Institutions, technology and water control: water users associations and irrigation management reform in two large-scale systems in India

Vishal Narain

Propositions

Proposals for reform in Indian canal irrigation need to consider their fit with the design of canal irrigation. *This thesis*

The WUAs that are being formed in the state of Haryana at the moment are essentially arms of the bureaucracy. They are not vibrant, robust, self-governing resource users organisations. *This thesis*

Institutional and technical reform below the outlet is meaningless in the absence of effective management of the main system or control over water supplies.
- (Hunt 1989; Wade & Chambers 1980).

WUAs are not associations of users of water, but of farmers who use water as an input into agriculture. WUAs would be more enduring if they were structured as multi-purpose organisations that were more central to the lives of their members. Goldensohn (1984)

The world has problems. Universities only have departments.
- *A cynic's view on the need for inter-disciplinary research*

There is a difference between efficiency and effectiveness. Efficiency means doing more things in less time; effectiveness means doing the right things.
- *Stephen R Covey*

Propositions attached to the thesis
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Glossary

Adhsali	Sugarcane planted in July-August and harvested after 18 months
Awsara	Turn for taking water
Bajri	Pearl Millet
Bandhara	Weir
Bawdi	Large diameter dugwell
Bhaichaara	A relationship based on a feeling of brotherhood and friendship
Burseem	A fodder crop
Chak	Area commanded by an outlet
Chakbandi	Land consolidation
Channa	Chickpea
Chaupaal	A building that serves as a meeting place for the village folk
Chaukhat	Field inlet
Chowkidaar	Watchman
Gat number	Revenue record number
Gurudwara	House of worship of the Sikhs
Hookka	Community Pipe
Izzat	Honour, respect
Jai, Jaw	Fodder Crops
Johad	Village Pond
Jowar	Sorghum
Karkhana	Factory
Khal	Watercourse
Kharif	The cropping season coinciding with the monsoon rains

Kuchhi Warabandi	Warabandi based on mutual consent
Maal	Fees for use of irrigation services
Mandir	Temple
Mogha	Outlet
Nahar	Canal
Naka	Field inlet
Nala	Rivulets/streams that drain excess waters in the fields
Paatkari	Waterman in charge of water distribution in an area of about 800-1000 ha
Panchanama	A statement of irrigation offence recorded by a canal officer
Panchayat	Unit of self-government at the village level
Panna	A geographical sub-boundary in a village
Pracheen	Old
Patwaari	Village level record keeper
Phad system	A system of irrigation managed by farmers for about 400 years in North Maharashtra on small river diversions
Pucki Warabandi	Warabandi based on a schedule prepared by the Irrigation Department
Rabi	Winter crop season
Sahakari	Co-operative
Sarpanch	Elected head of the Panchayat
Shejpali	A system of water distribution in which farmers apply for water at the start of the season on the basis of the area and crops; when applications are sanctioned, water is supplied tail to head to one farmer at a time. This system is practiced in Western India.
Suru	Sugarcane planted in the month of November and harvested after 12 months
Talati	Village Level Record Keeper
Thola	Ancestral Family Unit
Warabandi	A system of water distribution prevalent in Northwest India and Pakistan in which the available water is shared by farmers for a time period fixed in proportion to the size of their land-holdings

Abbreviations

APM	Adjustable Proportionate Module
BDO	Block Development Office
CADA	Command Area Development Authority
CADP	Command Area Development Programme
CASAD	Center for Applied Systems Analysis in Development
CCA	Culturable Commanded Area
DIRD	Directorate for Irrigation Research and Development
EXEN	Executive Engineer
GOM	Government of Maharashtra
GOH	Government of Haryana
GOI	Government of India
HAD	Haryana Agricultural Department
HID	Haryana Irrigation Department
HIRMI	Haryana Irrigation Research and Management Institute
HSMITC	Haryana State Minor Irrigation and Tubewell Development Corporation
ICA	Irrigable Commanded Area
IMT	Irrigation Management Transfer, Irrigation Management Turnover
INPIM	International Network on Participatory Irrigation Management
IndianPIM	Indian Network on Participatory Irrigation Management
JE	Junior Engineer
SE	Superintending Engineer

SOPPECOM	Society for People's Participation in Ecosystem Management
SPK	Samaj Parivartan Kendra
PIM	Participatory Irrigation Management
RWS	Rotational Water Supply
USAID	United States Agency for International Development
WC	Watercourse
WRCP	Water Resources Consolidation Project
WUA(s)	Water Users Association (s)

Preface

My first thinking on the subject of rural institutions and organisations goes back to my days as a student at IRMA, the Institute of Rural Management, Anand. That was when I started thinking about what made a vibrant, robust resource users organisation. Professor Tushaar Shah's notions of *swayambhoo*, or self-governing, self-replicating organisations left an indelible impact on my mind.

This received further consolidation during my experience with TERI, the Tata Energy Research Institute, New Delhi where my exposure to the analysis of water management problems and issues shaped my thinking on the need for local level institutions for water management. TERI provided an atmosphere that was very conducive to learning, intellectual development and independent research and fostered a stimulating exchange of ideas among young researchers. It is my days at TERI to which I am really indebted, because they cultivated in me a research orientation, and allowed me to learn with a free and adventurous mind. In fact, it was my association with the *Resource and Development Economics* group that fostered my desire for further learning.

My thinking on the subject further evolved during my first six month stay at Wageningen University as part of the *Matching Technology with Institutions* (MTI) Ph.D Programme. My research orientation underwent a change from a prescriptive, instrumental perspective on rural institutions to more of a process perspective, seeking to understand their behaviour and evolution. I also became conscious of the need for an inter-disciplinary orientation. With a basic training in economics and rural management, I wanted to explore more about the implications of design or irrigation

technology for institutional development. This was clearly something my own educational training and professional experience had so far not equipped me to do. I also wanted to know more about how legal institutional frameworks, social relationships and technology interacted in the working of local level institutions. In this thesis, I have essentially tried to capture these domains of interaction.

It is here that I owe an intellectual debt to the members of my supervisory team. They provided overall direction to this research, brought to it their own expertise and experience and lent it its inter-disciplinary character. Dr. Peter P Mollinga taught me how to think about outlets and hydraulic structures and irrigation design. My thoughts on legal pluralism were shaped through my interactions with Professor Dr. Franz von Benda Beckmann. Professor Linden Vincent helped me expand my ideas at the writing stage and analyse my empirical material more systematically. Professor Gopal Naik gave specific suggestions at various stages of my research and helped me stay focussed. The advantage of a team as this one was that it helped keep a balance between different perspectives and ways of doing research and kept me from falling in the trap of spending too much time just exploring one issue or theme in my research.

I also thank Peter Mollinga for his efforts and drive in keeping the MTI group together. The regional workshops that he organised served as a useful monitoring tool to track progress and the feedback that I received helped me complete my thesis in time.

My participation in the MTI Programme brought me in close interaction with several other researchers. What developed was a cohesive group and we shared as much fun and laughter together as we shared our research experiences. With great fondness will I remember my association with R. Manimohan, Shree Prakash Singh Rajput, Puspa Raj Khanal, Esha Shah, Anjal Prakash, Suman Gautam, Amreeta Regmi, Bala Raju Nikku, Preeta Lall, Jyothi Krishnan and G Mini. The series of regional workshops that we attended brought us together as a well-knit group with an interesting range of experiences to share.

In the course of my field work, invaluable support was provided by the SOPPECOM team at Pune, Maharashtra with whom I interacted on several occasions, in person, as well as via email. In particular, I thank Dr. R.K.Patil, Dr. S.N. Lele and Mr. Sane for patiently answering many of my questions on several

occasions. I thank the Indian Institute of Management, Ahmedabad for institutional affiliation during the course of my Ph.D. work. A special word of gratitude is owed to Professor Prabhakar at the Institute of Rural Management, Anand for his support in the initial stages of my research. I thank the Ford Foundation for financial support for research and field work in India. I thank the many farmers and staff of irrigation agencies that I interviewed in the course of my research. Without their time and attention, this research would have never been possible.

I thank Vikram Dayal, my friend and colleague at TERI, for stimulating discussions on research through our association in TERI and in the course of my Ph.D research. At Wageningen, I acknowledge the brief, but interesting exchange of ideas with Joost Oorthuizen, Margreet Zwarteveen, Jeroen Warner and Jeroen Vos. Trudy Freriks and Gerda de Fauw provided valuable administrative support and made my stays in Wageningen smooth and comfortable.

Last, but most important, I acknowledge the support and perseverence of my parents. It was because of their support that I could pursue my academic interests with a free mind and with little concerns about home or domestic responsibilities. They have always been a source of strength. I thank Nishu and Arvind for their encouragement and good wishes and Shyla and Atreya, my nieces, for the welcome breaks they provided from my work. Finally, I thank God for his blessings, kindness and generosity.

1

Introduction

Irrigation has played an important role in India's agrarian development and transition and in achieving self-sufficiency in food production. It is estimated that though only 28% of India's cultivated land is irrigated, it produces 56% of her agricultural output (GOI 2000). Agriculture, in turn, employs 75% of India's labour force, though it produces only a third of her GDP. Until the 1950s and 1960s, an increase in agricultural production was attained chiefly through an expansion in the area under cultivation. Having reached the ceiling for expanding the land under cultivation, increases in production since then have been achieved through increases in yield and cropping intensity (GOI 2000; Vyas 1994). In particular, the spread of irrigation, through private tubewells and canal water helped sustain cropping intensity in the northwest, which became the cradle of the green revolution.

It has been argued that irrigation in India has lived up both to its productive and protective role in terms of its impact on agricultural productivity, farm incomes and protection against drought (Dhawan 1988). As the incidence of rural poverty has been found to be inversely related to both the rate of growth of crop output and the irrigation factor, planners and policy-makers have seen investment in irrigation as an indirect instrument for eradicating rural poverty. Thus, there has been a huge resource commitment: since independence, over Rs 600 billion or US $80 billion (in constant 1980 prices) have been invested by the government (World Bank 1999a). Together with China, India's irrigated area now exceeds that of other countries.

However, as elsewhere in the world, there has been widespread disenchantment with the performance of canal irrigation systems in India (World Bank 1999a, 1991; Mitra 1996; Saleth 1996a, 1996b;

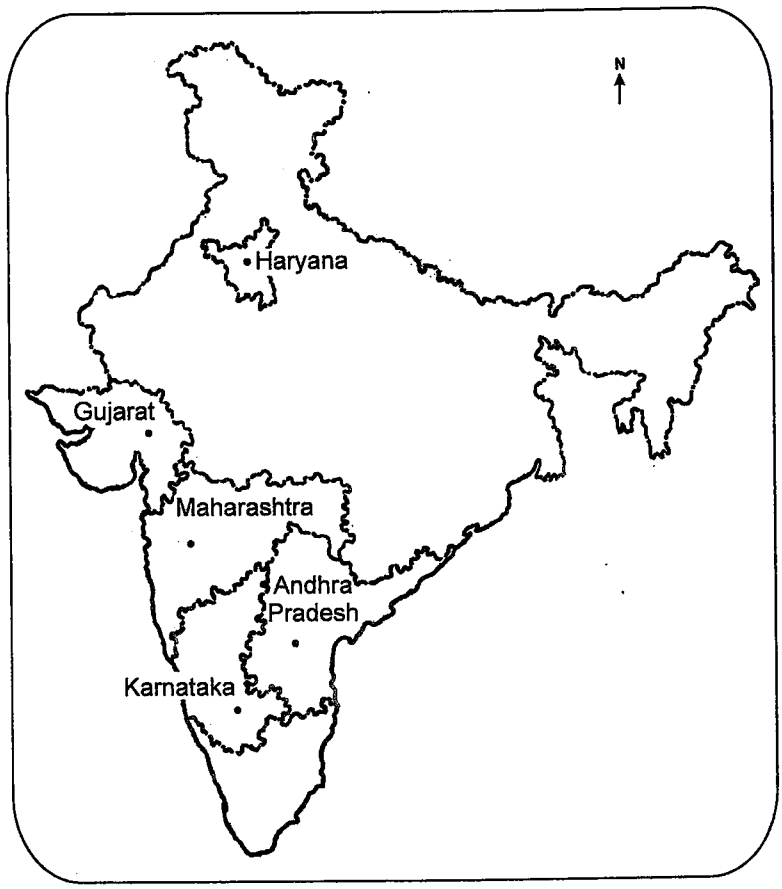
GOI 2000). The commonly cited problems in India's irrigation sector have been the widespread incidence of salinity, alkalinity and waterlogging, inequity between the head and tail reaches, the poor state of repairs and maintenance and the widening gap between irrigation potential created and utilised. There are also financial constraints. It is estimated that the cost of creating 1 hectare of irrigation potential rose from Rs 8620 in 1950-51 to Rs. 29587 by the year 1992-93 (GOI 2000). As an ultimate constraint, it is estimated that even when all of India's irrigation potential is utilised, half of her cultivated land would still be rainfed.

There has now been awareness of problems in the planning and functioning of canal irrigation systems in India for more than three decades (Mollinga 2000). Over this period of time, the focus of the debate has varied; it has moved from an emphasis on physical infrastructure and administrative issues to include agro-ecological, institutional and developmental concerns.

This book concerns itself with Irrigation Management Transfer, often advocated by policy-makers as a solution to the ills of the irrigation sector. Irrigation Management Transfer (IMT) is a term used to denote a variety of initiatives in devolving management responsibility and authority from the state to the irrigators (Turral 1995).[1] This devolution usually takes place to farmers' groups called variously as water users associations (WUAs), water user organisations or farmers' organisations for irrigation. Moves towards devolution of authority and responsibility to users have been led largely by financial pressures, both internal and externally imposed by international lending agencies, on governments which have been either unable to finance recurring costs of irrigation or to recover costs by collecting fees from water users.[2] Irrigation Management Transfer has thus come to be seen as a way to relieve governments of financial burdens and to improve productivity and sustainability of irrigation systems (Kolavalli and Brewer 1999; Kloezen 2002).

In India, policies and programmes for establishing WUAs are at different levels of formulation and implementation in 13 states (Ballabh 2002).[3] Through this research, I seek to contribute to a better understanding of the implementation of these policies in two Indian states, namely, Haryana and Maharashtra (Map 1.1).[4] I examine how a policy intervention translates into practice. What happens when a policy seeking to establish WUAs comes to the ground? I describe how the implementation process is shaped by

Haryana and Maharashtra on the map of India



MAP 1.1

the perceptions of the actors involved, their relationships with each other, as well as how they are able to articulate their interests and pursue them further in the implementation process. The practical constraints and bottlenecks to policy implementation are discussed.

To facilitate this analysis, I distinguish between a linear model of the policy process and an interactive one (Thomas and Grindle 1990).[5] A linear or rational model supposes that a reform proposal gets on the policy agenda for government action, a decision is made on the proposal and the new policy or institutional arrangement is implemented, either successfully or unsuccessfully. An interactive model, that has influenced the approach adopted in this book, on the other hand, views policy reform as a process, one in which interested parties can exert pressure for change at many points. Understanding the location, strength, and stakes involved in these attempts to promote, alter, or reverse policy reform initiatives is central to understanding the outcomes. Thus, a policy reform initiative may be altered or reversed at any stage in its life cycle by the pressures and reactions of those who oppose it.

The analysis of the process of policy implementation is particularly of relevance in the state of Maharashtra. This state, along with the neighbouring state of Gujarat, is considered to be a cradle of co-operation, with a wide variety of institutional forms in all agrarian sectors. Then, in such an environment, why have efforts at forming WUAs in canal irrigation been limited in their scale? There is resistance among the actors - the farmers as well as the Irrigation Department- who benefit from the *status quo* and thwart efforts at WUA formation. While two NGOs have made some efforts at WUA formation, they are constrained in their ability to produce reform at a scale larger than a local one.

The analysis of the implementation process in the state of Haryana suggests that state governments contemplating WUA establishment need a greater clarity about what they seek to accomplish through WUA formation, apart from this being done primarily under persuasion or pressure from donors and funding agencies. To be implemented successfully, a proposal for change must find acceptance among the affected constituencies – in this case the farmers as well as the irrigation bureaucracy- who need to be convinced that change is indeed necessary.

An Interdisciplinary Perspective on Water Users Associations

This book seeks to contribute to developing an inter-disciplinary, sociotechnical perspective on the analysis of the organisational dynamics of water users associations.[6] These dynamics are shaped by technology and social relationships. From this perspective, there are two sub-questions: (1) what are the implications of technology, or the design of canal irrigation, for the establishment and working of WUAs and (2) what are the organisational dynamics of water users associations, or how do WUAs behave as organisational entities? To answer the latter of these two questions, I have examined aspects of the local context in which the water users associations are embedded. Patterns of elite dominance and leadership, internal power structures and conflicts inside the WUAs as well as the context of rule enforcement and violation have been explored. Equity in water distribution has been examined.

The theoretical framework for this book highlights two levels of interaction (1) between the water users and the bureaucracy, mediated by the technology, social relations and rules for water distribution and (2) among the users, where, too, the interactions are mediated by the technology, social relationships, and rules for water distribution. The relationship between the users and the bureaucracy is mediated by technology at two levels. The first is the design principles. In protective canal irrigation, a concept that is explained in the following chapter, this is through some form of rationing or distribution of scarce water supplies. The second interface is through the tangible forms of technology: outlets and hydraulic structures. This interface is further shaped by the rules, norms and practices for water distribution.

Implications of technology for WUA formation

In this book, I examine the relevance of two different design settings - the *shejpali* system of water distribution prevalent in Western India and the *warabandi* system prevalent in Northwest India and Pakistan - for establishing WUAs. The design of canal irrigation shapes the organisational structure that is needed for its operation and to that extent has relevance for establishing WUAs. Further, it influences the extent to which water management and distribution practices can change by forming water users

associations, and the extent to which control relations between the users and the bureaucracy can be altered.

Shejpali is partially a demand-based system in which the Irrigation Department allocates water in consideration of a farmer's request according to his land, crops, and need. It is practiced in the states of Maharashtra and Gujarat in Western India. Under shejpali, it is optional for an irrigator to take water in a season, and at the start of the season he has to file an application indicating the area and crop, and number of watering turns desired. Water is supplied to the farmers' fields through gated pipe outlets.

Warabandi, on the other hand, is a supply driven system. Water is allocated to a farmer as a right based on his land area within the Cultivable Command Area. A farmer is then allotted his share and turn according to a pre-determined rotation schedule specifying the day of the week, time, and minutes of duration for which he will take water. There are no gates at the outlet. The flow of water from the outlets is supposed to be directed to one field at a time as per the water distribution schedule. The water is supposed to flow day and night for the allotted number of days. Farmers operate warabandi below the outlets. The government's main role is to assist in preparation of the water distribution schedule and in settling the disputes among the farmers. While a detailed discussion and comparison of warabandi and shejpali is reserved for chapter 2, the differences between the two systems are summarised in table 1.1.

As will be shown in chapter 2, warabandi and shejpali also have different contexts of water scarcity. In this book, the implications of these different systems of water distribution for establishing WUAs are examined. In particular, I focus on the implications of the different types of outlet structures: the gated pipe outlets in use in shejpali *vis-á-vis* ungated proportional dividers (open flumes and adjustable proportionate modules) in warabandi.

Outlets are a very important structure in a canal system (Mahbub and Gulhati 1951). Firstly, they are the points through which water is distributed from the minors and taken to the farmers' fields through watercourses. Since the crucial question in irrigation is whether farmers get water at the time, place and quantity that they desire, and this factor is shaped by the outlet structures, they are a subject of interest for irrigators as well as engineers. Secondly, they are the points where the management of the canal system moves from the hands of the public

administration to the farmers. Thus, an outlet structure is the point of transfer of responsibility and hence of great significance in Irrigation Management Transfer programmes. Thirdly, outlets are the signposts of struggle, their design being altered and re-altered through the balance of power representing interactions among the involved actors (Mollinga and Bolding 1996; Mollinga 1998a). For this reason, a difference in outlet structures is also a starting point for understanding conflicts around water.

TABLE 1.1: Shejpali and warabandi systems: a comparison

Criteria	*Warabandi*	*Shejpali*
Outlets	Ungated proportional dividers	Gated pipe outlet structures
Staff requirements	Smaller	Higher
Role of irrigation agency	Preparing the distribution schedule	Releasing water as per farmers' applications
Engineering and managerial control required	Limited	Higher
Choice of crops	Free	Restricted
Scope for farmer involvement	Implementing the schedule; limited role in financial or managerial responsibility above the outlet	Higher: possibilities of involving farmers at different levels of system operation

An approach to rules, law and institutional frameworks

Institutional frameworks are approached from the perspective of post-institutionalism (Benda Beckmann F von, 2001). This perspective problematises the relationships between the rule aspects, the normative legal institutional framework, the social relationships that develop in their context and the social practices these rules purport to regulate and which maintain or change the relationships and the normative institutional framework. This could be contrasted with new institutional economics approaches followed by authors like Ostrom (1990, 1992) and Tang (1991, 1992) that focus on institutions as "rules in use" for resource appropriation and management. In this book, I show that rules are

important in that they have enabling and constraining aspects. However, they are mainly mobilised as resources by individuals to accomplish certain objectives. Further, the ability of individuals to mobilise rules as resources is shaped by social relationships, especially the relations of power. An inter-disciplinary perspective on rules also shows that in canal irrigation, rules for water distribution are an expression of a certain configuration of technology and social relationships. Rules are embedded in design and social relationships.

Further, rules and law are approached from the perspective of legal pluralism. Benda Beckmann, F von (1988) reserves the concept of legal pluralism to denote the "duplicate nature of institutions, rules, and processes, as also the relationship between different normative systems".[7] Legal pluralism is an umbrella concept indicating the condition that more than one legal system or institution co-exist with respect to the same set of activities (Benda Beckmann, F von 2001). Legal pluralism helps us understand the interface of different sets of laws and normative systems with regard to the same set of activities. As a concept, legal pluralism comes particularly to the fore in examining water distribution in this book, when I examine the water distribution system under warabandi irrigation.

Human agency and social interaction are explored through the concept of *power*.[8] This concept is used in an absolute sense and in a relative sense. In an absolute sense, it refers to a transformative capacity, as defined by Giddens (1984). There is an assumption that as actors, human beings have certain goals and purposes. They seek to act in a way that produces the outcomes that they desire. Further, a certain outcome would not have existed if individual actors had acted otherwise. In a relative sense, *power* is seen as exercised through regularised relations of autonomy and dependence (Giddens 1979, 1984).

Related to the concept of power is that of control. The Concise Oxford Dictionary defines control as "...(to) dominate, command". In essence, control is a form of exercise of power. Mollinga (1998a) distinguishes three dimensions of water control (1) technical (2) organisational and (3) socio-economic and political control. Technical control implies "guiding-manipulating-mastering of physical processes." Essentially, it is exercised through the operation of physical artefacts, such as the canal irrigation system. Organisational control is the "commanding-managing of

people's behaviour." It pertains to organising and co-ordinating a set of activities among people. Socio-economic and political control relate to "the regulation of social processes and that of people's labour" (Mollinga 1998a: 28). These forms of control are inter-related. Technical control wields social and managerial control: a change in technical control relations between the users and the bureaucracy translates into a change in managerial and social control relations.

Power and control relationships in local water management shape the exercise of accountability. [9] Accountability relationships, in this book, are discussed at two levels. The first level is between the WUA management body and the WUA members. The exercise of accountability relationships between the WUA members and their leaders is shaped by power relationships. The location of WUA leaders in village networks that allocate resources and inputs may enable them to evade accountability to other WUA members. The second level at which accountability relationships is discussed is between the water users and the Irrigation Department. An issue that is raised is whether the formation of a water users association allows a set of mutual accountability relationships to develop between the irrigators and the Irrigation Department. Does the formation of WUAs seek to make the Irrigation Department accountable to water users for water delivery, or do water users associations merely remain arms of the bureaucracy carrying out certain functions that are delegated to them?

An essential aspect of the organisational dynamics of WUAs that is shaped by technology and social relationships is equity. Equity is a value-laden concept with different meanings and connotations. It derives its meaning in the socio-economic milieu of society with its values, beliefs, traditions and established principles of social behaviour (Patil and Kulkarni 1984). In the case of irrigation, it may refer differently to equal allocations of water between head and tail-enders, allocations proportional to the size of land-holdings, an equal amount of water allocated per acre per family or to preferential allocations to smaller farmers *vis-á-vis* larger farmers. It could also refer to the availability of water as per design, or as per crop water requirements. The failure to consider equity from the farmers' point of view is understood to be a major cause of much of the relatively poor performance associated with system rehabilitation and modernisation (Levine and Coward 1989).

In the Indian literature on irrigation, equity has been studied both for canal and ground water. A distinction is made between spatial and inter-personal or inter-class equity in gains from irrigation (Dhawan 1989). Studies of groundwater irrigation point to the pre-emption of the resource by the rural elite (Chambers, Saxena and Shah 1989; Shah 1993; Nagaraj, Frasier and Sampath 1999; Moench 1994).[10] In the case of canal irrigation, a major concern identified is the over appropriation of water by head-enders (Rao 1984; Dhawan 1989; Mitra 1986).[11]

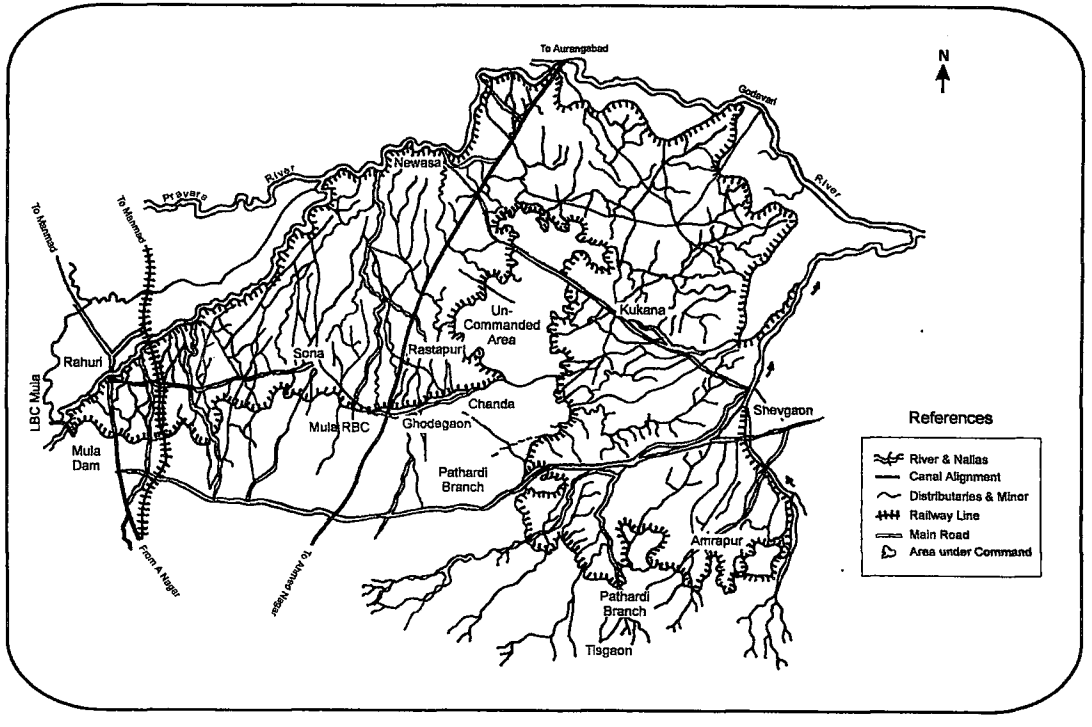
The subject of equity inside water users associations, however, has received relatively little attention. In this book, equity in water users associations is examined at two levels (1) the nature of relationship among the actors in the water users associations particularly in terms of the relationship between WUA leaders and other members and (2) equity in water distribution itself.

This book examines the relationships between these different dimensions of control, power and accountability relationships in the context of local water management as a form of local resource management. Van Steenbergen (1997) defines local resource management as the management of the resource by the users themselves. It is to be distinguished from *collective action* that is defined in terms of the effort of a group or category of people to accomplish a common or shared objective, from which the members of the group would stand to benefit.

These issues, namely the interaction between the social, technical, and organisational dimensions of water control, and between the legal institutional framework and rules and social relationships inside the water users associations, receive relatively little attention in the existing approaches to studying water users associations.[12] These bodies of work make valuable contributions to our understanding of water users associations, but are silent on several aspects of their internal dynamics as well as the nature of relationships among the WUA members and their relationships with the irrigation bureaucracy.

A major critique of the prevailing literature on water users associations is the limited treatment of technology. The implications of the design of canal irrigation for establishing WUAs have received very little attention.[13] In this book, the term technology is used in the sense of the design characteristics of canal irrigation and their physical manifestations such as outlets and hydraulic structures. This book makes a case for mainstreaming discussions of technology into

Index Map of Mula Project Maharashtra



MAP 1.2

debates on Irrigation Management Transfer, by arguing that technology is an important consideration that influences the extent to which water management and distribution practices can change by forming WUAs and control relations between the users and the bureaucracy can be altered.

