring the participation of the users as envisaged.

The incomplete participation of the users in the design had also consequences on the maintenance of these system as will be discussed in section 7.1.3.

The role of users and local institutions was limited in the design phase. This was even more the case when it came to the approval of the interventions. This approval was done mainly by the agencies, which provided the funds. In this respect the agencies involved were the MOWR, RAD and the DP/DDC. The approvals of the intervention were based on the evaluation of the field report by the overseers/engineers. This does not mean that behind the scenes, no political lobbying took place.

There was also variation when it comes to the design of the intervention processes. In the processes followed for the new construction, the agency did the appraisal, design and approval of the project, which was not based on the participatory approach. However, the processes followed for the projects with participatory approach included involvement from the local representative of the users. Thus, there was variation in the role of the agencies involved in the processes of intervention also. For example, in case of *Annapurna* the involvement of government agencies - WRID, DOI and MOWR were high from the design to the execution of the project, although the VP took the initiative for intervention. In case of projects that is said to be with participatory approach, the agencies involved were the VP/VDC, DP, project office (in case of *Tarkughat)* of district/regional level offices and their respective ministries, as mentioned above. However, government agencies except for the *Tarkughat* were more influential in the design processes in the government interventions than the local representatives of the people. The design processes of the intervention for participatory approach suggests that the tier of agencies involved from the selection to the approval of the project had implication for the users' participation. The less the number of tiers that the users have to contact, the more participatory it would be due to closeness between the village and district officials. For example, third intervention in *Ghachowk* was less participatory than the second intervention of *Ghachowk* by the DP and HFPP intervention in *Tarkughat*. This was largely due to the decision making processes involved, which was more centralised.

7.1.3 Implementation of the interventions

As mentioned earlier technical intervention in terms of changes in the physical infrastructure could be categorised into three types. They are the new construction, rehabilitation and improvement. This classification is necessary to understand the implementation of intervention and their modalities. The objective of the intervention determined the type and scale of financial, technical and the institutional involvement in its implementation. The magnitudes of the financial and technical assistance have affected the processes followed in the implementation of each intervention. This in turn has affected the interface between various actors and the decision making at different points in time.

The other aspect of the intervention was the introduction of new agricultural technologies to increase production and productivity, which was one of the primary objectives of the intervention. All the three interventions implemented by the government agencies had provisions for the introduction of agricultural technologies. However, the introduction of new agricultural technologies was varied between the interventions. The implementation of the agricultural component as envisaged in the project design for *Annapurna* was not fully implemented. For example, the construction of warehouse cum training centre and other staff quarters were constructed but the planned demonstration farm was not established. This shows the focus was more on the construction aspects than on the extension. This also indicates that there was lack of co-ordination between the WRID and RAD. The intensification of extension services in *Ghachowk* during the intervention and after the intervention was poor. However, the introduction of improved varieties of paddy had positive effects in the case of *Tarkughat*.

The *Annapurna Kulo* was a new construction, the interventions in *Ghachowk* and in *Chaurasi Kulo* were rehabilitation and *Tarkughat* was an improvement. The analysis of the cases indicates that the intervention for the construction of a new irrigation system has wider implications in terms of introduction of new technologies, financial resources and institutional requirement as compared to rehabilitation and improvement. There have been major changes in the social, technical and institutional aspects if we look at the intervention in *Annapurna kulo*. The introduction of new technology had effects on the introduction of new organisational elements as evidenced by the employment of *Dhalpa* and WUS. The involvement of DOI in the management of the irrigation system did induce the formation of new interface between the users and the DOI. The implementation of the intervention had also major social impacts as reflected by the increased access to the irrigation water besides, the changes in the social relation between the users in the old *Chaurasi kulo* and the new users in *Annapurna Kulo*. For example the right for water for planting only changed to unhindered access throughout the year for the tail enders. The introduction of technology was prominent in Gha*chowk*, as it did increase the access to the irrigation water to the tail enders also due to construction of new headwork and canal lining. However, there were no major changes in the organisational aspects except for the formation of an UC during the intervention. The division of water rights was the major social impact of the investment. The changes in the technology to better control of the water were prominent in *Tarkughat*. Thus, the cases indicate

that changes in the technology, such as permanent headworks and lined canals by using concrete, were prominent in all the interventions. However, the effects on the organisational and social aspects were varied as reflected in *Annapurna Kulo* and other irrigation schemes. The intervention of DIHM in 1962 and other politico-administrative changes had a major effect on the institutional role of the *Ditthawal*, with implications for operational water management.

Three sets of actors were most influential in shaping the implementation of the intervention: agency officials, the influential members of the VP/VDC/UC and the contractor. The majority of the users was left out in these processes. The irrigation agency played an important role by providing resources for the new construction and rehabilitation of the irrigation systems. The agency remained active during the time of implementation. It maintained intensive interaction with the UC officials and the contractor but the link with the local community in general was lacking. The officials of the VDC and UC were also more active in maintaining intensive contact with the agency officials at the district level and the contractor than with the users. Their close link with them and the local politicians helped in implementation of the intervention without any hindrances. However, there was an exception in the second intervention in *Ghachowk*, in which users played an important role. There were differences in the nature of actions of these actors depending on the nature of interventions. For example the contractor in third intervention in *Ghachowk* ignored the complaints from the users regarding the use of sub-standard materials due to his close ties with some of the UC officials, who took a sub-contract with him. Because of this, the UC officials could not check the quality of the works of the contractor. Likewise, the contractor in the *Annapurna Kulo* could not accomplish some of the works mentioned in the design on the advice of the irrigation engineer, as he was unsuccessful in convincing the farmers to provide land. In contrast, the *Tarkughat* case reflects more intensive contact in the interface between the users and the agency officials. This was among others made easier due to the small number of users and their rather well functioning communal linking loops in two interventions. Thus, the cases suggests that the functioning of a linking loop is depended on the opportunities available to each of the actors in the decision making processes and use and control of the resources.

The changes in the interface between the users themselves was observed after the formation of the UC resulting into the formation of a new loop among the UC members to attain the individual objectives as exemplified by the *Ghachowk*. This resulted into the breaking up of the original linking loop into new linking loops. This could be attributed to the influence of local politics also. This indicates power dynamics of the village wherein some people manipulated the outcome for their benefit by obtaining sub-contracts. Those users, who were in favour of good quality works, opposed them. However, their influence was limited, because some of them were at the bottom of the power structure in the society and some others opposed the VP leadership. This situation is partly the result of a lack of transparency maintained by the government officials and less involvement of the users in the decision making. This had implication in the continuation of the role of the UC, which was an important intermediary between the users and the DOI.

The analysis of the cases suggests that the forms of participation also varied. The most common form of participation for resource mobilisation was labour, land and time. The cash contribution was almost negligible. Because, the local people were unwilling and often unable to contribute cash. The condition of the intervention required some cash contribution as indicated by the *Tarkughat, Ghachowk* and *Chaurasi Kulo* cases. Some of the users in the *Ghachowk* irrigation system contributed cash at the initial stage for the deposit to the irrigation office. They were mostly the new users. But in all the cases except the *Annapurna Kulo,* the farmers pursued the contractor to pay for the contribution during the intervention. The negotiation between the farmers and the contractor is indicative of the effort to maximise the benefit by both sides. This sort of action has contributed in reshaping the outcome of the intervention, as the physical target of the intervention was not achieved. This is due to the fact that the users lost their social control on the implementation of the intervention.

The contacts between the users and the agency officials involved in the implementation of the intervention were not intensive. This could be partly explained by the conflicting motives of the persons directly involved in the implementation of the intervention. The users tried to avoid the costs and the focus of agency officials was on achieving physical targets. Besides, the use of a contractor also blocked the contacts between the users and the agency officials. Thus, required interaction was lacking in the decision making processes. This indicates that either the training provided both to the agency officials and the users were not adequate or they did not internalise it. Especially in case of *Ghachowk* training on how to implement the participatory approach of intervention was provided to both the agency officials and the users. This is because, the government bureaucracy always believed in the top-down approach. The institutions created at the local level did play an effective role in obtaining government funding. However, they were less effective when it came to the implementation. This could be attributed to limited attention given to the social aspects during the implementation, which is important for the sustainability of the institution.

The users lost the opportunities to influence the implementation through lack of own labour contribution. For example, the UC in *Ghachowk* decided to give their part of the work to the contractor, which they could have done themselves. The work was given to the contractor with a condition that they will not bear 12.5 percent labour contribution, as required by the project. But the users could influence the implementation in case of the *Tarkughat* because, the UC chairman took the responsibility for the implementation. This could be due to the fact that the amount of money for intervention was quite high. This indicates that disintegration of the linking loop, which was formed to initiate intervention, could diminish users' control in the implementation. Nevertheless, the users in *Annapurna Kulo* supervised the implementation of the project, which was helpful in controlling quality of the work.

The analysis of the cases suggests that the UC failed to achieve the intervention objectives as far as new management of the irrigation scheme was concerned. This is reflected in the cases of *Ghachowk* and *Tarkughat.* This is because, the VP/VDC was managing the irrigation system in case of *Ghachowk,* and users were able to make collective decisions in case of *Tarkught* because of the small size of the system. This

shows the effect of maturity of the VP/VDC as an institution and importance of collective decision making in case of *Ghachowk* and *Tarkughat* respectively. The UC was also not necessary as the VDC and *Kulo Samiti* was taking care of irrigation management in *Ghachowk* and UC was not required in *Tarkughat* due to the small size of the system. Thus, the transaction cost involved in replacing the existing arrangement with UC would have been greater for the users. Therefore, most of the UC formed for the purpose of the intervention acted as a 'construction committee' and failed to function after the completion of the intervention. In this respect the objectives of creating institutions for the implementation were partially achieved, as they could not ensure the complete participation of the users after the implementation. However, the UCs, were active during the implementation of the interventions in maintaining intensive interface with the contractor and the agency officials, but failed to embed necessary institutional arrangements for the management of the irrigation systems as they became obsolete after the intervention. The UCs could not maintain the confidence of the users due to the lack of the transparency in their activities in case of the third intervention in *Ghachowk*. In the view of the users UC seems to have been created for legitimisation of the activities implemented during the intervention. In essence, the creation of the UC is only for fulfilling official requirements for obtaining the funding. The only important aspect is that the UC created for the intervention was officially recognised before the intervention could be implemented. But the official recognition was not a sufficient condition for the functioning of an UC.

The analysis of the cases reveals that the users have devised institutional mechanisms for the operation and maintenance of the irrigation system. The VP/VDC in *Ghachowk* have employed the *Pale* since 1976 for the operation of the irrigation system with the support from the users. Besides, it has constituted the *Kulo Samiti* to co-ordinate the works of the *Pales*. The VDC at present was capable of mobilising internal and external resource for the operation and maintenance of the irrigation system as evidenced by the payment to the *Pales* and the fourth intervention. This was the reason why the users were not interested in the functioning of UC constituted during the intervention. The DOI employed the *Dhalpa* for the operation of the system in *Annapurna Kulo* besides, providing maintenance expenditure. However, users decided to form a WUS to manage water at lower level and to liase with *Dhalpa* and to maintain link with the DIO to obtain necessary resources. The case of Annapurna *Kulo* reveals that when a UC is organised by the users themselves there is a greater guarantee that it will function more effectively. The users did not felt the need of the UC in case of *Tarkughat* because of the small number of users.

In the past the local communities without government support did the maintenance of irrigation systems. This was possible due to strong local leadership, a considerable social control in the rather isolated villages that made the functioning of effective communal linking loops possible and the fact that technologies were used that could be maintained with local available resources.

The three case studies of FMIS show that the local leadership has become fragmented, especially after the introduction of the multi party system. The social control has diminished due to the opening up of the rural areas. The interventions

introduced new technologies such as the concrete linings of canals and constructions that could not be maintained with local available materials. These political, social and technological processes have led that the communal linking loops of the past have in most cases disintegrated and are not functioning or only limited functional in the maintenance of irrigation systems. For example, there is no functional irrigation organisation in *Chaurasi Kulo*. All the interventions were possible thanks to government funding and this has made the farmers aware that in combination with the processes mentioned earlier, they could try to get also governmental support for at least a part of the maintenance costs. As a result of the three interventions the irrigation systems have become or made themselves more dependent on the government.

Hence, the understanding and harmonising of the objectives by all the users is a precondition for the successful implementation of an intervention. The above findings suggest that the processes applied by the government agency could not lead to active participation of the farmers. This impeded the realisation of the objectives of the interventions in *Ghachowk* and *Chaurasi Kulo* when it comes to future independence and the sustainability of the irrigation system and their institutions. However, the primary objective of the intervention in *Annapurna* and *Tarkughat* was to increase the production. In this respect, the linking loop approach provided a framework for understanding the various objectives of the actors during the implementation of the interventions, and how these affected realisation of the objectives of the interventions.

7.1.4 The effects of the interventions

The effects of the interventions were largely the increase in the irrigable areas, improved water supply and reduction in maintenance demands. But in the case of the *Annapurna* and *Ghachowk,* it was less than promised. Besides, due to the permanent headwork and the canal lining, the labour contribution of the farmers for construction, routine and emergency maintenance of the canal have decreased as reported in the cases. The greater volume of water and more reliable supply in *Annapurna* and *Tarkughat* made more intensive agriculture possible such as vegetables. There was however, a serious problem in assessing the realised objectives in relation to the planned objectives because, the researcher was not able to obtain design reports on which the allocation of the money was based. So, there was also no insight on the cost-benefit calculations made in these documents.

