

# Management Transfer of Agency Managed Irrigation Systems in Nepal: Participatory Significance of the Policies and the Actions<sup>1</sup>

Ganesh P. Shivakoti and Ashutosh Shukla\*

## INTRODUCTION

The vast majority of irrigation systems in Nepal have been developed and managed by farmers since time immemorial which seems as old as rice cultivation in the country. Irrigation development, therefore, in Nepal has meant the efforts of farmers to organize themselves, to invest in the construction and maintenance of their own irrigation systems. For centuries, Nepali farmers have developed their own knowledge and shaped and reshaped the rugged terrain. Levelling paddy fields on steep slopes, making bunds, constructing headworks, building irrigation canal and ditches, setting and adjusting field canals--all these do not just happen. Individuals conceptualize possibilities; they talk about their ideas; they decide what to do first; and who should do what; they argue, have conflict, and settle disputes; they build and re-build; they cope with the floods, landslides, and droughts; and in the process they have created physical and social artifacts (Benjamin 1994).

As the farmers have been continuing to build and re-build the irrigation systems for centuries, over the past six centuries several of the farmer managed irrigation systems, as we see today, have had also their origin under *birta* and *Jagir* type land tenures started by the state. *Birta* and *Jagir* were land grants awarded to individuals by the rulers. The owners of *birta* and *Jagir*, having judicial and administrative authority as well, were in

---

<sup>1</sup> The earlier version of this paper was presented in the 5th annual conference of the International Association for the Study of Common Property held at University of California - Berkeley during June 5-8, 1996. The study was supported by the International Irrigation Management Institute (IIMI/Nepal), Country Office at Kathmandu and Ford Foundation Office at New Delhi, India through a grant made to the Irrigation Management Systems Study Group at the Institute of Agriculture and Animal Science, Tribhuvan University, Rampur, Chitwan, Nepal.

\* Dr Ganesh Shivakoti and Mr A Shukla are the members of the Faculty at the Department of Agricultural Economics and the Department of Soils and Agricultural Engineering respectively at the Institute of Agriculture and Animal Science Tribhuvan University, Rampur Chitwan Nepal

a position to mobilize huge amounts of labour for the construction of irrigation systems (Regmi 1978; Benjamin 1994).

In teral, particularly in the *Tharu* inhabited areas, a governance mechanism called *pargana* existed during this period. *Pargana* was a group of several *maujas* (villages) under one administrative jurisdiction headed by a *pargana chaudhary*. The *pargana chaudhary* would authorize construction of irrigation systems and would mobilize free labour from the people of a *pargana*. *Jhara* or *Jharahi* was the form of compulsory labour mobilization from each household existing among the *Tharu* inhabitants as customary norm.

Many irrigation systems in the country also had their origin under *Guthi* system with endowment of land and other forms of properties for supporting religious and charitable institutions. These institutions needed steady income for financing the personnel and the services of the institutions. Irrigation facilities were therefore, developed to irrigate endowed lands to increase and stabilize income of *Guthi* to finance the activities (Pradhan 1990).

There are also references to irrigation systems initiated under direct involvement of the state, known to be *Raj kulo* (King's Canal) but, their number were relatively smaller and the area irrigated was not very large (Regmi 1978). Many irrigation systems were also initiated by the farmers themselves with their own initiative and resources.

At the national level, jurisprudential infrastructure was established in 1854 with the *Muluki Ain*, the law of the realm. The code retained customary practices relating to irrigation and traditional customs of different ethnic communities. Important outcomes of this law had been statements on property rights and resource mobilization obligations (Regmi 1978; Pradhan 1990).

Although during much of this period, there were no public welfare values or objectives attached to irrigation development and management, a viable mechanism of collective action evolved. This over time led the users to organize the activities of irrigation development and management under self governing irrigation institutions (Benjamin 1994). Much of what is seen in FMIS in Nepal is testimony of evolution of user's participation during this period.

The planned irrigation development in the country began only after 1951. The Department of Irrigation (DOI) came into existence only in 1952 with technical assistance from India. In 1972, the DOI's name was changed to Department of Irrigation Hydrology and Meteorology (DIHM). DIHM became the principal government agency involved in planning, designing, construction and management of government owned irrigation schemes in Nepal.