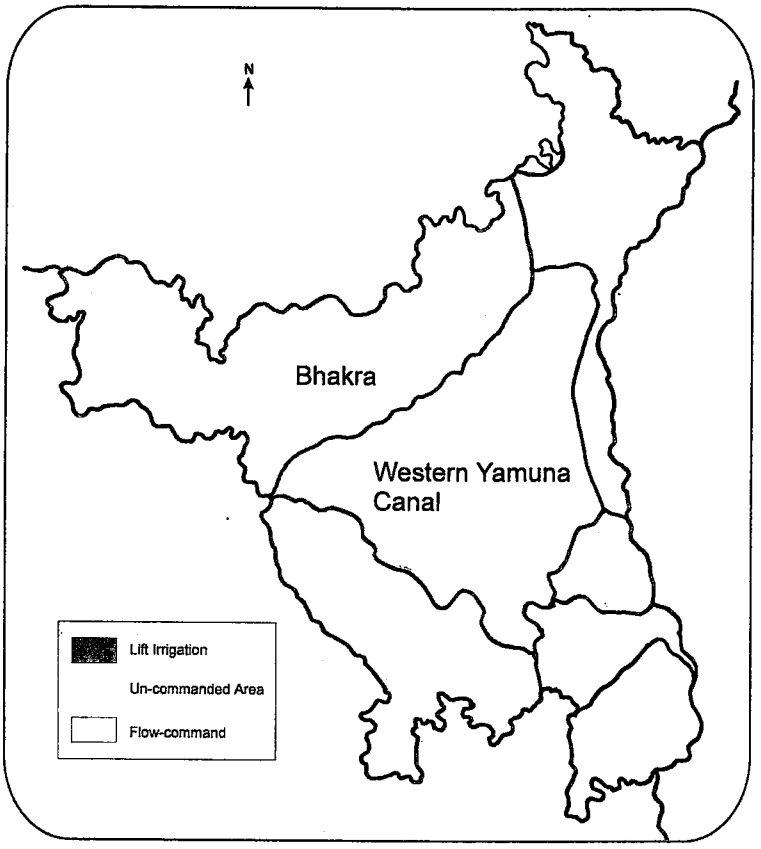
Research Sites and Methodology

In Maharashtra, fieldwork was carried out on the Minor No. X of the Mula Right Bank Canal of the Mula Irrigation system.[14] The Mula Dam was built late in the 1960s to harness the waters of the Mula river, a sub-distributary of the Godavari river system (Lele and Patil 1994). The Mula river rises in the Western Ghats and flows to the east for about 160 km. and meets the Pravara river, a tributary of the Godavari, at Newasa in Ahmednagar district (Map 1.2). The dam has a gross storage capacity of 767 million cum (M cum) and a live storage capacity of 609 M cum. It is located 60 kms upstream of the confluence and was completed in 1971-72 to irrigate 80,800 ha in 149 drought prone villages of the district.[15]

In Haryana, research was carried out partly on the Western Yamuna Canal System and partly on the Bhakra Canal system.[16] The Western Yamuna Canal is the older of the two and irrigates mainly the eastern parts of the state (Map 1.3). It diverts the waters of the Yamuna river. Constructed originally in the pre-British times, this modern canal system is one of the earliest British engineered systems in India (Brewer *et al.* 1999). The Bhakra system built since independence stores the waters of the Sutlej river in the Bhakra reservoir, designed to irrigate the western parts of the state.[17]

There were two criteria that guided my site selection. First, I wanted to compare a WUA in warabandi irrigation with one in shejpali to look at the implications of technology, or the design of canal irrigation, for WUA establishment.[18] Second, I was looking for WUAs that already had some sort of an institutional history that would enable an interesting exploration of their organisational dynamics. In Maharashtra, the Lakshmi Narayan WUA came closest to this criterion. In Haryana, it was the Rampur WUA. In Haryana, I chose one more, the Sitapur WUA, because it made an interesting comparison with the Lakshmi Narayan WUA in terms of the extent to which control relations did or did not change with

Irrigation commands in Haryana



MAP 1.3

WUA formation, and how that related to the technology, or design of canal irrigation.[19]

During my fieldwork, I visited the selected research sites across the different irrigation seasons. I used a mix of qualitative research tools such as direct observation, semi-structured interviews, relying on key informants and studies of written records. I interviewed four categories of actors: farmers and members of the WUAs, members of the irrigation bureaucracy (the Irrigation Department and other state organisations such as the Command Area Development Authority), facilitators and Non Government Organisations and representatives of donors and funding agencies. Another set of research activities comprised observations along the canal, minors and watercourses, to observe water distribution practices and the strategies employed by farmers to improve water control, as well as their interface with the irrigation bureaucracy.

I used the case study method of research. *A case study* is an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin 1984). A case study is used to 'paint a portrait of a particular social phenomenon' (Hakim 1987: 27). The case study method of research differs from a sample-based study. A case study seeks not to generalise to a population, as would a study based on a sample, but to a theory. The focus, thus, is not on *statistical generalisation*, but *analytic generalisation* (Yin 1984).[20] Case studies are often considered to be the most flexible of all research designs. This is largely because of the ability of the case to draw from a number of sources of data.

I have worked with the principle of *grounded theory*. A grounded theory is one that is inductively derived from the study it represents. Thus, data collection, analysis and theory stand in reciprocal relationship with each other (Strauss and Corbin 1990). It is a process whereby model building and information are constantly interchanged (Majchrzak 1984). Research proceeds through an empirico-inductive process with theories and tools that the researcher brings into dialogue with the evidence.[21]

Plan of This Book

This book has seven chapters. In chapter 2, the warabandi and

shejpali systems of water distribution are described. This chapter provides a brief review of the state of research in these systems and of the issues and debates surrounding their operation.

Chapter 3 is the first of the empirical chapters. This chapter provides the legal and policy framework under which the WUAs that I selected function. It describes the process of policy implementation for WUA establishment in Haryana and Maharashtra.

Chapter 4 addresses the research question: how does technology, or the design of canal irrigation, matter in establishing WUAs? I show that discussions of technology are important in the debates on Irrigation Management Transfer, since the design of canal irrigation influences the extent to which water management and distribution practices can be changed through WUA formation and the extent to which control relations between the users and the bureaucracy can be altered.

Chapter 5 focuses more closely on the following of the research questions, namely on an exploration of the organisational dynamics of the water users associations studied. The embedded nature of the processes of local water management is described. I describe the organisational dynamics of the Rampur WUA and how they relate to other aspects of social organisation-the division of society into social units, domination by local elite, the reproduction of power relations inside the water users association and the embedded nature of conflicts.[22]

To understand the internal dynamics of the water users associations, it was necessary to look at the internal processes of water distribution and at equity, from that perspective. This is the subject of the next chapter, chapter 6.

In chapter 7 the summary and conclusions of this research are presented. I show that understanding the technical design characteristics of canal irrigation is important for understanding the prospects for policy reform initiatives. The potential for reform varies with the technology for water distribution. Shejpali and warabandi systems have a different potential for reform. Three sets of policy reform measures are described: water rights reform and market creation[23], pricing, and Irrigation Management Transfer. I conclude the chapter by discussing some avenues for further research on protective irrigation and on irrigation management reform.

Notes

[1] The terms Irrigation Management Transfer, Irrigation Management Turnover and Participatory Irrigation Management are often used interchangeably to describe the process of devolution of management tasks to irrigators. In the Indian context, the use of the term Irrigation Management Transfer has been confined to the academic community (Brewer et al. 1999; IIM(A)-IWMI 1999; Pant 1999, 2000; Kolavalli and Brewer 1999). The term Irrigation Management Turnover has been barely used in the Indian context. Instead, Participatory Irrigation Management is the more widely used term. Participatory Irrigation Management, or PIM, "refers to the involvement of irrigation users in all aspects of irrigation management, and at all levels" (EDI 1998:9). Its use is widely in vogue among academics (Jairath 1999; Parthasarathy 2000; Raju, Meinzen-Dick and Gulati 2000; ISS 1999; Brewer and Sakthivadivel 2000), the bureaucracy (Ailawadhi and Bansal 2001; Mathur and Sibal 2000), and NGOs and training organisations (Lele 2000; IRDAS-WALAMTARI 1999). Multilateral organisations such as the World Bank have done their bit to popularise this term (EDI 1998; World Bank 2000). The usage of the term has received a boost from its use in the wider international arena with the establishment of INPIM, the International Network on Participatory Irrigation Management, and later, the establishment of IndiaNPIM, or the Indian Network on Participatory Irrigation Management.

[2] In countries such as Mexico, these reforms emerged as a strong reaction against a long period of extensive state intervention followed by a series of political and economic crises in the 1980s and 1990s, radically diminishing the size and scope of state intervention (Kloezen 2002). For a review of IMT experiences, see also Wijayratna and Vermillion (1994), Svendsen and Nott (1997), Brewer et al. (1999), and Korten and Siy (1989).

[3] For a review of the thinking regarding user involvement in irrigation management in the Indian context, see Pant and Verma (1983), Ambler (1994), Maloney and Raju (1994), and Hooja and Joshi (2000). See also Parthasarathy (1998) and Brewer et al. (1999).

[4] The other states marked on this map have been referred to elsewhere in this book.

[5] See also Crosby (1996), Brinkerhoff (1996), Hogwood and Gunn (1984) and Long and van der Ploeg (1989).

[6] The sociotechnical approach developed at the Irrigation and Water Engineering Group of Wageningen University, the Netherlands, seeks to combine scientific knowledge, practical engineering skills and social understanding in the analysis of irrigation processes and interactions (Vincent 1997). For more on the evolution of this approach, see Kloezen and Mollinga (1992) and Mollinga (1998a). For applications of this

approach, see Kloezen (2002), Wahaj (2001) and Pradhan (1996).

[7] Essentially, writings in this field of work question the legal centrist perspective that all legal ordering is rooted in what is called state law. It is recognised that there are multiple regulatory orders and that these are omnipresent. For a review of different theoretical issues and debates around the concept of legal pluralism, see Woodman (1998). See also Merry (1988), Vanderlinden (1989), Griffiths (1986), Spiertz and Wiber (1996) and Benda Beckmann, F von (1989). For applications of the concept of legal pluralism to water rights and distribution, see Meinzen-Dick and Bakker (2001), Bruns and Meinzen-Dick (2000), Spiertz (2000), Vermillion (2000) and Spiertz and de Jong (1992).

[8] This could be contrasted with the rational, utility maximising postulate used by authors like Ostrom (1990, 1992) and Tang (1991, 1992). For a discussion and critique of the concepts of human agency in the irrigation management literature, see Mollinga (1998a, 2001a).

[9] The significance of the concept of accountability has increased in the context of recent debates on decentralisation and local governance. For conceptual treatments of accountability, see Paul (1992) and Blair (2000). For a discussion of accountability issues in irrigation, see Merrey (1996), Vos (2002), Kloezen (2002), Malano and Hofwegen (1999) and Mollinga (1998a).

[10] A more recent analysis of agrarian change and groundwater markets in Gujarat is provided by Dubash (2002). Dubash argues that groundwater markets are embedded in and shaped by ecological and social characteristics, irrigation infrastructure, history and class power.

[11] In the context of protective irrigation in South Asia, discourses on equity focus on the discrepancy between head and tail reaches of the system, both with regard to discharges from the canal as well as the quality of groundwater supplies (Kijne and Vander Velde 1992; Bhutta and Vander Velde 1992; Latif 1993). See chapter 2.

[12] A review is provided by Zwarteveen (1999). See also Kloezen (2002), Uphoff (1986), Ambler (1994), Maloney and Raju (1994), Gulati, Meinzen-Dick and Raju (1999), Meinzen-Dick, Raju and Gulati (2000, 2002), Brewer et al. (1999), Shah (2000), Vermillion (1999), and Kolavalli and Brewer (1999).

[13] See also Horst (1987, 1998). Horst argues that in discussions on Irrigation Management Transfer, technology has received very little attention. At best, physical rehabilitation of systems is considered, taking the existing technology as given. For a discussion of the implications of irrigation management tasks and roles for the organisational structure, see also Yoder (1994) and Martin and Yoder (1987).

[14] Some sites were also studied briefly on the Waghad and Jayakwadi projects in the exploratory phase. I have changed the names of the water users associations that I studied as well as the villages and minors or distributaries on which they are located to protect the identity of the

research sites. The names of some of the members of my study have also been changed for the same reason.

[15] Agrarian change and development was brought into Ahmednagar district, where my research site was located, by the sugarcane revolution of the early 20th century. This district has a strong proliferation of co-operatives in several agrarian sectors. For a review, see Baviskar (1980). See also Attwood (1987, 1992, 1995) and Chithelen (1985).

[16] Sites on the Bhakra Canal system were studied only briefly in the exploratory phase.

[17] For further details on these systems, see Malhotra (1988). The research sites are located in Rohtak and Jind districts of the state. In Haryana, agrarian change was brought about through the green revolution in the 1960s and 1970s. With an emphasis on the use of high yielding varieties of seeds in optimum combination with other agricultural inputs, increases in production during this phase were achieved primarily through increases in productivity. For a review of the effects of the green revolution, see Paul (1989), Kumar (1989), and Sen (1974). In more recent years, the ecological sustainability of the green revolution has been put to question. See Rao and Gulati (1994) and Joshi and Tyagi (1991).

[18] For more on comparative research see Yin (1984). For a review of comparative research in irrigation, see Vos (2002).

[19] That explains the difference in the presentation of data in these two WUAs in this book.

[20] However, as the number of cases increases, the principle of analytic generalisation tends to be replaced by that of statistical inference (Hakim 1987).

[21] In operational terms, this meant that I tried to theorise about what I saw in the field. The process of defining and developing key concepts was carried out through the course of my fieldwork.

[22] The organisational dynamics of the Lakshmi Narayan WUA are presented in chapter 4. The thematic focus of that chapter, however, is on the changing of control relations between the users and the bureaucracy. The dynamics of the Lakshmi Narayan WUA are taken up again for discussion along with those of the Rampur WUA in chapter 5.

[23] The subject of water rights in jointly managed canal irrigation has, in fact, received relatively little attention in the Indian context (Mollinga 1998a).

2

Warabandi and Shejpali as Forms of Protective Irrigation

In this chapter, the warabandi and shejpali systems of water distribution are described. The first objective of this chapter is to describe what these forms of water distribution entail. The second objective is to provide a brief review of the state of research in these two systems. Through this chapter, I provide the technological context of my research sites.

In section 1, the concept of protective irrigation is introduced. I describe its genesis as a specific form of irrigation under colonial rule with certain policy objectives. The technical design, organisational and socio-economic characteristics of protective irrigation are presented. I describe their conflict with farmers' objectives. In Section 2, the warabandi system of irrigation prevalent in Northwest India and Pakistan is introduced. Its basic premises and operation are discussed. I review some of the literature on the experience with this system to assess its merits and demerits. In Section 3, I describe the operation of the shejpali system and compare it with the block system.

The chapter concludes in section 4 with a discussion of some of the discourses surrounding protective irrigation. I examine why the understanding of protective irrigation is essential to appreciating irrigation management concerns and how this understanding is central to my research.

Protective Irrigation: Concept, Evolution and Characteristics

Protective irrigation is a specific form of large-scale canal irrigation found in the semi-arid, drought prone areas of the Indian sub-

continent (Mollinga 1998a). These irrigation systems are designed and operated such that the available water in the rivers or reservoirs is spread thinly over a large area in an equitable manner. The objective is not to match water supply with crop water requirements. Instead, the goal is to reach as many farmers as possible, and to protect them against famine and crop failure, which would otherwise occur in regions of low and erratic rainfall. This is to be distinguished from the dominant design practice in irrigation engineering, which is to design irrigation systems so that water supply covers the full crop water requirements, either completely by irrigation or in addition to rainfall (Jurriëns, Mollinga and Wester 1996).

The concept of protective irrigation emerged as an element of British colonial irrigation policy in the 19th century (Mollinga 1998a). At that point of time, protective irrigation undertook to supply limited quantities of water to subsistence-oriented farmers growing traditional food crops. This would protect crops and livelihoods from drought, prevent famine and social unrest, and secure colonial rule.

Thus, "Protective works, as their name implies, exist primarily for protection against famine, not to bring revenue to the state" (Narain 1922: 272). Similarly, as Attwood (1987) put it, when protective irrigation works were constructed in the Deccan in the early 20th century, the 'protective nature' of Indian canal systems implied that (1) the canals were intended to protect food crop production against droughts over as wide an area as possible and (2) they were not required to be self-financing. In other words, the authorities did not expect to recover the full interest on capital costs from irrigation charges.

After independence, protective irrigation became part of the government's policy for agrarian development, with an emphasis both on growth and equity objectives: production and productivity increase and the spread of the benefits of development over different sections of the population and different regions (Mollinga 1998a). It has since guided the construction of canal irrigation projects in the phase of planned economic development. In 1987, the National Water Policy stated thus: "the irrigation intensity should be such as to extend the benefits of irrigation to as large a number of farm families as possible, keeping in view the need to maximise production" (GOI/MOWR 1987: 9). In evaluating the contribution of irrigation to India's economic development, it has

been argued that irrigation has lived up both to its productive and protective role (Dhawan 1988).

Historical origins of the concept

The principle of protective irrigation has had different meanings in a historical context (Mollinga 1998a). As noted above, the concept emerged under British colonial rule, at a time when the sub-continent was regularly struck by severe famines. The colonial authorities did not use the term protective irrigation at that time, but used the term "area protected" instead. This was to be distinguished from "irrigated area". An area was considered "protected" when a certain percentage of it received water to protect it from drought and crop failure. In the 1860s, a norm of 42.5% of the area came to be accepted as "protected" in the Punjab.

In the last quarter of the nineteenth century, the term acquired a second meaning, when protective irrigation systems came to be distinguished from productive irrigation systems. In the first half of the nineteenth century, irrigation schemes had been geared primarily towards a maximum return on a minimum investment. This had generally been very remunerative, with a return of up to some times as much as 69.5% on the capital expenditure (Whitcombe 1983 and Stone 1984 cited in Bolding, Mollinga and Straaten 1995). These irrigation systems were called "productive irrigation systems."

However, some changes took place after 1860, as the Imperial Crown took over ruling India from the East India Company (Mollinga 1998a). For irrigation development, this had certain implications. It led to a change in the way public works were financed, the establishment of an independent Public Works Department and a change in irrigation policy. This change in policy was formulated after the report of the Indian Famine Commission (1878-80), that drew attention to the indirect returns related to irrigation in terms of protection against famine.

The Famine Commission of 1880 defined the general policy that the British Government should adopt in dealing with famines (Narain 1922). It emphasised the need for anticipating famines and being prepared for them beforehand. It insisted on the government directly taking steps to prevent famine and provide relief. As

measures of protection against famine, it recommended the extension of irrigation and railways and an encouragement of diversification of occupations.

In 1879, a productivity test had been introduced for decision-making on the investment in canal irrigation. A per cent figure had been fixed that was the cut-off for accepting new projects; the others were rejected. Those approved were called 'productive' irrigation systems (Jurriëns, Mollinga & Wester 1996). The Famine Commission, however, recommended constructing schemes with lower returns as well, apart from productive irrigation schemes, with the aim chiefly of preventing famines and cutting on famine costs. These systems were referred to as 'protective irrigation systems'. A Famine Fund was created to this effect. The whole idea was further consolidated and given real momentum by the Indian Irrigation Commission of 1901-03.

Protective irrigation works came to play an important role under British rule. Writing about the state of India's economy then, Narain (1922) wrote thus: " Famines have been frequent under British Rule, but thanks to the chain of protective railways, and the great irrigation works, they do not cause so much suffering now as they did in the past. Very great progress has been made in famine protection and famine relief" (Narain 1922: 243). Further, "It would be difficult to overestimate the value to the country, of these fine systems of irrigation works which may be said, with some slight reservations in respect of the Cauvery works in Madras, to have been entirely created by the British Government within the last eighty years. They irrigate annually over 11 million acres, and completely protect from famine an area which, except in the Madras and Orissa deltas, may be said to vary from two to four times the area annually irrigated. In some parts, as in Sind, there can be no cultivation, and therefore no population, without canal irrigation. In others, the effect of the works in maintaining or raising the level of the subsoil water, on which the well irrigation depends, is of the utmost value and importance. The value of the crops irrigated by the canals in a single year is about equal to the whole capital cost of the works, and in years of famine, the produce of the irrigated area, being largely available for transport to distressed tracts, becomes an important item in the general food supply of the country" (Report of the Indian Irrigation Commission 1901-03 cited in Narain 1922: 290).

At present, the term protective irrigation has a third meaning.

It is used to indicate a form of large-scale irrigation, specific to the drought prone areas of the Indian sub-continent, and having particular technical, organisational and socio-economic characteristics. These characteristics are described in the following section.

Technical design characteristics

The goals of protective irrigation were sought to be realised through operational targets such as low irrigation intensity and high duties (or low water allowances) (Jurriëns & Landstra 1990).[1] By planning irrigation of part of the irrigable areas under canals only, and by limiting irrigation on a particular piece of land to one crop per year, the water is spread over a large area, and only part of the area commanded by the canal is irrigated. By designing a large area to be irrigated per unit discharge, supplementary irrigation is implied. The intensity of irrigation in many systems is less than 100%, thereby lending them a characteristic of 'water-constrained systems' (Tilak and Rajvanshi 1991: 1).

A further design characteristic is the supply orientation. Water supply into the system is not determined by actual, and fluctuating, demands in the field. Fine-tuning supply to demand, which is needed to maximise yield, is not aimed at. The supply orientation combined with the desire to keep the systems as cheap as possible (because they were unproductive systems yielding little revenue) has led to a minimum of regulating devices for controlling water levels between the intake of the system (weir or dam) and the outlet command areas at the farmers' level (Mollinga 1998a).

Organisational characteristics

The above specific technical design characteristics translate into certain organisational and institutional characteristics. Since the aim is not to match supply with demand, control structures are limited. Thus, these systems have low management intensity (Jurriëns, Mollinga and Wester 1996).

The second organisational characteristic, apart from the low management intensity described above, is that of hierarchy (Mollinga 1998a). The supply orientation of protective systems fits

well with the top-down organisational structure of the Irrigation Department. This structure is based on the principle of upward flow of information and a downward flow of instructions.

The third organisational characteristic is the institutional form of the rationing of irrigation water. Since these systems aim to spread water over a large area and number of farmers and the amount of water that a farmer is entitled to receive is insufficient to cover full crop water requirements, implicit in their operation is a system of 'scarcity by design' (Jurriëns, Mollinga and Wester 1996). This 'designed scarcity' necessitates a system of institutional rationing of water, spreading out limited supplies over a large number of farmers over a large area, where the objectives of an individual farmer may differ from those of system management.

Where water is too limited to meet the demands of farmers, it may be rationed through controls over supply: by controls over the amount of water which flows to the fields, with the farmers being left to decide which crops they will grow within the constraint of a fixed water supply. This is the Northwest Indian model (Wade 1976). In addition to supply side controls, there may be demand side controls, controls over the types of crops that may be grown, and over the areas on which they may be grown. This demand - oriented method is used in much of the Deccan plateau,[2] including Maharashtra. In South India, the control strategy for protective irrigation is localisation.[3]

Socio-economic characteristics

On account of its ability to contribute to the policy goals of equity, maximisation of farm output and agricultural incomes, the concept of protective irrigation has guided the construction and operation of large-scale canal irrigation systems in the phase of planned economic development in India (Mollinga 1998a). Economically, protective irrigation strives for high output per unit of water. A protective cropping pattern of light crops increases the total agricultural output of the irrigation system, as compared to concentrated irrigation. From a national policy perspective, thus, protective irrigation makes sense because (i) it increases agricultural output given the availability of a limited quantity of water (ii) it can generate more employment than wet irrigation, and (iii) it spreads the benefits of irrigation over a large number of producers.

Conflict with farmers' objectives

These basic characteristics of protective irrigation, however, imply an inherent conflict with the farmers' objectives. While the design and operation of protective irrigation systems is guided by the goal of maximising production per unit of water, farmers seek to maximise production of cash crops per unit of land (Mollinga 1998a).

Table 2.1 contrasts the case of protective and productive irrigation.

TABLE 2.1 Protective and Productive Irrigation

Technical characteristic	*Protective Irrigation*	*Productive Irrigation*
Irrigation intensity	Low (around 100%)	High (200% and more)
Duty (acres/cusec)	High (low water supply)	Low (meeting crop water requirements)
Crops	Low water demanding (sorghum, millet, oilseeds, etc.)	High water demanding (rice, sugarcane)
Operational design	Supply- oriented	Demand –oriented
Organisational characteristics		
Water availability	Planned scarcity, requiring rationing	Planned sufficiency, no rationing needed
Cropping pattern	Prescribed, or controlled by government (except under warabandi system)	Farmer's choice
Water flows	Constant	Varying with demand
Socio-economic characteristics		
Yield optimisation per	Unit of water	Unit of land
Benefits	Spread	Concentrated
Major objective	Food security/poverty alleviation	Agricultural growth
Farm labour	Emphasis on family labour	Emphasis on wage labour
Orientation	Towards subsistence	Towards the market

Source: Mollinga (1998a)

On account of this inherent conflict, the original objectives of protective irrigation have rarely been achieved in practice. In Northwest India, these systems were designed to irrigate mainly wheat; in recent years, rice and sugarcane have emerged as

important crops (Jurriëns, Mollinga and Wester 1996; Brewer *et al.*, 1999). In the early decades, the combination of a warabandi system with light crops such as wheat allowed the systems to work as designed (Jurriëns 1993). Later, however, with the onset of the green revolution, the introduction of high yielding varieties of seeds and the consequent commercialisation of agriculture, there occurred many changes in cropping practices. Farmers wanted to irrigate in two seasons instead of one. They wanted to irrigate all their land as against the low planned intensities, or at least more than planned. The initial high design duties, thus, became inadequate with the desire for more productive irrigation and the increase in rice cultivation.

In their study in South India, Jurriëns and Landstra (1990) note how the Irrigation Department was forced to find a compromise between the two objectives. The official duties were too high relative to the crop water requirements. Farmers wanted to take more water than they were entitled to according to the prescribed duties. Thus, upstream farmers took more water than authorised, leaving too little for the downstream farmers. Farmers took extra water to cultivate paddy instead of a light crop. They also tended to (1) irrigate all the land in both the seasons, instead of only part of the land in each season (2) irrigate good land which was not localised and (3) supply water according to actual crop needs instead of the official duties.

In a similar study for the Mula System in Maharashtra, Mitra (1986) notes that the area cultivated under different crops was different from that specified in the designed cropping area, with the highest discrepancy being for area under sugarcane.

The Warabandi System

Warabandi, prevalent in Northwest India and Pakistan, is a system of water distribution that is designed so that every farmer is entitled to receive a pre-determined share of water in proportion to the size of his land-holding (Malhotra, Raheja and Seckler 1984; Malhotra 1988; Berkoff 1990; Bandaragoda 1998). As a system of water distribution, warabandi covers an area of about 24 million hectares of irrigated land in these two countries (Bandaragoda 1998).[4]

'Wara' means turn and *'bandi'* means fixation. Thus, warabandi means fixation of turns (WALMI 1998a; Bandaragoda 1998). It

implies a rotational method of water distribution.[5] The cardinal principle underlying the warabandi system of irrigation management is that the available water, whatever its quantum, is intended to be allocated to cultivators in equal proportion to their Culturable Command Area (CCA), and not only to some of the farmers in the command to meet their total demand. This is intended to impose water scarcity conditions in the system.

The warabandi system is more than one hundred years old (Malhotra 1988; Malhotra, Raheja and Seckler 1984). Its origins can be traced to the late nineteenth century when large-scale canal systems directly fed from the rivers were constructed in Northwest India. Beginning in the 1880s, the British built a series of perennial, all-season canals, by controlling their flows over permanent weirs. The building of these canals was motivated largely by the political imperatives of consolidating state rule in the region (Gilmartin 1994); the link between canal building, agricultural settlement, and political control was seen as being central to the construction and consolidation of state power. The expansion of the Indus basin irrigation system was seen by British officers as the key to expanding cultivation, increased government revenue and enhanced government prestige and control. It was also seen as a means of extending the contours of a scientific administration.

Water supply in the rivers of Northwest India is perennial, but it is erratic, with variations from season to season and year to year (Malhotra 1988). Two options were available to the then British Government. The first would have been to confine the canal irrigation to such limited area as could be fully supported with the lowest available supply, leaving no gap between supply and demand. This would maximise production per unit of land, though not the production per unit of water. The other option was to extend distribution to a much larger area than could be supported by the lowest available supply and have perpetual scarcity conditions. This would also have meant that the resultant agricultural production and insurance against famine would have been at their optimum. The production would have been the maximum per unit of water available, though not per unit of land. Thus, "It would have a greater social appeal" (Malhotra 1988: 1).[6]

Irrigation developments under British rule in the 19th century were characterised by a trial and error approach that served to define and develop a coherent irrigation policy, management and technology (van Halsema 2002). The early British systems were

essentially man-made river diversions that diverted water from the riverbeds to be picked up and used by farmers on their land. The development of the distribution network and command area were left to the farming communities who had to build their own supply canals and connect them with the government main or branch canal.

This connection consisted of a simple open-cut along the banks of the canal. Thus, there was little or no control on water being taken up by each farmer or village channel. This process was regulated by the financial needs of the farmers to build a channel and invest in irrigated agriculture. This, in turn, meant that agriculture was limited to only those who could afford it. The early development of irrigated command areas, therefore, was confined to a narrow strip along the government main and branch canals. This led to serious water distribution problems as head-enders started taking larger quantities of water and expanding and intensifying cropping at the cost of tail-end farmers. This was perceived as inequitable and called for further extension of control by irrigation authorities. These considerations culminated in the passing of the Canal and Drainage Act (1873).

By virtue of this Act, the irrigation engineers, through the office of the Canal Officers, were put at the centre stage of irrigation development and management by empowering them to shape and take control of regulation of water distribution through technical as well as administrative means. This Act empowered the government to take over existing *Rajbulas* (secondary or distributary level canals) and remodel them to distribute water among different watercourses. In all new developments the distributary canal would henceforth be built and completed by the government before irrigation water would be supplied.

Another consequence of this Act was that the management domain of the Irrigation Department and water users were defined. An outlet was defined by law as the delivery point where government water was delivered to the community. The outlet itself was defined as government property. All regulation of water upstream and through the outlet became the management domain of irrigation authorities. In order to regulate water distribution and secure water delivery to the extremities of the command area, Canal Officers were empowered to close off temporarily the water supply to tertiary units to implement *Tatils* (rotation schedules). Section 37 of the Act contained a provision for Canal Officers to

regulate water flows through outlets as deemed fit by them.

Through the increases in the managerial control that the Act conferred, the irrigation authorities could seek the optimisation of command area development and tighten their grip on performance indicators.[7] Though this Act enhanced the management capabilities to control the parameters of irrigation, the actual regulation on the ground was severely hampered by the technical inabilities of the irrigation authorities to control silt and discharges.[8] The "unstable channels" that resulted from the occurrence of silt and scouring would effectively have varying water allowances. This meant that irrigation authorities could not fix the irrigation parameters in their operational management, but instead had to continuously adapt them to the new and changing capacity of the canals. One solution was found in replacing the open-cut outlets by *Colabas* (A colaba was a single pipe of standard size with a diameter of six inches or a multiple of the standard).

However, their discharge would frequently vary either as a consequence of changing water levels in the supply canal due to scouring or silting or by excessive silt clearing in the watercourse by water users so as to increase the hydraulic head.[9] Since the rate of water delivery at the outlet could not be controlled, the irrigation authorities could not be committed to formal allocation. In this process of continuously trying to stabilise the irrigation canals, the test of fair and proper water distribution seems mainly to have consisted of securing a reasonable water delivery to tail-end areas (van Halsema 2002).

At this stage, British Engineers were conscious of two major problems of water distribution in the Indus basin. The first was the fluctuations in supply levels that were intrinsic to run-of-the river schemes. The second was the gradual rising and falling of full supply water levels due to silting, and scouring of the canal bed.