When it comes to evaluation, documents were available for *Annapurna* and *Ghachowk*. Their findings are mentioned in these case studies. The main conclusions were: there has been increase in the area, but not as anticipated in the design of the project. There has not been substantial increase in the cropping intensity and crop yield after the intervention in case of *Ghachowk*. However, there has been an increase in cropping intensity and crop yield in *Annapurna* due to the availability of irrigation water. Farmers in *Annapurna kulo* reported a wider impact of the irrigation intervention due to the increase in the household incomes. This was due to the extension of the irrigated area, which were not cultivated before due to unavailability of irrigation water. Thus, the greater water security in lower costs is important in this

respect. The farmers with small-holdings benefited most due to the opportunity available for intensive cultivation. Besides, some individuals and groups derived benefit from the construction work during the intervention.

7.2 Institutions, organisations and the process of irrigation

The management of the irrigation systems requires strong institutions, because they have to manage the distribution of scarce resources and this can lead to various types of conflict. The governance of FMIS systems can be studied by looking at various rules-in-use. Ostrom (1992) sees institutions as rules-in-use, which define the rights and responsibilities of the water users. The layer of the rules-in-use are: operational rules, collective-choice rules and the constitutional-choice rules. These rules may change over a period of time due to external administrative and political interventions, changes in the environment for instance increasing scarcity of water, and changes in the physical infrastructure of the irrigation system. Also, changes can be made internally by the users as per their requirement. Ostrom (1992) has discussed how the sustainability of the FMIS, is shaped by the various conditions. These include a clearly defined set of users with shared cost and benefit, equal participation in the decision making; proper monitoring of the behavior of the members and effective sanction procedures applied from within the group; and minimal external intervention in the design of the rules.

Governance

The analysis of the cases reveals that four institutions were important to the governance and the management of irrigation systems. Some of these institutions have a direct role and some of them have an indirect role. These four institutions were: a) the Ditthawal system, b) DIHM/DOI, c) VP/VDC/*Kulo Samiti/Pale* and d) UC. Among these institutions the DIHM/DOI, and UCs, were directly involved in governance of the irrigation systems whereas the *Ditthawal* system, VP/VDC are the institutions with a broader scope of activities. However, in case of the *Ghachowk* irrigation system the VP/VDC was also directly involved in the governance of the irrigation system. The role of the DIHM/DOI with respect to the governance of the irrigation in *Chaurasi Kulo* was temporal in nature through the development of collective-choice rules during the intervention period, and was still very strong in all aspects in *Annapurna Kulo*.

The governance and management of the irrigation in Chaurasi *Kulo* during the pre-intervention time was under the *Ditthawal* system. The *Ditthawal* was a government functionary at the local level. Because of this he had the power to devise rules for a wide range of activities related to local administration. Because of this, the governance of the irrigation system was also under him and he could devise the rules for the functioning of the irrigation system and he was also entitled to collect land taxes. The users had little influence in the formulation of rules. In this respect, all three sets of rules-operational rules, collective-choice rules and constitutional-choice rules were defined. *Ditthawal* effectively implemented the operational-rules as he could apply the sanctions through the confiscation of the land. This institution was

instrumental in mobilising the internal resources and regulating the behaviour of the users, which was based on customary participation.

The abolition of the *Ditthawal* due to political, social and economic interventions as indicated by the introduction of land reform, abolition of the Birta system, rehabilitation of the irrigation system by the DIHM and the introduction of VP suggests how the various forms of intervention affected the loss of collective-choice rules. The institutional vacuum created by the abolition of the *Ditthawal* was the beginning of the anarchy in the enforcement of the collective choice rules and operational rules resulting in the mis-management in *Chaurasi Kulo*. This also indicates that the continuity of a traditional institution or its replacement with an effective new institution is crucial for the management of irrigation systems. The farmers at the head and middle reach were not interested in devising new collective-choice rule as the transaction cost would be too high. Further, they were waiting for new intervention as a platform to bring new institutions.

The DIHM intervention in *Chaurasi Kulo* in 1962 further contributed to the deterioration of the operational rule due to the state control of the irrigation system, although for a brief period. However, the VP as a new institution could not relate control of governance to organisation of the operational-rules and was also ineffective in continuing the old practices under *Ditthawal*. The emergence of new linking loops and interfaces between the users, VP and the DIHM did not lead to developing and enforcing new rules, as the users were mainly interested in new relationships with the external agency, which was providing the support. Nevertheless, the VP tried to develop collective choice rules through the *Kulo Samiti* and enforcement of operational rules through the employment of *Pale*. This effort was successful for a brief period only. The construction of the *Annapurna Kulo* further contributed to the loss of social control in *Chuarasi Kulo*, as most of its users at the tail end of *Chaurasi Kulo* became the users of the new *Annapurna Kulo*. In the past these people were instrumental in putting pressure to the farmers at the head and middle as a group, when they used to arbitrarily control the flow of water. Another important factor observed from the cases is that the effective sanction procedures are important for the governance of the irrigation system as reflected by the *Ditthawal* system, which was lacking when VP was in control of the irrigation system. The *Annapurna Kulo* case also reflects that the government employee *Dhalpa* is playing an effective role in the governance of the irrigation system. In the later years the WUS is providing necessary support to them by drawing operational rules, as the DOI was gradually withdrawing. This was reflected in the reduction in the number of the *Dhalpas*. This shows that institutional arrangement was necessary for their effective functioning. The elaborate procedure for the operation of the irrigation system by drawing constitutional choice rule by the WUS, and their involvement in maintenance of the irrigation system with an operational rule, is indicative of the users desire to develop a governance structure.

The control role of VDC in managing an irrigation system is varied. Some of the roles performed by the VDC were maintaining the linkage with outside institutions such as DDC and the DIO, mobilising external resources, facilitating the interaction among the people and mobilising internal resources. The VDC of *Chaurasi Kulo* is active in the initiation and implementation of the latest intervention. But it could not

develop rules for the governance of the old irrigation system. The *Chaurasi Kulo* also demonstrates that the conditions for the successful governance of the irrigation system such as clear allocation rules and enforcement of sanction are either not existing, or not recognised and violated.

In case of the *Chaurasi Kulo* and the *Annapurna Kulo* we also find that the VDC is paying more attention to the *Chaurasi Kulo* than to the *Annapurna Kulo* as it has deposited the farmers' contribution for the latest intervention from its resources. Besides, the *Annapurna Kulo* has a WUS since 1992, which is maintaining the linkage with the external institution whereas the VDC has to perform this role for the *Chaurasi Kulo*.

However, the VDC of *Ghachowk* is effectively controlling the governance of the irrigation system through the development of constitutional choice rule and execution of operational rules through the employment of the *Pales*. However, the implementation of the operational rule in regard to internal resource mobilisation is weak. The *Pale* system has proved to be effective in the operation of the irrigation system, as the users do not have major complaints against them. In this respect, it should be noted that the UCs created for different interventions could not replace the VDC function in irrigation management. The differences could be attributed to the role expected by the people and the role performed by these institutions in the past. It is because the VDC has been performing this role for a long time and people expect it to continue this role. Besides, the VDC has power of political links, which it can use in obtaining resources from outside for the operation of the system. The governance system in *Ghachowk* reveals that the traditional system of governance is difficult to abolish, as the users are more accustomed to it. However the VDC is not effective in meeting other conditions for the sustainability of the irrigation system. For example, the internal resource mobilisation for the upkeep of the system has not been worked out.

The VDC in *Tarkughat* however, is not playing an active role in the governance of the irrigation system. Because, the irrigation system is so small that the users could collectively manage the system, as there are no major issues to be addressed. Besides, the users in *Tarkughat* are adhering to the traditional operational-rules in the governance of the irrigation systems. However, the VDC's occasional support for the maintenance of the irrigation system is important for the continuity of the existing governance system.

All the cases indicate that the presence or absence of accepted irrigation governance institutions and users' participation in the management of irrigation systems has strongly influenced VDC's role in the irrigation management. The differences in the role performance of the VDCs are also due to the differences in the role performed by the users in these irrigation systems. Besides, the personal actions by users to form an organisation e.g. WUS in *Annapurna* had effect in the role of VDC.

The role of the UC in the governance of the irrigation system after the intervention was terminated in case of *Ghachowk* and the *Tarkughat* irrigation systems as the need for the UC was felt by the users only to be necessary to get government support. This was because other governance forums available to the users were more effective. However, the users of *Annapurna Kulo* have devised the governance structure and

are adhering to the operational choice rules. An UC was a necessity for the management of such a large and complicated system.

The cases also indicate that the legitimacy of the institutions is established through the confidence of the users. The formal or informal status of the institution is secondary. The governance system in *Ghachowk* is working properly without any written rules and regulations whereas the UC created for ILC intervention, which was officially registered, is not functioning. The *Tarkughat* case also reflects that formalisation of the institution is not an essential factor for the governance of the irrigation systems. The important consideration in this respect is the smaller group facilitating the close interface between the users. Nevertheless, the formalisation of institution by developing written rules is important for dealing with the external environment. The case of the *Annapurna Kulo* indicates that the recognition of the institution by formal authorities has helped it in mobilising external resources. Without recognition it was impossible for the DIO to provide funding.

Property rights

The analysis of the cases suggests that the property right in the irrigation system was observed in two ways. The first was between the users across the system. The intervention in *Ghachowk* irrigation system led to the clarification and legal adjudication of the water rights. The matter was serious, as evidenced by the court ruling, which defined the water right between the two systems. This shows how the change in the technical control did affect the property relations across the system.

The second type of property rights is between the users in the irrigation system in terms of rights to have water conveyed by the system. These case study show water rights can be obtained in two ways. The first one is that the owner can get water rights when he has land in the irrigation system that either was constructed by ancestors or a new construction of the government. Secondly, the users were able to secure water rights through investment as evidenced by water right of the *Bari* land in *Ghachowk* and construction of new sub-branch canal in *Annapurna Kulo*. The water rights practices prevailing in the case study area were irrigation water proportionate to the land holding, which was measured in *mato muri*. The analysis of the cases suggests that there have been changes in the property rights after intervention due to the availability of more irrigation water. The changes were effected by introduction of new technology and the wider social and political changes.

In the case study area all the users obtained their water right by the two ways mentioned above. In the *Chaurasi, Ghachowk* and *Tarkughat,* which were built by the ancestors of the present users one can speak of customary rights on water. For part of the users in *Tarkughat* systems there was a difference in the sense that farmers with land outside the command area could use the excess water from the lined canal for irrigation via unregulated systems of water allocation.

The intervention in the *Ghachowk* system led to a slightly greater number of users. The old users of the system protested because, they were afraid that they would lose some of their water rights in the sense that less water will be available to them. But in the end it is significant that the old users did not challenge the rights of the new users. There had been a gradual expansion of the irrigated area as was evidenced by the conversion of the uncultivated land, which were cultivated in 3 or 5 years as

irrigated land. Besides, these lands belonged to the descendants of one family and they were allowed to expand irrigated area in the past. Further, none of the users had invested for the development of irrigation system in recent years except for labour contribution for occasional maintenance. The labour contribution was also not mandatory. In that sense there was no longer any defined hydraulic property rights (Coward, 1990:86). This indicates that the expansion of the irrigated area was possible as long as the irrigation water was available. Thus, the farmers who contributed during the third intervention for planting rights then claimed for the full fledged right for irrigation water. The VDC agreed to it. This shows that with the passage of the time, they used their social influence (by being the descendants of one family, who had control in VDC decision making) and also act of investment to obtain the right. Besides, it could be due to the fact that the investment for the system improvement came from the government in the end and did not affect seriously the volume of water available to other users.

As a result of the construction of *Annapurna Kulo*, some users in the *Chaurasi* system lost their water rights from the *Chaurasi Kulo* and obtained new water rights from *Annapurna Kulo*. The remaining users at the tail end of *Chaurasi Kulo* were negatively affected due to this disruption in existing arrangements (Dani and Siddiqi, 1987). With their limited number, it was even more difficult to defend their rights on water against the users at the head and the middle reaches even while they are continuing their contributions such as assisting in the annual repair of the headwork. This indicates that the contributions in the operation and maintenance of the irrigation system are not a sufficient condition for a fair access to irrigation water. Tail enders are in most irrigation systems in a disadvantaged position. This is not only due to the geographical location of their plot but also because often the farmers at the head have a strong economic and social position. This was also the case in *Chaurasi Kulo*.

All the water users in the *Annapurna Kulo* could be considered as new users. Previously they had planting rights only in the old *Chaurasi Kulo*. However, there is differentiation in the water rights of the users in this system. This was evidenced by the fact that some of the users have more access whereas some of the users receive only field to field irrigation. The water right was partly defined by the technical design of the system (see 4.13.1), as all the available water cannot be diverted to one branch canal. The differentiation was also partly due to lack of co-operation among the farmers for the completion of the field channels. This shows that the users may not have equal right even in case of a new construction. Further, it reflects how the technical design could also have implications in the water right of the users.