By 1980, other agencies were also involved in irrigation development in the country besides DIHM, including Farm Irrigation and Water Utilization Division (FIWUD) of Department of Agriculture (DOA), Ministry of Local Development (MOLD) and Agricultural Development Bank (ADB/N). Side by side with these government agencies, several non-governmental organizations also included irrigation development as important component of their activities. Among them were ILO supported Special Public Works Programs (SPWP), CARE-Nepal, UMN, SNV and many other Integrated Rural Development Projects. Though the volume of work taken up by these organizations is not big, they have been successful in demonstrating alternative forms of institutional support for irrigation development.

A major change in government approach for irrigation development came with the Seventh Five Year Plan (1985-1990) that emphasized people's participation in irrigation development and management. In 1988, the government introduced a working policy on irrigation development for the fulfillment of *Basic Needs*. This document provided new direction to Nepal's irrigation sector by mandating the participation of users at all levels of irrigation development from project identification, design and construction to operation and management. Until this time the DOI (then DIHM) was basically concentrated on the development of irrigation infrastructures with least concern about beneficiary participation.

In 1986, Irrigation Management Project (IMP) was started under joint funding of HMG/N and USAID/ Nepal. The aim of the project was to improve irrigation management practices both in the agency as well as in farmer managed irrigation schemes. Two institutions: System Management Division (SMD) and Irrigation Management Center (IMC) were created under IMP to achieve the specific objectives of the project. The responsibilities of SMD were: to implement systematic operation and maintenance procedures, to facilitate the organization of WUAs and to initiate monitoring, evaluation and feedback procedures. The objectives of IMC on the other hand were: to train irrigation system management specialists, WUA organizers, agriculturists and farmers and to carry out short term and long term irrigation studies on irrigated agriculture systems. The SMD activities were implemented at three selected DOI operated irrigation systems: Sirsia - Dudhaura and Chandra canals in the terai and Hande Tar Irrigation System in the hills.

A new irrigation policy was drafted in 1992. The new irrigation policy has been instrumental in stating more clearly the role of the irrigation agency and water users associations, the cost sharing mechanism and the ownership of the system upon turnover to a water users association. The objectives of the new irrigation policy are:

- *to promote Irrigation development that is cost-effective, economical, technically viable, institutionally and environmentally sustainable contributing to a reliable increase in agricultural production and productivity.*
- *to promote private sector involvement in Irrigation development and expansion.*
- *to maximize the involvement and participation of users so as to decrease the government responsibilities in development and management of Irrigation and thereby promoting local resource mobilization and self reliance.*
- *to support personal and community efforts in Irrigation development.*
- *to support and strengthen the capacity of other government and non-government agencies in Irrigation development.*

In the new Irrigation Policy, although farmers (water users) are recognized as autonomous entities with legal power who have rights and duties of the water uses; full ownership of turnover systems; provision for joint management, and even the completed and handed over systems being the whole property of the users; the water is still regarded as government property. The government has not given full recognition of the prior use rights of the farmers and also the guarantee to the farmers that their systems will not be evicted for other competing water uses in the future.

A new Water Resource Act has been published in the Gazette in 1993 which addresses the issue of prioritization of hierarchy of water uses, privatization, incentives, licensing etc. A fundamental characteristic of the new Act is that the ownership of all water resources within the Kingdom of Nepal is vested in the HMG and the government has the ultimate power to allow corporations, communities, or individuals to use the water resource. The hierarchy of water use as outlined in the Act is: i. drinking water and domestic use, ii. irrigation, iii. agricultural use such as fishery and animal husbandry, iv. hydroelectricity, cottage industry, industrial enterprises, and mining uses, v. navigation, vi. recreational uses, and vii. other uses.

The Act also gives full authority to the government to utilize or develop water resources as it sees fit. The Act also provides mechanism for conflict resolution through the arbitration of a prescribed committee. However, the district water resource committee, as prescribed by the gazette, comprises all the line agency officials at the district with the Chief District Officer as the chairman and the Local Development Officer as the member secretary. There is only one representative member to be nominated by the District Development Committee. Although the Act will not affect the day to day operations of the Irrigation systems, the trend, however, shows the basis of power is centralized rather than decentralized.