British engineers sought to address this problem through the creation of two outlets. The first was the APM or the Adjustable Proportionate Module and the second was an open flume. Both these outlets comprise a narrow throat and a sloping sill. In the APM, in addition, a rounded block is placed on top of the throat to create an orifice. The discharge through these outlets depends on the upstream water level and the width of the throat and in the case of the APM, also on the height of the orifice, but not on the downstream water level. These innovations enabled the Irrigation

Department to fix the water allowances of each canal by carefully maintaining its regime balance.

The technical rationing of irrigation water could now be based and implemented on the regime carrying capacity of each canal (the water allowance) and the command area it served. This required the Irrigation Authorities to extend their administrative control further and formalise the discharges through the outlets as well as the command area of each *chak* (tertiary unit). Subsequent remodelling of canals was frequently undertaken between 1890 and 1947. In remodelling, the allocation of water in terms of relative water supply per unit of command area had first to be conducted and formalised administratively before it could be implemented. This process became known as *chakbandi.* This also meant doing away with the system of tatilling. Water distribution below the outlets was left to the farmers through the system of warabandi. The Irrigation Department would intervene to prepare a *pucka* (formal) warabandi schedule when disputes arose, to manage water distribution below the outlet.

Operation of the warabandi system

Since the water supply is inadequate to run the whole system continuously, warabandi works through a system of rotation (Tyagi and Mishra 1990; Malhotra 1998; Malhotra, Raheja and Seckler 1984). This system of rationing works at three levels. First, a main canal carries the water from the source, which may be a river or a reservoir. The main canal feeds two or more branch canals that operate by rotation and may or may not run full supply. This is the primary distribution system and runs throughout the irrigation season with varying supply. Branch canals supply water to a large number of distributaries, which must run at full supply level by rotation. The distributaries operate by eight-day periods. This is the secondary distribution system.

Distributaries supply water to watercourses through ungated, fixed discharge outlets. Watercourses are designed to run at full supply when the distributary is running full supply and its water is allocated by the farmers through the warabandi schedule. This is the tertiary water distribution system. A period of seven days (168 hours) is divided among the farmers in proportion to the size of their land-holdings. An eight-day period for running the

distributary ensures a minimum of seven-days running for each watercourse including the most distant from the distributary head. The eighth day is needed for filling the distributary. Water deliveries are controlled by time and are proportional to land. [10]

Main and branch canals are operated with variable flow (e.g. in response to variable river flows), but distributaries and minors are intended to be operated either full ON or full OFF (with reduction in flow to at most 80-90% of design) (Berkoff 1990). When main and branch canals run full, which is the normal case so long as river flows exceed diversion capacity, all lower channels also run full. When main/branch canals run less than full, lower channels operate in rotation such that the sum of discharges in ON channels equals the branch discharge less losses.

Along the main or branch canals, gates are needed to control changes in flow. At the distributary head, ON/OFF gates are needed to facilitate rotation of channels in response to less than full supply in the main and branch canals but not to modify flow. Below the distributary head, the system is ungated with proportional division. Flow levels are supposed to be monitored twice a day at key points, and when tail flow falls below full discharge, supply is considered to be inequitable and appropriate action needs to be taken to increase supply or to close channels to ensure ON channels remain at full supply.

Below the outlet, the warabandi schedule is supposed to be followed by the farmers. The government's main role is to assist in preparation of the roster and in settling the disputes. Farmers are allowed free use of groundwater and freedom to plant whatever they want following their own assessments of the availability of water.

The organisational set-up under warabandi

There are two establishments for irrigation management, that is, Engineering and Revenue and both work under a single command (Malhotra 1988). The Engineering Establishment is responsible for the maintenance and operation of all works relating to the main canal, branch canals, distributaries and outlet. The Revenue Establishment is responsible for recording the area irrigated and the preparation of water bills for individual farmers and passing on the same to the District Collector for realisation. In addition, it

helps in deciding all disputes and conflicts relating to the distribution of water, alignment of watercourses and transfer of areas from one outlet to another.

The administrative unit under warabandi *is* known as a Division. An Executive Engineer heads it. An average Division has 70, 000 hectares of Culturable Commanded Area. A Division comprises 3 to 4 Sub-Divisions, each of which is headed by a Sub-Divisional Officer, who is the junior most officer. A Sub-Division may have 3 to 4 Sectional Officers to help him. For the revenue work, a Sub-Divisional Officer is assisted by 2 to 3 *Zilledaars* (revenue officers) and 10 to 12 Irrigation Booking Clerks assist each Zilledaar. Each Division has one Deputy Collector who supervises the work of Zilledaars in a Division.

Along the canals the gates at the head of distributaries are operated by the Regulation *Beldaars* (helpers). The gates are opened on the basis of a telegram from the office of the Irrigation Department. The *Taar Babu* (Telegram Officer) delivers this telegram on the basis of an instruction from the XEN (Executive Engineer). The XEN sends the indent to the Regulation Beldaar.

The duty of the Canal Patrollers is to guard the outlets during the day as well as the night time. Each Patroller has a shift of 8 hours. His duty is to inspect the outlets and siphons. Should there be a water theft or tampering with an outlet, he is supposed to report the same to the JE (Junior Engineer). The JE is then supposed to send a telegram to the SDO (Sub-Divisional Officer), indicating that action needs to be taken. At some places, *ghaats* (banks) have been made to allow people to swim, wash clothes, or to bathe their livestock. When some other place along the canal is used for this purpose, the Canal Patroller is authorised to stop it. The copy of the pucka warabandi schedule is kept with the *Nahari Patwaari* (irrigation revenue officer) who has a direct interface with the farmers.[11] The Irrigation Department gives the task of desilting the canal on contract. This is done twice a year.

Scarcity by design under warabandi

Water allowance, capacity factor and irrigation intensity are the expressions of 'scarcity by design' in the operation of the warabandi system. Each unit of CCA is allocated a certain rate of flow of water called the *water allowance.* Its value is a compromise

between demand and supply. For instance, in the case of the Bhakra project in North India, the value of this allowance at the outlet to the watercourse is 2.4 cusecs of water per every 1000 acres of CCA (0.17 l/s.ha) (Malhotra 1988; Malhotra, Raheja and Seckler 1984).

No distributary operates for all days during the crop season: the ratio that the operating period of a distributary bears to the total period of the crop is called its *capacity factor.* This is again a compromise between demand and supply and is separately designed for each of the sub-periods. For example, in the Bhakra canal system, the designed mean capacity factors for *kharif* (the irrigation season coinciding with the monsoons) and *rabi* (the winter season) are .8 and .72 respectively, which means that during these seasons, each distributary may receive full water for about 144 and 129 days respectively, i.e. for about 273 days a year.

The above values of *water allowance* and *capacity factors* do not ensure irrigation for 100% of the Culturable Commanded Area. The ratio of the irrigated area to the total Culturable Commanded Area is known as the *intensity of irrigation.* Its value in case of the Bhakra canal is 62% per year, or about 30% per season.

When the distributary is running FSL (Full Supply Level), the watercourse draws its full (authorised) discharge. The capacity of the watercourse varies from 1 to 3 cusecs, depending upon the command area (WALMI 1998b). The value of the water allowance at the watercourse head is 2.5 to 3 cusecs per 1000 acres of the Culturable Command Area.[12]

To ensure that the stream size below the outlet is appropriate for handling by farmers (say 25-40 l/s), chaks are relatively large (100-300 ha). If the chak is 100 ha, and allowance is .2 l/s.ha, then the farmers receive 20 l/s for 1.68 hours per hectare; if chak size is 200 ha, they receive 40 l/s for .84 hrs.

Delivery capacity per hectare (allowance) is very low, about .10-.15 l/s.ha at the outlet (300-400 acres/ cusec). This is considered insufficient even if given continuously to meet the theoretical crop water requirements for more than perhaps 20-30% of land in kharif and 35-45% in rabi (Berkoff 1990). In a study of the Pabra Distributary of the Bhakra Project, in the Hissar district of Haryana, Malhotra, Raheja and Seckler (1984) conclude that for an average of 3-4 irrigations per field, the system of warabandi and the amount of water available provides adequate irrigation to 25-30% of the CCA; leaving 70% of the CCA as rainfed. This, the

authors argue, corresponds to the design objectives of the warabandi system.

On the Western Yamuna Canal, where the research sites for this book are located, the allowance is 2.4 cusecs per 1000 acres on the Bahlot sub-branch, 2.86 Cusecs per 1000 acres on the Butaana Branch and 2.57 cusecs per 1000 acres on Rohtak Distributary at the level of the outlet. [13] The designed irrigation intensity is 60% for the entire year.[14]

An important aspect of the studies of some of this irrigation system is the limited description of their technical design characteristics (Jurriëns and Wester 1994). One problem with documentation of design data in some of the studies is that it is not stated at what level it applies; similarly, when intensities are given, we do not know how they vary across the seasons (Jurriëns and Wester 1994). This limits the usefulness of these studies.

Evaluation of the warabandi system

A fall-out of the system of water rationing under warabandi is that the farmer is the master of his water budget. He is supposed to choose his crop profile to suit water availability. Unlike the localisation practices in South India and shejpali of west India, there are no cropping restrictions. Water is allocated in proportion to land and farmers are free to use their allocation as they want (Berkoff 1990).

The warabandi system is considered to have some virtues (Gustafson and Reidinger 1971). The opportunity to receive water is rationed in a way that could be considered 'fair', since each piece of land is designed to get its proportionate amount. The other possible benefit is that this model of running a distributary and its watercourses involves human control only at the distributary level head, leaving the outlet at the watercourse head automatic. Since the possibilities of human intervention in the operation of the system are small, Gustafson and Reidinger argue, the possibilities of corruption could be limited.[15] The rules of water distribution are 'public knowledge' and each farmer is sure of his rights (Reidinger 1974).

On the negative side, however, the system's result is an unpredictable and unreliable water supply (Gustafson and Reidinger 1971; Latif 1993; Tilak and Rajvanshi 1991; Jairath 1985;

Malhotra 1988). The physical design of the system, the design of the watercourse outlets, and especially the canal rotations all interact to produce a relatively unreliable water supply from the farmers' point of view. " Indian agriculture has been described as a gamble with the monsoons; in canal irrigated areas, it could be described as a gamble with the canal as well" (Gustafson and Reidinger 1971: A-158).

In a system that is entirely centrally controlled, the main weakness of the system is considered to be the lack of predictability, certainty, and controllability of the canal water supply by the farmer and the inability to match water supply with crop water requirements. A major disadvantage of this system, as designed, is that the volume of water available to a farmer is independent of the stage of crop growth and he is forced to either take his turn (whether needed or not) or to forego it. Another drawback is that it does not permit crops with high variations in water requirements in sub-commands. This is typically offset by the use of groundwater. However, in saline areas, the cropping patterns do face effective constraints.

Canal water deliveries in these systems have been known to be unreliable because of a number of factors (Latif 1993; Jairath 1985). These include drought conditions, limited storage, breaching, high losses and manual intervention and malpractice. Farmers are confronted with several problems: these include the absence of information about canal closure, illegal canal cuts, and breaches and water thefts by the use of siphons and pipes on the canals and distributaries. An important problem that is cited by Jairath (1985) is that of corruption and inefficiency in addressing irrigators' problems - such as alteration of the size of outlets and their level. The actual state of maintenance of the canals is also found far from satisfactory. The bureaucratic functioning of the Irrigation Department, Jairath argues, takes up a high proportion of the funds for the organisational working, leaving a small proportion for the operation of the system.

Another drawback of the system is that there is no knowledge as to how much water each farmer gets (Malhotra 1988). Further, there is no provision in the system to compensate any individual farmer who does not receive water in his turn, even when it is for factors for which he is not responsible (WALMI 1998b; Malhotra 1988). If for any reason a farmer is unable to receive his share of water, this system does not provide a method of compensating him

for the loss. Similarly, if the flow of water is less than the authorised flow because of a technical defect, the loss suffered on this account, too, is not compensated. Thus, "A primary virtue of the rationing system is that all recipients apparently share both water and insecurity equally" (Reidinger 1974: A-100).

The responses of farmers to a system of scarcity take three main forms: digging of tubewells, intra-seasonal and inter-seasonal exchange or sale of time turns, and intervening along the canal or the distributary (Gustafson and Reidinger 1971; Jairath 1985; Reidinger 1974; Bhatti and Kijne 1990; Meinzen-Dick 2000a; Reidinger 1994).

One response of farmers to this system has been the increase in the number of tubewell structures. The opportunities for more intensive agriculture in the wake of the green revolution and increasing population pressure have created demand for more water and more flexible deliveries (Meinzen-Dick 2000a) than can be provided through the warabandi system. In contrast to rigid warabandi schedules, farmers with tubewells can irrigate their fields more frequently in periods of peak demand throughout. The increase in water supplies made possible through ground water development at the watercourse level means that the designed low cropping intensities can be overcome.[16]

Another response of farmers is the exchange or sale of turns among themselves (Reidinger 1992, 1974; Jairath 1985).[17] A third response is the interference of farmers directly at the level of the distributary by modifying the dimensions of the outlets, the use of flexible siphoning pipes at night and cuts in the banks of the distributaries (Rinaudo, Strosser and Thoyer 1998; Jairath 1985; Wahaj 2001).

Other criticisms of the warabandi system relate to actual patterns of equity in water distribution (Kijne and Vander Velde 1992; Bhutta and Vander Velde 1992; Latif 1993; Khan 1991; Malhotra, Raheja and Seckler 1988; Bhatti and Kijne 1990; Tyagi 1993).

There are wide variations between the discharges actually realised between head and tail reaches (Bhutta and Vander Velde 1992). These variations occur at the level of the main canal and distributary as well as along the watercourses.

A criticism of the system from an equity perspective is that this system delivers an amount of water among irrigators that is unequal along tertiary channels. Under the existing rotational system,

transmission losses along the channel are not considered. A constant time per unit area is allocated to the farmers regardless of their locations along the watercourse. This results in decreasing amount of water delivered to the downstream farmers (Latif 1993). Farmers receive proportionate running time, but not necessarily proportionate quantities of water. This makes the water distribution system inequitable. Losses tend to increase towards the tail reaches. Thus, it is argued that the system rations time, or the opportunity to receive water, rather than water itself (Reidinger 1974).

Absorption losses in watercourses below the outlets have been found to be as much as 25% of the supply at its head (Malhotra, Raheja and Seckler 1984). Drawing upon a study in Pakistan, Khan (1991) estimated that the irrigation efficiencies in the watercourse command range from about 55 to 65%. Bhatti and Kijne (1990) report that farmers pay an equal amount per acre cultivated with a specific crop, though downstream farmers receive 20-30% less water with lower yields for similar cropped areas. Lining of watercourses is seen as one remedy but some losses would still remain (Malhotra, Raheja and Seckler 1984).

There have been some proposals to modify the warabandi system on equity and allocative efficiency grounds (Chaudhry and Young 1990). Chaudhry and Young propose a modification of the standard warabandi practice to attempt to account for losses in the watercourse so that an equal supply of water could be achieved per acre. They call it "warabandi by quantity".

To conclude the discussion on warabandi, it is a simple system to understand and follow, with few levels of managerial and organisational control. This would become clearer when it is contrasted with shejpali in the following section. However, its weaknesses stem from the fact that it is meant to be a centrally controlled and supply driven system that does not meet crop-water requirements, either in terms of volume or timing of water supplies. Under this setting irrigators devise their own strategies to secure greater flexibility in water delivery as well as to get extra water.[18]

The Shejpali System

Shejpali is partially a demand-based system in which the

government agency allocates water in consideration of a farmer's request according to land and crops. The word *shej* means turn and *pali* means water; thus, shejpali is essentially a system of taking turns for water. Unlike the warabandi system described above, under shejpali, a farmer has the option in a season to take water or not, and beforehand he has to file an application indicating the area and crop, and number of watering turns that he requires.

Irrigation works in the Deccan are fundamentally different from those in the North, where wide alluvial plains have been formed by great deltaic rivers with perennial flows (Gandhi 1979). The rivers in the Deccan arise in the valleys close to the ridge formed by the Western Ghats, flow in an eastward direction and are dry or practically so for 7 or 8 months of the year. These rivers flow during the monsoons only, and artificial means of conserving water are needed to store the waters for use for the rest of the year. Further, there is wide variation in the soil type and the cropping patterns across canal commands. Both these factors give rise to a system in which rainwaters need to be stored for the rest of the year and distributed through a system of water budgeting, with water distribution schedules being prepared to supply water to crops. Thus, the topography of the region and the practice of taking particular types of crops are cited as the major factors behind getting the shejpali *system* established on the Deccan canals (Gandhi 1979).[19]

Evolution of protective irrigation in Western India

An imperative to provide protective irrigation in Maharashtra emerged under British rule with the frequent incidence of drought and famine in the state. Till the late 19th and early twentieth century, the British government had followed a policy of promoting the development of wells through the grant of takkavi loans (Attwood 1987). By the 1860s, however, the British realised that small-scale irrigation works such as wells and tanks had a major pitfall, in that they were essentially seasonal in character. Monsoon rains recharged the wells and tanks annually, and the absence of rains meant that they would dry up. The British perceived a solution in storing the abundant rainfall in the coastal areas and transporting it over long distances into the famine prone parts of the state.

The British government realised that without storage reservoirs, irrigation systems in the state could not afford a reasonable measure of protection against drought, or support crops at critical periods of their growth (GOI 1972). Thus, the period of construction of reservoirs began. This led to the construction of a storage dam at Khadakvasla and the Mutha system of canals, a tank at Ekruk near Sholapur and of the Lekh Canal from the river Pravara.

However, protective irrigation systems remained rather unpopular in the Deccan (Bolding, Mollinga and Straaten 1995). There was a lack of interest both on part of the government as well as the farmers. In fact, one paradox of protective works in the Deccan was that although they were built in response to a devastating series of famines, they failed initially as protective works; and it was this failure that caused them to be treated more as productive works, with markedly greater success (Attwood 1987). A case in point is the Nira Left Bank Canal (Attwood 1987; Bolding, Mollinga and Straaten 1995).[20]

On the one hand, there was a problem of 'unwanted water '(Attwood 1987). In ordinary years, a food crop would mature with the available rainfall, mainly because of the water retaining capacities of the black cotton soils. Farmers saw irrigation as unnecessary and financially unattractive. The marginal contribution of irrigation to drought resistant subsistence food crops did not justify the cost and effort of bringing them under irrigation. There was a lack of capital to employ the additional draught power necessary for the preparation of the fields. Thus, in the event of a drought, farmers would wait till the last moment for rain; if the rains would fail, there would be a sudden demand for water, which the canal would be unable to supply.

Secondly, it was difficult for the PWD, the Public Works Department, to control the behaviour of irrigators who did not follow the regulations for water distribution. This led to wasteful use of water and created problems of waterlogging and salinity. The PWD could not control a large number of water distribution points. It was difficult to deal with a large number of individual applicants and to establish how much should go where. The resultant irregular and unpredictable water supply further deterred cultivators from entering into irrigated agriculture. For those already involved in irrigation, the irregularities and uncertainties induced them to take as much water as possible, whenever they

could. This perpetuated the vicious circle of irregular supplies.

To overcome these weaknesses, the engineers of the Bombay Presidency's PWD came up with what is called the Block System with M V Visvesvaraya as its chief architect and advocate. A block is a portion or a part of land for which long-term irrigation sanction is given (Lele and Patil 1994). The system emerged from the old *Phad* system (a farmer managed irrigation system practiced in Dhule and Nasik districts of the state).[21]

Under the Block System advocated above, there were three main components.

(1) Concentrate irrigated areas in blocks, fix the demand for irrigation water of these blocks and promote the production of a remunerative crop like sugarcane on part of the area
(2) Control the distribution of water and avoid corrupt practices and cultivator interference by the invention of a machine that discharges fixed quantities of irrigation water and
(3) Sell water by volume to cultivators to avoid waste of water and ensure its economic use by market principles

More specifically, the Bombay Block System included the following features.

(1) In a number of villages nearest to the head of the canals, one or two consolidated blocks would be formed, the total area being between one-fourth to one-third of the total culturable area. Within these blocks, a maximum of one-third of the area was allowed to be devoted to sugarcane. On the other two-thirds, food crops would be grown, in rotation with sugarcane. Water would be supplied for 12 months for the sugarcane and eight months for the food crops. Blocks would be established in multiples of 1.5 acres: one half acre for sugarcane and one acre for food crops.
(2) Each individual cultivator would enter a signed contract in which he would agree to take water in this block for a period of six years. The government in turn would guarantee to deliver the water. However, the cultivators participating in a block would have to make a joint application for water.
(3) The block would be charged at a fixed rate per acre regardless of the crops grown.

The introduction of the block system had specific social, economic and ecological effects. These effects included the stabilisation of sugarcane production, an increase in food grain production and the stabilisation of food grain prices and the

growth of a sugarcane economy. At the same time, it led to the emergence of an agricultural elite, the overuse of water by a select few and its environmental consequences in terms of waterlogging and salinity.

The block system was administratively simpler since it reduced the number of control and application points (Bolding, Mollinga and Straaten 1995). The cane blocks made canal irrigation more intensive and less wasteful. Food production and employment also stabilised after the block system was introduced (Attwood 1987). Since a fixed proportion of the land was devoted to the cultivation of food crops, there was an increase in food grain production. Food prices also stabilised. The cultivation of sugarcane led to an increased use of bullocks on account of their use in ploughing, processing and transport. It also led to an increase in the production of sorghum, since sorghum was a source of fodder as well as a food crop.

However, the block system never totally took off as intended (Bolding, Mollinga and Straaten 1995). First, land consolidation, concentrating irrigated land in contiguous blocks, proved to be impossible. A pattern of land holding as existed in the bandhara or phad system from which the block system was derived could not be enforced from the outside by the government. The scattering of land belonging to a block made control over the one-third/two-third division between sugarcane and food crops more difficult. Farmers also expanded sugarcane cultivation indiscriminately. A scattered, instead of a consolidated block also provided more spatial opportunity for expansion of sugarcane cultivation to adjacent plots not belonging to the block. Scattered blocks impaired the control of water supply. Essentially, the government was unable to exert sufficient managerial control over water. With constant trial and error, there was a failure to design an appropriate module for the delivery of volumetric supplies of water. For the same reason, the third element of the design, namely, volumetric supplies never came into effect.

Another issue was the politics of water distribution (Bolding, Mollinga and Straaten 1995). A disproportionate share of the benefits of irrigation was put in the hands of a few who succeeded in having their lands registered under the blocks. There was a failure to control the water distribution accurately; local officers were unable to withstand pressure from farmers to extend the water supply period. The monopoly of perennial irrigation in a

concentrated area near the head reaches of the canals created the problem of waterlogging and salinisation.[22]

Nevertheless, one long-term effect of the establishment of the Deccan canals was the expansion of the "irrigation frontier" (Attwood 1992: 75). Traditionally, sugarcane had been grown only on small plots under well irrigation. With the introduction of the Deccan canals in the 1880s, farmers discovered profits in sugarcane, which they processed into *gul* (jaggery). The *Malis,* who practiced garden cultivation, migrated from the Pune Saswad region into the Nira valley after the Nira Canal was opened. They met a society that was unwilling to take up high-cost cultivation. Local cultivators did not apply this water to traditional subsistence crops and were slow to take up sugarcane, since they lacked the capital and expertise needed for such an expensive crop. The canal waters were under-utilised. Thus, the Malis found along this valley a society unprepared for high-cost farming and an abundant supply of water and land waiting to be used.

The addition of canal irrigation to a large portion of the Nira valley was equivalent to a multiplication of the land area, since one acre under perennial irrigation was equivalent in value to many acres of dry land.[23]This created what could be called an *irrigation frontier.* This frontier stimulated cash cropping, innovation, migration, and industrialisation on an unprecedented scale. The *Marathas, Dhangars* and *Brahmans* (the local inhabitants) started imitating the Malis.

In fact, the construction of river fed canals in the Deccan region, particularly the Godavari and Pravar Canals in 1918 and 1920 respectively, watering most areas in Ahmednagar district, was to later play a vital role in the development of the sugar industry in the region in the 1930s (Chithelen 1985). The spread of canal irrigation helped the rich peasants to move into commercial cultivation. Along with irrigation, the organising of co-operative credit societies led to a further consolidation. These two schemes, promoted by the British rulers, were to later set the ground for introduction of and shift into sugarcane cultivation and eventually for setting up of co-operative sugar factories in Ahmednagar district in the 1950s (Chithelen 1985).

The shejpali system at present

The dominant water distribution system in Maharashtra is shejpali

(Lele and Patil 1994). The block system prevails mostly in the older systems, viz., those built before independence.[24] The phad system exists in some systems in the Nashik region.

Shejpali is a form of an arranged water delivery schedule. The rationing of scarce water is sought to be achieved through crop zoning, by sanctioning the types and areas of crops, which may be grown. It is thus a method of water control in which the demand for water is regulated. It is different from the localisation system of the south in two respects (Jurriëns, Mollinga and Wester 1996). First, there is interaction between the farmers and the Irrigation Department concerning the area they want to be localised (i.e. sanctioned), as the farmers can indicate which crops they want to irrigate. Also, each year the sanctioned area is revised on the basis of new requests.[25] Second, the Irrigation Department commits itself to realising the water delivery schedule that is drawn up before the start of the cropping season and thus manages the water flows.

In irrigation under shejpali, the following sets of terms are commonly used (WALMI 1998b).

Duty is the area irrigated by one-cusec flow of water flowing throughout the base period.

Delta is the depth (in cms) of water required to bring the crops to maturity.

AI/DC (Area Irrigated per day per cusec) is the area of mixed crops irrigated by one cusec of water flowing throughout the day (24 hrs). This is essentially considered to be duty on a "day" basis.

Base period: It is the total number of days in a season. The seasons, their dates of commencement and end and total number of days in a season are as under:

Kharif: July 1 to October 14: 106 days
Rabi: October 15 to March 29: 137 days
Hot weather: March 1 to June 30: 122 days
Irrigation year: July 1 to June 30: 365 days

Rotation period: Canal design is generally based on rotational water supply to crops. The rotations are 14 days in Kharif, 21 days in rabi and 10 days in hot weather. In the peak period, which occurs in the rabi season, the canal is assumed to run continuously. In kharif and hot weather seasons, canal closures of 4 days and 3 days are assumed. The flow period is thus 10 days in kharif and 7 days in hot weather. The latest practice is to assume rotation of 14 days for all seasons with 7 days ON and 7 days OFF.

Design allowance: This is the discharge during flow period, required to irrigate one hectare of land measured in l/s.ha. e.g. if design allowance is 1.25 l/s, it means one hectare of land will be irrigated with a continuous discharge of 1.25 l/s in flow period.

Intensity of Irrigation is the ratio of area planned to be irrigated (considering the water availability and the project cropping pattern) and the total service area, that is the CCA.

In the shejpali system, farmers request water before the cropping season by representing the Irrigation Department with proposed cropping patterns.[26] These proposed cropping patterns are partly sanctioned by the Irrigation Department and the farmers are then entitled to irrigation supplies for these crops. The distribution of the sanctioned water is in rotation, taking into account the requirements of the sanctioned crops.

A Preliminary Irrigation Programme is prepared at the start of the season, and the crops that are to be grown as well as the area under each is announced, based on the water in the storage. A quota is fixed for each canal and the quota is further distributed over the outlets. For each outlet, the Canal Inspector prepares a list of sanction-holders, indicating their sanctions in terms of acreage. On the basis of the AI/DC, he calculates the total time for which a particular outlet is required to run and prepares a *palipatrak* (time-table) for each outlet indicating the definite date that a certain sanctioned area is to be irrigated.

If water is available over and above the amount needed for the sanctioned requisitions, applications are invited from farmers for the other crops they want to grow. Areas are then partly sanctioned, with proportionate reduction of the areas proposed by the farmers being made if the demand exceeds the available water supply. Once crops are sanctioned, farmers receive an irrigation passbook in which their sanctioned area and the first irrigation date are indicated.

Thus, irrigation water supply under shejpali is effected only to those farmers who apply for getting water in response to the notification issued by the Executive Engineer (EE) before a season. The EE collects all applications and if there is adequate water, sanctions all the applications or applies cut in case of shortage of water. The application is also rejected if the farmer is a defaulter on past payments or if he has not maintained the field channel.

The Canal Inspector is then supposed to fix a certain time and

location in the command of each minor where the farmers assemble and based on the sanctioned area, he gives the time in days (a group of farmers with area of 4 to 5 acres) for each group to take the water and complete irrigation. The turns are fixed from tail to head, i.e., the farthest farmer from the outlet gets water first and the one located near the outlet gets water at the end of the rotation period. This turn system is called shejpali system.

Thus, the steps that are followed in the working of the shejpali system could be summarised as follows (WALMI 1998a).

(1) The preparation of the Preliminary Irrigation Programme before the start of the irrigation season and deciding the area and crops to be grown on the basis of water in storage
(2) Inviting the water applications from farmers and sanctioning them
(3) Preparation and publication of rotation programme, that is, days "on" and "off"
(4) Preparation of water release programme
(5) Preparation of palipatrak by the Canal Inspector and communicating the day and time to irrigators by calling them at a predetermined place
(6) Rotation of supplies among farmers on each outlet on the distributary, among different distributaries and in different sections of the canal
(7) Checking of irrigation by the Canal Inspector and his colleagues
(8) Field-to-field distribution of water from tail to head of field channel and the main system
(9) Preparation of completed irrigation report at the end of each season

Some changes have been made in the operation of the shejpali system. Though the Irrigation Department is expected to supply water to a cultivator on a certain date under shejpali, this is not guaranteed in practice since there are no restrictions on the length of time that a cultivator can take for irrigating his sanctioned area. Thus, farmers at the head reaches take more water, while the tail-enders suffer. This has led to the introduction of the rigid shejpali system or the system of rotational water supply, where the time for taking water is also fixed.

Thus, when the time allotted to each irrigator is rigidly prescribed, it is called rigid shejpali or rotational water supply (WALMI 1998a). The system of rotational water supply was

introduced in 1977 in the Girna canals and extended to other systems.[27] The government policy now is to introduce the RWS system everywhere and to implement it in all the major and medium irrigation systems in the state (Lele and Patil 1994).

The following assumptions are made in the implementation of the Rotational Water Supply system:

(1) Water delivery at outlet head is standardised at 30 l/s (one cusec in the old systems).
(2) Water is delivered from the tail to head.
(3) Water is delivered to one farmer at a time.
(4) Travel time is worked out and accounted for to the starting time of irrigation for the tail-most farmer.
(5) The irrigators away from the outlet who are bound to get discharge less than one cusec due to inherent losses in the field channels are compensated by providing proportionately more time for irrigation.