As the interventions in *Tarkughat* were an improvement and did not change the size and structure of the irrigation systems, there were no changes or discussions among the users as far as water rights were concerned. However, it should be noted here that the water right for field to field irrigation is also defined in this irrigation system. Thus, there has been some effect on the water right of the user, who depend on field to field irrigation. The terraces, which receive excess water from the lined canals, have been able to get more water after the intervention due to the increase in the volume of water in the lined canal. But the terraces, which receive excess water from the earthen canals, have not been able to get that benefit.

7.2.1 Management of irrigation tasks

Water acquisition, system development and system water allocation
All the irrigation schemes studied were using local skills and locally available materials for water acquisition before the intervention. Thus, the construction of temporary headwork before the monsoon was a routine work for the users in the irrigation system. The intervention constructed permanent headwork using modern technology. However, the technology used was varied. At present all the irrigation systems except *Chaurasi Kulo* have permanent headworks to acquire water from the *Khola*. System development was also part of intervention as evidenced by the canal lining of main and branch canals. Therefore, the intervention brought changes in water acquisition practices due to introduction of the new technology. In case of *Annapurna Kulo*, the users took the initiative for system development as evidenced by the construction of sub-branch canal from branch canal 2. In this respect the farmers linking loop was effective in introducing new control technology through the mobilisation of DOI and concerned users resources. However, the intervention did not have effect on system development at field channel level. Farmers are using the same field channels, which were developed in the past.

As far as the past intervention in *Chaurasi Kulo* was concerned, there have been changes in system water allocation due to construction of *Annapurna kulo. Annapurna Kulo* has potential intake of 2.0 m^3 /s of irrigation water from the Yamdi Khola. This means the available water is divided between the two systems. Thus, the construction of the permanent headwork through the intervention increased the volume of water, made the availability of water more reliable and the water allocation in the system easier. The case of *Annapurna kulo* further reveals that water allocation within the system is controlled through the technical design. This had implication for the user allocation of irrigation water across the branch canals. Besides, there has been redistribution of users between the two systems, as the users at the tail end of the old *Chaurasi Kulo* have become the users of the newly constructed *Annapurna kulo.*

As far as *Ghachowk* was concerned, the third intervention did change the system water allocation because a headwork was built in the small river. This led to a conflict with the irrigation system of *Lahachowk.* This was solved via the court, which allocated 2/3 of water to *Ghachowk* and 1/3 to *Lahachowk. Ghachowk* benefitted because the allocation was made for 200 ha as specified in the design of third intervention. The construction of permanent headwork and the canal lining has facilitated the operations of the systems in *Tarkughat* and the tasks of the users in system development have been made easier. As a result, less participation of the users was needed for the regular repair and cleaning of the canal. The discontinuation of system maintenance by the formal user group created by the intervention shows that the intervention did not achieve the objective of institution development, which is important for system development and maintenance and its sustainability without external assistance.

User allocation, system operation and water distribution

The user allocation of water in the case study area is based on irrigable land measured in *mato muri*. Three types of water distribution practices are prevailing in the case study area. They are rotation, field to field and unregulated allocation. In the past the rotation system was effectively operating in the *Chaurasi Kulo*. This case shows that political and administrative changes such as the abolition of *Ditthawal* system and the introduction of VP undermined existing water practices governing the water allocation and distribution. The provision of *Pale* for supervising the allocation of water during the time of VP on the basis of availability of the irrigation water and area under irrigation indicates that the institutionalisation of allocation rules was perceived as necessary. Absence of the lack of effective organisational control by the VP led to the non-conformance of the operational rule by the users and as a result the *Pale* could not function properly. The other reason was that the VP for which they were working lacked authority due to the changes brought in the local administration by the referendum of 1980. This shows that it is difficult to revive the rules-in-use once they are lost. In absence of the operational-rules, the farmers at the tail end of the *Chaurasi Kulo* are not receiving the volume of irrigation water which they should have according to their rights. This was largely due to the change in the role of institutions due to administrative changes.

As noted earlier, the user allocation in *Annapurna Kulo* is also dictated by the technical design of the system, which does not allow allocating all the water to one branch canal, if necessary. The rotation across the branch canals cannot be practised, as all the available water cannot be diverted to one branch canal, when the canal has full supply. Thus, this has affected user allocation in the branch canals. One of the reasons for the field to field irrigation in this system is due to the non-construction of the field channels by the users. The case of the *Tarkughat* system is different in the sense that the intervention did not affect changes in the principles for allocation and distribution of the irrigation water. However, the intervention facilitated the allocation and distribution by increasing the volume of water, which means increased access to the use of the water resource.

We find variations in the effectiveness of the institutions in these tasks. The *Pale* system of *Ghachowk*, the UC and *Dhalpa* of *Annapurna* and the customary practices in *Tarkughat* were effective in the distribution of water. The *Pale* system under the authority of the VDC in *Ghachowk* was effective, as they were entitled to devise flexible rules through ad hoc adjustment for the distribution of water to the individual plots proportionate to the land and the availability of water. This indicates that flexibility in the allocation of water based on the principle of *mato muri* is important for the implementation of the allocation rules. This is because, the distribution is equitable, as indicated by the *Bhijaune palo* in *Ghachowk*. In that sense the traditional institutions were more effective in the enforcement of collective-choice rules and the operational rules with respect to the allocation and distribution of water. The development of the norms and acceptance of it by the actors were fundamental for the embedding of institutions. This is because the allocation and distribution of water in all the systems was consistent with norms and social control associated with it.

The size of the irrigation system was also important in determining whether the operational rules should be more formal or informal. The elaborate procedure of allocation and distribution for different seasons in *Annapurna Kulo* is an indication that the larger the system the more formal arrangements are required due to the operational requirement to meet the demand of individual users (Vincent, 1995). This was materialised by the appointment of *Dhalpa* by the DIO, which also supervised him. In a later stage the supervision was gradually taken over by the WUS. The separate distribution arrangement for the summer and winter crop reflects that the availability of water and the crop water requirement are the determinants for the users' allocation of water. The adequate supply of irrigation water for the planting was facilitated by the introduction of a new water control technology that made flexibility possible. Nevertheless, there is some distribution problems at the tail end due to non-availability of adequate water after planting. This was due to non-cooperation by the users at the head. This indicates the disintegration of the linking loop, as fulfilment of individual objective was the primary concern of each farmer.

This shows that the development and adherence to the operational-rules by each member, which is facilitated by the intensive interface between the actors, is necessary for the flexible and reliable access to the resources. However, the degree of social control on which the institutions can rely is also an important factor for ensuring equality among the members in the distribution of water resources. This was evidenced through the existing operational rules in *Ghachowk, Tarkughat* cases. However, this was weak in *Chaurasi Kulo*, as VDC is not doing any thing to address the problem of tail enders.

Conflict management

Three types of conflicts have been identified from the analysis of the cases. They are the conflict between the irrigation systems as reflected in the case of the *Ghachowk* system. The conflict was for the right over the use of a single water source (*Lasti Khola)* between two irrigation systems. The intensity of the conflict was very high as it involved court cases. The government intervention in the *Lahachowk* system prior to the *Ghachowk* system was the basis of conflict, as the users could claim the right on the source of the water. The conflict had an effect on the technological intervention in the *Ghachowk* irrigation system as the division of water has to be ensured through the introduction of a new water control technology (permanent weir).

The second type of dispute is among the users. The intensity of the dispute in *Chaurasi Kulo* is higher than in other irrigation systems. The loss of traditional management practice as a consequence of abolition of *Ditthawal* and a weak VP unable to back *Pales* due to lack of any plan to introduce a water distribution schedule are the likely cause of the conflict. The conflict has resulted into the unequal access to water resources. Nevertheless, the expectation of a new intervention made it possible to maintain the social interface between the actors and the formation of informal linking loops between them has contained the disputes, so that the new intervention was not endangered.

There are some disagreements among the users in *Annapurna Kulo* regarding the first use right of water between those who had *Khet* before the intervention and those who converted their *Bari* land to *Khet*. But the conflict is contained due to the

effectiveness of the WUS. Besides, the dispute between the users at the head and tail end is also reported in some branch canals. This was due to the inequal power relation between the users, as the head ender are the large land holders in some canals. Therefore, the WUS was not fully effective in this respect.

The third type of conflict is between the agency and the users due to a lack of intensive interfaces during the planning and implementation of the intervention. The non-completion of the structures in *Annapurna Kulo* by the agency as a result of the refusal of the farmers to make land available for the complete construction of branch canals had implications for turning over the management of the irrigation system. Surprisingly the farmers now refuse to take-over the system unless the branch canals were completed. The agency would like to turn-over the irrigation system. However, users' demand is the complete repairing of the irrigation systems besides, providing irrigation water to targeted command area. However, the main reason for the user's refusal is that they would not be able to maintain the irrigation system. After the take-over they will not receive the annual maintenance cost. As of now the UC however, is successfully negotiating with the agency for mobilising the resources. This conflict is contained, as the users are afraid to lose the external resources, which have been mobilised by WUS.

Resource mobilisation

The farmers were undertaking simple maintenance through their own resources and sought external resources for the work, which they could not do on their own. Labour, material and cash are the main types of resources mobilised for the upkeep of the irrigation systems. The internally generated resources are the material and the labour. For example the construction of temporary headwork in *Chaurasi Kulo* and canal cleaning in *Ghachowk* and *Tarkughat* are through the labour resource mobilisation. The payment to the *Pale* in paddy on an annual basis in *Ghachowk* irrigation system is an example of material resource contribution. Cash is mobilised mainly from the external agencies like DIO, DDC and VDC for the rehabilitation and lately also for maintenance of the irrigation system.

The internal resource mobilisation is gradually decreasing if we take into account the resources mobilised in the past. The changes in the pattern of resource mobilisation are caused by the changes in the water control technology e.g. the construction of permanent intakes and canal lining. The use of forest products, which was a must for the construction of the intake, is also declining as a result of this. Consequently, the labour contribution by the farmers has decreased. Evidently, the drudgery has been reduced as reported by the users in *Tarkughat*. Hence, the new headwork has not been repaired regularly and the cleaning of the canals was easier due to the construction of a silt trap box and the lining of the canal. The organisational strength of the users for resource mobilisation, which existed in the past, is declining after the intervention due to the reduced need for collective activities. However the users were able to form an informal linking loop to access external resources. But the dependence on the external resources has made their administrative control on irrigation system weak.

The pattern of resource mobilisation shows that the permanent structures of the irrigation systems make the user more dependent on external resources. The reason

for this is the reduced use of local materials due to changes in the water control technology. The use of cement and the requirement for skilled labourers has increased the cash component of the resource mobilisation. However, the users' unwillingness to generate necessary cash on a regular basis, although they have the ability to do so for simple maintenance, will be contributing in the future to the deterioration of main and branch canals.

The decrease in the labour contribution has reduced the necessity of a communal linking loop between the users, but it increased the interfaces between the agency and the users. The analysis of the cases also indicates that some institutional set up is required for mobilisation of the external resources as evidenced by the role played by the VDC and the UC of *Annapurna Kulo*. Their role is important in facilitating the interface among the users and maintaining the linkage with the outside institutions. The roles of formal institutions were important in resource mobilisation as evidenced by the involvement of the VDC and the DIO. Nevertheless, the leadership factor is also important in maintaining the linkage with external institutions as exemplified by the role played by the UC chairman of *Annapurna Kulo* and the former UC chairman of *Tarkughat* systems in external resource mobilisation.

System maintenance

In all the irrigation systems it was found that users have to do both emergency and regular maintenance. The level of regular maintenance varied between the irrigation systems and also the level of involvement of the users. The regular maintenance of the main canal has been reduced after the intervention as exemplified by the *Ghachwok* and *Tarkughat* cases. However, farmers are doing the maintenance of field channels. The *Chaurasi Kulo* case reflects that the traditional practice of regular maintenance has been decreasing over a period of time. The loss of traditional institutions and the effect of intervention due to the change in the number of users have affected the maintenance of main canal. The changes in the number of users due to the construction of *Annapurna Kulo* also affected negatively the collective action, which was important for the regular maintenance of the main canal in *Chaurasi Kulo*. In absence of the regular maintenance there has been a change in the physical structure of the canal due to the deposition of the silt and the canal lining has not been properly maintained. As a result the availability of water for the tail enders diminished gradually. Besides, there has been decrease in the intake in due to lack of adequate labour mobilisation for headworks construction.

The reported cases for emergency maintenance were from the *Chaurasi* and *Ghachowk* irrigation systems due to the floods and the landslides. The complexity of the technology has considerable consequences for the need for external resources and expertise. For example, the requirement for regular maintenance will be much greater in terms of resource mobilisation in the *Annapurna Kulo* than in the *Ghachowk* and the *Tarkughat* systems. This is due to the sophisticated technologies used in the system such as a type of weir that was constructed, the underground tunnel and the aqueducts for the *Chaurasi Kulo* system.