## INSTITUTIONAL FRAMEWORK FOR TURNOVER AND JOINT MANAGEMENT IMPLEMENTATION

The Irrigation Policy, 1992 has classified irrigation systems for the programs to be operated in accordance with the policy into four categories:

- Systems operated by Water Users or to be operated by them in future.
- Government irrigation systems to be turned over to Water Users Associations (WUAs).
- Systems under the joint management of HMG/N and WUAs or irrigation sub-systems of multi-purpose projects.
- Farmer-Managed Irrigation Systems or private irrigation systems.

The majority of its provisions are directed mainly to category two of turnover systems, and to joint-management systems under category three. The policy further lays down that the full ownership of a turned over irrigation system lies with a WUA registered by HMG/N, which will be responsible for all operation and maintenance (O & M). The policy also provides some basic provisions regarding the structure and responsibilities of WUAs under joint-management projects, but not for turnover projects.

The objective of a Joint-Management Program to share the system O&M responsibilities of large irrigation systems between WUOs and the irrigation agency, and through training and strengthening of WUOs, to attract farmers to actively participate in the improvement of O&M of the sector entrusted to them (HMG/N 1993).

Two action plans stemming from this policy, that are being implemented by DOI are: Turnover Program wherein operation and management of irrigation systems constructed and managed by DOI are to be turned over to organized groups of water users and *Joint Management* of irrigation schemes by increasing participation of users. Concerning size of the irrigation systems to be turned over or jointly managed, the policy states:

***"Among the government operated irrigation projects at present having up to 500 hectares of irrigated area in the hills and 2000 hectares of irrigated area in the teral, and even bigger projects than those, if feasible, shall be gradually turned-over to water users association. In general projects larger than 500 hectares in the hills and 2000 hectares in teral which can not be turned over to the water users association for their operation, maintenance and management shall be jointly carried out by the concerning irrigation office and water users association" (HMG/N 1993).***

Other provisions in the policy are concerning ownership of irrigation systems to be turned-over, collection of water fee and incentives to WUAs in its collection and cost sharing mechanisms. The provisions encompass the legitimization of WUA registered under the Association Act.

For the implementation of irrigation policy structural changes have been made within the organization of DOI. The DOI is currently structured with a central division for Irrigation Management (IMD), Medium and Large Scale Construction, Ground Water Utilization, Planning and Design and River Training and Environment, each headed by a Deputy Director General. Regional Irrigation Directorates (RIDs) are located at each of the five development regions of the country. At the district level, the District Irrigation Office (DIO) has been established in all the 75 Districts. IMD is entrusted to implement a participatory management program by developing appropriate policies and processes and implementing them in collaboration with RIDs and DIOs. Within the IMD a System Management Training Program (SMTP) has been established with three constituent branches: System Management Branch (SMB), Research and Technology Development Branch (RTDB) and Human Resource Development and Training Branch (HRDTB). The activities of the three branches is coordinated by a coordinator of SMTP. SMB is charged with design and implementation of participatory management program, formation of Water Users Organization (WUO), providing guidance to WUO and system managers on program implementation and monitoring and evaluation of the programs. RTDB has the responsibility of developing processes and procedures through research and technology development to strengthen the institutional base of WUO and reorient DOI's traditional construction approach to more dynamic system management functions and provision of services to WUOs. HRDTB is new arrangement in SMTP responsible for developing the human resource base for the implementation of participatory management programs through training of DOI's staff, WUA functionaries and user farmers.

The objectives of IMP are reformulated in 1989 to provide a broad program of support for the institutional development process within DOI. IMP since then has been working in close cooperation of SMTP to provide technical support to SMB and RTDB to strengthen their capabilities in development and implementation of process and programs for participatory management.

The USAID funded Irrigation Management Project (IMP) has been working since 1985 to assist the DOI, other government agencies and farmers to strengthen their capabilities to develop and sustain efficient irrigation management practices. Beginning in 1989 the objectives of IMP are reformulated to provide support to DOI in the implementation of participatory management programs.