However, there are a number of conditions for RWS to work effectively (WALMI 1998a).

(1) Outlets must discharge 1 cusec (30 l/s) even at low supply level in the minor, which requires the presence of cross-regulators on the minor or distributary.
(2) A measuring device is needed on the outlets.
(3) Field channels should be able to carry 1-cusec discharge, and they need to be maintained properly.
(4) Rotational water schedules need to be prepared well in advance and communicated to the farmers in rotation so that the process of water distribution proceeds smoothly.
(5) Adjustment of levels in channels by operating cross-regulators and gate openings to ensure 1 cusec discharge from every outlet is needed.
(6) A viable organisational structure is needed at the level of the irrigators to organise internal distribution of water and to maintain the chak and minor command.

A number of problems have been known to exist with the prevalence of the system of Rotational Water Supply (WALMI 1998a). Firstly, all demands are not known to the Irrigation Department in advance, before the start of the season. Demands tend to increase up to the 3rd rotation in rabi. Secondly, there is often an increase in demand due to clearance of dues by defaulters after 1 or 2 rotations are over. Thirdly, there is a tendency for irrigating area in excess of demand (that is, for carrying out

unauthorised irrigation).

Operational implications

An operational implication of the water distribution process arises from the characteristics of the gated pipe outlets from which water is released into the watercourses. Hydraulically, these outlets are non-modular structures (Bolding, Mollinga and Straaten 1995; WALMI 1998a). This implies that the discharge depends both on the upstream and the downstream water levels. Discharge is driven by the working head, that is, the difference between the water level in the parent channel (in this case, the minor) and the watercourse. Thus, the discharge varies as the level in either changes.

For instance, on the downstream side, when high fields are being irrigated, the watercourse heads up and the discharge is reduced (WALMI 1998a). When low fields are being irrigated, the water level goes down in the watercourse and the discharge is increased.[28] If the watercourse silts up, the working head is reduced and hence discharge is reduced. Upstream, this has to do with the absence in protective irrigation systems of cross-regulators: these are elevations or other structures on the canal bed that stabilise water levels with varying discharge (Bolding, Mollinga and Straaten 1995).

In Maharashtra at present only one type of irrigation outlet is used, that is 30 cm diameter pipe outlet, fixed at the bed of the distributary or minor having a gate for closing and opening of it (WALMI 1998a). The size of the outlet is standardised without consideration of available working head and the area to be served. All the outlets are not discharged simultaneously, but are clubbed, opened and closed in rotation, during the period that the canal is running. The canals do not run with a fixed discharge and the supply level in the canal varies in time depending upon the requirements of irrigation. This requires constant adjusting of gates and measurements to ensure that 1 cusec water flows through the pipe outlets.

The other implications of this design of the outlet are as follows (WALMI 1998a).

(1) When the outlet is closed after its irrigation is completed, it can be reopened during night time by breaking the lock.
(2) A hole can be made in the skin plate of the gate and piping can

be made below the outlet sill level by farmers for stealing water.
(3) If not constructed properly, leakages can take place.
(4) The discharge can also be increased by increasing the opening of the outlet.
(5) Tail outlets may suffer badly due to excess withdrawals in the head-reaches.

Comparison of shejpali with block system

The block system described earlier in this chapter is still in practice in some parts of Maharashtra, especially in the older systems. It has essentially evolved into what is now a system for controlling the cropping pattern through six-year period sanctioning of particular crops in particular tracts of land (WALMI 1998b; Jurriëns, Mollinga and Wester 1996). The block system is, thus, essentially a variation of shejpali, with a longer time frame of allocation. Sugarcane blocks are mainly sanctioned, and primarily in the head reaches of the system. Water distribution is the same as under shejpali and the blocks are treated as any other sanctioned crop area.

Normally, under the shejpali system described above, every farmer has to apply for getting water to the area proposed to be irrigated under specific crops every season. This is a long and cumbersome procedure and there remains uncertainty in getting water for long duration crops like sugarcane, banana and other fruits.

Hence to provide guarantee to the farmers for a long-term basis for high value or cash crops, blocks are introduced.[29] A certain quantity of water with high dependability is allocated for supplying water on long-term basis, that is, 6 years for sugarcane and banana and 12 years for fruit crops.[30] For sugarcane blocks, 1 part for sugarcane and 3 parts for other light crops are sanctioned.[31] The sanctions given are for 6 to 12 years, thereby assuring the irrigators of a supply of water.[32]

The difference between the block system and shejpali is that a block is allocation of water for certain area and period and shejpali is order or sequence in which water is to be taken by the farmers. Under ordinary shejpali, all farmers have to apply for getting water indicating the crops and area after the Executive Engineer invites

such applications before the season. This is called application for season on form No. 7. Blocks, on the other hand, are sanctioned for specific crops or area for a 6 to 12 years' fixed period (and not on form 7). Further, shejpali is order or sequence of getting water. Hence it would change from year to year, season to season, and also from rotation to rotation, depending on the crops and area to be irrigated in that rotation. The area under blocks as well as that sanctioned under form No. 7, however, both have the same rules for getting sequence turns in irrigation. Only in case of a shortage of water does the area sanctioned under blocks get a higher priority, and the seasonal area is reduced if water is not adequate. In the block system, as in shejpali, distribution is done by the Canal Inspector from the Irrigation Department.

The organisational structure under shejpali

The organisational structure under Shejpali is as follows (WALMI 1998b):

Under a Management Circle, there are 4 to 5 divisions of irrigation management. Each covers a hectarage of 40 to 60 thousand hectares of mixed irrigation (perennials + seasonals). Each Division is headed by an Executive Engineer. Under every Division, there are 3 to 4 Management Sub-Divisions, each Sub-Division dealing with 10 to 12 thousand hectares of mixed irrigation, and headed by a Sub-Divisional Officer. Under every sub-division, there are 3 to 4 sections, each section dealing with 3000 to 4000 hectares of mixed irrigation. Each section is headed by a Sectional Officer. A Sectional Officer is assisted in his task by Canal Inspectors.

There is a Revenue establishment in the office of the Executive Engineer, the Sub-Divisional Officer and the Sectional Officer to assist the office in irrigation matters. In the office of the Executive Engineer there is a branch known as "Irrigation Branch", consisting of 4 to 5 *Dafter Karkoons* (record keepers) – one Daftar Karkoon for each Management Sub-Division, working under the Head Clerk of the Division. Similarly, in the Sub-Divisional Office there is a small Irrigation Branch, consisting of 3 to 4 Daftar Karkoons, one for each section. In the Sectional Office, there is one sectional Daftar Karkoon who attends to the work of maintaining the record of Irrigation Management in the section.

The following officers have duties in the operation of the system:[33]

It is the duty of the Executive Engineer to prepare a seasonal forecast (Preliminary Irrigation Programme) for utilisation of water stored in the reservoir. He is required to conduct surprise inspections of water distribution at least once in a month. In his inspections, he is expected to note the conditions of the channels and any repair work that may be needed.

The Sub Divisional Officer is required to control and be in direct touch with the field staff of the Irrigation Department and regulate the rotations and the discharges in the system under his control. He has to observe field irrigation at least once in a rotation and observe the general condition of the head-regulator, check irrigation passes, and whether unauthorised irrigations are brought to notice.

The Sectional Officer is supposed to inspect field irrigation in his beat very frequently. He also keeps with him the schedule of rotation and running of the distributaries in his beat, the shejpali record and list of *Panchanamas* (statements of irrigation offence).

A Sectional Inspector is an upgraded Canal Inspector, at times placed in charge of an irrigation section. His duties in respect of irrigation management, control and supervision, are the same as those specified for Sectional Officers.

The Canal Inspector is supposed to prepare a palipatrak and get it approved by the Sectional Officer for each channel before the irrigation season starts, and submit to the Sectional Officer at least 4 days in advance, an indent for supply of water at the head of each distributing channel in his beat in the next rotation, update irrigators' passes, open the gates of the outlet channels at scheduled hours to let down adequate discharge for water and close them at the channels at the scheduled hours, inspect irrigation to see if the areas for which passes were given for the previous day have been completed, and to keep the Sectional Officer constantly informed.

The Muster Clerk helps the Canal Inspector in control of maintenance work and prepares water bills. The Technical Assistant surveys maintenance work, helps the Section Officer in preparing estimates and supervises the maintenance work.

The *Paatkari* (waterman) assists the Canal Inspectors in charge of larger beats. He opens and closes the outlets in the beat of the Canal Inspector, under the orders of the Sectional Officers. His duty is also to report to the Canal Inspector any cases of the misuse

of water or waste of water, if detected.

The keyman works directly under the Section Officer. His duties are to open, regulate and close, in each rotation, the distributing channels in a Section, according to the orders of the Section Officer. He also helps the Canal Inspector in carrying out the authorised rotation programme for the different channels in the section.

Design characteristics

In order to understand the context of water scarcity, it is necessary to know the basic design characteristics of irrigation systems. This is necessary to know how scarce the water is by design, and what proportion of crop water requirements it is designed to meet. As noted earlier in this chapter, scarcity by design is an essential characteristic of protective irrigation systems.

Design data on irrigation systems in the state, which is needed to assess their performance as well as to gauge the magnitude of "scarcity by design" is very scattered. The Second Irrigation Commission (GOI 1972) cites the case of the Jayakwadi Dam. One of the post-independence, modern dams of the state, it is designed to cover a gross cropped area of 183, 565 ha and irrigable area of 141, 640 ha. The designed intensity of irrigation is 77%.[34] Major crops to be irrigated are cotton and rabi crops, and rice on 5% and sugarcane on 1.5%.

On the Mula Dam, Lele and Patil (1994) cite the designed crop pattern as 5% area under perennials (mainly sugarcane), 20% two-seasonals (cotton), 30% monsoon seasonals (July to October), 42% winter crops (November to February) and 3% hot weather crops.

The CCA, ICA and the cropped area as designed and the intensity of irrigation as per the design report of the Mula Project is presented in table 2.2.[35]

The irrigation intensities are lower than 100%. The assumption is that some soils like light/shallow soils are more suitable for kharif, where as deep soils are more suitable for rabi crops. Hence in some areas the area available for irrigation in kharif is more as per the soil conditions and in some areas the area available for irrigation would be more for rabi.

TABLE 2.2 Design features of Mula Project

Canal	*CCA (ha)*	*ICA (ha)*	*Irrigation intensity ICA/ CCA %*	*Cropped Area (ha)*	*Cropping intensity %*
MRBC	85167	59292	70	62257	105
MLBC	15182	10121	66	10627	105
Pathardi Branch	17853	11397	64	14018	123

WALMI (1998b) presents the following assumed irrigation duties in the upper Pravara Project. The duty figures are at the outlet level.

TABLE 2.3 Duties for working out live storage necessary for irrigation in the upper Pravara Project, Maharashtra

Serial Number	*Crop*	*Kharif Duty*	*Rabi duty*	*Hot weather duty*
1	Sugarcane overlap	65	70	50
	Kharif	65	-	-
	Rabi	-	70	-
	Hot Weather	-	-	50
2	Other perennials	100	105	75
3	Long Staple Cotton	200	400	100
4	Two seasonals	300	140	-
5	Green manure	400	-	-
6	Kharif Groundnut	200	-	-
7	*Bajari* (pearl-millet)	-	Unirrigated	
8	*Mung* and *udud* (pulses)	-	Unirrigated	
9	Rabi *jowar* (sorghum) after mung, udud and early ground nut	-	200	
10	Chickpea after bajari	-	400	-
11	Hot weather maize and vegetable	-		100

In Maharashtra the canals are designed taking into account the cropping pattern and the area to be irrigated in peak period (personal communication, Mr. Sane, SOPPECOM). The canals are usually designed with 0.7 l/s.ha in case of non-paddy crop and 1.0 l/s.ha for paddy crops. The duty of various crops considered for designing canals are as below. (These figures are at the outlet level.)

	Kharif	Rabi	Hot Weather
Sugarcane	60	50	40
Sorghum	200	150	200
Wheat	–	100	-
Vegetable	200	200	7.5
Pulses	200	200	100

The figures of 0.7 l/s.ha and 1 l/s.ha are actually not far from crop water requirements. When considered in addition to rainfall,[36] this would suggest that water is actually not scarce by design in Maharashtra. Box 2.1 presents some calculations, in a comparative perspective, of water scarcity in the water users associations that I studied. The calculations suggest that water is definitely scarcer by design in the case of the WUA in Haryana. This box helps us analyse scarcity by design in a relative context and interpret the preceding discussion.

BOX 2.1: Water scarcity in the WUAs chosen for study

Allocation in the case of the Lakshmi Narayan WUA (Maharashtra):
These figures of allocation were arrived at through a process of negotiation between the Irrigation Department on the one hand and the WUA and an NGO on the other. The season-wise allocation of water was determined on the basis of design, cropping pattern and the water requirements of the crops considered in the cropping pattern as per the assumptions made at the time of preparing the Mula project report. The designed cropping pattern for Mula Project is sugarcane (4%), other perennials (1%), two seasonals (cotton and chillies) 19.5%, Kharif seasonals (paddy, bajri and groundnut) 30.5%, rabi seasonals (wheat, jowar, maize and gram) 43%, Hot weather seasonals 3%, total 105%. While fixing the quotas of water for this minor, only the design cropping pattern as considered in the project report was taken into account, assuming water required for each crop and losses in the canal network.

Kharif Allocation is 0.434 million m^3 to irrigate 94 hectares
434000 m^3 to irrigate 94 x 104 m^2
434 000 m^3/ 94 x 104 m^2 = 0.462 m = 462 mm
Rabi: 1.058 million m^3 for 120 hectares
1058000 m^3 for 120 X 104 m^2
1058000 m^3 / 120 X 104 m^2 = 0.882 m = 882 mm
Hot weather (summer)
0.283 million m3 for 62 hectares
283000 m^3 for 62 x 104 m^2
283000 m^3/ 62 x 104 m^2 = 0.456 m or 456 mm
Total Allocation= 462 + 882 + 456 = 1800 mm (for a piece of land that receives water in three seasons)
Irrigation depth for the year in the command of the WUA is 1800 mm. If we add to this the average annual rainfall of 594mm, this would come to about 2400 mm, which is enough for a crop such as sugarcane.

Comparison with designed allocation on the Mula Right Bank Canal:
The designed allocation on the Mula Right Bank Canal is as follows:
Kharif 196. 31 million m^3
Rabi 256.53 million m^3
Hot weather 126.96 million m^3
Total 579.8 million m^3
(These figures are obtained from the Operation Plan prepared for the MRBC in 1986 by CADA)
Total ICA of the Mula Right Bank Canal is 59292 ha.[37]

So, when this designed allocation is applied to the Lakshmi Narayan WUA, it would be as follows.
For kharif, (94 / 59292) x 196.31 x 10 6 m^3 = 0. 311 x 10 6 m^3
The actual allocation is 0.434 X 106 m^3
The actual allocation is thus higher than the design allocation.
For rabi, it would be (120 / 59292) x 256.53 x 10 6 m^3
= 0.519 x 10 6 m^3.
The actual allocation is 1.058 x 106 m^3
In rabi, the actual allocation is almost double the designed allocation.
For hot weather, it is (62 / 59292) x 126.96 x 106 m^3
= 0.133 x 106 m^3
The actual allocation is 0.283 x 106 m^3
This is again almost double the designed allocation.
Thus, in all the seasons, the WUA has succeeded in securing the allocation more than the designed. Hence, it could be considered a favoured WUA. It is perhaps not surprising that the WUA has been able to expand the irrigated area, as will be seen in chapter 6.

Water allocation in the case of the Rampur WUA (Haryana):
Capacity factor of the Distributary is 165 days (This was obtained as 90 days in the monsoons + 75 days across four groups of the distributary each for the rest of the year)
Designed discharge at FSL into the outlet is 1. 56 cusecs. (As 2.4 cusecs per 1000 acres for 648 acres)
Area of outlet is 648 acres or 260 hectares and the whole of it is designed to get water from the canal. This entire area is under the warabandi schedule.
Total volume for 165 days = (1.56 x 0.0283) x 60 x 60 x 24 x 165 m^3
= 629373. 88 m3
or 629374 m^3
Irrigation Depth = Volume of water/ command area of outlet
= 629374 m^3/ 260 hectares
= 629374 m^3/ 260 x 104
= 0.242 m or 242 mm annually
When an average annual rainfall figure of 500 mm is added[38], we get an annual irrigation depth of 752 mm. Water is much scarcer by design in the Haryana case.[39]

Evaluation of shejpali

The system of shejpali is known to have two major shortcomings. First, as noted above, gated outlets are vulnerable to manipulation and second, the procedure for submission and sanctioning of applications is cumbersome (Tilak and Rajvanshi 1991; Lele and Patil 1994). Both these operations provide opportunities for illicit payments and corruption.

The intended advantage of shejpali is that a farmer should be able to get the water that he wants for his particular crops. It makes it possible for the government to enforce certain practices about crops (such as crop restrictions); offenders and those who do not pay their bills can be denied water. A disadvantage to the farmer, however, is that he has to submit an application and can not change his crop afterwards. He may also resent crop restrictions. Further, it is cumbersome for the Irrigation Department to receive, process and sanction all the applications as well as to adjust the water supply throughout. The operation of this system requires precise engineering and managerial control, which can not always be provided by the Irrigation Department. For shejpali to be implemented properly, a large number of staff is required to adjust

the water supply throughout, as well as to receive, process and sanction water applications. Besides, crop zoning often proves very difficult to enforce. Farmers with good water supply are able to grow higher valued, more water-consumptive crops than allowed.

Conclusion and Discussion

The essential differences between the warabandi and shejpali systems are presented in table 2.4:

TABLE 2 4 Comparison between warabandi and shejpali

Warabandi	*Shejpali*
The available water is allocated in proportion to size of the land-holding	Water is supplied as per the demand of crops and the area sanctioned
No control exists on the cropping pattern from the Irrigation Department	Control exists on perennial irrigation, but farmers can demand water for any seasonal crop; water is supplied according to the crops sanctioned
Size of outlet and field channels is related to CCA and all outlets run simultaneously as long as the distributary is running	Size of outlet and field channels is standardised to 30 l/s capacity; as the water is supplied as per the demand, outlets are required to be rotated
Outlets are ungated	Outlets are gated
Crop water requirements are not considered in the process of water allocation	Crop water requirements are considered while sanctioning applications
Fewer points of human operation exist along the system	A larger number of points of human operation exist along the system
Water supply is from head to tail	Water supply is from tail to head

Source: Based on WALMI (1998a)

Even though irrigation practices under warabandi have received much more attention and documentation, both the warabandi and shejpali systems have been the subject of extensive debate and review. Since both these systems imply a system of rationing water that is scarce relative to demand, instead of

matching water supplies with crop water requirements, the management concerns relating to Indian canal irrigation, especially in terms of their productivity, need to be appreciated in this backdrop (Jurriëns, Mollinga and Wester 1996; Reidinger 1974; Gustafson and Reidinger 1971).

Another point of discourse relates to the applicability of the warabandi system of North India to the West, where shejpali is followed. In fact, the adaptability of the warabandi system was studied in the old Bombay state (Lele and Patil 1994). However, it was found unsuitable because of the variation in ground water availability due to rocks underlying the soils, the changing soil conditions within the canal commands that necessitated different frequencies and doses of water supply, the resulting variation in crops and cropping systems followed by the farmers and the preference of farmers for high value, high water consuming crops like sugarcane and banana (Lele and Patil 1994).

In fact, warabandi came to be treated as a magic buzzword, and efforts were made to implement it in many other states (Malhotra 1988).[40] States like Andhra Pradesh, Karnataka, Maharashtra and Gujarat introduced this system on an experimental basis.[41]

However, what was missed in these discourses and efforts was a consideration of the fit of the organisational system with the type and standard of the physical infrastructure- especially the distributary, its outlets and watercourses. Warabandi, as a system of water distribution, needs to be supported by a set of physical and institutional conditions which form the broader environment of warabandi, transcending the boundaries of the tertiary system in which it is applied (Bandaragoda and Rehman 1995).

Another issue relates to the relevance of warabandi under present circumstances, especially after the introduction of the green revolution. The introduction and rapid spread of high yielding varieties after the mid-1960s generated a demand for assured irrigation. Under these circumstances, warabandi has been criticised for the total lack of control that irrigators are confronted with and the fact that it limits the participation of the farmers in the green revolution.[42]

One fall-out of the limited flexibility in irrigation conferred by warabandi that constrained the farmers' ability to take part in the green revolution was the increase in tubewell structures. In the early 1970s, northwest India experienced a "tubewell explosion" in

response to the commercial gains that accrued to farmers from the introduction of the new technology in wheat production. In fact, in Punjab, the increase in area devoted to paddy cultivation and the development of groundwater occurred at the same time (Chopra and Bathla 1997).

As regards shejpali, the criticisms relate to the large number of avenues for human control in the system, breeding grounds for illicit payments, the administrative burden that a system of receiving, processing and sanctioning applications imposes on the Irrigation Department, and the high requirement for engineering and management control that this system entails.

Having said that, I examine the relevance of this discussion for my research. I have stated in chapter 1 that one of my research objectives was to study WUAs under two different design settings. Warabandi and shejpali as two different forms of protective irrigation entail a different physical layout: in warabandi, water is distributed through ungated proportional dividers: the adjustable proportionate module and the open flume. In shejpali, water is distributed through gated pipe outlets. Human operation of the canal irrigation system in warabandi is limited till the distributary level, where gated structures exist. Shejpali has gated structures throughout, from the main system down to the farmers' fields, requiring human operation. Further, the process of applications for irrigation, sanctioning those applications and collecting fees on the basis of the areas irrigated under different crops necessitates a whole set of operational and management requirements and farmer-bureaucracy interface in shejpali that are absent from warabandi. The operation of gated pipe outlets in shejpali also has certain organisational implications that I have explained above. Thus, the operational implications of the shejpali and warabandi systems are different, and they place correspondingly different demands on the organisational structure for water management. In the chapters that follow, I examine the implications of these differences for irrigation management transfer, the water distribution process and the farmer-engineer interface.

Notes

[1] Irrigation intensity expresses the intensity of the use of the command area of an irrigation system. When irrigation intensity is 60%, 60% of the

land is cultivated with an irrigated crop once per year (or 30% is double cropped). When it is 200%, all land is cultivated twice with irrigated crops per year. Duty expresses the area that can be irrigated with a unit discharge of water. It is usually given in acres per cusec (cubic foot per second). It is the inverse of 'irrigation allowance', which is expressed in l/s. ha (litres per second per hectare) (Mollinga 1998a).

[2] The Deccan is a drought-prone region in peninsular India.

[3] Localisation is a water control strategy in the South Indian states of Andhra Pradesh, Tamil Nadu and Karnataka (Mollinga 1998a). It is a form of agricultural land use planning that aims to control water distribution in an irrigation system through the legal prescription of the cropping pattern. Juridical procedures exist to prosecute those farmers that violate the cropping pattern. For instance, in Karnataka, the main elements of this strategy are as follows:

(i) irrigation is allowed in part of the irrigable command of an irrigation system, and excluded in another part

(ii) limitation of the irrigation of a localised piece of land to one season (with some limited allowance of two-seasonal and perennial crops)

(iii) the prohibition or strong limitation of water-consumptive crops, particularly rice and sugarcane, in favour of light crops such as sorghum, millet, cotton and oilseeds.

[4] For accounts of warabandi in Pakistan, see Bandaragoda (1998), Bandaragoda and Rehman (1995), Bandaragoda and Firdousi (1992), Merrey (1986a, 1986b) and Wahaj (2001). See also van Halsema (2002).

[5] The theory of the warabandi arrangement is that each cultivator is assigned a turn, represented by the specific period of time--a time share--and the volume of water available during that slice of time is his to use (Coward 1986). This time share becomes a property right legitimised by the state through the creation of a formal and legal warabandi roster for the delivery channel in question. The warabandi share, as a property right, then serves to organise the social relations of irrigation among the cultivators and between them and the irrigation agency (Coward 1986).

[6] "Protective irrigation for many rather than intensive irrigation for few, has been the central theme, on which the warabandi system has been planned and designed. For social reasons, the protective approach by thinly spreading the available water over a greater area was considered to be much more effective against famines than the approach for more intensive irrigation over a smaller area. With limited supply and serious constraints about its certainty, nothing better than the protective approach could be thought of.. ... "(Malhotra 1988: 39).

[7] These performance indicators were irrigation intensity, irrigation capacity factor and water allowance. A definition and elaboration of these concepts is presented in the section that follows.

[8] Rivers in the Indo-Gangetic plains are known to carry vast amounts of silt and suffer from problems of silting and scouring (van Halsema 2002).

[9] The hydraulic head is the difference between the upstream and the downstream water levels.

[10] There are two variants of warabandi. The first is kuchha warabandi, under which farmers take water on the basis of mutual consent. The second is pucka warabandi that is framed by the Irrigation Department. A day and night interchange is also effected every six months. Farmers who take water in the day-time during the first half of the year take water at night time during the second half. See also Merrey (1986b) and Bandaragoda and Rehman (1995).

[11] Nahar is the Hindi word for canal.

[12] Outlet discharges are based on duty. For instance, an outlet of 28 l/s (1 cusec) would serve 120-160 ha.

[13] Personal communication, Mr. Satish Sharma, Irrigation Department, Rohtak, December 10, 2001. I observed that Engineers in the Irrigation Department are not very conversant with these design figures. One practice, however, is that at the end of the Irrigation seasons, in kharif and rabi, respectively, the Nahari Patwaaris, when they assess the dues to be paid for irrigation on the basis of the crop area rates, make an assessment of the area irrigated within the command of an outlet. Expressed as a percentage of the gross cultivated area, this figure is used as an indication of the intensity of irrigation achieved. It serves partly as a monitoring tool. But this is the total area irrigated in the command of the outlet, and also includes irrigation from groundwater. An irrigation intensity achieved that is less than 50% is considered a sign of poor performance.

[14] Personal communication, Mr. Mattoo, CADA, Rohtak, December 11, 2001.

[15] I show through my own empirical observations in the following chapters that this means little in practice. Farmers do intervene both at the level of the outlets as well as above, to increase discharges by breaking outlets or by inserting siphons on the canal. Similarly, farmers bribe the officers of the Irrigation Department to allow them to do so. For a discussion of these strategies and their effects on discharges, see also Wahaj (2001).

[16] Even considering breakdowns, tubewell operators in Pakistan reported that pump or engine failures made groundwater unavailable for an average of 1-2 weeks per season, which was still better than the reported unavailability of canal water for an average of 4-5 weeks per season (Meinzen-Dick 2000a).

[17] My own empirical observations on time exchanges and sales of water turns are presented in chapter 6.

[18] These strategies are described further in chapter 6.

[19] " (The) Irrigation Engineer has to see that the total water available with the storage along with the river-gains is fully utilized up to June of every year and no drop of water remains unutilised; at the same time, his foremost duty is to see that all the committed irrigation is fully satisfied

according to the rules and practices of irrigation and no crops starve for want of water. This, therefore, leads to the Executive Engineer to the formulation of the programme for the utilization of the stored water, considering the duties of the various sanctioned crops, river-gains, evaporation losses, canals and distribution losses, in a planned manner. " (Gandhi 1979: 399-400).

[20] The Nira Left Bank Canal is located in the Deccan. The canal was constructed as a famine relief work in the period 1876-85. The area has an average rainfall of 450-500 mm a year. This falls mainly during the monsoon, which last from June until October. The rainfall is very erratic: in dry years, even traditional drought resistant food crops such as sorghum and millets would not survive. This would result in famines.

[21] A phad is a group of contiguous farmers where the same crop is grown under irrigated conditions (Lele and Patil 1994). The phad system refers to the management of irrigation by a group of farmers. For over 400 years such a system of irrigation management has been practiced on small irrigation works in North-western Maharashtra. Farmers have managed the allocation and distribution of water, rotation of crops, and the maintenance of the system through community effort. This system has been practiced in the Tapi basin on rivers Panjra, Mosam and Aram. On these rivers there is a series of bandharas (weirs). These systems receive their run-off from the monsoon flow which can sustain sizable irrigation in the winter and summer seasons. They are managed, operated and maintained by the irrigators themselves. Each system comprises a low diversion weir across the river, a small canal on the bank, and a distribution system for irrigation. The area under irrigation in each weir varies from 4 to 192 ha. The irrigators contribute funds for maintenance, manage these funds and organise community labour from the village.

[22] The disenchantment with the block system led to a long period of debate over the merits of the block system and the difficulties in its implementation. See Lele and Patil (1994) and GOI (1972).

[23] This made possible double cropping as well as increased production per unit of land in a season.

[24] I return to this point and a comparison between the block and shejpali systems later in this chapter.

[25] This does not always happen in practice. Often the cropping pattern is announced after the crops have been sown. Further, the cropping pattern realised does not adhere to the pattern proposed.

[26] What is described here is the principle of shejpali, that is, how shejpali is supposed to work. The extent to which these practices are actually followed varies from location to location.

[27] RWS in Maharashtra can be considered as rigid shejpali when the discharge from the outlet is standardised at 28.3 l/s or one cusec. Based on the discharge and delta of irrigation, precise time allocation is done for preparing water distribution schedules below the outlets. This was

introduced first in Girna Command in 1977. Experiments were conducted to see how much discharge one farmer could handle for efficient irrigation like borders/furrows and accordingly one cusec or 28.3 l/s discharge was fixed. When the exact time was prescribed in advance, there was better understanding among the farmers which led to disciplined use of water and confidence in getting water by all, head as well as tail-end, farmers. The system was then applied to larger areas in other projects. The process involved observing filling/emptying time of each minor/field channel for preparing distribution schedules accurately and determining the irrigation delta as required for different soils/crops and season. The time allotted for irrigating one ha of land varied from 5 to 10 hrs. A discharge of one cusec provides, theoretically, without considering transit losses in field channel, 5 cm of water at field level per hour, and the time allocation was 5 hrs. Giving 5 cm of water at outlet level or 5 x 0.85 = 4.25 cms of delta of crop level. Similarly 10 hrs. allocation/ha provides irrigation delta of 10 cm if calculated at outlet level, or 10 x 0.85 = 8.5 cms at crop level (Personal communication, Mr. Sane, SOPPECOM, Pune).

[28] This applies when more than one outlet is drawing water at a time, as happens with outlet operation in this case. When a single one draws, it will head up till the outflow matches inflow or the canal overflows.