Another important aspect is that the users' interests in maintenance have decreased after the intervention. In the past the users had to do system maintenance on their own but now the interventions of the government took that responsibility

more or less away from them. This is largely because funding for occasional maintenance is available from DIO, DDC/VDC and also from a Member of Parliament. In this respect, it could be said that the funding from other than DIO sources are means for political control. This shows that the users linking loop are formed in time of need and it disintegrates after the objective is achieved. This could be one of the reasons of loss of ownership feeling towards the irrigation system, when it comes to maintenance as was observed after all the interventions. This may affect institutional development. However, the maintenance of the irrigation system after intervention has been institutionalised in a different way. Internal resource mobilisation is weak in all the irrigation systems as the institutions created by the intervention were not functioning as evidenced by the *Tarkughat* and *Ghachowk* irrigation systems. Nevertheless, the VDC and the users are using government grants occasionally. In case of *Annapurna,* the WUS have been taking initiatives for the maintenance although on an ad hoc basis. The availability of external resources on a regular basis is an important factor for regular maintenance as presented by the case of the *Annapurna* system.

7.2.2 Water control

The intervention and introduction of new political institutions have brought changes in the case studies in all the three elements of water control (Mollinga, 1998) viz. technical control, organisational control, and socio-economic and political control. The cases indicate that in the past, the technical control of irrigation water was in the hands of the users due to the use of locally available technology and maintenance resources. Thus, the functioning of the irrigation management institutions and performance of their tasks was dependent on the traditional customary collective action. The authority structure at that time was instrumental in enforcing the required social control. The broader changes in the local administration through the introduction of new political systems such as VP/VDC and abolition of the *Ditthawal* system introduced new roles for the users, the local institutions and the outside agencies. The increasing role of the local institutions like VDC/DDC and the government agencies in irrigation water activities had both positive and negative effect on user control over water resources, which is an important factor for developing the appropriate rules for distribution of water (Mollinga, 1998).

The cases also indicate that the administrative and social control in the implementation of the intervention was also important in achieving better technical control of irrigation system. The analysis suggests that full administrative and social control by the agency in the intervention of *Annapurna Kulo* did help in realising better technical control. Likewise, the full administrative and social controls by the users in the implementation of first and second intervention in *Ghachowk* was better in achieving technical control than the third intervention, which was a mix of control by users, agency and contractor. The same was the case with the intervention in *Tarkughat.* This was largely due to the effective organisational control in the hand of either the agency or the users.

The system control was better during the time of *Ditthawal* in *Chaurasi kulo* but the users had representation control in the irrigation system. *Ditthawal* was able to

increase his control in irrigation water through the power vested by the government for land tax collection and confiscation of land, if users did not abide by it. The ineffectiveness of the VP/VDC led to actions by group of people to increase their social control in irrigation water. This shows that the changes in the organisational control could lead to changes in the social and political control, for example as the large farmers at the head are in control of water resources. This was because of their dominant role in the village politics.

At the same time the construction of the *Annapurna Kulo* increased administrative and political control, as an agency took over the system. This was made possible due to the changes in the technical control of the system. The case of *Ghachowk*, shows that the VP was effective in introducing new organisational control through the employment of *Pale*. This checked the individual actions to control water and increased users' control in the irrigation system. Thus, the changes were effected in the social control of these irrigation systems through the changes in technological and political control of water, as reflected in the introduction of new technologies along with new financial resources and institutional mechanisms. In addition the opening up of villages, new income opportunities other than from agriculture and changing political structures at local level also contributed to the loss of social control.

One of the objectives of the interventions was to introduce new or improved water control technologies to ensure flexible and reliable water delivery with increased supply. The water control technology used in interventions can be classified as simple, moderate and sophisticated in view of the technological and financial involvement in the creation of artefacts in the irrigation systems. This classification is made keeping in mind their sustenance through the resources within the local capability. The local capability is viewed in terms of financial, technical and the institutional capabilities. The financial capability is reflected in terms of the willingness and ability to generate necessary resources. The technical capability is the ability to acquire necessary materials and the required skills to carry out the work. The institutional ability is the existence of formal or informal institutions, which are capable of mobilising required resources-financial, technical, and human to accomplish the job.

In this respect the water control technology used in the rehabilitation of *Ghachowk* system is moderate in the sense that the users can mobilise required resources for the system operation and maintenance. Only the gate at the intake and the acqeduct is beyond the financial and technical capability of the locals to maintain. When it comes to water control per se, there were no changes. The *Pale* continues to function under the authority of the VDC. The UC, active during the implementation of the third intervention stopped to function once the construction phase was finished. However, the bad implementation of the third intervention contributed to the weakening of the social organisation required for maintaining technical and organisational control through mobilisation of necessary resources.

The water control technology used in *Tarkughat* requires only simple technical and organisational control, which was made easier due to the small size of the systems and existence of social control in the rather isolated village. The local capability is enough to maintain the technology.

The technology used in the *Annapurna* system is sophisticated and is beyond the capability of the local people in all respects-technical, financial and institutional, if major maintenance is required. These changes reinforced the need for new forms of organisational control to maintain effective operations, as was evidenced through employment of *Dhalpa* and the formation of UC. However, some of the large land holders at the head of some branches effectively control the water at the cost of the tail ender. Thus, socio-political controls are insufficient to get the overall control necessary for effective and equitable operations of the irrigation system.

Thus, the increasing dependence on external agencies for the sustenance of the irrigation system reflects that new linking loops have to be formed through interfaces between the actors involved in irrigation development. This indicates that the technical intervention is demanding new organisational control in the irrigation system. Together with other local government changes, they also bring into being needs for new socio-economic control. This can only work if there are effective working institutions and effective social and political negotiations. In this respect, the informal organisation of farmers in *Tarkughat*, the VDC through *Pale* in *Ghachowk* and emerging new organisation in *Annapurna* are playing important roles in the operation and occasional maintenance of the irrigation systems.

The discussions and analysis of the cases suggest that the principles, in which the government interventions are based, are not effective in achieving its objectives due to the underlying motives of the people. One of the objectives was to make provide sustained benefit to the users in the long run. However, the users became interested in further interventions because of the opportunities available to them. Further, the interventions except for the new construction did not bring substantial changes in the irrigation tasks except for shift in resource mobilisation from local resources to the outside resources due to the change in control technology. However, the social and organisational control of the irrigation system has links to the changes in local politics. The new intervention in *Chaurasi kulo*, perhaps can provide a means to new political and organisational control to hydraulic control in future.

7.3 Conclusions

Limitations of the study and the methodology used

The study focused mainly on the physical aspects of the interventions and the way they were implemented and the consequences for the local institutions. This was a rather narrow approach to look into the overall effects of intervention on production and livelihood, due to unavailability of the baseline data on production to compare with the present situation. The gap between the time the interventions were implemented and the study period made it difficult to locate all the local and regional officials who were involved in these interventions. This gap also made it difficult to lay hand on relevant project documents. This means that the case studies reflect mainly the views of the farmers, local leaders, members of the local institutions and some officials who were contacted. Therefore, only a limited analysis could be made of the interfaces between the government officials and the local populations. Also, the recollection of the actors was affected by the fact that the

intervention took place many years ago. Besides, some actors had good reason not to explain fully what they did in the past. For two schemes evaluation reports were available and these were used in the case studies of *Annapurna* and *Ghachowk*. The choice of the systems was made to look into the interventions by multiple institutions. The study also saw differences not only between objectives of interventions but also the intervention approaches of district versus technical agencies. The sites chosen for the study provided insights into variations in the intervention strategy, technologies, resource use and users response to it. In that respect the sites for the case studies were found to be appropriate for the purpose of the study.

Concepts

The concepts used in the study were useful instruments to organise and analyse the case studies. Among them the concepts of participation and the communal linking loop, were relevant to understanding interventions. Management, governance and control of irrigation were useful to understand impacts of intervention on irrigation systems. The concept of the communal linking loop was found to be useful in understanding the dynamics of relationships between the actors and how it shaped the interventions. Since the individual objectives might have changed, their action needs to be understood in relation to that particular event.

Growing dependency

A major finding of the study was that before the intervention users were able and willing to operate and maintain the irrigation system without outside support. However, after the interventions, there was a growing dependency on external resources for the maintenance. This was partly due to the way the intervention processes took place and also due to the changing local government finance. The use of foreign materials was one of the reasons as also indicated by other studies (DOI, 1997; MOF 1998).

- When it comes to the initiation of the intervention the study shows that the users were active in stimulating VP/VDC to mobilise external support and they in their turn were active in pursuing government agencies to start interventions. In this respect VP/VDC were major actors in liasing with government agencies involved in the implementation of interventions. They were successful in creating links and developed communal linking loops to maintain contacts with these agencies for funding and execution. One of the problems encountered was that the actors involved had different objectives and sometimes even conflicting objectives. Besides, hidden agendas among profit seeking local leaders played a role in the interface between the actors involved.
- When it came to the design of the interventions, there was little or no participation of the users. The consequence was that little or no use was made of local knowledge. The lack of participation and barriers in the interfaces made that the opportunities to harmonise the objectives of the various actors were scarce. The lack of understanding between the users and the government officials was also influenced by the users themselves, as their main interest was on how to avoid contributions. As a result, in the design of the interventions, the government

objectives were well represented but limited attention was given to the objectives of the users as the procedures outlined in the participatory approach were not properly followed as in other government interventions (MOWR, 1997). This has led in several cases to a loss of feeling of ownership by users, and their willingness to make available internal resources (Table 7. 2).The emphasis on the process approach as in FIWUD (Shrestha 1987) and in action research projects (WECS and IIMI, 1990) in which farmers played an active role in the design and implementation of the public intervention was lacking in the interventions of the cases studied. The introduction of new technology like for instance in *Annapurna Kulo*, were of such a magnitude and complexity that the maintenance of the structures were way out of the capability of the users and automatically led to the dependency on external expertise and resources.

- The per hectare costs of the irrigation systems are high in all the irrigation systems and highest of all is in the *Tarkughat* system and farmers would not be able to repay it back. This indicates that the users would have to depend on the outside resources when it comes to the major maintenance of the irrigation systems.

The functioning of the irrigation systems

The management of irrigation tasks among others the allocation of irrigation water was functioning reasonably well except in *Chaurasi Kulo*. The poor functioning of the *Chaurasi Kulo* was the result of the gradual abolishment of the *Ditthawal* system and inability of the new local institution (VP) to take up the tasks due to weak enforcement of the operational rules for the operation of the irrigation system during the *Pale* period. Another problem that had to be faced in the *Chaurasi Kulo* was the over extension of the system what led to regular conflicts between farmers at the head and tail end. This considerably complicated the management of the irrigation system. The VP in *Ghachowk* and local leadership in *Tarkughat* were more capable to perform the irrigation tasks. These tasks were relatively easy due to enforcement of operational rules, besides, the irrigation systems were with a limited number of users.

- From the middle of the 1980's the government required the formation of an UC before funding the implementation of interventions, with the exception of the central level projects. The analysis of the cases suggests that UCs were seen by the users only as vehicles for obtaining resources and government considered it as an arrangement for obtaining farmers resources. However, the government failed to pay attention to institutional development. This was also observed by Lam, (1994) who studied the performance of various FMIS and AMIS in Nepal. In small schemes like *Tarkughat* and *Ghachowk* there was no need for an UC because the traditional irrigation practices were sufficient for managing the systems. Another reason that the UCs were not readily accepted was that one of its tasks was the maintenance of the system. In this respect it is important to note the transaction costs involved in the replacement of existing institutional arrangements with new ones.

Table 7. 2: Comparison of interventions in relation to technology and irrigation management

Irrigation systems	Intervention programme	Local government	Irrigation management	Current water functionary	Technology change
Chaurasi Kulo (FMIS)	1. Landslide 2. DDC 3. NISP of DOI	VP VDC VDC	Previously *Ditthawal*, then *Kulo Samiti* and now VDC and UC	None	1. Canal rehabilitation after landslide 2. Checkdam construction 3. New intake, canal rehabilitation, new culverts and checkdams
Annapurna Kulo (AMIS-Changing to joint management)	1. Farmers with the help of Peace Corps volunteer 2. Hill Irrigation Project of DOI	VDC	Emerging Water Users Society	*Dhalpa*	1. Initiation of main canal construction 2. New intake and main canal
Ghachowk (FMIS)	1. Flood repair by District Panchayat 2. Irrigation Line of credit of DOI 3. Maintenance through fund by Member of Parliament	VP VDC VDC	*Kulo Samiti* under VDC	*Pales*	1. Repair of flood damage 2. Widening and deepening of canal Permanent intake, canal lining and extension of irrigated area 3. Maintenance of canal lining
Tarkughat (FMIS)	1. Hill Food Production Project of DODA	VP	None	None	Simple permanent intake and canal lining

For example, the users in *Ghachowk* did not like to abolish the *Pale* system under which it was possible for them to escape partly their contributions for maintenance. But the revival of UC would entail higher costs, as the farmers would have to contribute for all the maintenance cost of the irrigation system if the UC became effective in its role. Another reason why the UC in *Ghachowk* did not function once the project was completed was because of the lack of trust of the UC officials by the villagers. The users in *Ghachowk* were suspicious of the UC officials who handled the ILC intervention. The users felt that the UC officials did not represent their interests properly.