Sirsia Dudhaura and Handetar were the first irrigation schemes where a joint management program was introduced through IMP. The processes and performance of IMP approach are summarized by Shukla (1995) as follows:

*"The procedure adopted by IMP in the implementation of joint management program included formation of water Users Organization and operation and management capacity building of the users and the DOI. The project aimed that capable water Users Organization would eventually take over the operation and maintenance responsibility of the system. Association Organizers (AOs) were appointed to help the farmers organize at block, branch canal and main canal levels. Roles and responsibilities of water users and the agency were worked out. In addition IMP provided support in the improvement of essential structures in the system. Both in Sirsia- Dudhaura and Hande Tar the operation and management performance improved as long as assistance of IMP was in place. There has been reversal to original state after IMP pull out in both the systems".*

### Joint Management and Turnover Program of DOI

Joint management and turnover programs originate from current policy of the government to share the operation and maintenance responsibilities of large scale irrigation systems between the water users and the irrigation agency. The overall objective is to improve irrigation management and thereby to create a favorable environment for irrigation systems to become more productive, equitable and sustainable. Both joint management and turnover programs aim at placing the users in charge of operation and management and thereby reducing the role of the agency as provider of services and technical assistance.

The turnover program aims at complete transfer of operation and maintenance responsibilities of small and medium scale irrigation systems to legally recognized water user groups. The program envisages handing over a total of 53,568 hectares comprising 42,120 hectares in the terai and 11,568 hectares in the hills by the year 2,000 A.D. (Poudel 1992). Parallel to turnover is a joint management program for large scale irrigation schemes (more than 500 hectares in the hills and more than 2000 hectares in the terai), where it would not be possible for WUA alone to take over total operation and maintenance of the system. Beginning in 1993, the joint management program has been started in a total of 33,600 hectares covering five irrigation systems: Kankai Irrigation System (8000 hectares), Manusmara Irrigation System (5,200 hectares), Khageri Irrigation System (3,900 hectares), Nepal West Gandak Irrigation Scheme (10,300 hectares) and Banganga Irrigation System (6,200 hectares).

In the proposed Irrigation Management Transfer Project (IMTP), additional systems for joint management and turnover programs have been identified. Those include: Panchkanya (600 hectares), Hardinath

(2000 hectares), Chaurijhari (800 hectares) and Pathraiya (2,100 hectares) for turnover and Kamala (25,00 hectares), Chandria Canal (6,800 hectares) and Mohana (3,500 hectares) for joint management.

Both joint management and turnover programs have been envisaged to be complementary to each other originating from a broader concept of participatory management transfer. In a management continuum joint management has been considered as an intermediate stage of eventual turnover for a system to become fully farmer managed. The degree of DOI and users responsibility are to be decided by size of the system, their structural complexity and socio-economic environment, including organizational strengths and the capabilities of water users.

Joint management for DOI has been considered to mean a commitment on the part of DOI to deliver required water or at least a portion of canal water supply to a certain level in the system for the users through their WUO to pick up and become responsible for management functions below that point. In the beginning the WUO may begin with blocks on a tertiary level and as they develop their own management capabilities and confidence, they could take over larger parts of the system. In terms of authority and responsibility the role of WUO has been expected to increase and that of DOI to decrease over time. That would ultimately allow the DOI to assume the role of authorizing resource use and mobilizing resources that are beyond the reach of the users.

The most important aspect of this management transfer program is to develop WUAs capable of operating and managing the irrigation systems. The WUAs have been considered the target audience so improvement and strengthening of their capability has been given importance. In the beginning DOI would work as partner in the process of management transfer until WUA would be capable enough to assume full responsibilities. Another important aspect of management transfer is improvement of agricultural support services in order to improve the performance of irrigated agriculture. The WUAs over time have been envisaged to develop their capabilities to take up much broader management functions like provision of agricultural inputs and marketing.

## **Process**

### *Formation of WUO*

The process of management transfer has been considered to begin with formation of WUA wherein water users are to be organized in multi-level of organization depending upon the size and structural complexity of the system. This is to be started with an introductory workshop to explain the users and discuss with them the objectives and process of joint management and turnover. Association Organizers (AOs) from DOI, placed in the system, are expected to identify and train local



farmers to become Farmer Organizers (FOs). The AOs together with FOs are then expected to generate relevant information to decide the nature and tiers of Irrigation organization that best fit the socio-economic and structural complexity of the system.