[29] The advantages of the block system, as in practice now, vis à vis ordinary shejpali are as follows (Lele and Patil 1994):

(i) Irrigators get a guarantee for long term water supply (i.e. 6 to 12 years) for an agreed or fixed area, and they can, therefore, incur capital expenditure for land development and higher inputs.

(ii) Perennial /sugarcane blocks involve rotation of crops within the block area, thus improving fertility of soils.

(iii) The high water consuming crop area is restricted and farmers have an obligation to grow seasonal crops.

(iv) Farmers are free from the hassle of applying and getting sanctions every year/season. The Irrigation Department's effort to scrutinise and sanction crops every season and measure the irrigated area is reduced. The Irrigation Demand is stabilised, which simplifies the preparation of Preliminary Irrigation Programme.

[30] Personal communication, Mr. Sane, SOPPECOM.

[31] 0.2 ha. sugarcane + 0.6 ha. other crops - i.e., 0.8 ha- is called a block area. The bearer of a block is a person who has a share in a block.

[32] The blocks are sanctioned for sugarcane-banana crops with one-third area (later reduced to one-fourth) and the remaining area for other seasonal crops in kharif and rabi. Similar blocks are sanctioned for two seasonals, i.e. either two seasonal crops like cotton, or half area in kharif and the balance in rabi. Fruit blocks are sanctioned for 12 years without any obligation of seasonal crops (Personal communication, Mr. Sane, SOPPECOM).

[33] This section draws upon IIM(A) -IWMI (1999).

[34] This intensity is split up as 60% for rabi, 10% for hot weather and 7% for Kharif (personal communication, Dr. S A Kulkarni, INCID, New Delhi).

[35] Personal communication, Dr. S.N. Lele, SOPPECOM, Pune.

[36] In the command of the Mula Project, for instance, where my research site is located, the average annual rainfall is 594 mm (Lele and Patil 1994).

[37] This calculation is on the assumption that the water is spread over the entire 59292 ha. When the NGO was negotiating the water allocation for distributary 4 of branch 1 of the Mula project, the question of equitable distribution to all the minors came up. The Government of Maharashtra had issued a circular (in 1992) for allocating water equitably across the minors. The quotas for all minors of the Dy. 4 were worked out on this basis as 3520 m^3 per hectare. However, this circular is not followed scrupulously (Personal communication, SOPPECOM team, Pune).

[38] This figure of 500 mm is an estimate of average rainfall in Rohtak district based on data obtained from the Agriculture Department, District Rohtak, Haryana.

[39] However, one factor that has not been taken into account to arrive at these calculations is the possibility of lateral inflow through canal seepage. In both the cases, there is some recharge from canal waters. In fact, in the Lakshmi Narayan case, recharge from canals led to the digging of a large number of tubewells in the canal command. In the Rampur case, too, some percolation from the canal waters benefits the saline ground water. Since the hydrogeologies of the two regions are different – Haryana has deep alluvial while Maharashtra has shallow black cotton soil with hard rock – I have been unable to make a substantive claim regarding the differences in water availability through seepage.

[40] This discourse became very popular particularly in the 1970s and 1980s.

[41] The introduction of warabandi became one of the tasks entrusted to the CAD agencies constituted under the Command Area Development Programme. For a review of the experience with introducing this system in Karnataka, see Mollinga (1998a).

[42] In chapter 6, I describe how farmers seek to deal with this situation.

3

Policy Support and Resistance

The process of WUA establishment in Haryana and Maharashtra

This chapter describes the reform processes of WUA establishment in Haryana and Maharashtra. In both these states, very little effort has been made to garner support for the reform process, or to ensure that the necessary resources are available. A principal weakness of the process in Haryana is that water users associations have been formed below the outlet, while the main management challenges are located above it. Besides, there has so far been no place for the Irrigation Department in the reform process. In Maharashtra, while the policy for WUA formation is more ambitious as a reform strategy, it is opposed by vested interests that benefit from the *status quo.*

An overview of the policy environment for WUA formation in the state of Haryana is first presented. This is followed by a discussion of the implementation process, where I describe how this policy translates into practice. The perceptions of different actors involved are described, and the bottlenecks to policy implementation are discussed. I then repeat this exercise for the state of Maharashtra. Later in the chapter, the experience of both these states is compared with that of other Indian states where policies for establishing WUAs are at different levels of formulation or implementation.

WUA Formation in Haryana

As noted earlier, Haryana is one of India's leading agricultural states. Along with the Punjab, it was the cradle of India' s green revolution in the 1960s and 1970s and remains a major contributor to her food basket. The state has predominantly an arid and semi-arid type of agro-ecology and irrigation has had a significant role to play in raising agricultural productivity. The spurt in tubewell

BOX 3.1 The organisational and Institutional Framework for Irrigation Management in Haryana

In Haryana, the Haryana Irrigation Department (HID) has the primary responsibility for managing the state's water resources and provides the essential services in this sector (GOH 1998). Two other agencies of the Government of Haryana are involved. The first one is the Haryana State Minor Irrigation and Tubewells Development Corporation (HSMITC). This organisation takes up groundwater development through deep tubewells. It also does the lining of watercourses in canal irrigated command areas. The Command Area Development Authority (CADA) is the second organisation. It was established in 1975. It does lining of watercourses where irrigation is lagging, also under lift irrigation schemes.

The HID has the responsibility for the operation and maintenance of canals, distributaries, minors and outlets up to the head of watercourses which are the lowest common channel serving an area of 100-300 hectares. According to the Haryana Canal and Drainage Act (1974), the maintenance and repair of watercourses is the responsibility of farmers; alternatively, the Act provides for the Irrigation Department to operate and maintain the system and charge farmers to cover the cost.

Watercourse lining is carried out both by CADA and the MITC. Most MITC work is in the command of the Bhakra system while most CADA work is in the WYC (Western Yamuna Canal) and other systems in the state.

The Haryana Irrigation Research and Management Institute, HIRMI, based at Kurukshetra, carries out research and training in the irrigation sector. In the context of WUA establishment, it has been training farmers and WUA leaders.

structures in the state facilitated the participation of the farmers in the green revolution. In recent years, however, doubts have been cast over the sustainability of the green revolution on account of falling water tables and rising salinity. The role of the government in irrigation has been in the development and spread of canal irrigation and the development of state tubewells (See Box 3.1).

Factors driving WUA formation in Haryana

In 1995, it was decided by a resolution passed by the Government of Haryana, that beginning 1995, new watercourse lining on canals would be carried out only for farmers who had organised themselves into a water users association.[1] This act of forming water users associations has acquired the label of Participatory Irrigation Management in the state.

The most important factor driving WUA formation in the state is the agreement made by the Government of Haryana with the World Bank for the Water Resources Consolidation Project (WRCP).[2] The components of this project in Haryana are rehabilitation of existing irrigation facilities, research and training, canal lining, watercourse lining, building a main canal link, a drainage programme and the erection of the Hathni Kund barrage (World Bank 1993).[3] This project, signed in 1994, mandates improving farmer contribution to O & M in large systems by raising fees and by promoting WUAs below the outlets to take over maintenance of lined watercourses.

The HSMITC has been entrusted with the task of forming WUAs under this programme. The emphasis on WUA formation under the WRCP supports the general thrust on devolution of functions in the World Bank's programmes. The World Bank's Water Resources Management Policy (1993), stressing the need for decentralisation asserts thus...

> the principle is that nothing should be done at a higher level that can be done satisfactorily at a lower level. Thus where local or private capabilities exist and where an appropriate regulatory support can be established, the Bank will support central government efforts to decentralise responsibility to local governments and to transfer service delivery functions to the private sector to financially autonomous public corporations and to community organisations such as water user associations.

Further,

> when properly designed, community-based programmes can be highly effective in managing natural resources, providing basic infrastructure or ensuring primary social services..... Successful design requires tapping into local needs, understanding and building on the strengths of existing institutions and defining the changes needed in intermediary implementing agencies to support community action. (World Bank 1996: 247)

A justification for WUA formation that is presented by the Irrigation Department is that farmers need to show an involvement in the maintenance of lined watercourses. Two senior officials from the Haryana Irrigation Department put it as follows.

> as far as the history goes, farmers had been maintaining the watercourses themselves till these were lined and are still doing so in case of unlined watercourses. The question is what goes wrong when a watercourse is lined? The reason is quite simple that the investment on lining of watercourses is entirely made by the state. As a result, the shareholders lose the sense of ownership of the watercourse and start looking upon the state for every aspect of watercourses, and importantly maintenance. It is the intervention of the state in creating the infrastructure without any share of the stakeholders in investment that the shareholders change their perspective to see the lined watercourse as a state property. .. the essential requirement of success of PIM at primary level is to imbibe a sense of ownership of watercourse in its stakeholders. No interest can be created for responsibility for O & M alone unless there is a sense of ownership. Since in the present arrangement stakeholders do not have any share in investment for lining of watercourses, this lack of involvement prevents from getting a sense of the ownership..... (Ailawadhi and Bansal 2001: 17).

Apart from the HSMITC, the other organisation engaged in forming WUAs in the state is CADA, the Command Area Development Authority. The CADP (Command Area Development Programme) was launched in India in 1974. CAD agencies were set up to overcome the monodisciplinary outlook of irrigation agencies and to bring in water/land management and agricultural services at the farm level and to bridge the gap between irrigation potential created and utilised (Maloney 2000; Sivamohan and Scott 1992).[4] One of the reasons for the large gap between potential created and utilised

in Indian irrigation was taken to be the underdevelopment of irrigation infrastructure between the main system and farmers' fields (Sivamohan and Scott 1992).[5] It was recognised that this gap had to be tackled directly by concentrating on the construction of field channels and supplying water as close to the farmers' fields as possible. Thus, emphasis shifted to On-Farm Development; in particular, to construction of watercourses to bring water to the fields of farmers. In 1983, attention turned specifically to field channel construction. This shift was also reflected in the patterns of financial assistance given by the central government. During the sixth and seventh plans, the construction of field channels was accorded a high priority to make irrigation accessible to farmers.

The emphasis on watercourse lining is seen as a way of reducing seepage losses, which in turn, is seen as a way of reducing the gap between irrigation potential created and utilised.[6] A senior CADA officer in Haryana explained that there was a realisation among the senior management at CADA that these activities would not bear fruit in the absence of participation from farmers.[7]

Though CADA had already been engaged in the task of forming WUAs in Haryana, it was only in 1995 that the effort received a strong push under the ongoing HWRCP (Ailawadhi and Bansal 2001). The Government of Haryana took a policy decision to pass on the responsibility of operation and maintenance of the irrigation system under watercourses to farmers, organised into water users associations. The Institute of Resource Development and Social Management (IRDAS), an NGO with some experience in WUA establishment, was entrusted with the task of evolving a strategy for establishing WUAs and assisting the HID in establishing 10 WUAs on a pilot basis. The work was initiated in June 1996 and IRDAS organised a total of 70 WUAs (GOH 1998).

In the year 1998, the state government approved model bye-laws to be adopted by the WUAs at the time of forming the WUAs and a draft MOU to be signed at the time of turning over management to WUAs on completion of modernisation or rehabilitation of a watercourse. Essentially, this MOU entrusts responsibilities for repair and maintenance of the watercourses to the WUA. It also requires the WUAs to carry out the water distribution process on the lines of the warabandi schedule.[8]

In order to step up and coordinate the programme, a core group on PIM was formed in the Haryana Irrigation Department, with representation from the implementing agencies such as HSMITC,

HAD (the Haryana Agriculture Department) and HIRMI (Ailawadhi and Bansal 2001). The core group prepared a strategy to implement the programme, which includes a mass awareness and training programme for WUAs and agency officials.

Water users associations organised by the HSMITC

The WUAs formed by the HSMITC are registered under the Societies Registration Act (1860) with the state's Registrar of Cooperatives. The principle is that at the time of the formation of the WUA, the state government contributes Rs 100/ha and each farmer contributes Rs.100/ha. This is deposited in a Fixed Deposit Account in a commercial bank. The interest accruing on the Deposit is to be the source of future funds for maintaining watercourses. For these WUAs to be formed at least 50% of the members in a watercourse have to agree to become members; they then work with an Executive Committee under a Chairman. Table 3.1 gives details of the status and number of water users associations thus formed in the state.

TABLE 3.1 Water Users Associations formed by the HSMITC, Haryana (December 1999)

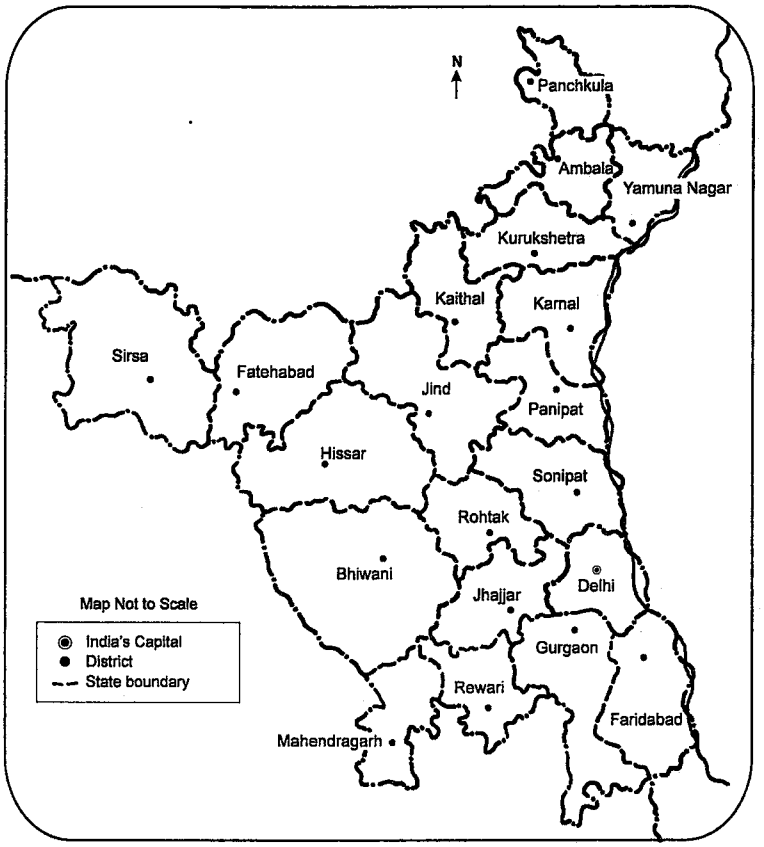
	Hissar	*Kaithal*	*Bhiwani*	*Hand over of watercourses completed*[9]
Modernisation of WCs[10]	601	47	97	141
Rehabilitation	73	19	5	6
O&M	28	18	--	2
Total	702	84	102	**149**

Source: Haryana Irrigation Research and Management Institute, Kurukshetra

There was some progress in the following year. Out of 1550 WUAs registered by March 2001, hand-over of watercourses had been completed in 389 cases.[11]

By July 31, 2001, under the HWRCP, 1957 WUAs had been formed and 728 WUAs had been turned over to WUAs for management. These WUAs have been formed in Kaithal, Bhiwani and Hissar districts of the state (Map 3.1). Most of these WUAs are quite recent, having been formed only after 1997-98. My discussions

Political Map of Haryana



MAP 3.1

at the senior management level of the HSMITC revealed that eventually a number of functions, including collection of water charges, are proposed to be transferred to the WUAs. The justification presented is that this would relieve the burden on the state Irrigation Department.

WUAs under CADA

The WUAs formed by CADA are also registered under the Societies Registration Act (1860). The state government contributes Rs 225/ha and the centre provides Rs 225/ ha while the farmers contribute Rs 50/ha at the stage of formation. CADA provides for a subsidy to water users associations. This takes the form of a maintenance grant of Rs 100/ha, in each of the first two years, and Rs 75/ha in the following year, respectively. Table 3.2 gives details of WUAs thus formed by CADA in the state.

TABLE 3.2 Water Users Associations formed by CADA in Haryana (December, 1999)

District	*Number of WUAs formed*	*Number in which hand-over has been completed*
Faridabad	248	53
Jind	229	122
Rohtak	515	52
Total	991	227

Source: Haryana Irrigation Research and Management Institute, Kurukshetra

As of December 1999, 991 WUAs had been registered. This number rose marginally over the following year. As of December 2000, 1036 WUAs had been registered and of them, hand-over of watercourses had been completed in 333 cases. Most of these associations were formed in or after 1998, when the bye-laws were approved. They have been formed in Faridabad, Jind and Rohtak districts of the state.

There is some thinking within policy circles for extending the level at which WUAs are formed. An undated CADA document entitled *'Sahabhagi sinchai prabandh'* (Participatory Irrigation Management), states that WUAs should be formed at the level of the

outlet first and then at the level of the minor and the distributary.

The process of implementation of reforms

The major weakness of the process of WUA establishment in Haryana is that WUA formation has been carried out below the outlet, while the more important management challenges are located above the outlet. There is little reflection of what WUA formation seeks to achieve. There is no reorientation of the Irrigation Department, and very little control has been devolved to users.

Limited range of functions transferred: no change in control relations between farmers and the bureaucracy

Perhaps the strongest critique of the PIM process in the state is at the level of the content of the policy itself, in terms of the limited range of functions transferred to users. The only function transferred to the WUAs is the maintenance of lined watercourses. The task of the WUAs is to supervise the repairs and construction of watercourses and to keep a check on the quality of material used by contractors who are assigned (by the government agencies) to do so.[12] Thus, during my first interface with the members of the Sitapur WUA, they rightly said ... "they have left us as *Chowkidaars* (watchmen)". The Chairman of the WUA said, "They have made me chief, but have not given me any powers". A point that cropped up in further discussions was.. "we only have problems and problems, no real powers." Unlike the case of WUAs in Maharashtra, which is discussed later in this chapter, where, in principle, the formation of water users associations seeks to transfer control over system operation to farmers, the process of "PIM" in Haryana does not devolve any real control to users.

As noted earlier, there is some thinking within policy circles about involving WUAs in other functions such as assessment, collection and sharing of irrigation revenues (Ailawadhi and Bansal 2001:15; Brewer *et al* .1999). There are also proposals for forming WUAs at the distributary level (GOH, n.d.; Ailawadhi and Bansal 2001: 19, 20). A common perspective among many field level CADA and MITC officers that I interviewed, however, was.." We

will first see if farmers are capable of performing the functions that are transferred to them... only then will we think of giving them more powers." A member of the senior management at CADA also felt that the demand for the transfer of more functions should come from the farmers. What is amazing, however, is that there is no direct feedback loop between the farmers and the senior management at CADA; so there is a question mark over how such a demand would be communicated.

The only reporting on WUAs in the offices of both CADA and MITC is quantitative; "numbers formed, share money deposited, hand over completed". Beyond quantitative targets and meeting them, there is little effort to understand at what level of working these WUAs are. Senior management at the organisations engaged in forming WUAs openly admits that they have no information about their working and no feedback or evaluation has been carried out.[13] This speaks of the little real commitment to the act of establishing WUAs.

An instrumental perspective

There is a strong instrumental perspective to WUA formation in the state. WUAs in the command of CADA and MITC remain essentially arms of the bureaucracy, performing functions delegated to them. They are liable for their actions to CADA and the MITC.

A field level official at HSMITC said, " they (the farmers) now maintain watercourses and do not come to us.. what else do we want.." Another one, in a similar vein, said, " they are quite useful to us, and serve our objectives effectively". The justification that the farmers are presented for forming water users associations is thus... "The government manages the entire irrigation system: can't you manage even the watercourses?"[14]

Further, these WUAs continue to be strangled within the clutches of the bureaucracy. When a watercourse is repaired, WUA members have to approach CADA with a request and go again through a number of procedures and formalities. A field level HSMITC official with whom I had a long interview felt that the process of formation of water users associations was long and cumbersome.

During my meeting with the Chairman of a WUA, he said, "we have to keep very careful accounts.. you never know when there

will be an audit". Even while members deposit share capital, its withdrawal has to be approved by the CADA. Even then, field level officials at CADA express their dissatisfaction at being unable to "keep checks on them". Some go to the extent of saying that WUAs are ineffective because there is no permanent agency to "monitor" them. This sentiment runs counter to the spirit of devolution.[15]

The role of the Irrigation Department and CADA: absence of an enabling environment

There are different views circulating within the government machinery on the policy for WUA establishment, revealing little real interest, or commitment to implementing the policy initiative. There is little ownership of the reform process. An enabling environment for sustained support to WUAs has failed to emerge.

Many field level officers of the Irrigation Department admitted that they had "nothing to do" with water users associations. Lining of watercourses has been the domain of the lining wing of the Command Area Development Authority and the Haryana State Minor Irrigation and Tubewells Development Corporation. It is effectively these organisations that are involved with WUA establishment. It is their functions that are transferred to water users.

On the other hand, some field level CADA officers felt that these WUAs are not sustainable because there is limited sustained involvement of other organisations at the village level: in particular, the Irrigation Department and the *Gram Panchayat* (unit of local government at the village level). Proponents of this view hold that unless other village level institutions are involved, the WUAs will not 'deliver results'.[16] Several CADA officials feel that the Irrigation Department, the canal Patwaari and the BDO (Block Development Officer) should take a greater interest in the working of these WUAs. The rationale behind this position is that CADA withdraws soon after the task of lining the watercourse has been completed and turnover of the watercourses has been effected.[17] For continued "monitoring" of the WUAs, to use the bureaucracy's own jargon, it is argued that there is a need for involvement from an agency that interacts with farmers on a regular basis.

One reason for the limited success of CADA programmes at the

state level is that CADA schemes are essentially a central government programme being implemented by the state government, on a subject that is a state subject (water). A CADA officer with whom I had regular meetings during my fieldwork summed up this attitude thus..." we do not involve ourselves much in this programme...because it is basically a central government scheme".

No effect on water distribution practices

Further, with WUA formation, there is no change in the *status quo* with regard to other activities and practices in water management and distribution.[18] This is similar to what Byrnes (1992) established with regard to his study of water users associations in Pakistan's World Bank Assisted On-Farm Water Management Programme. "Generally, the establishment of legally-authorized WUAs on the W/Cs (watercourses) has not resulted in farmers drastically changing or going beyond what they traditionally accomplished through their informal *khal* (watercourse) committees" (Byrnes 1992: xiv). Further, " the underlying reason for this problem lies in the failure of the design of World Bank-assisted irrigation projects to include an effective strategy, and to provide the necessary resources to implement that strategy, for WUAs to function as the farmers' own vehicle for investing and sharing in the benefits of development. Much work remains if WUAs are to evolve from short-lived paper organizations for improving watercourses to self-sustaining organizations active in promoting agricultural and rural development (Byrnes 1992: xv)."

The experience in Haryana supports the point that is raised by Byrnes, namely, that changes are necessary for WUAs to become sustainable catalysts for agricultural and rural development, rather than being seen as a means of accomplishing agency objectives of securing watercourse lining. Byrnes argues that viable WUAs should be built as the programme's primary objective, not simply as a formality that needs to be completed to proceed with watercourse improvement.[19] It is interesting that the World Bank did not learn from its experience in Pakistan about a decade ago.

Reform needed above the outlets

The more important management challenges, as will become

evident from my association with two WUAs in the state that is presented in the following chapters, are located above the watercourses: tampering with outlets, inserting *soondiyas* (siphons) to extract more than the protective entitlement of water and bribing the employees of the Irrigation Department for being allowed to do so. Real water management issues are, therefore, located at a different level than where reform is concentrated at present.

Some farmers that I interviewed felt that lining watercourses did reduce seepage losses and supervision of construction improved the quality of materials used. However, they also complained that when they did not get their share of water from the main system, it did not matter whether the watercourse was lined or unlined. Many farmers even complained that when they deposited money for lining the watercourse and did not get their share of water, they felt cheated. Institutional and technical reform below the outlet is meaningless in the absence of effective management of the main system or control over water supplies (Hunt 1989; Wade and Chambers 1980).[20]

There is some complacency within the Irrigation Department on grounds that there is no need for PIM in the state since the warabandi system itself is a form of farmer participation. The point that needs appreciation is that warabandi is only a system of water distribution.[21] There *is* a need for reform but for reform to be meaningful, it needs to be introduced above the watercourses and outlets. The limited appeal of "management turnover" in the state as is being carried out now is not that there is a warabandi system *per se*, but that the points where intervention is required are different from where action is concentrated at present.

The politics of reform

High-level political support is now widely acknowledged as a necessary ingredient for success of irrigation reforms.[22] Haryana policy circles recognise this.

> "Political patronage for ownership of the programme and spreading the message across will provide necessary impetus to the programme. PIM will have a better mass appeal, when elected representatives promote it. Once ministers and legislatures are committed to PIM and strongly advocate the cause of PIM, it will be far easier for the stakeholders to get

> convinced to own the programme. The message from this forum will spread faster and have far better results than by the irrigation agency" (Ailawadhi and Bansal 2001: 18).

However, officers at CADA and the HSMITC are quick to point out that the required "'political will" for WUA formation is absent in the state. The policy approach to establishing WUAs was given concrete shape during the reign of the state's former Chief Minister, Bansi Lal. In the year 2000, there was a change of government and a new state government headed by Om Prakash Chautala came into power. Chautala contested the elections to the State Legislative Assembly by promising free water and electricity to farmers. In March 2000, he announced that his government was committed to raising agricultural production by repairing watercourses and carrying out free lining of watercourses.

Populist announcements such as the one described above contradict the policy approach of CADA and MITC of engaging farmers and making them contribute financially. According to many of the field level officers that I interviewed, this weakens their efforts and dampens farmer enthusiasm as well. They said that it takes a lot of effort to persuade farmers to contribute. Once this is done, and the corresponding share money of the state government does not come forth, it weakens CADA's credibility with the farmers. The non-availability of share capital from the state government also plagues WUAs formed by the MITC under the World Bank's WRCP. Farmers are often reluctant to contribute because they expect that they vote for a government and it is the latter's duty to provide water. Populist politics reinforce this attitude: the elected representatives actually promise free water and electricity.

Demand for PIM

As noted earlier, the formation of WUAs is seen largely as a response to the on-going HWRCP initiated by the World Bank, with little ownership of the agenda among the bureaucracy. A number of field level HSMITC officials expressed the view that the chief reason that the WUAs are being formed is that the World Bank insists so under its WRCP and that barring that there is little demand for PIM.[23] Some CADA officials also feel that the only reason they are being formed is that there is financial support for them from the central government.[24] Lately, however, there have

been some initiatives for WUA formation. At Bhiwani, for instance, members of the Gowshala trust, a charitable organisation, approached CADA for support in forming a water users association.[25]

There is little self-reflection - within the Irrigation Department or the State Government -of what "PIM" should really accomplish. There is also no effort to mainstream the initiatives into overall water development efforts. At the moment, Haryana is in the midst of an overall programme for social and economic development, led by the Chief Minister Om Prakash Chautala, targeting agricultural transformation and industrial modernisation. Little thought has gone into how an irrigation reform programme can be integrated with overall development and agrarian transformation.

Limited involvement of civil society

It is rare that all members of WUAs participate in meetings of the WUA, or take decisions. Usually, it is a managing committee (comprising anywhere between three to eight members) that takes most of these decisions. This managing committee is often a body distanced from other farmers.[26] Thus, the concept of vibrant, self-governing robust institutions of mass participation from civil society is missing in practice.

Another critique, related to the previous point, from my association with both the Sitapur Water Users Association as well as the Rampur Water Users Association is the absence of any mechanism to ensure the accountability of the management of the Water Users Association to the other WUA members. That there is a local level mechanism for the management of water does not necessarily mean that this structure is egalitarian, transparent and accountable. Or that sharing leads to greater empowerment.[27]

Empowerment has been one of the major goals of the processes of decentralisation. But the critical question is empowerment of whom? Power has been concentrated with and shared among those who were already powerful in other ways. The other members have not been involved. They do not have access to information and there is little transparency between them and their management body. Most members do not have a sense of identification with the water users association. They do not know what happened to the money that they contributed, where it was

used, if ever a meeting was held, or what their rights are.

Conclusion

The major, if any, benefit of forming the WUAs is that the organisation of farmers gets a legal identity, by being registered as a water users association. However, the implementation of the policy intervention is left wanting on many fronts.

First, there seems to be little commitment to the imperatives for reform among the implementers, barring the external pressure from the World Bank. Those responsible for carrying out the reform do not identify with it and are not convinced about it. The second limiting factor is the scale of reform and management transfer. There has been some talk in the past of devolution of more powers to the water users associations, but it has not materialised. At CADA, a perspective is that more functions have not been given to WUAs because the demand for this has to come from among the farmers, but there has been no representation from the farmers. What is amazing is how the senior management expects this demand to be communicated in the absence of a direct feedback mechanism between the farmers and the bureaucracy.

Another limitation in terms of scale is in terms of federating. One reason why scaling up of the WUAs may not be possible at the moment is that there is no direct involvement of the Irrigation Department, which means that reform does not proceed above the outlet. The process of federating or upscaling is relevant only after reforms have been introduced above the outlets.

Third, a feedback mechanism should be an essential ingredient of a policy reform process, where proposals for reform are articulated and debated. The head-offices of CADA and MITC are limited in their ability to obtain such feedback. Fourth, a common observation among the officers of both CADA as well as the HSMITC is that the infamous "political will" has been absent. When the Chief Minister promises free lining of watercourses, it dampens the enthusiasm and the move to reform. Finally, the poor availability of financial resources from the state government serves as the *coup de grace* in retarding progress.

In many ways, these WUAs have become little more than products of government programmes, enmeshed in a number of problems, reliance on government funds, confusing and

contradictory policies and a half-hearted commitment of the state government. While the idea behind PIM should be to build new partnerships and empower, this is not happening. Real power continues to vest outside the WUA, technically in the main system and institutionally with the Irrigation Department, while WUAs simply perform functions handed over to them by CADA or MITC. They continue to be dependent on and accountable to the bureaucracy and perform the functions assigned to them with little or no matching powers and rewards.

WUA Establishment in Maharashtra

Maharashtra is India's fourth largest state, and known for its powerful sugarcane economy. In Maharashtra, the state has had to play a much more active, interventionist role in development, than in Haryana. In particular, it has had to play a role in famine prevention. The ingredients of such an intervention have been the generation of employment for cash on a large scale and provision of relief for those unable to work.[28] Box 3.2 lists the roles of different organisations engaged in irrigation development and in WUA formation.

Maharashtra is considered a cradle of co-operation, with co-operatives pervading virtually every sphere of agrarian activity. The state has several conditions conducive to the spread of co-operation, including a vast pool of local leadership, and a tradition of NGOs. It has a tradition of co-operative management in the management of water and other natural resources. What is interesting, however, is that efforts at forming WUAs in canal irrigation have been very limited in their scale and spread. In this section of the chapter, I describe this phenomenon.