- The users in *Annapurna* were aware of the gradual disengagement of the DIO as evidenced by the reduction in the annual maintenance fund made available by the DOI. Therefore they initiated a process, through the formation of a WUS, which mobilised available resources for simple maintenance activities, which could avoid higher costs in future.
- The cases indicate that the fundamental reform of collective-choice rule due to the changes effected by the irrigation intervention in the governance structure contributed to increasing anarchy in 'rules in use', which was fundamental for the sustenance of the institution (Tang and Ostrom, 1993). There was little contribution in the design by the users due to confusion about who makes the rules. Thus, all three levels of rules were no longer synchronised and effective in the management of the irrigation systems. The study also shows that many aspects of 'conditions for successful schemes' (Ostrom, 1992), of which effective sanction procedures and shared cost and benefit are fundamental to the operation of irrigation systems, were violated due to a changing village administration. Most interventions also show that agencies were taking over constitutional-choice rule (policy) without adequate understanding of the village needs.
- The study also reveals agency intervention in collective-choice rules due to changes in the physical layout of the irrigation system as indicated by the *Annapurna Kulo* case. This indicates that the introduction of a new water control technology can effect changes in the organisational control related to irrigation tasks. This in effect requires a more formal arrangement to perform irrigation tasks, as the control technology had effect on the organisational aspects of the irrigation.

  Besides, the cases of *Annapurna* and *Chaurasi Kulos* indicates that physical intervention leading to changes in hydraulic control have weakened/paralysed existing institutions. The changes in the hydraulic control were unsuccessful in maintaining the continuity of the new institutions required to get funds for new interventions as evidenced by the non performance of UCs in *Ghachowk* and *Tarkughat* cases. However, the expectations of new interventions could allow a new nexus of technical, political and social control to emerge.

The consequences of the political and administrative changes in the environment for the functioning of FMIS

- This study shows that changes in general political and social control at the local level have led to the disintegration of old institutions as evidenced by the *Chaurasi*

Kulo case. At the same time these changes have given new options in resource mobilisation.

- The changing of attitudes among the farmers with regard to the maintenance of the main canal of the irrigation system has to be seen in a larger context. In the past most villages were rather isolated and had little or no contact with the central government except for the collection of land taxes. In the past decades the role of the government has changed considerably. Via the expansion of the road system villages became less isolated and drawn into the national economy. This undermined the hierarchical social structure and the social control in the villages. The government became active in the provision of education and health services and in the provision of resources for the rehabilitation of local infrastructure including irrigation systems. This changed the view of farmers with regard to the role of the government and they were quick to ask and expect the government to 'assist with' the tasks performed in the past by them. This growing dependency on the government affect in a negative way the mobilisation of local resources and have diminished the sustainability of the FMIS that have been rehabilitated by the government assistance. The availability of local funding and the maturity of the VDCs in obtaining external funding for simple maintenance have also negatively affected the local resource mobilisation, especially the cash, from the users.

Future research

As mentioned earlier one of the weaknesses of the present research is the detailed focus on the irrigation systems. Without complimentary data on the livelihoods and production patterns achieved by the intervention it was difficult to get an in-depth view on the daily way of life of the people after the intervention. But the focus was on the water delivery and institutional changes related to this. In this connection future research on irrigation intervention would be useful in the following areas.

- To study the effect of interventions at the production and livelihood in order to understand intended and unintended impacts of interventions as it will help in understanding whether the final objectives of the intervention are achieved or not.
- The analysis of the network of the actors who influence the process of intervention and its outcome need to be better understood as this knowledge in future will facilitate the creation of well-functioning linking loops of actors involved in development intervention.
- Another area of interest could be the study of the government bureaucracy, funding agencies that shape the intervention and their outcome.

To sum up, the processes followed in the irrigation intervention often have major implications for institution building needed for the sustainability of the irrigation systems. However, the changes in the irrigation institutions need to be viewed in the wider context of political, economic and social transformations, which had major effects on irrigation institutions, and how the tasks were performed by them. Keeping in view the growing number of government interventions emphasising the sustainability of the irrigation institutions, it is important that the design and the way of implementation is done in such a way that it will guarantee sustainable irrigation

institutions. This means that considerable changes are needed in the way the government at present is improving or rehabilitating FMIS.

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Summary

With the support from various donors, His Majesty's Government of Nepal has implemented support programmes with a view to transform water availability, improve production, and increase the institutional capabilities of farmers to develop and sustain efficient, fair and reliable irrigation management practices in irrigation systems in Nepal. In this respect, this study aimed to understand the social, administrative and political processes involved in the social and institutional changes brought about by development interventions at local level. This study focused mainly on the physical aspects of the interventions, the way they were implemented and the consequences for local institutions.

The study consists of seven chapters. The first chapter consists of the nature of the problem, research focus and research objective. The various concepts and the theoretical framework along with the various methods used in generating information are presented in the second chapter. The socio-political and administrative environment of the country along with government policies and the priority in irrigation and agriculture development in different plan periods are discussed in the third chapter. The four case studies are discussed in chapters four to six. The case studies consist of the description of the general environment along with the presentation of the cases. The presentation is followed by an analysis of the case. The final chapter includes major findings of the case studies and conclusions.

The changes in the government policy at various times have resulted in differences in the intervention strategies designed for various programmes. Moreover, there was no consistency in the intervention policies for various programmes at the same time. The government policy of seeking users' participation in the decision making of project design and implementation was mixed during the 1980s, as indicated by the interventions under different programmes. For example, small-scale financial support for the improvement of the FMIS was implemented with a more or less 'participatory approach'. The processes followed in new construction projects were not based on a 'participatory approach'. However, users' participation in the decision making since the early 1990s was a precondition for the initiation of intervention processes.

The study shows that the initiation of interventions is complicated and not always very transparent due to the different objectives and hidden agendas of all the actors involved such as: the users, local leaders, local and regional institutions, government agencies, and external donors. The initiative for interventions started at the local level. The users, local leaders and VP officials formed a linking loop to obtain the resources from in which, they were successful. The VP acted as intermediary between the users and the government agencies in the initiation process of the intervention. However, the linking loop did not function well during the design of the project, as the government officials designed the interventions and great emphasis was placed on the financial and technical aspects, which were not discussed at length with the users. As a result the knowledge of the users' was not fully utilised by the agency officials. The cases indicate that the interface between the users and the other actors were not so intensive to reflect a 'participatory approach'.

The implementation of the intervention could be categorised into three types. They are the new construction, rehabilitation and improvement. The objective of the intervention determined the type and scale of financial, technical and the institutional involvement in its implementation. The cases indicate that most of the UCs formed for the purpose of the intervention acted as 'construction committees' and failed to function after the completion of the intervention. In this respect the objectives of creating institutions for the implementation were partially achieved, but they could not ensure the complete participation of the users. Thus, the linking loop formed to obtain the government resources disintegrated during the implementation of the project. However, users with the help of the VP/VDC were quick to form a linking loop to obtain resources for other interventions.

The analysis of the cases reveals that four institutions a) the *Ditthawal* system, b) DIO, c) VP/VDC and d) UC were important for the governance and the management of irrigation systems. The cases also indicate that the legitimacy of the institutions was established through the confidence of the users. The formal or informal status of the institution is secondary. The cases indicate that the fundamental reform of collective-choice rule due to the changes effected by the irrigation intervention in the governance structure contributed to increasing anarchy in 'rules in use'. Besides, there was little contribution in the design by the users due to an absence of constitutional-choice rule. The study also shows that many aspects of 'conditions for successful schemes' were violated due to changes in village administration. The study also shows that agency taking over constitutional-choice rule (policy) without adequate understanding of the village needs.

The construction of permanent headworks and the canal lining has facilitated the operations of the system and the task of the users has been made easier. As a result, less participation of the users was needed for the system development, regular repair and cleaning of the canal. The users however lost the social control of the irrigation system due to the introduction of new technology and their dependence on outside resources was increasing. The user allocation of water in the case study area is based on irrigable land. Three types of water distribution practices are prevailing in the case study area. They are rotation, field to field and unregulated allocation. The cases indicate that the contributions in the operation and maintenance of the irrigation system are not the sufficient condition for a fair access to irrigation water. The degree of social control on which the institutions would rely was an important factor for ensuring fair distribution of water resources among the members.

Three types of conflicts have been identified from the analysis of the cases. They are the conflict between the irrigation systems over the use of a single water source. However, the construction of the permanent weir did facilitate in defining the water rights between the irrigation systems. The second type of dispute is among the users due to weak institutional arrangements for the distribution of water. The third type of conflict is between the agency and the users due to lack of intensive interfaces during the planning and implementation of the intervention, which had implications on turning over the management of the irrigation system.

The nature and extent of the participation by the users reflects that the interventions were not successful in seeking the active participation of the people in decision making due to a lack of an intensive interface between the actors involved in

the design and implementation of the interventions. The analysis of the cases suggests that the most common form of participation for resource mobilisation was labour, land and time. The pattern of resource mobilisation shows that the newly introduced irrigation technologies such as permanent structures of the irrigation systems make the user more dependent on the external resources. The cash contribution was almost negligible. The complexity of the technology has considerable consequences for the need for external resources and expertise. The increasing dependence on external agencies for the sustenance of the irrigation system reflects that new linking loops are emerging through interfaces between the actors involved in irrigation development. This indicates that the technical intervention is demanding new organisational control.

In all the four case studies, the maintenance of the system after the interventions depended largely on external resources when it came to cash contributions. The newly introduced UCs were only functioning during the time of the intervention but were not functional in mobilising resources for the maintenance of irrigation system. This means a greater dependence on government support. When this is not forthcoming the sustainability of the FMIS is questionable. It is therefore necessary that in the future more attention be given by the government to the institutional aspects of intervention that aims at the improvement of rehabilitation of FMIS. However it was not only the intervention and the way they were implemented that led to a diminishing participation of the users in the maintenance of their irrigation system. The changes in the local, political, and administrative institutions, the opening of the villages via new roads lessened cohesion of the rural communities and opportunities were created or made accessible what led among others to a diminished social control. The provision of all kinds of facilities (school, health-posts) led farmers to look for new roles for the government e.g. to support them with the maintenance of the irrigation system.

Samenvatting

Met de hulp van verschillende donoren heeft Zijne Majesteits regering van Nepal programma's uitgevoerd met het oogmerk de beschikbaarheid van water te verbeteren, de landbouw productiviteit te verhogen en de institutionele capaciteit van de boeren te versterken opdat deze in staat zouden zijn in hun irrigatiesystemen irrigatie management praktijken uit te voeren die efficiënt, rechtvaardig, betrouwbaar en duurzaam zouden zijn. In dit kader was deze studie erop gericht inzicht te krijgen in de sociale, administratieve en politieke processen die invloed hadden op de sociale en institutionele veranderingen die teweeg werden gebracht door op ontwikkeling gerichte ingrepen op het lokale niveau.

Deze studie bestaat uit zeven hoofdstukken. Het eerste hoofdstuk gaat in op de aard van het probleem, de onderzoeksfocus en het doel van het onderzoek. De verschillende concepten en het theoretisch raamwerk alsmede de diverse onderzoeksmethoden die zijn gebruikt bij het verzamelen van materiaal worden behandeld in hoofdstuk twee. De sociaal-politieke en administratieve situatie in het land evenals de overheidspolitiek en de prioriteiten in de irrigatie en landbouw ontwikkeling in de verschillende plan perioden worden bediscussieerd in het derde hoofdstuk. De vier case studies worden besproken in de hoofdstukken vier tot en met zes. Deze case studies bestaan uit een bespreking van de omgeving waarin de interventies plaatsvonden en de beschrijving ervan. Deze presentaties worden gevolgd door een analyse. Het laatste hoofdstuk bevat de belangrijkste bevindingen en conclusies.

De veranderingen die op verschillende momenten plaatsvonden in het overheidsbeleid hadden tot gevolg dat er verschillende interventie strategieën werden ontwikkeld voor de diverse programma's. Bovendien was er geen consistentie in het beleid in de programma's die op hetzelfde moment werden uitgevoerd. Het overheidsbeleid dat er op gericht was de gebruikers te laten participeren in de besluitvorming gedurende de opstelling van het project ontwerp en de uitvoering daarvan varieerde gedurende de tachtiger jaren zoals aangegeven is in de verschillende programma's die hierna worden besproken. Bijvoorbeeld bij de uitvoering van de financiële ondersteuning op beperkte schaal voor de verbetering van de door de boeren zelf beheerde irrigatiesystemen werd min of meer een participatieve benadering gevolgd. Maar bij nieuw te bouwen irrigatiesystemen was van participatie nauwelijks sprake. Toch was de participatie van gebruikers sinds het begin van de jaren negentig een voorwaarde alvorens eenn interventie proces mocht beginnen.

Deze studie laat zien dat het begin van interventies een gecompliceerd proces is dat niet altijd doorzichtig is als gevolg van het feit dat de actoren die erbij betrokken zijn, zoals de gebruikers, de lokale leiders, lokale en regionale instellingen, overheidsorganisaties en externe donoren, verschillende doeleinden en verborgen agenda's hebben. Initiatie van interventies op het lokale niveau kwam van gebruikers, lokale leiders en Village Panchayat (VP) functionarissen. De VP bemiddelde tussen de gebruikers en de overheidsorganisaties gedurende de initiatie fase van de interventie. De case studies geven de indruk dat het de overheidsfunctionarissen waren die de interventie projectmatig uitwerkten waarbij

hun aandacht vooral uitging naar de technische en financiële aspecten en dat deze niet uitvoerig met de gebruikers werden besproken. Dit had tot gevolg dat de kennis die bij de gebruikers aanwezig was niet werd gebruikt. De case studies geven aan dat de contacten tussen de gebruikers en de andere actoren niet zo intensief waren dat gesproken kan worden van een participatieve benadering.