The formation of the WUO is to be initiated based on the hydraulic boundary of the system beginning with block and tertiary levels to/of the main system level. The DOI has identified a need for four tiers of Irrigation organizations depending upon the size and structural characteristics of the system. The lowest tier called *Upatolls* (quaternary committee), are to be formed at the level of off takes from main farm ditches. Two or more *Upatolls* would be combined to form *Tolls* (tertiary committee) and similarly two or more *Tolls* would be combined to form a branch committee. All branch committees and other *Upatolls* of direct off takes from the main canal would be combined to form the main committee of WUA. A general assembly formed of all the *Upatolls* would be the main regulatory body to which the WUA main committee would be accountable. The general assembly would be represented by one member from each *Upatolls*.

Side by side with formation of the WUO and election of functionaries at different level, the constitution of WUA is to be drafted. The WUA is then to be registered to obtain the status of a legally formed body. This then becomes the starting point for further Institutional development process.

#### *Joint Agreement*

The second phase of activities include Joint agreement between WUA and DOI stating roles and responsibilities of each party. At this stage the agency personnel together with the WUA are expected to identify operation and maintenance options that would eventually lead to the development of operation and maintenance plans. A classification of operation and management plans into short term, medium term and long term would help defining the gradual process of management transfer to WUA. A memorandum of agreement is to be signed between the WUA and the agency.

#### *Implementation and Follow-up*

The third stage in the management transfer program is actual implementation of programs agreed upon during stage II. These include programs for operation, deferred and regular maintenance, payment for operation and maintenance and other activities to be implemented. The full implementation is expected to take 3 to 5 years depending upon the nature of the system and the capabilities that the WUA develop.

Extensive training for water users, WUA functionaries and agency

personnel are to be organized to develop and strengthen their capabilities in such areas as communication, leadership, account and record keeping, operation and maintenance, agricultural production and improved on-farm practices.

Though the strategy for joint management and turnover was drafted in early 1992, the actual implementation began only in 1993 with the formation of WUAs in Khageri, West Gandak and Banganga Irrigation Systems. One of the achievements made in the management transfer program is formation of WUA. While multi user organizations have been formed in Khageri, West Gandak and Banganga, the process is still in progress in Kankal and Manusmara Irrigation Systems. The WUAs in Khageri and West Gandak have been found to be very active in developing plans for their organization. The WUA functionaries in both these systems meet more frequently to discuss the emerging issues. In Banganga however conflict and lack of coordination has been reported between the WUA and DOI (Shukla 1995).

### **ADEQUACY OF PROVISION OF PRESCRIPTION FOR MANAGEMENT TRANSFER**

The existence of a very large number of farmer-managed irrigation systems in Nepal where farmers themselves construct, govern, maintain, manage such a large number of irrigation systems has many things to offer in the management and governance of the agency-managed irrigation systems. Given the geographical setting of the systems, FMISs have been able to perform in agricultural productivity better than the AMISs (Laitos et al. 1986; Pradhan 1989; Shivakoti 1992; Yoder, 1986). It is estimated that FMIS support the irrigation needs of over 21 percent of cultivated land as against 11 percent under public sector irrigation schemes. Approximately 40 percent of the national cereal crop requirements are met from irrigated farming under FMIS. The FMIS in the country are not restricted to smaller units. While there are systems of less than one hectare in size, supporting irrigation needs of an individual farmer, there are also FMIS as large as 15,000 hectares (Yoder 1986). There is still a large discrepancy in the total area reported under FMIS despite improvements in resource inventory and mapping techniques. Pradhan (1989) estimated the number of FMIS to be 1700 in the terai and 15000 in the hills. Similarly, Poudel (1992) puts their number to be 16000 in the hills and mountains with estimated irrigated area of 3,22,000 hectares, and 17000 in the terai, irrigating a total of 5,20,000 hectares.