BOX 3.2 The organisational and institutional set-up for irrigation management in Maharashtra

Apart from the Irrigation Department of Maharashtra, a number of other organisations are involved in the irrigation sector and in the formation of WUAs. They are described as follows: [29]

The Directorate for Irrigation Research and Development (DIRD)
The DIRD, an arm of the Irrigation Department, monitors the water users

(Box 3.2 continued)

associations in the state. It keeps a record of water users associations formed. Its role is purely advisory in nature (to the Irrigation Department). The DIRD functions through its section offices in Pune, Aurangabad, Akola, Nasik and Thane.

Water and Land Management Institute, (WALMI), Aurangabad
WALMI is engaged mainly in training programmes. It trains several actors, including members of the Agricultural Department, farmers, women, and appointees and position holders of WUAs. The Irrigation Department funds it. It also carries out some action research, but does not have an implementing role.

Cooperatives Department
The Cooperatives Department provides a facility for the registration of WUAs. The Cooperative Water User Guidelines (GOM, 1992) provide the broad set of modalities. The department monitors the working of water users associations.

NGOs
Two NGOs have been engaged in fostering water users associations; the Society for People's Participation in Ecosystem Management (SOPPECOM), Pune and the Samaj Parivartan Kendra (SPK), Nashik. SOPPECOM, an outgrowth of CASAD, the Centre for Applied Systems Analysis in Development, was instrumental in forming a WUA on the Mula Project, that later became the basis for evolving a set of guidelines for WUA formation in the state. The SPK has been working with three water users associations on the Waghad Project at Ozhar village near Nashik.

Donors and funders
The state has had a presence of funders such as the USAID (United States Agency for International Development) and the World Bank that have insisted on the formation of water users associations in their projects as a condition for financial support in their lending projects (Brewer et al. 1999).[1] Also prominent in its influence was the Ford Foundation that provided financial support for Action Research on effecting management turnover and was keen on replicating the Philippines model of management turnover.

Command Area Development Authority
CADA set up outlet committees in a number of CAD projects in 1982-84. It undertook experiments in involving farmers for distributing water and solving disputes in Girna and Mula Projects through Pani Panchayats (water management committees) at the level of the Minor (Lele 2000). CADA initiated pilot projects in Khadakvasla and Jayakwadi Irrigation Projects in response to the guidelines issued by the Ministry of Water Resources in 1985 and 1986.

Factors driving PIM in Maharashtra

The PIM process in Maharashtra started much before that in Haryana.[30] Maharashtra has a policy called Participatory Irrigation

Management as expressed in the PIM guidelines formulated by the Government of Maharashtra through its policy resolutions of 1992 and 1994. A listing of these provisions is provided in Box 3.3.

BOX 3.3 Guidelines for formation of WUAs

In March 1994, the Cooperatives Department issued a set of guidelines for the registration of canal WUAs. The main ingredients of the policy for forming WUAs in the state are as follows (Pant 1999):

1) *Unit of IMT.* The primary unit of IMT is a minor comprising about 200 to 300 farmers covering about 300 to 800 hectares. The Water Users Association at the minor level is a formal organisation registered as a water users' society under the Cooperative Societies Act, 1960.
2) *Eligibility Criterion.* At least 51% of beneficiaries or 51% of the Culturable Command Area of the minor is the eligibility criterion for the registration of the WUA.
3) *Memorandum of understanding (MOU).* MOU is an agreement between the WUA and the Irrigation Department, which specifies rights, responsibilities and functions on either side.
4) *Volumetric Supply.* The Irrigation Department supplies water to the farmers on a volumetric basis. Water quota for each cropping season is fixed, based on a normal water supply, and is entered into the MOU.
5) *Freedom of crop choice.* The WUA has the freedom of growing any crops within the sanctioned quota.
6) *Use of surface and groundwater.* According to the Provisions of the Maharashtra Irrigation Act, 1976 the canal and well water can not be used on the same area. The Act envisages a distance of at least 3 meters between channels conveying water from wells. Since WUAs are charged on a volumetric basis, the government does not levy any additional fees on the groundwater exploitation by the farmers.
7) *Maintenance Grant.* The Irrigation Department gives a grant of Rs 20 per hectare to the WUA; in addition, WUAs can charge additional fees or service charges from the water users.
8) *Payment Rebate.* An incentive of 5% rebate is given by the Irrigation Department to the water users association on timely payment of the bills.
9) Rules for distribution of surplus or deficit water. They are framed in the MOU.
9) Multi-Purpose Cooperative Societies. The WUAs are designed to be multi-purpose cooperative societies and can undertake other allied activities that may promote agricultural production and increase incomes of the members.

(Box 3.3 continues)

Other Irrigation-related laws and Acts in the state

The current irrigation policy for Maharashtra is the result of numerous legislative acts. Among these acts are the 1934 Bombay Canal Rules, the 1967 Maharashtra Irrigation Act, and the 1867 Bombay Irrigation Act.
The implications of the provisions of these acts are as follows:

1) In command areas, irrigated land is designated as either groundwater-irrigated or canal-irrigated. Areas irrigated with canal water may also receive ground water if canal supplies become short. The farmer must report this use to the Executive Engineer within 8 days. The water charge in this case is 50% of the regular canal charge (Rule 18, Bombay Canal Rules, 1934). In contrast, ground water-irrigated areas may at no time be irrigated using canal water.
2) Well water transported via surface channels constructed for canal water is charged at the full canal rate (Rule 19, Bombay Canal Rules, 1934).
3) With the permission of canal authorities, a farmer may divert or pump water from natural surface drainage that originates from percolation or leakage of canal water (return flow). The water charges for such use are at par with the direct canal water supply (Rule 55a, Maharashtra Irrigation Act, 1976).
4) Irrigation water from wells located within the irrigable command of canal or within 35 m on either side is charged at 50% of the normal canal water charge (Rule 55 b, Maharashtra Irrigation Act).
5) Any person planning to construct a well in an irrigation command is required to inform the canal authorities of his intentions, or he may be penalised (Rule 105, Maharashtra Irrigation Act, 1976).
6) The irrigation of perennial crops with canal water is restricted as follows:
7) In major irrigation systems, the area planted in sugarcane, a heavy-water consuming crop is limited to 1/4 to 1/3 of the total command area. This restriction, popularly known as the X limit, does not apply to sugarcane grown exclusively with well irrigation (Form II, Condition 1, Bombay Canal Rules, 1934);
8) In minor irrigation projects it is not feasible to irrigate perennial crops with canal water since water can not be assured on a year-round basis.

In practice, adherence to the rule requiring a farmer to inform the irrigation authorities of his plans to construct a well in the command area depends on other financial factors. If a farmer is using his own money to

(Box 3.3 continued)

construct a well, he often does so without seeking permission. However, if the farmer approaches the Maharashtra Cooperative Land Development Bank (LDB) for a loan to construct the well, the bank must first do a hydrologic feasibility study of the well site. Depending on the results of the study, the well may or may not be financed. LDB loans are special long-tem, low-interest loans. A farmer has the choice of obtaining a higher cost loan from another bank in which case the well may not need to meet any hydrological conditions.

The PIM guidelines mentioned above have been developed from many sources and have many different influences (Brewer *et al.* 1999; Pendse and Bhogle 1994). These include actions from a number of actors -funders as the World Bank and the USAID, the experience and lobbying by NGOs, and a traditional heritage of cooperation in the state, exemplified by the Phad system and lift irrigation. Some benefits of WUA formation have also been demonstrated to the farmers and the Irrigation Department.

A history of policy developments

The introduction of WUAs in the Maharashtra irrigation debate stems from the 1930s. Among the many suggestions made by the 1938 Irrigation Inquiry Committee, chaired by Sir M Visvesvaraya, was the establishment of co-operative societies or water Panchayats, one for every ten mile section of a canal, for efficient and equitable distribution of water (SOPPECOM 1997). The irrigators of all the villages that constitute a canal section would choose these Panchayats. The water Panchayats would decide the water cess once a year. The committee also recommended sale of water on a volumetric basis to the user groups at the distributary level once in a year.

About 25 years later, the First Maharashtra Irrigation Commission endorsed the 1938 Committee's recommendations. The Commission built on the Committee's recommendations, emphasising that it would be obligatory for all farmers to become members of the organisation. It also recommended that the co-operative structure should be built up from the distributary level to the divisional level.[31]

In 1982, the High Power Committee, under the Chairmanship

of Shri Suresh Jain again stressed the need for turning over O & M to the farmers' organisations (Lele 2000; SOPPECOM 1997). It reiterated the need for farmers' participation and suggested establishment of farmers' societies. In 1985, the Ministry of Water Resources, Government of India, issued a circular to state governments emphasising the need for collective efforts by farmers for water management in a distributary or minor on irrigation projects commanding an area of 500-1000 ha. It further suggested that Non-Government Organisations should be persuaded to take up the work of organising farmers for this purpose. The Ministry agreed to finance the expenses, on a 50:50 basis, in collaboration with the concerned states. In this backdrop, in 1987, an NGO called CASAD, the Centre for Applied Systems Analysis in Development, decided to take advantage of the Ministry's offer to launch an Action Research Programme on the Mula Irrigation Project. This was done in collaboration with the Irrigation Department, Government of Maharashtra (Lele and Patil 1994).[32]

In 1996, the study group appointed by the GOM for recommending the 9th Plan proposals in the irrigation sector estimated that, at the minimum, 2000 societies should be initiated and complete turnover of water management effected to these societies by the year 2002. It also suggested that action should be taken to establish federal and apex bodies, so that water management at the project level as well as lower levels is handed over to the cultivators.

Tradition of co-operation in other sectors

The state has an active history of co-operation in several other sectors such as lift irrigation, sugarcane, dairying, forestry, and watersheds. With a successful history of the co-operative movement, there is a well-developed pool of leadership at the village level.[33] The state has seen rapid institutional innovation and variety, as well as experimentation (Apte 1995; Chopra 1995). Even among cooperatives of the same general type, there is a great variety of organisational patterns (Attwood and Baviskar 1995a, b).

The state has had a tradition of cooperation in the lift irrigation sector since the 1950s (Brewer *et al.* 1999; Palakudiyil 1996). Lift Irrigation Co-operatives (LICs) have been established with the support of the cooperative sugar factories. They have worked in

close co-operation with the Irrigation Department over a considerably long period of time, providing an example of such cooperation.

In lift irrigation co-operatives, the Irrigation Department sanctions the withdrawal of water from a river, or, in some cases, from a tank. It charges the LICs for water used and collects the same from members. The management of these systems requires financial skills to repay construction loans, to pay water fees, and maintain the systems. Though no Irrigation Management Transfer is involved, the existence of Lift Irrigation Co-operative societies served as an example of farmers' ability to manage their own systems, as well as an example of a partnership between the farmers and the Irrigation Department (Brewer *et al.* 1999). The Lift Irrigation Cooperatives provided the justification and an initial model for the registration of other types of WUAs by the Cooperatives Department.

Similarly, the phad system is a form of farmer managed irrigation prevalent for about 400 years in the Southwest parts of the state.[34] The existence of the system is often used as a justification to promote the introduction of PIM initiatives. " These systems have been a part of the livelihood of farmers; thus the management discipline for system operation and other activities have merged with the local way of life. Equitable distribution of water shortage and conflict resolution are internally managed. Such aspects of phad irrigation are, therefore, worth considering for adoption in other irrigation projects (Pendse and Bhogle 1996: 40). " The existence of small-scale farmer managed irrigation systems over centuries has prompted a consideration of the potential of farmer management in large scale canal irrigation systems.

Role of NGOs

There is a rich tradition of NGOs active in a number of natural resource management activities, mobilising local level action for resource conservation (Pendse and Bhogle 1994). There is a wide presence of NGOs scattered through the state, such as Marathwada Sheti Sahaya Mandal in Aurangabad, Vanrai in Pune, Manav Lok in Ambejogai, Beed district and Samaj Prabodhan Sanstha in Pune. They are actively engaged in a wide range of rural development programmes, including watershed development.

Social workers like Vijay Borade of Adgaon village and Anna Hazare of Ralegaon Siddhi village have been known for their efforts in organising farmers in the activities of water and soil conservation, social forestry and watershed management.

In the canal irrigation sector, the pilot experiments by two NGOs, SOPPECOM and the Samaj Parivartan Kendra, have made a significant contribution. As noted earlier, the efforts made by SOPPECOM in transferring management to farmers on one of the minors of the Mula Project became the basis for a set of guidelines later issued by the Co-operatives Department for transferring management to water users associations. What is interesting, however, is that only two NGOs have been involved in the canal irrigation sector, while several NGOs have been involved in many other sectors. This issue is discussed further below.

Donor pressure

Another important factor has been donor interest and pressure. In certain aided projects undertaken by the Government of Maharashtra such as the Maharashtra Water Utilisation Project aided by the World Bank and the Maharashtra Minor Irrigation Project aided by the USAID, the formulation of guidelines for the formation of WUAs has been incorporated (Kulkarni and Kulkarni 1994).[35] "Thus in a way, the draft agreement ... as well as certain procedures to enhance farmers' participation in managing minor irrigation schemes are the outcomes of these projects (Kulkarni and Kulkarni 1994: 60)." There was also an influence of the Philippine model of management transfer, popularised by the Ford Foundation.[36] The foundation supported visits of government officials to the country and gave financial support to the NGOs in this sector for organising farmers for management turnover.

Benefits to the Irrigation Department

The formation of the WUAs results in some benefits to the Irrigation Department. Many field level officers of the Irrigation Department admitted that it lowers the administrative burden. It

has the potential of improving the collection rate of irrigation charges. They presented this as an argument in favour of management turnover. In fact, for the Irrigation Department, ending shejpali does reduce the paper work and field enforcement needs (Brewer *et al.* 1999). Under shejpali, only about 65% of the water rates are collected. The reason is that the shejpali system applications process through which the water rates are collected is extremely difficult to enforce.[37] Volumetric rates for WUAs, on the other hand, are easier to enforce and cheaper to collect. Since farmers take over the operation and maintenance of lower level field channels, it reduces the involvement of the Irrigation Department in administrative aspects of the operation of shejpali.

Another indirect benefit has been the greater political acceptability of water rates for irrigation (Brewer *et al.* 1999). Till 1990, the water rates that prevailed were those of 1974. In the early 1980s there were some efforts to raise the rates. Farmers complained to politicians and these efforts failed. In a more recent move, the 1991 rates were doubled by progressive increases from 1990 to 1994. No outcry from farmers took place.[38] If recovery improves gradually and subsidies are cut, it could reduce the financial burden on the Irrigation Department (Brewer *et al.* 1999).

Benefits to farmers

There are several benefits of WUA formation to the farmers that provide a justification for turnover. These benefits stem from the provisions of the Memorandum of Understanding that is signed between the water users association and the Irrigation Department (See Box 3.2). First, the farmers, as a group, have a guarantee of a particular amount of water for the period of the MOU, and control over the scheduling of the delivery of water. Water that is saved in the rabi season can be shifted over to the hot weather season. Second, restrictions on crops, such as sugarcane, vanish, except where waterlogging threats exist. Restrictions on ground water use disappear. Farmers apply for water to the WUA instead of to the Irrigation Department, which reduces the hassle of travelling to the Irrigation Department for filing their applications. Further, volumetric charges are lower than average crop area charges and much lower than crop area charges for sugarcane. Farmers get a 5% rebate on timely payment.

The other benefit that accrues, both to the farmers and to the Irrigation Department, is in terms of improved maintenance (Brewer and Sakthivadivel 2000). WUA establishment is shown to have improved the maintenance of irrigation infrastructure and to lower the costs to the Irrigation Department by putting resources in the hands of the farmers and giving them flexibility in using them. It is argued that WUAs have better information and more flexibility in maintenance planning. A WUA can put in more maintenance effort per season, and is not bound by slow government funding and approval processes.[39]

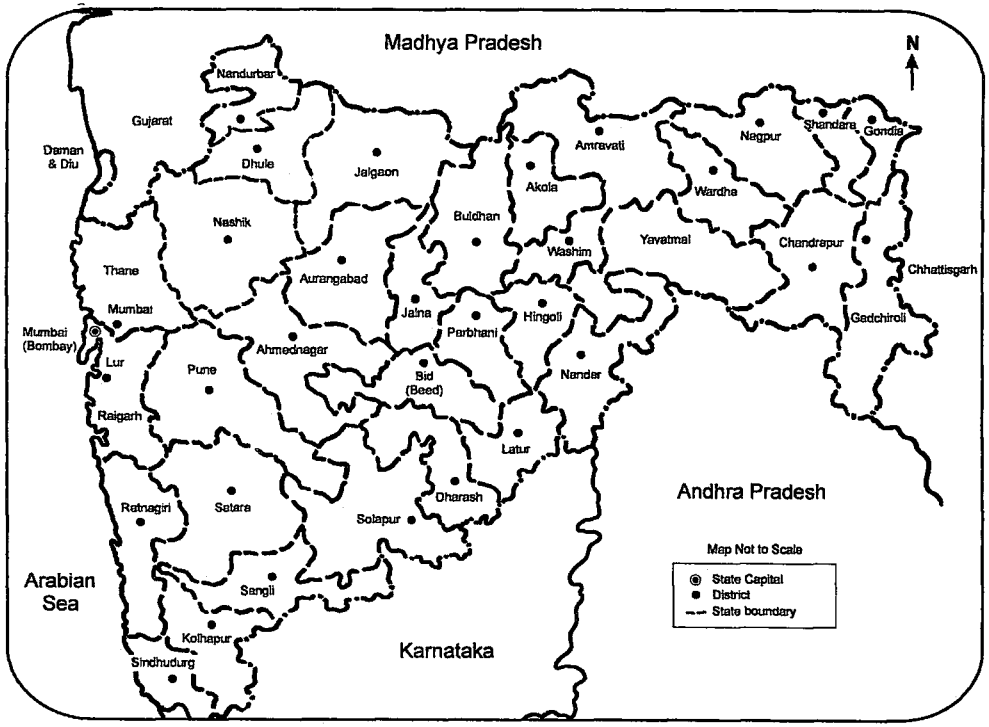
An assessment of IMT in Maharashtra (Pant 1999), based on a study of 23 WUAs spread through the state, concluded that water user associations have done well on three fronts. First, they have increased the irrigated areas in their commands using less water. Even in such WUAs where more water has been used after the IMT, the per unit water use efficiency is found to be higher. The second front on which WUAs have done well is the revenue from water charges. Recovery has improved after the IMT. At the same time, the WUAs have been charging a much higher amount from their water users. This is considered a good sign since it would enable the WUAs to accumulate funds for the maintenance of microstructures relating to conveyance of water at the WUA level. The third redeeming feature is that the WUAs are running on profit. The shift to volumetric pricing of water is causing farmers to think more about saving water (Brewer *et al.* 1999).

However, even though benefits to farmers as well as the Irrigation Department have been well demonstrated, they have not had a significant effect on expansion of the number and coverage of WUAs. I return to the analysis of the underlying factors later in this chapter, when I describe where the breaks are located.

Progress in establishing WUAs

Two WUAs had been registered in Ahmednagar and Sholapur districts but they remained islands in the larger irrigation scene and were not replicated (SOPPECOM 1997).[40] In 1987, CASAD, the Centre for Applied Systems Analysis in Development, decided to organise a WUA in the Mula Project with funding from the Ford Foundation and support of the Irrigation Department. In 1991, the SPK, the Samaj Parivartan Kendra, took the lead in initiating 3 WUAs

District Map of Maharashtra



MAP 3.2

in Nashik and some officials from the Irrigation Department of the rank of Deputy Engineer established a couple of societies in the Marathwada region.[41] WUAs have been formed by some other scattered efforts of the Irrigation Department officers in Aurangabad, Jalna and Parbhani districts (Map 3.2).

By March 1997, 124 societies had taken over the management of irrigation functions and 410 were at various stages of registration, signing of MOUs and takeover. As per the records of the DIRD, Pune, as of September 1, 1999, in all, there were 693 water users associations, spread over 252, 566 ha, covering about 6% of the command area, at different stages of operation, registration or functioning. Of these, 236 WUAs had taken over the management of irrigation systems, covering about 89,245 hectares. 55 WUAs, covering 19,322 ha, had made the agreement but did not have the systems turned over yet. 222 WUAs, covering 78, 969 ha, were only registered. 180 WUAs covering about 65,030 ha were in the 'proposed' stage.

This number rose marginally in the following year. As of September 1, 2000, in all, 721 WUAs were at various stages of formation, or working, covering a Culturable Command Area of about 258,318 hectares. Of these, hand over had been completed on 247 water users associations, covering a Culturable Command Area of 91,619 hectares. The MOU was signed on 66 WUAs (but hand over had not yet been effected), covering a Culturable Command Area of about 23, 546 hectares. 241 WUAs had been registered covering about 84527 hectares and 167 Water Users Associations were in the proposal stage, covering about 58, 626 hectares.

SOPPECOM tried replication of WUAs and the eventual scaling up into a federal society at the Distributary 4 located at the tail of Branch 1 of the Mula Right Bank Canal. However, the effort did not take off. SOPPECOM attributes it to the lack of support from the Government. (I discuss this further below). At Ozhar, there have been some efforts at federating WUAs, but these have been to form a federation where there is a forum to negotiate over common issues. This is a federation of 75 water users associations on the Upper Godavari Project. This is essentially to form a pressure group. The federation was formed in 1996.[42]

The process of implementation of PIM reforms in the state

The analysis in the preceding sections seems to suggest that there should have been rapid efforts at replicating WUAs in canal irrigation, and there are many factors that seem to make the environment conducive to this development: a tradition of co-operation in many agrarian sectors, a history of policy developments favouring the establishment of WUAs, a vast resource of astute leadership and demonstrated benefits to both farmers as well as the Irrigation Department. In the section of the chapter that follows, I examine why progress in WUA establishment in the state has been limited, in spite of these factors.

Fragmentation of roles of different actors

A number of Departments are involved in the formation of Water Users Associations in the state; the Irrigation Department of the Government of Maharashtra, the DIRD and the Cooperatives Department (see Box 3.2). The involvement of a large number of actors and the fragmentation of roles among them not only breeds room for ambiguity, but some times also make it difficult to fix responsibility. A tendency among many of the officers is to shift responsibility for poor implementation on each other, without accepting any real responsibility on their own. Similarly, a common tendency at different levels within the bureaucracy is to hold another level responsible, as if it were helpless on its own.

Field level irrigation officers feel that the DIRD needs to play a more active role beyond its present monitoring and recording role. The perspective of the management at the DIRD, on the other hand, is that the motivation for forming water users associations should come from the farmers or from the Irrigation Department, especially the lower level bureaucracy. At the lower levels of the bureaucracy, it is felt that the drive for PIM should come from the higher levels so that there is a reflection of a commitment to the process. This is a call on hierarchy.

A tug of war

My own observation of the PIM process in the state has been that

there is a constant tug of war between the state government and two NGOs, SOPPECOM and the SPK, that have been engaged in forming WUAs. The NGOs insist that there is preparedness among farmers for PIM to take off. Officials of the State Irrigation Department and the Directorate for Irrigation Research and Development (DIRD), on the other hand, while in principle accept the need for PIM, show resistance to its implementation.[43] The justification presented by the Irrigation Department and the DIRD is that funds are inadequate for repairs and maintenance that has to be carried out prior to the hand over of systems to farmers. They also feel that there is insufficient demand for PIM.

A senior member of the academic community that I interviewed felt that a trump card in the hands of the bureaucracy is that if there were enough demand for PIM, it would have taken off by now. That it hasn't shows that the level of dissatisfaction with the bureaucracy is not that high. NGOs that are pushing for Irrigation Management Turnover, on the other hand, feel that the bureaucracy has clearly failed in its task of providing adequate, reliable and timely supply of water (SOPPECOM 1997).[44]

In fact, there *are* many reflections of the half-hearted approach of the Government of Maharashtra to the process of PIM. Firstly, there is no clear-cut legal backing for PIM, barring a set of policy guidelines. In the state of Andhra Pradesh, on the other hand, the FMIS Act (1997) makes it legally mandatory to form water users associations.[45] In Maharashtra, however, the formation of WUAs is backed only by the guidelines issued by the Cooperatives Department. This does reflect a lack of seriousness on part of the state government in terms of how keen it is to go ahead with a reform agenda.

Though the state government has adopted the PIM concept, as also emphasised in the National Water Policy (1987), critics feel that the Irrigation Department officers still view it as little more than a pilot activity. This was also my own assessment of the process.

As also noted by Mollinga (2001b), policy development on this front has come to a virtual stand-still in Maharashtra since the mid-1990s. In the neighbouring state of Gujarat, on the other hand, the Government of Gujarat has passed several resolutions to the effect of legitimising PIM. Gujarat is now on the verge of drafting its own Act for PIM, on the lines of Andhra Pradesh.

Resistance among the bureaucracy: delays in implementation and lack of funds

In Maharashtra, the IMT model aims at changing control relations between the users and the bureaucracy, by handing over control over outlets and operating devices at the level of the minor. This amounts to a significant change in control relations and an altering of the balance of power between the two actors.[46]

As a reform strategy, the bureaucracy implements PIM. The bureaucracy is involved in implementing a policy that results in a diminution of its own status, role and importance. This, in itself, tends to slow down the pace of reform. Though in principle, the bureaucracy admits to the need for PIM, it also reveals some resistance to change. This resistance is stronger at the lower levels of the bureaucracy that fears a loss of control, power or of jobs. At the higher levels of the bureaucracy, this finds expression in the inconsistent behaviour of the Irrigation Department, delays in rehabilitation of projects and intermittent withdrawal of support to effecting management turnover.[47]

As noted above, in some parts of Maharashtra, WUAs have been formed through the efforts of the Irrigation Department officers; this has happened in Aurangabad, Jalna, Parbhani and Nanded districts.[48] Here, too, the rehabilitation of projects took a very long time, about 1 to 2 years after registration. This delayed the signing of Memoranda of Understanding. The reason cited by the Irrigation Department has been the non-availability of funds. Similarly, along Distributary 4 of the Mula Right Bank Canal (MRBC), a proposal to form six WUAs found ready acceptance by the farmers (SOPPECOM 1997). However, because of the paucity of funds, rehabilitation could not be completed even after registration and signing of the MOUs. Five out of six WUAs decided to take over the management even without rehabilitation after the drought of 1994-95. One resolved to take over the following year. Finally, the MOU was executed in 1997.

Monitoring and accountability issues

A consequence of the somewhat erratic behaviour from the side of the state government has been that a demand for greater accountability of the government has been building up from the NGO sector. It is felt by the NGOs that appropriate techniques of monitoring have to be devised to cover the relevant issues in PIM

(SOPPECOM 1997). This task of monitoring, further, it is felt among the NGOs, should be handed over to an external agency, such as the Planning Board or Planning Department.

SOPPECOM had suggested that steering committees should be formed comprising NGOs and government officers to monitor the progress of water users associations. However, till the period of my fieldwork, there had been no progress on this front. Even after the experience of forming the water users association on a minor of the Mula Canal, SOPPECOM alleges that the procedure for registering the WUAs has not been simplified. SOPPECOM also furnished the necessary details on benefits of forming a federal society, but an agreed meeting between the SOPPECOM and the Government of Maharashtra (GOM) did not take place. A valid criticism of the process of PIM in the state is that in the absence of a consistent policy on this front, much is left to the whims and fancies of concerned officers.

What role for NGOs?

While NGOs have potentially a powerful role to play in organising management turnover, and in Maharashtra, while they have played such a role, they are constrained in their ability to produce reform on a larger scale than a local level. Further, in the absence of a consistent policy and support for NGO led research and action, the scale of even this activity in the state has been limited.[49] Another critique of the role of NGOs is that they have made little effort to strategically influence policy reform (Mollinga 2001b). They focus fully on farmer organisation for water management. There is little effort to involve the users in advocacy or policy formulation; users remain mere recipients of the policy initiatives, but are not involved in their formulation.[50]

One reason cited for the limited presence of NGOs in the sector is the perception among the NGOs that irrigation is the domain of the rural elite- a small section of large, powerful farmers, who have pre-empted the benefits. NGOs are reluctant to support such a section.[51] The other important reason cited for the limited presence of NGOs is that relatively little financial support is available for research and catalysing action in the canal irrigation sector. While there are many NGOs involved in other natural resource management activities, they all look up to external sources

of funding, including the central government; such resources are scarcely available for canal irrigation. Another weakness in the policy environment that was cited by a member of the academic community is that there is no clear-cut policy on the role of NGOs in the PIM process. This has resulted in only two NGOs being involved.

Factionalism among farmers

Another impediment is that WUAs have become heavily politicised. This point emerged during several discussions with government officers, the Irrigation Department and other observers of the PIM process. The fact that farmers owe their allegiance to different political parties acts as a deterrent to their coming together. Another aspect of the factionalism is non-political: there is a vested interest among a lobby of the farmers that resists the reform effort. This resistance comes from the larger, influential farmers who are in a strategic position to manipulate water supplies in their favour. They resist the effort because it threatens the *status quo.*

This observation was made twice in the course of my fieldwork. It was once made in my own experience with the Mula Minor No.Y. One of the reasons why efforts at WUA formation did not take off was that the efforts were resisted by the large and powerful farmers who could bribe the Paatkari to get water when they needed it. Since both tended to gain from the *status quo*, it dampened the effort at WUA formation. Second, I learnt from my interactions with SOPPECOM that it had once received a threatening letter from an MLA, a large sugarcane grower, to "stop all this PIM business", since he had always got water without paying for it. The formation of a WUA creates a relationship of mutual accountability among farmers as well as the bureaucracy. This tends to be evaded by those who benefit from the *status quo.*

An obstacle cited by the Irrigation Department is the reluctance on the part of farmers to contribute financially. Farmers have to deposit a share capital, but they do not do so. Essentially, the formation of WUAs creates a relationship of mutual accountability, which farmers seek to evade "...by forming a society, the member farmers will be required to pay irrigation charges regularly, something which they can avoid by not forming a

society (Pendse and Bhogle 1994:48). " For the reasons described above, the formation of water user associations is evaded by both sides, as to what could otherwise be a forum for dual accountability.

Conclusion

Thus, in Maharashtra, on the one hand, NGOs, multilateral organisations and donors have been pushing for management turnover. On the other hand, there has been some resistance among the farmers as well as the bureaucracy that gain from the *status quo*. While NGOs have been successful in their efforts, they are constrained in their ability to produce reform beyond a local scale. It is because of the resistance among these actors, and the half-hearted interest in the state government that the progress in WUA establishment has been limited.