Er zijn drie typen van uitvoering van een interventie: een nieuwe constructie, herstel en verbetering. Het doel van de interventie bepaalde de aard en de omvang van financiële, technische en de institutionele betrokkenheid van de gebruikers bij de uitvoering. De case studies geven aan dat de meeste gebruikers commissies (UC) die werden opgericht vooral functioneerden als 'constructie commissies en ophielden te functioneren nadat de uitvoering van de interventie was voltooid. Het doel om instituties te scheppen voor de uitvoering was óp deze wijze gedeeltelijk gerealiseerd, maar dit garandeerde nog niet de volledige participatie van de gebruikers.

De analyses van de case studies tonen aan dat vier instituties van belang waren voor het bestuur en beheer van irrigatiesystemen: a) het Ditthawal systeem, b) DIO, c) VP/VDC en d) UC. De case studies geven ook aan dat de legitimiteit van de instituties gebaseerd was op het vertrouwen van de gebruikers. Van minder belang was het of het formele of informele instituties waren. De case studies tonen aan dat de ingrijpende hervorming van de 'collectieve keuze regel' als gevolg van de veranderingen die voortkwamen uit de interventie in een irrigatie systeem in de bestuursstructuur ervan bijdroegen tot een toenemende anarchie in de 'regels in gebruik'. Bovendien was er maar een geringe bijdrage van de gebruikers in het ontwerp van de interventie als gevolg van het ontbreken van de 'constitutionele keuze regel'. Deze studie toont eveneens aan dat de organisatie die de 'constitutionele keuze regel' (beleid) overnam geen inzicht had in de behoeften die in het dorp bestonden.

De constructie van permanente inlaatwerken en het met betonwanden bekleden van de irrigatie kanalen maakten de exploitatie van het systeem gemakkelijker en de taken van de gebruikers werden minder zwaar. Het gevolg was dat minder participatie van de gebruikers nodig was voor het geregeld onderhouden en schoonmaken van de kanalen. De allocatie van water aan de gebruikers is gebaseerd op het te irrigeren areaal dat ze bezitten. In het gebied waarin de case studies plaatsvonden waren drie typen van waterverdelingspraktijken: rotatie, veld tot veld irrigatie, en ongeregelde allocatie. De case studies tonen aan dat de bijdrage van de gebruikers aan de exploitatie en onderhouden van het irrigatie systeem nog geen zekerheid gaf voor een eerlijke verdeling van het water. De mate van sociale controle waarop de instituties konden rekenen was een belangrijke factor om te verzekeren dat er een eerlijk waterverdeling onder de gebruikers tot stand kwam.

De analyse van de case studies laat zien dat er drie typen van conflicten kunnen worden onderscheiden. Er is het conflict tussen twee irrigatiesystemen over het gebruik van één enkele waterbron. Ten tweede kan er een dispuut ontstaan tussen de gebruikers over de verdeling van het water als gevolg van gebrekkige institutionele regelingen. Het derde type van conflict is dat tussen de organisatie die het systeem beheert en de gebruikers. Dit is het gevolg van het gebrek aan contacten gedurende

de planning en de uitvoering van de interventies hetwelk gevolgen had voor de overdracht van het management van het irrigatie systeem.

De aard en de mate van de participatie van de gebruikers geeft weer dat bij de interventies niet met succes de actieve participatie van deze gebruikers is gezocht bij de beslissingen door de actoren die waren betrokken bij het ontwerpen en uitvoeren van de interventie. De analyse van de case studies suggereert dat de meest voorkomende vorm van participatie voor de mobilisatie van middelen was het geven arbeid, land en het beschikbaar stellen van tijd. Het patroon van middelen mobilisatie laat zien dat de geïntroduceerde nieuwe irrigatie technieken de bevolking meer afhankelijk heeft gemaakt van externe hulp.

Bijdragen in geld waren praktisch te verwaarlozen. De complexiteit van de nieuwe technologie had belangrijke gevolgen en maakte dat de gebruikers meer afhankelijk zijn geworden van externe expertise en middelen. Deze toename van de afhankelijkheid van externe organisaties geeft aan dat nieuwe samenwerkingsverbanden moesten worden gemaakt door het leggen van contacten tussen de actoren die betrokken zijn met de ontwikkeling van irrigatiesystemen. Dit geeft aan dat interventies van een technische aard ook vragen om een nieuwe vorm van organisatorische controle.

In al de vier case studies was het onderhoud van de irrigatiesystemen, wanneer het om geldelijke bijdrages ging, in zeer belangrijke mate afhankelijk van externe middelen. De nieuw opgerichte gebruikers commissies functioneerden alleen maar gedurende de uitvoering van de interventies maar waren niet in staat om middelen te mobiliseren voor het onderhoud van de systemen. Dit betekent een grotere afhankelijkheid van overheidssteun. Wanneer die steun niet komt dan is een duurzaam voortbestaan van deze irrigatiesystemen onwaarschijnlijk. Het is daarom noodzakelijk dat de overheid meer aandacht heeft voor de institutionele aspecten van interventies die gericht zijn op de verbetering en onderhoud van door boeren beheerde irrigatiesystemen.

Maar het waren niet alleen de interventies en de wijze waarop zij werden uitgevoerd die hebben geleid tot een vermindering van de participatie van de gebruikers in het onderhoud van hun irrigatiesystemen. De veranderingen in de lokale, politieke en administratieve instituties, het uit hun isolatie halen van de dorpen door de aanleg van wegen maakte dat de sociale cohesie van de rurale gemeenschappen verminderde. Ook werden nieuwe mogelijkheden voor de bevolking geschapen of werden bestaande mogelijkheden toegankelijker gemaakt waardoor de sociale controle afnam. Het beschikbaar stellen van vele soorten faciliteiten (scholen, klinieken) maakte dat de boeren de overheid een nieuwe rol toedachten, bijvoorbeeld bij het hun terzijde staan bij het onderhoud van de irrigatiesystemen.

Appendix

CONSTITUTION OF HEMJA IRRIGATION SYSTEM WATER USERS SOCIETY, 2049 (1992)

Preamble

Whereas the need for a Water Users Society has been felt in order to systematically meet the demand for water through its appropriate and timely supply from various branches within the irrigated area of the Hemja Irrigation Project, which comprises of one main canal covering the entire area of Ward Nos. 1, 2, 3, 4, and 9 of the Lower Hemja Village Development Committee of Kaski district in the Gandaki Zone of the Kingdom of Nepal, with boundaries comprising of the Seti river in the east, the Yamdi Khola in the south and west, and the Seti river and Sulastara and Muryanghat in the north, and branches 1, 2, 3, 4, and 4A (Annapurna New Canal), and supervise the branches and sub-branches of the canal as well as its structures, increase its capacity, expand, repair and maintain its branches and sub-branches, and work according to the rules and policies of His Majesty's Government through coordination between the water user-farmers and the concerned agency of His Majesty's Government for raising food, fruit, and vegetable crops and thus becoming self-reliant and increasing the sources of income of farmers, now therefore, the following Constitution of the Lower Hemja Irrigation System Water Users Society, 1992, has been framed and brought into force through consultations among and with the cooperation of the farmers of the area.

Chapter 1
Preliminary

1. **Short Title and Commencement**
   (1) This Constitution shall be known as the Constitution of the Hemja Irrigation System Water Users Society, 1992.
   (2) It shall come into force on the date of registration of the Hemja Irrigation System Water Users Society, 1992, as an association under the 1977 Registration of Associations Act.
2. **Definitions**
   Unless otherwise meant with reference to the subject or context, in this Constitution:
   (a) Association means a Water Users Association.
   (b) Irrigated area means the irrigated area in Ward Nos. 1, 2, 3, 4, and 9 of the Hemja Village Development Committee of Kaski district in Gandaki Zone, with boundaries comprising of the Seti river in the east, the Yamdi Khola in the west and south, and the Seti river and Sulastara and Muryanghat in the north; the term includes the main, branch, and sub-branch canals.
   (c) Society means the Hemja Irrigation System Water Users Society formed under this Constitution.

(d) Canal includes the Annapurna main canal and other branch and sub-branch canals, channels, etc. built for the supply and regulation of water under the irrigation system.
(e) Irrigation (command) area includes the lands covered by the dams, canals, and structures under the irrigation system, as well as the entire area which has yet to be irrigated through the canal.
(f) Irrigation Office means any project office, or the District Irrigation Office or the Regional Irrigation Directorate prescribed by His Majesty's Government for providing technical and other assistance to the Hemja Irrigation Project and the irrigation system.
(g) Other agricultural agencies include the Kaski District Agricultural Office and its other faculties, the Agricultural Inputs Corporation, the Agricultural Development Bank, the Cooperative Society Ltd., and other agricultural agencies.
(h) Water users mean farmers who utilize the water of the irrigation system within the irrigated area.
(i) Farmers' Assembly means an assembly or meeting of farmers as mentioned in Article 9.
(j) Ordinary member means an ordinary member of the Society as mentioned in Chapter 3.
(k) Team means a Water Users Team as mentioned in Article 11 (a), which is formed under Article 11 on the basis of the water boundaries within the irrigation system.
(l) Team Members mean persons chosen under Article 11 for different teams mentioned in Schedule (see 3. below).
(m) Team Leader means a team leader or chief chosen under Article 11 (c) by members of each team from among themselves.
(n) Representative Assembly means the assembly of teams as mentioned in Article 13.
(o) Chairman means the Chairman of the Water Users Society formed under this Constitution.
(p) Vice-Chairman means the Vice-Chairman of the Water Users Society.
(q) Secretary means the Secretary of the Water Users Society.
(r) Treasurer means the Treasurer of the Water Users Society.
(s) Executive Member means a member or office-bearer of the Water Users Society.
(t) Office-bearers include the office-bearers (Chairman, Vice-Chairman, Secretary and Treasurer) of the Water Users Society; or members assuming those posts.

3. **Seal of the Society**

The Society shall have a separate seal of its own for its identification and official business. The seal shall be circular in shape, with the words "Hemja Irrigation System Water Users Society, 1992" written inside the circle.

4. **Office of the Society**
The Society shall have an office in order to discharge its functions and hold meetings. The office shall be located within the premises of the Hemja Irrigation Project Office located in Ward No. 4 of the Hemja (Village Development Committee).

Chapter 2
Objectives

5. **Objectives**
The objectives of the Society shall be as follows:
(a) The water of the Yamdi Khola, which flows through the Hemja Village Development Committee of Kaski district in the Gandaki Zone, and which is known upstream as Dhyangkhola, is being used under an irrigation system as a reliable and appropriate source of water for agriculture or for irrigation. The objective of the Society shall be to supervise and operate the entire structure of the system in order to supply water in an appropriate and timely manner.
(b) To encourage farmers to increase agricultural production.
(c) To make collective efforts for the protection of the rights relating to water and resolution of problems relating to irrigation of all farmers.

Chapter 3
Membership

6. **Qualifications for Ordinary Membership**
Every tenant, in the case of lands which are under tenancy rights, and every landowner, in the case of lands which are not under tenancy rights, who belongs to the Hemja Irrigation Project Area shall automatically be eligible for ordinary membership of the Water Users Society if he has attained the legal age, irrespective of whether he is a man or a woman.

7. **Acquisition of Membership**
(a) It shall be mandatory for every farmer who possesses the qualifications mentioned in Article 6 to acquire the ordinary membership of the Society by paying the fee specified in Article 8.
(b) Every person who has acquired membership under Clause (a) shall automatically be a member of the Farmers Assembly, and also eligible for contesting for the post of Team Member.

8. **Membership Fee**
(a) Every ordinary member must pay every year the annual membership fee specified by the Hemja Irrigation System Water Users Society so as to be credited to its fund.
(b) In addition to the membership fee mentioned in Clause (a), every ordinary member must pay an amount as specified by the Representative Assembly or as determined by the (concerned) Team in order to meet the expenses needed for the construction, operation, repair and maintenance of the

irrigation system, or for undertaking any welfare activities or meeting any contingency expenses.

(d) The Representative Assembly shall have the power to make changes in the annual membership fee specified under Clause (a).

Chapter 4
Provisions Regarding Water Users Organization

9. Farmers' Assembly

All ordinary members within the irrigated area shall be members of the Farmers Assembly. The working procedure of meetings of the Farmers' Assembly shall be as follows:

(a) Meetings of the Farmers' Assembly shall be held at least twice a year, once before the winter crop and once before the summer crop.

(b) In case it is deemed necessary for any special reason to convene a meeting of the Farmers' Assembly in addition to its regular meetings mentioned in Clause (a), it may be convened in case at least 50 percent of the total membership of the Farmers' Assembly request the Chairman for the same in writing, explicitly mentioning the reason therefor, or in case the Society itself feels the need for holding such a meeting.

(c) The venue, time and date of a meeting of the Farmers Assembly shall be as determined by the Society.

(d) Notice of each meeting of the Farmers' Assembly must be issued at least 10 days in advance, explicitly mentioning the venue, date, time, and agenda.