Traditionally, FMIS in Nepal have existed on a self-help basis. They have established mechanisms to accomplish the irrigation management tasks: acquisition, allocation, distribution, resource mobilization and conflict management. The evolution of mechanisms has been possible due to the tradition of ownership, organizational capabilities, users'

participation and mutual trust and accountability. The mechanisms were time tested: tried, modified and tried again, and dynamic: changed over time in response to the stresses of social, economic and ecological forces.

Two important characteristics of FMIS in Nepal have been: that they are developed and operated in a demand-driven mode and that they have assured participation of users at every stage. In proposing a participatory approach to irrigation development and management, HMG/N has envisaged to initiate and retain these characteristics in government operated irrigation schemes. Since FMIS exist in diverse terrain, representing wide variations in resource base and socio-economic environment, they provide an excellent opportunity for learning while formulating and executing a participatory model in irrigation development and management.

The transfer of Nepal's public sector irrigation systems to water users' organization for operation and management is based on the current irrigation development policy of the government which seeks user's participation at all levels of irrigation development from project identification, design and construction to operation and management. Based on this program several government managed irrigation systems are in the process of turnover to water users organizations. The government aims at transferring the management of small and medium irrigation systems to the users with the service area of nearly 100,000 hectares (which is nearly one-third of total AMIS) by the year 2000 A.D. There are, however, no clear cut policies available to guide the turnover process. Several issues originate from the turnover process which, among others, are: turnover to whom, when to turnover, what part of the system, what size of system, what legal provisions for turnover, what role of the government.

## CONCLUSION

Recent changes in irrigation policy and the new Water Resource Act have to some extent clarified many confusions on the management transfer of the AMIS to the FMIS. The policy provides basic provisions regarding the structures and responsibilities of WUAs under joint-management projects, but not for turnover projects. Similarly, there is no clear cut distinction made on the responsibility of DOI to the joint-managed irrigation systems, although the policy lays down that the full ownership of a turned over system lies with a WUA registered by HMG/N. Thus, there is further need to lay out the clear cut roles and responsibilities of DOI and WUAs.

The role of the Research and Technology Development Branch and the System Maintenance Branch of the Department of Irrigation are

very crucial in determining the process of turnover both in terms of building the capacity of the field level staff and on documenting the management experiences of FMIS which can be applied to the management transfer of AMIS. We outline here some of the lessons drawn from the study of FMIS (Shukla 1995) which need to be incorporated into the action plan of the management transfer so that it can be participatory in true sense.

#### *Membership Defined by Property Rights*

The FMIS in most cases are found to exercise some kind of property right in defining membership and irrigation access. The resource mobilization obligations and participation in decision making are also tied to irrigation entitlement. Such a link has been the basis for collective obligations and compliance to the rules in use.

#### *Local Control on Institutional Innovation*

In FMIS the rights, roles and duties are entirely under local control with users themselves defining the roles and duties for operation and management. The rules and roles of the users are tailored to local needs and interest of the users. Further, the rules and roles are not rigid. They are developed, modified and tried again, matching the system dynamism and changing needs and preferences of the users.

#### *Prompt Decision Making and Effective Enforcement*

Prompt decision making and effective communication of decisions ensure a higher degree of compliance to the decisions. Further, the mechanism of irrigators being pressurized by the neighbors to comply with the rules in use has evolved a collective obligation on part of the users. The enforcement of the rules is backed by a system of penalty that matches with the severity of default.

#### *Equity in Resource Mobilization and Irrigation Access*

Equity in resource mobilization and irrigation access has been the basis for prompt and assured mobilization of resources and compliance to rules in use. In FMIS the users are assured of a due share of water in return to their investment of time, labour and money during system construction and operation and maintenance.

#### *Transparency and Accountability*

The FMIS maintain transparency in rules and regulations and accounts and book keeping. The functionaries of the WUO are accountable to the users and therefore the chances of favoritism and fraudulent behavior are minimized.

Any irrigation system, for its effective management and high

performances needs institutional support for its viability and sustainability. Management transfer is not the same as shifting of responsibility. Due to the heavy investment nature of AMIS, whether the systems remains under joint-management or turnover programs, farmers need continuous support in various degrees. Thus, the role of government is equally important in providing support beyond the capacity of the farmers and also in protecting the interest of farmers. Thus, there is need for a shift in the policy of government from that of protector to that of facilitator.