A Comparison with Other States

In this section, I compare the experiences of Haryana and Maharashtra with that of other Indian states where PIM initiatives have been made and policies for establishing WUAs are at varying levels of formulation and implementation. The comparison is written from a perspective of what these two states could learn from the experiences elsewhere in the country, as well as where their experiences depart from, or align with experiences elsewhere.

As noted in chapter 1, 13 states in India have adopted policies or laws that seek to establish WUAs (Ballabh 2002). There is significant variation in the extent, processes adopted and the outcomes of Irrigation Management Transfer in the country.[52] However, broadly two models can be distinguished (Parthasarathy 1998). The first is the top down approach of Andhra Pradesh where 10, 292 WUAs were sought to be created at one go over the entire command area of the state with legal backing and political support. The second one is the bottom up approach in states like Gujarat and Maharashtra where the process has been slow and gradual, with NGOs piloting and making efforts to replicate.

The exact mix of circumstances and compulsions that have promoted PIM initiatives or urged state governments to introduce

PIM reforms have varied from state to state. However, broadly, they have been driven by pressure from funders and donors as the World Bank and the USAID, an urge to reduce the financial burden on state governments and through some interest and lobbying on part of non-government organisations. A strong influence of PIM 'models' is also evident (Mollinga 2001b). In the 1980s, this was the "Philippines model", popularised by the Ford Foundation, that funded visits to that country. More recently, this has been the "Mexico Model", popularised by the World Bank, that is keen on its replication elsewhere.[53]

An emphasis on "farmer participation" has also been part of a philosophy of development where "decentralisation" and "empowerment" have been powerful buzzwords. These dimensions of water management have received emphasis in national level policy statements such as the National Water Policy of 1987.

While the cases described in this section do tell us about the experience in the individual states, they are reflective of the general approach to WUA formation in India. The process of WUA formation has been a slow and haphazard one, driven largely by the availability of external financial resources for state restructuring programmes (Ballabh 2002). Powerful groups and sections of the irrigation bureaucracy have tended to maintain the *status quo*. What seems lacking largely, and has been somewhat missed, is a stronger reflection of what the formation of water users associations itself should achieve. Further, the *modus operandi* of irrigation reform itself has come to be seen as the formation of water users associations, with little clarity on how WUA formation would bring about irrigation reform.[54]

While in some other countries such as Mexico, the establishment of WUAs was part of a broader agenda of neo-liberal reforms in the wake of the past dissatisfaction with the overengagement of the state in several sectors, in India, that integration of the irrigation reform process with overall efforts at structural transformation has not happened. WUA establishment has been an *ad hoc*, haphazard activity, isolated from mainstream efforts at agrarian change, social transformation and development.

Andhra Pradesh

In 1997, Andhra Pradesh became the first state in India to legislate

on farmers' participation in the management of irrigation systems (World Bank 1999b). 10, 292 WUAs were created covering the entire command area of the state with political backing and legal support. This "model" has come to dominate the international limelight, right next to the experiences of Turkey and Mexico.

A three-fold rise in the price of water, physical rehabilitation of systems and the creation of accountability relationships by making the irrigation bureaucracy accountable to the WUAs have been ingredients of an overall reform strategy in the state. This is clearly a strong contrast with the Haryana case described above. The Andhra "model" is significant in that it aims at reform of both irrigation management at system level and at the agency level (Mollinga 2001b). Its strengths are that it devolves real powers to users, links availability of management funds with water rates collection and raises water rates to make the sector financially viable. WUAs have also been federated at the distributary level.

While there has been much euphoria on the process of PIM in Andhra Pradesh, driven and reinforced by the international limelight that it has received, one critique has been that its benefits have not extended beyond the head-reaches (Jairath 1999). To realise its full potential, Jairath argues that much more attention needs to be paid to the redistributive implications of reform. The emphasis has been purely on 'supply side' improvements aimed at physical rehabilitation to improve the availability of water. These efforts need to be supported by demand side management that could have redistributive effects by releasing water for use at the tail-reaches. This would require, among other things, a switch to low water consuming crops through a mix of new technologies and market and non-market instruments directed at inducing water savings.

We also still know little about the organisational dynamics of water users associations in the state and how other small and marginal groups take part in them or are affected by them (World Bank 1999b; Mollinga 1998a). Further, as in other states, farmers have been recipients of the reform policy, and have not been involved in the policy formulation process itself (Mollinga 2001b). A welcome development, however, is that as part of addressing 'second generation' problems, policy implementation managers are talking more of consultation and negotiation with farmers to drive the reform process further. This could be seen as a sign that the policy formulation process itself is maturing and going through a

process of evolution.

Gujarat

Several factors have given a thrust to PIM initiatives in Gujarat (Brewer *et al.* 1999). Among them are a consideration of reduction of costs to the state government, elimination of the administrative burden of the shejpali system, and the demonstration effect of the success of PIM efforts in other countries. Notable particularly has been the influence of the Philippines model, popularised by the Ford Foundation that sponsored several trips of the State Irrigation Department and other officials to the Philippines and extended support to NGOs in establishing WUAs. Also in the league of those promoting and supporting reform have been the USAID and the World Bank.

As in other states, here, too, the influence of national level policies such as the National Water Policy of 1987 has been important. The activities of NGOs in organising user groups for management of natural resources in other sectors-lift irrigation, ground water and forests- have demonstrated the capability of farmers to manage resources effectively. More lately, NGOs have succeeded in lobbying for change and urging the Government of Gujarat to pass a series of resolutions, starting in 1992, to effect management turnover.

A distinguishing feature of the PIM process in Gujarat has been the reliance on Process Documentation Research (PDR) (Shashidharan 2000; Parthasarathy 2000). PDR was carried out in 6 of the 13 pilot projects in the state (Parthasarathy 2000). Two research and academic institutes - the Institute of Rural Management, Anand (IRMA) and the Gujarat Institute of Development Research, Gandhinagar (GIDR) -undertook field research on the pilot projects undertaken by NGOs. Commissioned by a High Level Working Group, this process gave feedback that fed into mid-course corrections.

PDR reports served as a major source of identifying administrative and policy bottlenecks in the PIM process (Shashidharan 2000). This process provided a strong basis for further improvements in policies and procedures to create an enabling policy environment. This has relevance both for Haryana as well as Maharashtra, and should be seen as a welcome move

from the usual obsession with quantitative targets that are typically resorted to by bureaucratic agencies to show their progress in promoting participation of farmers in their programmes. Further, this exercise presents a good example of a collaborative effort between NGOs and the academic and research community.

The approach in the state, as in Maharashtra and unlike that in Andhra Pradesh, has been a pilot approach. NGOs hire community organisers, who organise farmers, mobilise local support and negotiate with the Irrigation Department for reform. Here, too, farmers have been the recipients of reform, rather than those asking for it. This is an interesting contradiction. Much like Maharashtra, this state has been known for its history of institutional innovation. Different institutional forms have come up on their own, ranging from water markets to tubewell companies and lift irrigation co-operatives, well before their significance and potential was acknowledged outside the state, and by the international community (Shah 1997; Shah and Bhattacharya 1996). In a state known for a tradition of self-emerging water institutions that replicate steadily, that they have not come up in the canal irrigation sector throws up an interesting question mark.

In Gujarat, as in Maharashtra, NGOs have demonstrated the feasibility of a farmer-centred management system. However, this is not sufficient to ensure a scaling up of PIM (Shashidharan 2000). NGOs have proved their ability to experiment and come up with good results, but there is no evidence yet to demonstrate their ability to operate on a sufficiently larger scale. In both these states, the slow and gradual approach of NGOs has meant that it would still take a long time to accomplish a significant coverage of the command areas of the respective states under PIM initiatives.

My own assessment about Gujarat was that there is a questioning of the role of NGOs in the PIM process: that is, should NGOs pursue steady efforts at forming and replicating local level resource user organisations in canal irrigation, or should they seek to inform policy change.[55] There is now a new focus within the NGO sector in the state on policy advocacy and dissemination, and training of farmers and irrigation engineers, where earlier this focus was mainly on creating and replicating local level resource user organisations.[56]

Where the Gujarat experience differs from the Maharashtra experience is that in the former, NGOs, by pursuing advocacy and pressing for reform, have succeeded in making the Government

pass a series of resolutions.[57] In Maharashtra, on the other hand, as also noted earlier, policy development has come to a virtual standstill since the mid-1990s (Mollinga 2001b). Further, unlike Gujarat, Maharashtra has successfully experimented with volumetric supply of water to user groups. However, with the slow and gradual pace of reform, both states face a problem of replication and expanding the scale of reform.

Karnataka

In Karnataka, as in other states, reform has been driven by a mix of factors: compelling budgetary constraints, reform conditionalities attached to loans for the Upper Krishna Project from the World Bank and the evidence from PIM initiatives in other states, particularly Maharashtra and Andhra Pradesh (Mollinga 2001b). There has been some disenchantment with the bureaucratic top-down approach of the Command Area Development Programme, with about 200 WUAs existing on paper. Further, the process has received some thrust forward through the formation of *Sahayog*, an NGO, to serve as a platform for debating reform proposals and negotiating for further reform.[58]

However, the speed of the process has been very slow and the scope of changes proposed by the Government very limited. Introduction of reform has been sought through the Proposed Amendment Bill to the Irrigation Act of 1965. The Amendment Bill proposes registration of water users societies under the State Co-operative Act of 1960 and registration of water users associations at four levels of the system. Critics of this provision argue that by providing for the registration of the water users' co-operatives under the State Co-operative Act, it gives very little autonomy and freedom to the users and confers a great deal of control with the state government. Essentially, this proposal gives more powers to the state government than it gives to the farmers, and the spirit of the proposed reforms does not promote a genuine devolution of powers to user groups.

The spirit of reform here seems somewhat similar to that in Haryana: form water users associations, but retain real powers and control with the bureaucracy. However, where the Karnataka experience provides some learning, as also that of Gujarat, is in the emergence of a platform where feedback on the policy process is

sought, through NGOs and farmers' organisations, and actors get an opportunity to negotiate before driving the reform process further. The response of farmers to whether they would be interested in such a policy change has been positive (Mollinga 2001b).[59] The evolution of such a forum has potential learning both for the states of Haryana as well as Maharashtra, and generally for other states where efforts at WUA formation are at different levels of development.

Conclusion

At the level of the content of the policy, the critical difference between efforts at WUA formation in Haryana and Maharashtra is that they seek to accomplish very different levels of change in control relations. In Maharashtra, control over system operation is transferred to farmers who enter into a contract for volumetric water supplies. In Haryana, control is centralised, with the bureaucracy, while farmers perform some functions in supervising lining of watercourses. Further, in Haryana, the policy resolution for WUA establishment has been the outcome of a more prescriptive approach that has received a push under a programme funded by the World Bank. In Maharashtra, there has been more of a process at that level itself, prior to the evolution of the PIM guidelines, in terms of NGOs organising farmers, negotiating and pressing for turnover, and making efforts to federate and replicate. However, there is much similarity in the experience of the two states as regards the implementation of the policy interventions. This process is characterised by the presence of resistance among the concerned actors and the poor availability of financial and material resources to carry out the reforms.

The main critique of the reform process in Haryana is that it is hardly a reform process. WUA establishment has been carried out below the outlets, while the more pressing challenges are above the outlets. Another critique is that there has been no redefinition in the role of the Irrigation Department. In Maharashtra, the model for WUA formation is much more ambitious as a reform strategy. However, there are forces of resistance among vested interests that gain from the *status quo* and resist efforts at WUA formation.

These issues get further strengthened in the following chapters. That the policy intervention for forming WUAs aims at different

levels of changing control relations in the two states comes out in chapter 4, when I compare the case of two WUAs, one in each of the states. Chapter 5 describes further the processes of local water management in terms of the internal dynamics of the water users association. What happens after the WUA has been formed? That chapter shows that local level governance structures can be autocratic. PIM is not necessarily about community management.

Notes

[1] Initially, the farmers were required to pay part of the costs of lining. Since the 1980s, the cost has been fully subsidised by the state (Brewer et al. 1999).

[2] The World Bank-assisted Water Resources Consolidation Projects are under implementation in the states of Haryana, Orissa and Tamil Nadu (Mathur and Sibal 2000). The main objectives of WRCP are: (1) improvement in agricultural productivity through rehabilitation and completion of irrigation schemes and farmers' participation (ii) water resources planning by river basin across all uses of water (iii) assuring sustainability of infrastructure and the environment and (iv) improving institutional and technical capability of managing the state's water resources. To achieve these objectives, the thrust areas under the project include system improvement, farmers' participation, enhanced O & M of the systems, water planning, research, and environment management.

[3] The WRCP in Haryana provides support for activities in the HID for a five to six year period through to the year 2000. These activities include infrastructure planning, design and construction, improvements to operation and maintenance, environmental training and institutional strengthening as a basis for intensive water resource planning and management including a State Water Plan. The WRCP's overall objective has been to further improve performance of the irrigation sector to meet the state's water requirements. Under the WRCP, Rs. 2651 million have been sanctioned for watercourse lining with an intended impact of "water conservation, better distribution to local farmers and rural water supply sources" (World Bank 1993, page iv, Table 1). One of the important components of WRCP is improving the water delivery system at tertiary level, mainly watercourses, (WCs) by way of lining 1,500 watercourses, and rehabilitating around 200 watercourses that were lined earlier. In addition, about 50 minors are planned to be extended along with the construction of lined watercourses. It is estimated that this will cover another 200 watercourses. A total of 1,900 WCs are programmed to be lined or rehabilitated under the WRCP (GOH 1998). The programme was given an extension till the year 2001.

[4] In 1973, the central government issued instructions to the states to establish

CAD authorities for irrigation schemes (Mollinga 1998a). The CADP, of which the establishment of CADAs was an element, was supported by organisations like the USAID and the World Bank. It was funded by the central government. The establishment of CADAs was the result of the recommendations of the National Commission of Agriculture (1973) and the Second Irrigation Commission (GOI 1972). CADAs were intended to be inter-disciplinary organisations that integrated and had authority over the line departments that worked in the irrigation systems concerned. They were to focus on OFD (On-Farm Development) activities as field channel construction and introduction of Rotational Water Supply. The CADP would be a centrally sponsored scheme on a matching basis, implying that the central and state governments contribute financially in the same proportion for its implementation (Sivamohan and Scott 1992). Most states located CADAs under the Department of Agriculture.

[5] In the 1970s, there had been created a large irrigation potential of 20.70 million hectares by the end of the fourth plan period (1969-74), while the potential utilised was only 18.6 million ha (Sivamohan and Scott 1992).

[6] CADA, Haryana entered into the task of watercourse lining in 1988 on the Jawahar Lal Nehru Canal. In 1993, lining was introduced on the Western Yamuna Canal (Personal Communication, Mr. O P Daiyya, CADA, Rohtak). Before that, CADA, Haryana had been involved in other activities such as land -leveling and providing financial support for drip and sprinkler irrigation sets.

[7] One of the reasons that CADA programmes have been understood not to be successful is the absence of farmer participation in them (see also Saleth 1996a).

[8] However, that is a function that farmers have been doing even otherwise. This point is elaborated further later in this chapter.

[9] "Hand-over completed" means that after modernisation or rehabilitation, the watercourse has been taken over by the WUA for future repairs and maintenance.

[10] The difference between rehabilitation and modernisation is that under rehabilitation, the existing (watercourse) structure is demolished and a new one is put in its place. Under modernisation, an existing watercourse is simply lined. Brick lining is carried out along the sides and on the bed level of the watercourse. O & M activities refer to recurring activities of watercourse maintenance such as desilting and clearing the watercourse of weeds.

[11] Personal Communication, HSMITC Head-Office, Panchkula.

[12] In an interview with a World Bank official, the justification presented for keeping reform at this level was the size of the watercourse; it was felt that forming WUAs at a scale larger than this (100-300 ha), may not be viable. The watercourse was considered a size large enough for the formation of a WUA. Interestingly, when I tried to seek his opinion on why the state governments found the WRCP loan attractive, he refused to

comment on this, saying,..'ask the state government.. that is their domain.

[13] A related question is whether training programs for farmers for WUA formation serve as a feedback loop. That is, does CADA use any training programmes as a feedback mechanism for further improvements and development? When I asked this question to field level officials, I got different categories of responses. The first response was that training activities are the domain of HIRMI- the Haryana Irrigation Research and Management Institute- and research and evaluation is their responsibility. The second response is that training programmes come to the field offices from the head-office and it is they who do the monitoring. The third response is that "all those evaluations are done only on paper, but are not put to any constructive use". The fourth response is that the concept of WUAs is rather new and it will still take some time before a meaningful evaluation of training programmes is carried out. I could not make any further assessment than this of whether CADA used training programmes as a mechanism for feedback and monitoring.

[14] This point was virtually hammered on to the members of one of my water users associations in a training programme organised by HIRMI.

[15] See also Merrey (1996). Merrey argues that countries promoting partial turnover programmes face a serious problem: water users associations in parts of systems are not likely to become stable and effective institutional mechanisms for managing irrigation systems unless there is clear provision for mutual accountability between users and managers. "While public organizations, under various forms of pressure, have agreed to share many of the responsibilities - especially the expenses and hard work - of system management with farmer organizations, there is no significant change in the power relations between officials and farmers. Mutual accountability is absent. Officials have no incentives to foster independent WUAs. Farmer organizations remain dependent on the public organization legally, financially, and psychologically (Merrey 1996: 1-2)".

[16] A related issue is whether the functions that are assigned to water users associations can be handed over to the village Panchayat. An interesting observation through my association with two WUAs in the state was that the Jaats, (the agriculturists), showed a strong resistance to this happening. Agriculture, and therefore, irrigation, is seen as the domain of those who have land. A village Panchayat, on the other hand, is supposed to be a democratically elected village body with representation from different communities. Among the farmers that I interviewed, there was a strong resistance to these functions being handed over to the village Panchayat.

[17] In fact, CADA is known to have two structural bottlenecks: (1) its staff are on deputation and there is little institutional continuity and (2) it is still seen as a technocratic agency staffed entirely by irrigation engineers and technician agronomists, without sociologists, professional trainers, rural economists, or rural development experts (Maloney 2000). Mollinga (1998a) argues that in Karnataka, CADA remained by and large

ineffective. On account of the weakness of CADA in number of staff, it remained extremely dependent on the Irrigation Department. The latter sought to protect its own territory and resisted the formation of a co-ordinating organisation between CADA and itself. For a further review of the experience with Command Area Development, see also Hooja and Kavdia (1994).

[18] This point was reconfirmed through my association with the Sitapur and Rampur Water Users Associations. The formation of the WUAs in these cases did not change water distribution and management practices. Water continued to be distributed through the warabandi system and farmers continued to participate in watercourse cleaning activities as they did before WUA formation. They would get together and clean the watercourses serving their respective fields. Alternatively, a farmer would clean the watercourse serving his field on the day of his turn for taking water. One difference, however, was that a lined watercourse reduced the frequency of watercourse cleaning.

[19] Goldensohn presents a somewhat different critique. WUAs have been formed through desperate efforts at technical and social engineering, without considering what they actually mean for the people they are supposed to organise (Goldensohn 1984). WUAs are not associations of users of water, but of farmers who use water as an input into agriculture. Further, according to Goldensohn, WUAs would be more enduring if they were structured as multi-purpose organisations that were more central to the lives of their members.

[20] Singh (2000a) argues that the outlet-based irrigation committees of the late 1970s that were created by government departments under the CADA programme collapsed soon after being born because they were not connected with a higher level of the minor or the distributary. This made them inherently vulnerable as they had little control over the dependability of water supplies.

[21] See the discussion in chapter 2.

[22] This is borne out particularly by the experience of Andhra Pradesh in India. See Peter (2000) and World Bank (1999b).

[23] See also Brewer et al 1999: 280-281, where the authors note that the chief reason for WUA formation being under serious consideration is "World Bank pressure". I found it interesting that the perception of the lower level bureaucracy was that the WUAs were being formed under World Bank pressure, while the senior management saw it more as an outcome of a process of persuasion on the part of the World Bank.

[24] During the later stages of my research, a field level CADA official also admitted to the significance of World Bank pressure behind WUA establishment. The current thinking is that no watercourse lining would be carried out unless a WUA has been formed.

[25] The Gowshala trust approached CADA for help in lining a watercourse that serves their fields. The demand for establishing a WUA

is more of a reflection of a perceived need for lining a watercourse, since WUA formation is a condition for watercourse lining. What this reflects is that farmers are interested in lining of watercourse, but perhaps not in formation of WUAs.

[26] In one of the WUAs studied, the reason for the alienation of other members was that the WUA was dominated by three position holders who comprised the village elite. They were large farmers, with strong positions in local village networks. They also represented the tholas (ancestral family units) that were numerically the most powerful on the watercourse. These three position holders shared the information and the power mutually among themselves and did not involve other farmers or members of the WUA (See chapter 5).

[27] I elaborate more on this in chapter 5, where I describe the organisational dynamics of the Rampur WUA.

[28] For a review, see Drèze and Sen (1989) and Drèze (1995). The state has also intervened through watershed development and management programmes. See Dev (1996) and Kerr (2002). For a general review of the role of the state in agriculture and irrigation, see Mitra (1986, 1998) and Dev and Mungekar (1996).

[29] This discussion draws upon Brewer et al. (1999) and Barrett et al. (1999).

[30] In fact, Maharashtra has a long tradition of community-based water management. For a review of community based traditions of water management in the state, see Agarwal and Narain (1997). See also Lele and Patil (1994) and Brewer et al. (1999).

[31] It recommended a tiered structure, with primary co-operative societies at the distributary level, federal bodies at the sub-divisional level, and apex bodies at the divisional level. It said that a provision should be made under the irrigation rules for the handing over of water by measurement at the distributary head to the primary co-operative societies of irrigators. The primary co-operative societies would be responsible for the collection of irrigation charges from their members and remitting the amount to the Irrigation Department. The co-operative body at the sub-divisional level would be a federal body consisting of all the primary co-operative societies of irrigators within the sub-division. These sub-divisional societies would fix the rotation and quota of water for different distributaries and keep a watch on the working of the primary co-operative societies. This model was advocated as a means of reducing complaints regarding undesirable practices against the lower levels of the Irrigation Department.

[32] This period also corresponds to what Pant (2000) calls the second phase in the evolution of the concept of Participatory Irrigation Management in India, (1985-90), with an emphasis on pilot projects. During this phase, the MOWR, GOI, asked all the state governments to select one minor in each CAD project as a pilot for farmer participation.

Consequently, in Maharashtra, pilot schemes were initiated in Khadakvasla and Jayakwadi projects.

[33] The late Padmashree Vikhe Patil established the nation's first cooperative sugar factory in the state in 1952-53. The state has taluk (block) and district level federations of sugar co-operatives (Brewer et al. 1999). They serve as a lobby group to pressurise the government with respect to electricity rates and supply, and water rates. In fact, Maharashtra leads all other Indian states in sugar production. This is owed in large part to the tradition and character of rural leadership. Cooperative leadership has been associated with prestige, patronage and power. Many leaders of cooperatives become members of the state and central legislature, and cabinet ministers. There are several sugar co-operatives whose leaders compete and vie with each other for offering their members better prices and for acquiring positions in the State Legislative Assembly (Attwood 1995).

[34] See the discussion on the phad system in chapter 2.

[35] The USAID and the World Bank have insisted on WUA formation as a reform condition for financial support in the case of their projects on the Jayakwadi Dam (Pant 2000).

[36] For a review of the "Philippine model", see Korten and Siy (1989).

[37] See the discussion on shejpali in chapter 2.

[38] My interpretation is that farmers may not resent price increases when they are part of an overall reform strategy aiming at transferring control, making the bureaucracy accountable and improving water supplies. This has indeed happened in Andhra Pradesh. See Peter (2000) and World Bank (1999b).

[39] As an example, the Irrigation Department has a Paatkari to look after 2-3 minors to report on repair and maintenance needs of canals, but the Mula Minor 7 WUA itself hires two full time Paatkaris. Thus, management and repair needs are better kept track of and communicated (Brewer and Sakthivadivel 2000).

[40] The Samvatsar society came into existence because newly irrigated areas were being acquired for private sugar factories during the early 1930s. This caused anxiety among the Mali community who had migrated from Pune district and had taken lands in the command on lease or purchased them outright. As a way out, eleven persons belonging to the Mali community formed a society (command 158 ha) to take water on a volumetric basis to grow sugarcane (Lele and Patil 1994). The other society, the Malinagar Irrigators' Water Supply Cooperative Society, was registered in July 1967 on the Nira Canals in Sholapur District. A peculiar feature of this society is that though the society formally exists, the management of water distribution is done by the Saswad Mali Sugar Factory Ltd, a private limited company formed in 1931. As a matter of fact, the agreement of water supply with the Government of Maharashtra is signed by the sugar factory and not by the co-operative water supply

society. An interesting observation common to both these societies is that the membership is restricted only to the Mali Community. Non-Mali irrigators in both commands are not members and they get supplies directly from the Irrigation Department. Though these were interesting institutional innovations, they were not replicated elsewhere (Lele and Patil 1994). For more on these WUAs, see also Bhogle and Bharas Wadkar (1994).

[41] The Vice-Chancellor of Mahatma Phule University, Sambhaji Rao Dorage and his colleagues, Dr. Desai, Dr. Bapat, and Dr. Magar took keen interest in the Action Research Programme initiated by SOPPECOM on the Mula Irrigation Project and offered to hold a seminar on the subject at the University. The seminar, held in 1990, enthused Shri Bapu Saheb Upadhye of the Samaj Parivartan Kendra, to form three water users associations in Waghad Project at Ozhar (Lele & Patil 1994). The WUAs at Ozhar were formed through the efforts and leadership of Shree Upadhye and Bharat Kawle.

[42] When I visited the Ozhar sites during my exploratory phase, there were some efforts at evolving bylaws for such a federation. However, I did not get a chance to revisit the developments later in my research.

[43] This statement may seem to contradict the observations made earlier in terms of the role of some officers of the Irrigation Department in facilitating management turnover. The point is that those efforts are more of the exception than the rule, but the general trend, from my own observations, is that of resistance. The evidence of this resistance is the long time that the Irrigation Department takes in effecting management turnover and the insistence on procedural formalities and red tape on its part. This observation came out in many of my interviews in the course of my fieldwork. I also describe more on this in chapter 4, when I discuss the case of the Action Research Programme initiated by SOPPECOM.

[44] Neither shejpali nor warabandi are designed to provide adequate, reliable and timely water supply for the entire crop water requirements (see Chapter 2). Perhaps what is implied by a statement such as this one is the failure of the Irrigation Department to provide water as per the schedules that are drawn for water deliveries. This point was evident in the case of the Mula Minor No. X WUA, described in the following chapter, where the main reason that farmers agreed to take over the water distribution function was the failure of the Irrigation Department to supply water as per the set schedules. This was indeed still the case in a neighbouring minor in the same village where the WUA had not been formed. Irrigators on that minor often complained that water supplies were undependable and not as per the schedules set by the Irrigation Department.

[45] This is not to suggest that a big bang approach is necessarily superior to a slow but steady, gradual, piloting approach. However, the absence or presence of a specific policy or legal provision do reflect how far a state

government is willing to push a reform initiative. In Andhra Pradesh, supportive legislation for WUA formation may be reflective of a prescriptive, top-down approach, but it surely reflects that the state government is really serious about the subject.

[46] For lower level staff, this means the loss of opportunity to extract illicit payments from farmers for releasing water. This also explains the resistance on their part.

[47] Lele (2000) reports that turnover in about 400 WUAs covering an area of 1.5 lakh ha is pending due to incomplete rehabilitation of the systems. The GOM has issued instructions to allocate 10% of the O & M grants for rehabilitation but even this is not monitored at the higher level, and is, therefore, not fully utilised for this purpose. Besides, Lele argues, this amount is inadequate.

[48] For instance, during my exploratory phase, I spent a long time with an Executive Engineer who had organised farmers on the Waghad Project into water users associations. His approach to convincing them was " if you do not assert your water right, someone else will snatch it away from you".

[49] For a similar analysis of the role of civil society organisations in irrigation reform in the state of Gujarat, see Shashidharan (2000). See also Ballabh (2002). For a further discussion of the role of NGOs in natural resource management, see Kolavalli and Kerr (2002). For a review of issues in NGO accountability, see Najam (1996).

[50] There is a more fundamental issue involved here: why should NGOs be involved in catalysing farmers for collective action ? Both in the states of Gujarat and Maharashtra, farmers themselves have come up with different forms of institutional innovation. When farmers themselves want this to happen, they would make it happen. Perhaps the answer to this question, as demonstrated in the case of the Lakshmi Narayan WUA that I describe in chapter 4 is that NGOs have certain strengths that facilitate the process of turnover by their acting as intermediaries between the farmers and the bureaucracy.

[51] Personal communication, Dr. R K Patil, SOPPECOM.

[52] For a review, see Brewer et al. (1999). See also Joshi and Hooja (2000) and Mollinga (2001b).

[53] For more on the Mexican model and its implementation in Mexico itself, see Kloezen (2002).

[54] Going back to the Haryana case discussed above, there is actually no "reform" or institutional transformation through WUA formation.

[55] During the earlier part of my exploratory research phase, I spent some time reviewing the PIM process in the state of Gujarat. I interacted with NGOs, community organisers, farmers, WUA leaders and members of the academic community.

[56] Parthasarathy (2000) notes other bottlenecks to PIM reforms in the state. There are difficulties in convincing farmers to participate and

differences in the understanding of PIM policy at different levels of the bureaucracy. Further, Parthasarathy argues that WUAs need to be more efficient in making allocative and investment decisions, for which a clarification of legal rights is imperative.

[57] Gujarat is now writing its own Act, following but adapting the Act of Andhra Pradesh. The Development Support Center, an NGO, has been a prime actor in this policy formulating process.

[58] The mandate of Sahayog is to assess whether farmers are motivated to claim reform from the Government and if so, to facilitate the organisation of farmers in a platform to discuss the desired policy changes (Mollinga 2001b). It also seeks to sensitise the public, through mass media on the imperatives, objectives and modalities of reform. Sahayog serves as an intermediary between the farmers and the irrigation bureaucracy and as a platform to bring different actors together to facilitate the formulation of an effective strategy and a transition to its implementation. The latest development on this front has been the formation of Pragathi, an off-shoot of this organisation, by farmers who got disenchanted with a rift among the more professional leadership of Sahayog. The momentum of discussion on irrigation policy in the state has now shifted to tanks because of a World Bank loan for large–scale tank rehabilitation, but formation of WUAs and WUA federations is proceeding on a large scale, as of September 2002 (personal communication, Peter Mollinga).