(e) The quorum for a meeting of the Farmers' Assembly shall comprise of 50 (percent) of its total membership.

(f) In case the quorum mentioned in Clause (e) is not fulfilled in any meeting convened under Clause (d), another meeting shall be convened with an advance notice of at least three days. The presence of 25 percent of the total membership shall be deemed to have fulfilled the quorum of such reconvened meeting.

(g) The opinion of the majority shall be binding at meetings of the Farmers' Assembly.

(h) The Farmers' Assembly shall itself determine the working procedure of its meetings. Alternatively, such procedure shall be prescribed in the rules framed subject to this Constitution.

(i) Meetings of the Farmers' Assembly shall be presided over by the Chairman of the Society, or by a person or office-bearer of the Society who is deemed appropriate for the purpose.

10. Functions, Duties and Powers of the Farmers' Assembly

The functions, duties, and powers of the Farmers' Assembly shall be as follows:

(a) To hold discussions on and endorse annual reports and statements of income and expenditure prepared and submitted by the Water Users Society.

(b) To approve new year's programs and estimates of income and expenditure presented by the Representative Assembly.
(c) To hold extensive discussions and consultations on the various problems of farmers, and make recommendations for the implementation (of decisions).

11. Composition of Teams

(a) In every Team, the ordinary members living within the concerned water boundaries shall choose at least five but not more than 9 members from among themselves.
(b) In addition to the members chosen under Clause (a), each Team shall consist of an employee, office-bearer, or technician of the Irrigation Office as a Team Member representing that office.
(c) The Team Members chosen under Clause (a) shall choose a Team Leader from among themselves.
(d) Elections of the Team shall be held once every two years.
(e) The working procedure relating to meetings and other activities of the Team may be determined by the Team itself, which shall be implemented only after they are approved by the Society.

12. Functions, Duties, and Powers of the Water Users Team

The functions, duties, and powers of the Team shall be as follows:
(1) To construct, operate, repair, and maintain the branch canal, sub-branch canal, channels, field channels, etc. lying within its water boundaries.
(2) To help in the supply of water in lands to be irrigated according to the type of crops, and make arrangements for supplying water to the water users.
(3) To help in the collection of the irrigation service fee.
(4) To recommend the deletion of records of lands which are not to be irrigated, in case it becomes necessary to do so.
(5) To submit a petition to or lodge a complaint with the Water Users Society in writing explicitly mentioning all details in case anyone acts in contravention of this Constitution or causes any loss or damage by raising obstacles or voicing opposition to any action.
(6) To resolve any problem arising among the water users of the area under its jurisdiction on the issue of supply of water.
(7) To help farmers desirous of constructing new channels, field channels, or sub-branches in matters concerning the supply of lands for the purpose, as well as in other matters.
(8) To issue necessary directives to the water users of its area in matters concerning the use of water for irrigation; it shall be the duty of the concerned water users to comply with such directives.
(9) To implement the decisions and comply or make arrangements for complying with the directives of the Water Users Society, and exercise the powers delegated to it by the Society.

13. Composition and Meetings of the Representative Assembly

(a) There shall be a Representative Assembly comprising all the Team Leaders and members coming under the irrigation system.

(b) The Representative Assembly must meet at least twice a year. Provided that in case the Society deems so necessary, it may convene meetings of the Representative Assembly any number of times. In addition, the Chairman must convene a meeting of the Representative Assembly in case one-third of the total number of members of the Representative Assembly request for such a meeting in writing.

(c) The date, time, venue, and agenda of a meeting of the Representative Assembly shall be as decided by the Society.

(d) Meetings of the Representative Council shall be presided over by the Chairman. During the absence of the Chairman, such meetings shall be presided over by the Vice-Chairman. In case both the Chairman and the Vice-Chairman are absent, the concerned meeting shall be presided over by an Executive Member of the Society chosen by the members of the Representative Assembly who are present at the meeting.

(e) Notice of each meeting of the Representative Assembly must be sent to all the concerned explicitly mentioning its date, time, venue and agenda. Provided that in case any meeting cannot be held according to the notice issued for the first time, another meeting shall be convened with an advance notice of three days.

(f) The quorum for a meeting of the Representative Assembly shall be deemed to have been fulfilled in case it is attended by two-thirds of the total number of its members.

(g) The quorum for a reconvened meeting of the Representative Assembly shall comprise of 50 percent of the total membership. This rule shall be applicable only if the previously convened meeting had not been held due to lack of quorum.

(h) The decision of the majority shall be binding at meetings of the Representative Assembly.

(i) The other working procedure relating to its meetings shall be as determined by the Representative Assembly itself.

14. **Functions, Duties, and Powers of the Representative Assembly**

The functions, duties, and powers of the Representative Assembly shall be as follows:

(1) To frame and enforce rules needed for the operation, repair and maintenance of the irrigation system.

(2) To approve the audit reports of the Society.

(3) To amend the Constitution of the Society according to need.

(4) To formulate the annual programs of the Society and present them before the Farmers' Assembly for approval.

15. **Composition of the Society**

(a) There shall be established a Society comprising the following Executive Members in the Hemja Irrigation (Canal) System:

(1) One representative or Team Leader of each of the Teams, who has been chosen as mentioned in Article 11(a), and

(2) One technician representing the Irrigation Office.

(b) The Executive Members mentioned in Clause (a) (1) shall elect one Chairman, one Vice-Chairman, one Secretary, and one Treasurer of the Society from among themselves.

(c) The office-bearers and Executive Members of the Society shall have a tenure of two years.

16. **Meetings of the Society**

(a) The Society shall meet at least once every two months.

(b) If the Chairman so deems necessary, he may order that an emergency meeting of the Society be convened. An emergency meeting may also be convened in case one-third of the total number of Executive Members of the Society request the Chairman for the same in writing.

(c) The Secretary shall convene a meeting of the Society on the date and at the time and place prescribed by the Chairman.

(d) Meetings of the Society shall be presided over by the Chairman, and in his absence by the Vice-Chairman. In case both the Chairman and the Vice-Chairman are absent, the concerned meeting shall be presided over by a person chosen by the Executive Members attending the meeting from among themselves.

(e) Notice of each meeting of the Society must be sent to all its office-bearers and Executive Members at least three days in advance.

(f) In case any meeting cannot be held according to the notice issued for the first time due to lack of quorum, another meeting shall be convened, and the quorum for such reconvened meeting shall comprise of 50 percent of the total membership.

(g) The decision of the majority shall be binding at meetings of the Society.

(h) The other procedure relating to its meetings shall be as determined by the Society itself.

17. **Functions, Duties, and Powers of the Society**

(a) To maintain coordination among the Water Users Teams.

(b) To offer advice or make recommendations to the Site Engineer or technician in regard to the allocation of water.

(c) To establish contacts between the Irrigation Office and the Teams, obtain technical and other assistance from the Irrigation Office, and supply them to the Teams, or mobilize people's participation in the programs of the Society.

(d) To undertake repair, maintenance, and improvement works in the irrigation system by establishing contacts with the Irrigation Office.

(e) To resolve any problem relating to supply of water among the teams coming under the irrigated area.

(f) To have its decisions implemented by the Teams

(g) To work in accordance with the plans and programs approved by the Farmers' Assembly and the Representative Assembly.

(h) To spend in the name of the Society funds needed for the implementation of the plans and programs mentioned in Article 17 (g).

(i) To submit annual statements of income and expenditure and other particulars and reports of the Society to the Farmers' Assembly.

(j) To delegate some of its powers to any office-bearer or Executive Member according to need.
(k) In case the post of an office-bearer or Executive Member falls vacant before the expiry of its term, to fill up the vacancy by nominating any person as its member from among the remaining members of the Team represented by the concerned office-bearer or Executive Member; and chose a person to fill up the vacancy in the post of the concerned office-bearer as mentioned in Article 15 (b).
(l) Notwithstanding anything contained above, in case the post of a member or office-bearer of the Society falls vacant, the Representative Assembly may fill up the vacancy by nominating a person belonging to the concerned Team itself or from elsewhere if it so deems necessary.

Chapter 5
Functions, Duties, and Powers of the Office-Bearers

18. Functions, Duties, and Powers of the Chairman

The functions, duties, and powers of the Chairman shall be as follows:
(a) To preside over and conduct the meetings of the Farmers' Assembly, the Representative Assembly, and the Society.
(b) To prescribe the venue, time, and date of a meeting of the Society.
(c) To exercise his casting vote in the event of a tie in the course of voting at a meeting of the Society.
(d) To represent the Society, or designate any office-bearer or Executive Member to do so.
(e) To issue orders to convene emergency meetings of the Society.
(f) To open a bank account of the Society with a provision to operate it jointly by himself and the Treasurer.

19. Functions, Duties, and Powers of the Vice-Chairman

The functions, duties, and powers of the Vice-Chairman shall be as follows:
(a) To help the Chairman in discharging the functions of the Society.
(b) To extend help in the absence of the Chairman.
(c) To discharge the functions and duties and exercise the powers of the Chairman during his absence.

20. Functions, Duties, and Powers of the Secretary

The functions, duties, and powers of the Secretary shall be as follows:
(a) To convene meetings of the Farmers' Assembly and the Representative Assembly according to the decisions of the Society.
(b) To convene meetings of the Society as ordered by the Chairman.
(c) To keep minutes of discussions and decisions of the meetings of the Society.
(d) To submit annual reports of the Society to the Farmers' Assembly.
(e) To authenticate the decisions of the Society.
(f) To make necessary correspondence on behalf of the Society subject to its Constitution, polices, decisions, and objectives.

(g) To perform such other necessary functions as are prescribed or approved by the Chairman keeping the interests of the Society in view.

21. **Functions, Duties, and Powers of the Treasurer**

The functions, duties, and powers of the Treasurer shall be as follows:

(a) To take custody of the cash and supplies of the Society and keep their accounts and records on a current basis.
(b) To prepare annual budgets of the Society according to the budget prepared by the Representative Assembly, and submit them to the Farmers Assembly for discussions.
(c) To keep accounts of income and expenditure of the Society.
(d) To make arrangements for collecting fees, contributions, fines, etc. to be collected by the Society from its members.
(e) To operate the bank account opened in the name of the Society together with the Chairman.
(f) To supervise and regulate all activities relating to the financial transactions of the Society.

Chapter 6
Financial Arrangements

22. **Financial Sources**

The financial sources of the Society shall comprise the following:

(a) Fees, fines, etc. collected from members.
(b) Donations, rewards, financial assistance, grants, etc. received by the Society from any source.
(c) Loans obtained by the Society.
(d) Amounts received from the Irrigation Office.
(d) Donations, rewards, grants, and loans from any foreign organization, association, institution, or individual shall be accepted only with the prior approval of the concerned agency of His Majesty's Government.

23. **Inventories of Movable and Immovable Property**

(a) The Treasurer shall keep the inventories of the movable and immovable property of the Society in the form prescribed by the Society.
(b) In case the Society is dissolved for any reason and there is no possibility of its reconstitution, all its movable and immovable property shall accrue to His Majesty's Government.

24. **Fund**

(a) There shall be a fund for executing the functions of the Society. All amounts received in the name of the Society shall be credited to this fund.
(b) The fund shall be operated through the joint signatures of the Chairman and the Treasurer.
(c) All expenses to be incurred on behalf of the Society shall be borne from the fund established under Clause (a).

25. **Audit**

(a) The accounts and records of the Society shall be audited every year by an auditor appointed by the Society.

(b) It shall be mandatory to have the audit report of the Society endorsed by the Representative Assembly.

(d) One copy each of the statement of income and expenditure and the audit report must be submitted to the District Administration Office and the Irrigation Office every year.

Chapter 7
Vacancies and Arrangements For Filling Up Posts

26. Resignations

(a) In case any office-bearer or Executive Member wishes to quit his post, he may submit his resignation to the Society. The post held by him shall be deemed to have fallen vacant only after the Society accepts his resignation.

(b) In case any Team Member wishes to quit his post, he may submit his resignation to the Chairman of the Society through his Team Leader. The Chairman may accept such resignation only if he receives it along with the recommendation of the concerned Team Leader.

27. Automatic Removal for Failure to Attend Meetings

(a) In case any office-bearer or Executive Member of the Society remains absent from three consecutive meetings or from more than 50 percent of the meetings held in a year, without any satisfactory reason and prior notice, he shall *ipso facto* be deemed to have quit his executive post.

(b) Any Team Member or Team Leader who remains absent from three consecutive meetings of the Representative Assembly without any satisfactory reason and prior notice shall *ipso facto* be deemed to have quit his post.

28. No-Trust Motions

(a) In case 25 percent of the total membership of the General Assembly table a no-trust motion against any office-bearer or Executive Member of the Society on the ground that he has not behaved in a manner befitting his post or failed to full fill his responsibilities, and in case the motion is passed in the Representative Assembly by a two-thirds majority, the concerned office-bearer or Executive Member may not continue in office.

(b) In case 25 percent of the total number of ordinary members within the water boundaries of a Team, table a no-trust motion against any Team Member or the Team Leader, and in case the motion is approved by a two-thirds majority in the course of voting, the membership of the concerned Team Member or Team Leader shall terminate automatically.