### SELECTED REFERENCES

Benjamin, P. (1994) "Historical Basis of Irrigation in Nepal" in Benjamin, P., W.F. Lam, E. Ostrom, and G. Shivakoti ed. *Institutions, Incentives and Irrigation in Nepal*. Decentralization, Finance and Management Project Report; Associates in Rural Development, Inc. in colation with Indiana University, Workshop in Political Theory and Policy Analysis.

His Majesty's Government of Nepal (1988) *Working Policy on Irrigation Development for the Fulfilment of Basic Needs*, Kathmandu, Nepal: Ministry of Water resources.

HMG/N, National Planning Commission (1991) *Eighth Five Year Plan*, Singh Durbar: Kathmandu, Nepal.

HMG/N, Ministry of Water Resources (1992) *Irrigation Policy: 1992* Singh Durbar, Kathmandu.

MHG/N, Ministry of Water Resources (1993) *Water Resources Act, 2049*, Singh Durbar, Kathmandu.

HMG/N, Ministry of Water Resources (1993) *Irrigation Management Transfer Project*. Draft Final Report. Kathmandu, Nepal.

IMSSG/IAAS (1994) *Nepal Irrigation Institutions and Systems: Resource Inventory and Process Documentation* Progress Report submitted to Ford Foundation. Irrigation Management Systems Study Group, Institute of Agriculture and Animal Science, Rampur, Chitwan, Nepal.

Laitos, Robby, et al. (1986) *Rapid Appraisal of Nepal Irrigation Systems*, Water Management Synthesis Report No. 43. Fort Collins: Colorado State University.

Ostrom, Elinor, (1992) *Crafting Institutions for Self-Governing Irrigation Systems*, San Francisco, Calif.: Institute for Contemporary Studies Press.

Ostrom, Elinor, Paul Benjamin, and Ganesh Shivakoti (1992) *Institutions, Incentives, and Irrigation in Nepal*, Volume 1, Bloomington, Indiana University, Workshop in Political Theory and Policy Analysis.

Poudel, S.N. (1992) *Irrigation Profile of Nepal*. Research and Training Branch, Department of Irrigation, Kathmandu, Nepal.

Pradhan, P. (1989) *Pattern of Irrigation Organization in Nepal: A Comparative Study of 21 Farmer-Managed Irrigation Systems*, International Irrigation Management Institute, Colombo, Sri Lanka.

Pradhan P. (1989) *Increasing Agricultural Production in Nepal: Role of Low-cost Irrigation Development Through Farmer Participation*. Colombo, Sri Lanka: International Irrigation Management Institute.

Pradhan, Ujjwal (1990) "Property Rights and State Interventions in Hill Irrigation Systems in Nepal." Ph.D. diss; Cornell University, Ithaca, New York.

Pradhan, Ujjwal, (1994) "Farmers' Water Rights and Their Relation to Data Collection and Management." In Sowerwine, J., G. Shivakoti et al. (ed.), *From Farmers' Fields to Data Fields and Back: A Synthesis of Participatory Approaches to Resource Information System*, Proceedings of an International Conference held at the Institute of Agriculture and Animal Science, Rampur Nepal March 21-26, 1993. Colombo, Sri Lanka: IIMI, and Rampur, Nepal.

Rana, Jitendra et al. (1994) *Experience of Management Transfer to Users in Nepal*, Paper presented at an International Conference on Irrigation Management Transfer, Wuhan, China, IIMI and Wuhan University of Hydraulic and Electrical Engineering, September 20-24.

Regmi, Mahesh Chandra (1978) *Land Tenure and Taxation in Nepal*. Kathmandu, Nepal: Ratna Pustak Bhandar.

Shivakoti, Ganesh (1992) *Variation in Interventions, Variation in Results: Assistance to FMIS in Nepal*, Irrigation Management Network Paper 11, Overseas Development Institute. London.

Shukla, A.K. (1995) *Process and Performance of Participatory Irrigation Management Program in Nepal*, A Review Paper prepared for International Irrigation Management Institute, Country Program, Nepal, Kathmandu.

Yoder, Robert, P. (1986) *Farmer-Managed Irrigation Systems in the Hills of Nepal*, Ph.D. diss., Cornell University.