(c) A fresh no-trust motion may not be tabled against any office-bearer, Executive Member, or Team Member against whom a no-trust motion has already been tabled under Clause (a) and (b).

(d) A fresh no-trust motion may not be tabled for one year against any office-bearer, Executive Member, or Team Member against whom a no-trust motion tabled earlier had failed to be approved.

(e) Any member who has been removed from his post following the approval of a no-trust motion filed against him may not become a candidate in the by-election to be held for the same post.

29. **Disqualifications for Candidacy**

Any person who is physically or mentally ill so that he is considered to be incapable of understanding his functions or decisions or fulfilling his obligations in a responsible manner shall not be provided with an opportunity to become a candidate for the post of an office-bearer or Executive Member or Team Member of the Society.

30. **Continuation in Office**

Except when the term prescribed under this Constitution has expired, all office-bearers who leave their current post shall continue in their usual post as follows:

(a) An office-bearer who has resigned under Article 29 shall continue to be an Executive Member of the Society.

(b) An Executive Member who has resigned from his post under Article 29 (a) shall continue to remain a member of the Team represented by him. Provided that he may not become a candidate in the by-election to be held for the post of Team Leader.

(c) Any Executive Member or office-bearer of the Society who is removed from his post under Article 27 (a) and Article 28 (a) shall continue to remain a member of the Team represented by him. Provided that he may not become a candidate in the by-election to be held for the post of Team Leader.

31. **Provisions Concerning Elections**

(a) In case the term of a Water Users Team expires under Article 11 (d), it shall be reconstituted through elections subject to Articles 11 (a) and 11 (c).

(b) In case the term of the Society expires under Article 15 (c), it shall be reconstituted through elections according to Articles 15 (a) and 15 (b). Provided that the elections of the Society shall be held only after holding the elections of the Teams under Clause (a).

(c) By-elections for posts which have fallen vacant under Articles 26, 27, and 28 shall be held in the following manner:

(d) By-elections of office-bearers of the Society shall be held from among the Executive Members of the existing Society under Article 15 (b). Provided that a person who has quit his post may not become a candidate in such by-elections.

(e) In the case of an Executive Member or Team Leader of the Society, the post shall be filled up under Article 11 (c) from among the concerned Team Members. Provided that a person who has quit the post of Team Leader may not become a candidate in a by-election.

(f) Vacant posts of Team Members shall be filled up in the manner mentioned in Article 11 (a).

(g) Notwithstanding anything contained in Article 31 (c), in case any member of a team leaves his post and in case the number of remaining members is sufficient to meet the minimum number prescribed in the Article, the team

shall continue to function in its present form, and it shall not be mandatory to hold by-elections to fill up the vacancy.

32. **Formation of Election Committee**

For the purpose of holding elections of Team Members, Team Leaders, Executive Members and office-bearers in a systematic and according to rules under this Constitution, an Election Committee comprising of three ordinary members shall be formed in the manner decided by the Society. No member of the Election Committee may contest for any post.

Chapter 8
Miscellaneous

33. **Amendment of Constitution**

In case it becomes necessary to amend any provision of this Constitution, a resolution to that effect may be presented by at least 25 percent of the total membership of the Representative Assembly. The concerned resolution shall be deemed to have been approved in case at least three-fourths of the total membership vote in its support.

34. **Power to Frame Policies and Rules**

(a) The Society may frame policies, rules or regulations subject to this Constitution. Such policies, rules, and regulations may be brought into force only after having them endorsed by the Representative Assembly.

(b) The Society may delegate powers and issue directives to the Teams directly after having them approved by its meetings.

35. **To be Deemed to Have Been Formed Under This Constitution**

Notwithstanding anything contained in Article 1 (b) of the Constitution, the Hemja Irrigation System Water Users Society and the various Water Users Teams formed by His Majesty's Government under the 1988 Irrigation Rules before the commencement of this Constitution shall be deemed to have been formed under this Constitution, and the term of the said Society and Teams shall also be as mentioned in this Constitution.

36. **Inoperation**

All such provisions of this Constitution as those which conflict with current Nepal law shall be deemed to be inoperative to the extent of such conflict.

37. **Provisions Regarding Advisors**

In case the Hemja Irrigation System Water Users Society formed under this Constitution feels the need for appointing or obtaining the services of advisors belonging to any related field or institution,, it may make necessary arrangements for the purpose. Provided that not more than three persons may be so appointed as advisors.

38. **Amendment of Constitution**

(a) In case it becomes necessary to amend the Constitution of the Society, its Managing Committee (Water Users Society) shall prepare a resolution to that effect and convene an extraordinary meeting according to the Constitution for a debate on that resolution.

In case two-thirds of the total number of members attending the extraordinary meeting vote in its support, the resolution shall be deemed to have been approved by the extraordinary meeting. Provided that the approval of the Local Authority must be obtained before implementing such resolution.

(b) Accounts to be Submitted

The Managing Committee (Society) must submit the statements of income and expenditure of the Society along with the audit report to the Local Authority every year.

(c) Scrutiny of Accounts

The Local Authority may, if he so deems necessary, have the accounts of the Society scrutinised by an officer appointed by him.

(d) Dissolution of Society, and Its Consequences

In case the Society is dissolved because of its failure to carry out its functions in accordance with its Constitution, or for any other reason, all its assets shall accrue to His Majesty's Government.

Hemja Irrigation Project Water Users Society Rules 2052 (1995)

Preamble

Whereas it is desirable to frame and enforce rules for the Water Users Society of the Hemja Irrigation Project subject to Article 34 of its Constitution, now therefore, the following Hemja Irrigation Project Water Users Society Rules, 1995, have been framed and brought into force:

1. **Regarding Supply of Water**
   (a) In regard to the supply of water for irrigating the paddy crop, all branch, sub-branch, depot, and group committees must submit to the Main Committee the data of the irrigated area under their respective jurisdiction in the form prescribed by the Main Committee before the end of Asadh (July 16) every year. The Main Committee may withhold the supply of water to any branch, sub-branch, depot, or group which fails to submit such data, and the concerned branch, sub-branch, depot, or group committee shall itself be held responsible for any loss resulting therefrom.
   (b) Water for the paddy crop shall be supplied from Shrawan 1 (July 17) to Kartik 10 (October 27). In case any branch, sub-branch, or group under the canal system demands water supply during night time, the concerned committee and users must agree to bear full responsibility for the same in case the concerned branch of the canal runs along paths leading to houses and settlements. In case any branch, sub-branch or group does not agree to bear such responsibility, the Main Committee may not supply water to it during night time.
   (c) During the period between Jestha 10 (June 4) and Asadh 31 (July 16), water shall be supplied not on the basis of the area involved but on the basis of the plough units. In case the number of plough units is higher than the available volume of water in the canal, water shall be supplied to the concerned branches and sub-branches on a rotation basis according to the plough units.
   (d) Regarding Irrigation of Rabi (winter) Crops
   During the period between Marga 1 (November 17) and Magh 29 (February 12), water shall be supplied on a rotation basis according to need.
   (e) Inasmuch as the volume of water available in the canal begins to decline from Falgun until Jestha (mid-February to mid-June), water shall be supplied during that period to all branches and sub-branches on a rotation basis according to their crops in case the users' demand for water is high.
2. **In Case Anyone Causes or Instigates Others to Cause any Loss or Damage to the Canal**
   (a) In case any individual, user, committee or group causes or instigates others to cause any loss or damage to the headworks of the main canal, or the underground system, the main canal, or any branch, sub-branch, or depot of this irrigation project, the concerned committee may itself, in case such incident has occurred in a branch, sub-branch or depot, valuate the loss or damage, and realize the amount involved therein from the

concerned party keeping the loss or damage and the particulars of the incident in view, in addition to a fine at the rate of five percent of the amount involved.

In case any loss or damage as mentioned in Rule 2 (a) occurs in any area under the jurisdiction of the Main Committee, the Main Committee shall itself take actions in respect thereto. In case the Main Committee fails to resolve any problem, it shall submit a petition requesting for action along with its recommendation to the concerned agencies, the Village Development Committee or the District Administration Office and the District Water Resources Committee. In case any branch committee fails to resolve any of the above- mentioned problems, it shall submit a petition requesting for action along with its recommendation to the Main Committee.

In respect to any loss or damage caused to the main canal or to any branch, sub-branch, etc. as mentioned in Rule 2 (a) above, a warning may be issued to the concerned group, individual or user for the first time keeping the nature of the offense in view.

Anyone who repeats the offense, causes any loss or damage, or acts in contravention of the Constitution and the rules and regulations of the Society time and again despite efforts to convince him not to do so shall be deprived of the right to use the water if he is a user, and if he is not a user but any other individual or institution, the amount involved in the loss or damage shall be recovered from him/it along with a fine amounting to five percent of that amount, and, in addition, the District Administration Office shall be requested to subject him/it to administrative and judicial action according to current law.

(b) The fines collected or compensation realized by a branch committee under Rule 2 (a) shall be credited as income, and may be used by the concerned branch committee itself.

3. **Regarding Regular Repair and Maintenance Works**

(a) The Main Committee shall formulate programs relating to the regular repair and maintenance of the headworks, the underground system, and the main canal, and undertake such repair and maintenance works. For this purpose, it may collect cash contributions from or utilize the labor of all the users (on the basis of their area).

(b) The regular repair and maintenance works of the irrigation project and the task of keeping its branches and sub-branches neat and clean shall be carried out by the concerned branch, sub-branch or group committees. For this purpose, they may collect cash contributions from or utilize the labor of their respective users on the basis of their area.

4. **Regarding Emergency Repair and Maintenance Works**

(a) In case the headworks, the underground system, or the main canal of this Hemja Irrigation Project suffers a serious damage due to any natural causes thereby making it necessary to repair and maintain them, and in case no relief is likely to be available from the government immediately, the Main Committee of the Project shall hold an emergency meeting,

request all users to contribute cash or labor (on the basis of their area), and carry out repair and maintenance works on a provisional basis.

(b) In case the irrigation project suffers a damage as mentioned in Rule 4 (a), His Majesty's Government or the concerned agency shall be requested to carry out repair and maintenance works on a permanent basis.

(c) In case any branch or sub-branch of this irrigation system suffers a serious damage as mentioned in Rule 4 (a), the concerned branch or sub-branch committee shall meet immediately, collect cash contributions from and/or utilize labor of all the concerned users, carry out provisional repair and maintenance works, and request the concerned agency for carrying out repair and maintenance works on a permanent basis.

5. **Regarding Financial Transactions**

(a) In case it is deemed necessary to carry out repair and maintenance works in the Hemja irrigation system, or to conduct the other businesses, or establish a permanent fund of the Main Committee, all branch, sub-branch, depot, and group committees shall collect funds in the manner prescribed by the Main Committee on the basis of their area.

(b) In case any user or committee does not pay and tries to evade payment of the prescribed amount according to the provisions made under Rule 5 (a), he/it shall not be supplied water for any crop.

(c) In case it is deemed necessary for a branch committee to collect funds from the users or groups under its jurisdiction for its own purposes as mentioned in Rule 5(a) and (b), and in case any such user or group does not pay and tries to evade payment of the amount prescribed on the basis of his/its area, the concerned committee may deprive him/it of the right to use the water.

6. **Penalties**

(a) In case any individual, user, or group takes any action in contravention of the Constitution, the rules of the Society, or the decisions taken by its meeting, he/it shall be punished with a fine of Rs 100 for the first time, keeping the nature of his offense in view. In case he/it repeats the offense, he/it shall also be punished with an additional fine of Rs 100 every time he/it does so.

(b) In case any user-farmer utilizing water from the irrigation system of the Hemja Irrigation Project acts or instigates others to act in contravention of the conventions and the rules prescribed by the Main Committee or any branch committee of the Society, or the Constitution and the rules of the Society, he shall be punished with the fine and subjected to action as provided for in Rule 2 (a) and Rule 6 (a) of the rules of this Society.

7. **Regarding Expansion of Branches, Sub-Branches and Depots of the Canal**

(a) In case it is deemed necessary for the irrigation project to expand its branches or sub-branches, or open new depots within its command area, the farmer-users of the area where the irrigation canal is to be so extended must make available the land needed for the purpose.

8. **Regarding Amendments in Rules**

(a) In case it is deemed necessary to make any changes or alterations in any provision contained in these rules, the general meeting of the Society may do so after having a resolution to that effect endorsed by a two-thirds majority of the (attending) members, and securing the approval of the District Water Resources committee.

Curriculum vitae

Dhruba Raj Pant was born in October 1953 in Kathmandu, Nepal. He did his M.A. in Economics in 1977 from Tribhuwan University, Nepal. After completion of the study in the university he joined His Majesty's Government service in 1980. During his job in the government, he was primarily working in the field of rural development.

He did his M. Sc. in Rural Sociology in 1986 at the University of the Philippines at Los Banos. He worked with the government for about 13 years and left the job in 1993 to work in the Non-Governmental sector before coming to Wageningen Agricultural University for his Ph.D in 1995.

He was involved in various short and long term research studies in the field of rural development as a free lance consultant (Rural Sociologist) in Nepal. He plans to work in the area of rural development intervention. His area of interest are decentralisation and institution development at local level.

He is happily married to Usha and they are blessed with two sons Prajwol and Ujwal.