[59] In about a years' time, federations of water users associations were formed in 8 major irrigation systems, and the formation of a state level apex body was under discussion (Mollinga 2001b). Following from a consultative process led by Sahayog, one point that emerged was that instead of registering the WUAs under the Co-operative Societies Act, 1960, they should be registered under the Societies Registration Act, which might give more freedom and autonomy to the water users.

4

Transferring Control to Water Users Associations

Does design matter?

This chapter is about the processes and effects of WUA formation in two of the cases that I studied. It describes the "coming about" of these WUAs and the motivations and processes involved. The first case presented is the Lakshmi Narayan Water Users Association located on the Mula Minor No. X of the Mula Right Bank Canal in Maharashtra. The second is the Sitapur Water Users Association located at the tail-end of the Sitapur Minor of the Western Yamuna Canal in Haryana.

In the former case, the formation of the WUA is aimed at changing control relations between the users and the bureaucracy. The process is a gradual one, carried out by an NGO through a series of steps convincing farmers of the benefits of WUA formation, having meetings with the bureaucracy and effecting management turnover. The formation of the WUA is designed as a strategy to shift control over system operation from the Irrigation Department to the WUA. The Irrigation Department enters into a contract with the WUA for supplying volumetric quotas of water for each season as per the schedules drawn by the latter. The formation of the WUA has significant effects on water management and distribution practices that are similar to those conceived of by the initiators of the turnover process.

In the latter case, WUA formation is carried out through a bureaucratic procedure by contacting an officer from CADA. It is not motivated by an intention of changing control relations

between the users and the Irrigation Department, but by the intention of getting a watercourse lined. The WUA is assigned some functions, but there are no corresponding powers or rights. Control continues to vest outside the WUA, technically in the main system and organisationally with the irrigation bureaucracy.

TABLE 4. 1 A comparison between the Lakshmi Narayan WUA and the Sitapur WUA

Parameter	*Lakshmi Narayan WUA in the shejpali system of Maharashtra*	*Sitapur WUA in the warabandi system of Haryana*
Formation of the WUA	With the support of an NGO, through a systematic, step by step process	By approaching an officer of CADA, through a bureaucratic procedure
Motivation behind WUA formation	Changing of control relations between the users and the bureaucracy	Assigning the WUA some functions to secure watercourse lining, with no corresponding change in their rights or powers
Contract on water supplies with the Irrigation Department	Yes	No
Control over water supplies: volume and timing	Yes	No
The WUA's room to manoeuvre	High	Small
Enabling support received by the WUA	High	Low
WUA formation alters the balance of power between the bureaucracy and the farmers	Yes	No

Through this comparison, I show that analysis of situations of Irrigation Management Transfer requires an analysis of the extent to which the relative roles of the irrigation bureaucracy and the farmers undergo a change. "Self-governance" in canal irrigation occurs when essential water management tasks and activities are

taken over by the farmers' groups from the Irrigation Department and control relations between these two sides undergo a change.[1] Thus, much depends on the motivations behind WUA establishment. In the latter part of this chapter, I show that the extent to which control relations between the users and the Irrigation Department can undergo a change is shaped by the technology, or the design of canal irrigation. Design influences the potential for change in water management and distribution practices through WUA formation. Table 4.1 summarises the differences between the two WUAs.

The Lakshmi Narayan WUA

In this section, I document the formation of the Lakshmi Narayan WUA. I describe first the Gowda village and its setting, followed by the genesis of the WUA. I then present a brief account of its institutional history and describe the process and implications of management turnover.

The Gowda Village[2]

Gowda is a village in Ahmednagar district of Maharashtra. The village has well-developed social and physical infrastructure. It has primary, middle and secondary schools, and a primary health centre

BOX 4.1 Time line: Gowda village

1956	Primary School
1965	High School
1973	Water flows from the Mula Right Bank Canal
1975	Electricity Connection
1978	First borewell in the village
1980	TV comes to the village
1985	First telephone in the village
1990	Dev Raj becomes *Sarpanch* (head of the gram panchayat) (BJP)
1995	GB Shelke becomes Sarpanch (BJP)
2000	Rajaji Jawle becomes Sarpanch (Congress)

Source: informal discussion with villagers

and three private dispensaries. The village is equipped with a post office that has telephone facilities. It is connected to the state power grid. Box 4.1 presents a time line of the major events and milestones in the development of the village.

The people and livelihoods

The village has a population of about 12, 000. This population comprises different castes. The Malis and the Marathas are the more powerful groups, numerically and in terms of land ownership. *Dahatonde, Shelke, Gaekwad, Pehre* and *Adhsure* are the important Maratha groups. The Dahatondes are the original inhabitants of the village and take great pride in their descent from Kakaji Dahatonde, who is said to have served the army of Shivaji some 300 years ago.[3] Malis are the traditional agriculturists in the Maharashtrian society. They have been traditionally associated with irrigated agriculture, from a *bawdi* (dug well). *Jawle, Punde,* and *Chawre represent* the Mali communities in the village. Within this broad group of Marathas and Malis, the *Dahatondes* are the most powerful numerically and in terms of land ownership, followed closely by the Jawles, Gaekwads and Shelkes.

Ahlat, Gadhve and *Adhav* represent the Christian communities. Some *Chandekars* are *Brahmans* while some others are Christians. The village also has a sizeable presence of Muslims. Some Muslims and Christians practice agriculture while some Muslims also pursue trade, work as construction labourers or run meat-shops. The *Jains* and *Marwaris* are the businessmen and traders.

A number of other smaller groups inhabit the village. *Sutaar* are the carpenters. *Navhi* are the barbers. *Kumbhaars* do pottery. *Maatank* make ropes. *Dohaar* work with leather and *Lohaar* work with iron. *Vadaar* have traditionally provided agricultural labour; but agricultural labour no longer comes from any specific caste. Similarly, while traditionally agriculture has been the domain of the Malis, it now cuts across castes and groups.

At the entrance of the village is the village market and *Panchayat Ghar* (office of the gram panchayat). In the market are a number of shops selling agricultural inputs, groceries, meat, clothes, shoes and slippers. Soon at the entrance, to the right hand side, live the Muslims. Further down is a church and the region around that is

inhabited by Christians. Beyond the market live the Baniyas and Jains. The Marathas and Malis are scattered all over, to the left of the village. Some of them also build small houses near their farms. The members of the scheduled castes live in a secluded section at the outskirts of the village.

Agriculture and cropping practices

There are three cropping seasons. Kharif (July 1-October 15) is the rainy season with little or no irrigation. Rabi (October 15-March end) is the main irrigation season. The hot weather season is from March 15-June end.

The main crops in the kharif season are pearl millet, sorghum, sugarcane, some paddy, chillies, and *tur* (a variety of pulses). In the rabi season, the main crops are wheat, sorghum, chickpea and sugarcane. In the hot weather season, the main crops are groundnut and sugarcane. The predominant rotation is wheat-pearl millet. Besides, farmers grow a variety of fruits and vegetables such as papaya, guava, tamarind, chillies, aubergines, onions, cauliflower and coconut. Wheat is both a cash crop and a food crop. Pearl millet is a staple food crop and it is also a source of fodder. It is

BOX 4.2 Visit to Pehre's fields

30/11/00
...Pehre (whose fields were located near the head of the minor) then showed me around his fields. He had 7 acres of land on the left hand side of the canal where he had grown fruits, vegetables and some wheat. On the right hand side, he had 2 acres of land where he had sugarcane fields. He had planted chillies, papaya and tamarind. Some land had been prepared for sowing wheat. He told me that fruits and vegetables were sold in the market in Gowda and in Ahmednagar. He had also planted some cauliflower. There were mangoes, coconut and some bananas.

Source: field notes

used for making *chapattis* (flat wheat bread), a major component of the household diet. Boxes 4.2 and 4.3 describe the cropping pattern

and field layout of a typical farmer in the Gowda village.

BOX 4.3 Interview with Tukaraam Gangadhar Kaale

1/12/00
Tukaraam was a tail-ender. He had 2.5 acres of land. I spoke to him and his wife; their land lay on the left hand side of the tail outlet. In the rabi season, he grows sugarcane, wheat and chickpea. In kharif, he grows pearl millet and pulses. In the hot weather season, he grows sugarcane and pulses. The land is of the heavy, black cotton type. It is not fit for the cultivation of fruits. If soils are light, they can grow some fruits, but he can not.. [1]

Source: field notes

Irrigation

The cultivated area in the village is irrigated by two minors from the Mula Right Bank Canal of the Mula Dam, the Minor No. X and the Minor No. Y.[4] The Mula Minor No. X has 13 outlets while the Minor No. Y has 20. The Mula Minor X, which was the minor chosen for this study, passes through Gowda and Hastinapur villages. The Minor X takes off directly from the Mula Right Bank Canal. It runs for 2.2 kms. The 13 outlets along the minor are each designed for one cusec flow. The area commanded by an outlet varies from 72.77 ha to 6.27 ha. The water in the Minor X first flowed from the MRBC in 1973. The command area of the minor is estimated at 500 ha of which 300 ha lies in Gowda village. The minor also serves the neighbouring village of Hastinapur situated 4 km from Gowda.

Farmers also tap groundwater through bawdis and some borewells.[5] The depth of the water table varies between 50 and 100 feet. The water table falls in the hot weather season and rises during and after the rainy season. Thus, the aquifers are recharged both from the canal waters as well the rainfall.

Irrigation from surface and ground water is used to supplement each other; water from the canals recharges the groundwater while groundwater is used when the canal rotation is off or inadequate. When there is not enough water in the dam, or when the canal irrigation is off, irrigation is through the bawdis. During the start of the rainy season, for instance, when canal

irrigation is off, farmers irrigate from the bawdis. In between canal rotations, too, farmers irrigate from the bawdis. There is no selling of groundwater, though some farmers take water from their neighbours.[6] Most farmers resort to groundwater for the cultivation of fruits and vegetables. This is because fruits and vegetables require watering much more frequently, which the canal irrigation cannot provide.

Institutional arrangements in agriculture

Apart from self-cultivation, two land use relations exist in the village. In one, sharecropping, the land and water are provided by the owner while the tiller provides labour, seeds and inputs. The produce is shared as one half each; in some cases, the proceeds are shared as 2:1 between the tiller and the owner. This is called *batai.* In another arrangement, when the land owner is away from the village, he gives out his land on lease for a year and shares 50% of the produce as well as 50% of the expenses with the lessee.[7]

Labour relations, inputs and markets

Almost all landowners employ agricultural labour. Labour for agricultural operations is needed throughout the year. It is employed for a variety of agricultural operations such as sowing wheat and harvesting pearl millet, sorghum and wheat.[8] The usual practice is that farmers work on their own fields but also employ labour for part of the agricultural operations. Some smaller farmers supplement the income from their fields either by working on the lands of others as labourers or by entering into contractual arrangements for sharecropping.

The main source of agricultural credit is the Shree Ganesh Society, set up in the village in 1935. It is a multi-purpose cooperative society that provides agricultural loans and sells agricultural inputs. Other sources of credit are the Ahmednagar District Co-operative Bank Ltd, Gowda and the Central Bank of India, Gowda. Besides, there is some informal lending in the village and the rate varies from 4% per month to 12%. Most farmers prefer to take crop loans from the Shree Ganesh society. Some seeds are bought from the Lakshmi Narayan Water Users Association. There are also some private

suppliers of seeds and fertilisers in the main market of Gowda village. The Vardaan Society is a cooperative society that provides credit for business purposes.

Wheat and pearl millet are sold in the market in Ahmednagar. Sugarcane is sold at the two co-operative factories located at a distance of 15-20 kms from Gowda: the Nyaneshwar Sahakari Shakkar Karkhaana and the Mula Sahakaari Shakkar Karkhaana. These factories have been around for more than 20 years. The village has a lively weekly market every Saturday where colourful clothes, groceries, fruits, vegetables and other household items are sold.

Village Politics

The village politics are split between the BJP-Shiv Sena and the Congress. The village Panchayat comprises a Sarpanch and 17 other members. They are elected every five years. The village has a new Sarpanch from the Rashtrawaadi Congress party since August 2000 while the last two Sarpanches were from the Bharatiya Janata Party (BJP). 15 members of the 17 at present belong to the Rashtrawaadi Congress. 2 belong to the BJP. Usually, the Sarpanch hails from the Dahatondes or Jawles, the castes that are numerically and socially powerful. Politically, the Ahmednagar area has been a strong hold of the Congress party.

Institutional history of the Lakshmi Narayan WUA

In 1985, an NGO called CASAD was looking for a site for WUA formation as part of an Action Research Programme. One of the representatives from CASAD met G A Punde, a political worker from Gowda village, at the office of the irrigation sub-division, 5 kms away from Gowda. Punde said that they had not got water from the Irrigation Department for the last 30-40 days. The CASAD representative offered to help them in buying water in bulk from the Irrigation Department and organising the distribution of water more effectively themselves. Punde said that he would have to consult the other farmers. He promised to return after 15 days.

The farmers in Gowda village were unhappy since they had not received water as per the schedules set by the Irrigation Department. Sometimes, the Irrigation Department would say that the water would come in 10 days but it would not come even in 30 days. Punde consulted the farmers and returned after 15 days. He said that they were willing to organise management turnover, provided CASAD helped them. The CASAD representative said that they could experiment and if over one year, they were not satisfied, they could revert to the old situation and hand the management and water distribution back to the Irrigation Department.

USAID (The United States Agency for International Development) extended some support and a conference was organised in Pune where Punde and some other farmers were invited to participate. The idea of forming a WUA to take over the water distribution function from the Irrigation Department took shape. In February 1987, a General Meeting of the farmers on the minor was called and the proposal for WUA formation was explained to them (Lele and Patil 1994). 120 farmers attended this meeting. The following points were made in the meeting:

(1) The Irrigation Department would deliver measured supplies of water at the minor head.
(2) The WUA would carry out the distribution of water to farmers.
(3) The Irrigation Department would be paid on a volumetric basis while the farmers would pay the WUA on a crop-area basis.
(4) The WUA would decide the cropping pattern, based on water allocation.

Two additional points were also discussed. The first had to do with the choice of the unit for WUA formation. There were two possibilities: the first was to organise one unit for the minor and the second was to form a number of separate entities for each of the 13 outlets. The farmers realised that the outlet societies would be too small in terms of financial viability and management. It was, therefore, decided to have one society for the minor as a whole. The second issue related to the legal status of the water users association. Here, too, there were two possibilities. The first would have been to register the WUA as a co-operative society under the Registration of Societies Act. The second would have been to register it as a company under the Companies Act. The farmers opted for the co-operative form, as it was the more familiar to

them.[9]

After this meeting, two tasks had to be performed by the farmers and the NGO. The first was to approach the Irrigation Department for a Memorandum of Understanding (MOU) between the department and the proposed WUA. Under this MOU, the terms and conditions for the switch over of the control of water management to the society would be laid out. Second, they would have to arrange for the registration of the WUA under the Cooperative Societies Act.

Soon after that, CASAD employed two field organisers and two supervisors in the area to discuss the related issues with the farmers regarding the formation of the WUA. The organisers started discussions with small groups of farmers. They also identified the farmers who would be able to work in the Managing Committee in the initial period.

This was followed by a series of negotiations between the farmers and CASAD on the one hand and the Irrigation Department, Government of Maharashtra and the Co-operatives Department on the other.

Village leadership and support

From within the village, leadership came mainly from NT Gharonde and GA Punde. Punde and Gharonde found strong allies in each other, and received the support of two other farmers: KC Pehre and NA Punde.

GA Punde was a political worker. He enjoyed a strong clout in the local politics and had served as a village Sarpanch earlier. At the state and district level politics, though, he remained little more than a handmaiden to Shelke, a member of the state legislature, who came from the Congress Party. However, he (GA Punde) enjoyed the confidence of small farmers. Whenever he went to Ahmednagar, they would request him to convey their problems and concerns to the concerned officers. He had also been on the board of the Shree Ganesh Society.[10] Thus, he had a political clout at the local level and enjoyed the faith and confidence of the smaller farmers. This helped him influence them. He never studied beyond primary school but had worked as a contractor in the Irrigation Department.

Punde has a strong commitment to the ideals of Gandhi and

Vinoba Bhave, which have guided his motivation in organising people. He is devoted to these ideals and laments their loss in the current management. This came out very strongly in my interviews with him. While he normally looked old and weak, his eyes would suddenly brighten up and he would be totally charged and energetic when talking about his motivations behind WUA establishment. Punde's chief consideration had been that all the farmers should share in the water equitably and should have a right to water for irrigation. He struggled very hard during the years 1985 to 1989, the formative years of the WUA.."only I know the struggle that I had to face...the senior people never wanted to co-operate" , as he would often put it in my interviews with him. He would further say proudly.." when I made this organisation, I put my spirit into it..." there are 400 WUAs in the state... but none is as good...they are not well-planned". He had strong ideas about what a good water users association should be like. His perception was...".even a thief earns profit. When a WUA also exists only to earn profit, how is it different from a thief.... A WUA should help the farmers grow and diversify..... the water distribution should be equitable...the views of Bapu and Vinoba Bhave have to be brought back into our society.."

NT Gharonde, popularly called Gharonde Sir, was the other key WUA leader. He is a teacher in the village high school. He was also on the Board of Directors of the Shree Ganesh Society. Gharonde Sir is a very articulate speaker. At the time of the formation of the WUA, he was the bearer of a sugarcane block and was related to an officer in the Irrigation Department.[11] He himself, therefore, did not have a problem getting the supply of water from the canal. In fact, he initially was not keen on the idea of taking over the management of the system. However, the CASAD representative warned him about what would happen if the officer got shifted or moved to another place. Gharonde Sir thought again.

While Gharonde Sir was ambitious personally and did aspire for a position on the governing board of the water users association, Punde himself did not seek an official position inside the water users association. Further, though a political worker himself, I did not see any evidence of Punde's political aspirations being expressed inside the water users association.

These two leaders received the support of K C Pehre and N A Punde. KC Pehre was also on the board of Directors of the Shree Ganesh Society and the Vardaan Society. G A Punde supported

Pehre and helped him acquire the Directorship of the Nyaneshwar Sahakari Shakkar Karkhana, one of the two co-operative sugar mills in the vicinity of the village. KC Pehre is affiliated with the Bharatiya Janata Party and contested the elections to the Gram Panchayat in August 2000. NA Punde is the brother of GA Punde. He is the priest of the Someshwar temple. He is known to be a hard working and progressive farmer with a keen sense of agricultural experimentation.

In the early days this group provided the basic leadership. GA Punde provided a link between the farmers and CASAD. He played an important role in organising farmers and convincing them of the benefits of the collective effort. Gharonde Sir, with his good oratorical ability, participated in a series of meetings with the Cooperatives Department, the Government of Maharashtra and the Irrigation Department. GA Punde and Gharonde Sir served to lobby on behalf of the farmers to press for management turnover of the system to farmers. They bore the organisational burden, and did so effectively.

In a series of meetings and individual discussions held with farmers in 1987 and 1988, CASAD explained the benefits that would accrue to the irrigators if they managed water distribution below the minor. These meetings, held in Bombay and Pune, involved several rounds of negotiation and discussion, to arrive at an MOU that was later to become the basis of PIM guidelines issued by the Government of Maharashtra.[12]

Overcoming obstacles and bureaucratic resistance

The WUA leaders faced several obstacles in the process of organising the management turnover. This resistance was shown at different levels of the state machinery and can be seen as indicative of the reluctance of those in command to let go. The Cooperatives Department first insisted that the promoters of the water users association should get a clearance from the Maharashtra State Electricity Board, as it did also from lift irrigation co-operatives. The WUA leaders worked hard to convince them that this being a surface irrigation scheme, there was no need for a clearance from the Electricity Authorities; no lifting of water was involved.

The office of the Co-operatives Department created several other hurdles that made the process of registration bureaucratically

complex, long and cumbersome. This included insisting on detailed information, and not keeping commitments and postponing dates for meetings. Both Gharonde Sir and GA Punde, in my interviews, expressed the view that this was because the bureaucracy feared a loss of power, which it was reluctant to let go of. Another problem was that the *Talati* (village level record keeper) would have to furnish details on every individual farmer, his *gat* (revenue record) number and land holding size. For each, he would also charge some 'fees'.[13] This process was simplified to the effect that one common listing for all farmers would do.

For these reasons, it took about 22 months to register the society and arrive at an MOU with the Irrigation Department (Lele and Patil 1994).[14] The Society finally became operational in July 1989, with the signing of the MOU on 30th June 1989. The first General Body meeting was held on March 16 1989, with attendance from 35 members.

The WUA entered into a contract with the Irrigation Department to supply water on a volumetric basis and a season-wise quota was fixed.[15] The operation of the 13 pipe outlets along the minor was taken over by the Paatkaris employed by the water users association.[16]

The early years

The formation of the water users association conferred several benefits to the member farmers.[17] Earlier, they had to go to the sub-division of the Irrigation Department to apply for water. Now, their applications were processed in the office of the WUA within the village. This saved them a lot of time and effort. Further, it removed the element of illicit payments that had to be made to the officers of the Irrigation Department for releasing water to operate the gates. Virtually all the members that I interviewed in the course of my association with the WUA confirmed that the employees of the Irrigation Department had to be bribed to open the gates along the minor as well as the gate at the head of the minor. This pattern was inequitable since the capacity to bribe would vary with the social and economic position of a farmer.

In the elections to the WUA that were held in 1990, Gharonde Sir was elected as the Chairman. K C Pehre became the Vice-Chairman. Also on the Board was Ukeerde, a former Sarpanch of

the Hastinapur village and a former board member of the Village's *Gram Vikas Samiti* (village development council).[18] This team continued to provide the essential leadership in the early years and represented the farmers' case forcefully. The management turnover gave some bargaining power to the water users association.[19] In 1992-93, there was a financial crisis and the financial recoveries of the WUA dipped very low. The leadership, led by Punde and Gharonde Sir, went around convincing people to pay up. At one time, the farmers were in short supply of seeds. WALMI suggested that they make use of their position as a collective entity and write a request for procuring them.

While CASAD provided much support during the infancy phase, it soon withdrew. In most activities, it remained a spectator. After the earlier years, there were several occasions when the organisation offered advice, but the WUA acted on its own. For instance, on one occasion they suggested that the WUA should give a higher salary to the Secretary; the WUA refused, feeling that this may not be sustainable in the long run. After one year of formation, CASAD asked the WUA members if they wanted the distribution to continue, or they wanted it handed back to the Irrigation Department. The members felt that they were better off and did not wish the management to be returned to the hands of the Irrigation Department.

Soon the WUA began diversifying in other areas. Its General Body Meetings became a forum for discussing better crop management practices, water saving techniques and other problems of farmers. It also received support from other organisations. CADA, the Command Area Development Authority, organised a special visit of about 50 farmers from the minor to WALMI, Aurangabad, to the Agriculture University, Rahuri and to other projects, to educate them on better water management, new varieties of crops, farming practices and drip and sprinkler irrigation. WALMI, The Water and Land Management Institute, Aurangabad took a keen interest in the experiment and sent their teams of trainees for studies of farmer managed systems and organised special training of farmers from the minor. The faculty of WALMI visited the area and also gave suggestions to the WUA members on several occasions. The Secretary and Paatkari of the water users association received training at WALMI.

Being the first of its kind, the Lakshmi Narayan Water Users Association became a showpiece. WALMI gave the WUA a base to

expose itself. Gharonde Sir and GA Punde became invited speakers. Gharonde Sir, in particular, became used to speaking to audiences with thunderous applause and standing ovations. The WUA started drawing the attention of visitors from far and wide. Soon within the first one and a half year of its formation, there were about 50 distinguished visitors. In January 1999, when I made my first visit to the water users association, it had already had about 350 visitors. On the last day of my association with the WUA, I learnt that an international delegation was visiting it to learn how it managed water.

The management shuffle

The next major turning point in the history of the WUA came about in the elections to the WUA in 1995, when a new management body headed by KC Pehre came into power. On the new Committee was Changdeo Gaekwad, a former Sarpanch of the Gowda village and a member of the Board of the Shree Ganesh Society. He is an affiliate of the Bharatiya Janata Party. Also present on the board now was N A Punde, the brother of GA Punde.

There were several factors behind the management shuffle of 1995. First, Gharonde Sir was essentially a schoolteacher and that took up most of his time. Further, many farmers felt that he used the WUA as a base for self-propagation. Apparently, his participation in several conferences and forums reduced his availability to the WUA. At the same time, the limelight that he and Punde received aroused the envy of others and made a position on the Governing Board more attractive to them.

Other close observers of the WUA felt that Gharonde Sir did not believe in teamwork. He gave all credit to himself and to Punde. This was also my impression of him and became evident in the manner in which he described his association with the WUA and with Punde, whenever I spoke to him about the WUA. When I asked him if he would contest the next elections to the WUA, he refused vehemently and asserted arrogantly .."I will not contest the elections, but if all the members appealed to me to take over the management of the WUA, only then would I do so." Gharonde Sir resented the loss of his authority as the leader of the WUA. GA Punde, on the other hand, said that he was now too old to contest elections, but would be happy to train farmers.

Some WUA members felt that Gharonde Sir and G A Punde tried to drive the WUA at a level that not all could keep pace with. Gharonde Sir and Punde tended to be forceful and rigid about their ideas and tried to impose them upon other members. The members, on the other hand, wanted a more down to earth, simple leadership. For most farmer members, my impression is that they basically want a mechanism that delivers them water when they need it; it does not matter who comprise their governance structure. [20]

A third and perhaps more subtle reason was a purely political one. Both K C Pehre and Changdeo Gaekwad are affiliates of the Bharatiya Janata Party, while Gharonde Sir and Punde were supporters of the Congress Party. In fact, G A Punde, as noted earlier, was a political worker from the Congress Party. 1995 was the time when the BJP-Shiv Sena coalition came into power at the state government level in Maharashtra. The third factor behind the management shuffle was an expression of the changed political configuration at the higher levels of the administrative hierarchy. My understanding was that this was initiated from the higher levels of the bureaucracy. Gharonde Sir, in my interviews with him, often hinted that the Co-operatives Department did some political manipulation. Though initially this was just a hunch, it got confirmed later through my interviews with him and with the other members of the WUA. Many observers of the WUA expressed the view that state level politics had a direct bearing on district and village level politics. Further, that politically influential people used WUAs to add another feather in their cap.

While Gharonde Sir and GA Punde provided the initial thrust and leadership, this could not be sustained over into the long term. GA Punde, with his strong sense of socialist ideals, could not drive all the members along with him. Some present members actually viewed him with disgust. I was often surprised with this, considering the role that he and Gharonde Sir had played in organising the management turnover and improving the water distribution process. After enjoying the status of the co-promoter of the WUA, he probably tried to control the water users association; but he did not receive the support of the other members.

This committee worked on till 1999, when K C Pehre resigned and asked Changdeo Gaekwad to take over. K C Pehre was unable to give time to the affairs of the water users association. Sharad

Rao Dahatonde took over as the Vice Chairman. Among the present members, both Gaekwad and Pehre have a political affiliation. They are affiliated with the BJP. At present they provide most time to the activities of the WUA. They attend to visitors, entertain correspondence, and chair the meetings of the Executive Committee.

Current Status

A few observations can be made about the composition of the present Executive Committee (see Box 4.4). Firstly, they hail mainly from the dominant/upper castes (Dahatonde, Jawle, and Shelke from Gowda village and Ukeerde from Hastinapur). Secondly, they are people who have served in positions of power and prestige in the village society (former Sarpanches, or members of the Executive Committee of the other important local bodies and co-operatives). Two of them, namely, Changdeo Gaekwad and K C Pehre, have political affiliations.

Thus, the governance structure of the water users association is dominated and controlled by the village elite. There can be two possible explanations of this. The first is that they seek to consolidate their power and position through interlocking leaderships that give them clout and position. The second is that people wish to be led by those who already have demonstrated their leadership experience. The explanation, perhaps, lies in both factors. Besides, all of the WUA position holders are large employers of agricultural labour. Many of the WUA members work on the fields of the WUA position holders. Patterns of power relations as captured by relationships of domination and subordination in the agrarian structure and the village society also find expression in the constitution of the Executive body.

It is interesting to note that the present chairman has a very small size of land holding that is irrigated from this minor. Most of his land is located on another minor.[21] His motivation as a WUA chairman is not so much to use his position to be able to irrigate more effectively. His motivation as a WUA leader is to use it as platform to consolidate his political position.

There is a strong rift between the present management and the earlier one. Gharonde Sir and G A Punde both are critical of the management.[22] There is also a small segment of members that feel

that the water users association has lost some of its initial vigour and robustness, largely because the earlier drive and leadership is absent. There is a section of the WUA membership that believes that the position holders of the WUA should not be elected. The management of water is a technical and specialised activity that should remain the domain of those who have the expertise. This segment believed that the earlier leadership, with GA Shettye, who had technical expertise since he had worked as a contractor in the Irrigation Department, was much more robust.

BOX 4.4 Profile of the Members of the Executive Committee of the Lakshmi Narayan WUA

Changdeo Gaekwad, the present Chairman, has 0.9 hectares served by the minor. He was earlier on the Gram Panchayat and the Gram Vikas Samiti. He is an affiliate of the BJP. Ukeerde has 2.8 ha served by the minor. He is from Hastinapur village. He was a former Sarpanch and on the Gram Vikas samiti. K C Pehre has 1.4 hectares served by the minor. He was the vice-Chairman on the first committee and the chairman on the second committee till 1999. He is an affiliate of the BJP and contested the village Panchayat elections in 2000. Earlier on, he was on the board of the Shree Ganesh Society, the Vardaan society and the sugarcane cooperative society. Sumanbai Shelke has 1.3 ha served by the minor. She is the female representative. She represents women on other village and district level bodies. NA Punde has 3 hectares served by the minor. He is known to be a hardworking and innovative farmer. Sharad Rao Dahatonde has 1.56 ha served by the minor. Dhonde has 0.34 hectares served by the minor and represents the backward classes. R B Dahatonde and G Y Jawle are the other members of the Executive Committee.

There is some sense of complacency in the water users association as well as the Irrigation Department, that have become used to entertaining visitors and projecting the association as the "best water distribution society in the region". Firstly, the association does not charge the farmers (both members and non-members) for groundwater because it would displease them and cause them to resent a perceived injustice. It is clear that well owners derive this water through seepage and percolation from the canal. In contrast, the WUA at Ozhar, which came up after the Gowda experiment does charge the members for groundwater, since most of the availability of ground water in the region is

through the recharge through percolation from canal water. At Ozhar, too, when this was done, it was a difficult task, and it required concerted and persistent efforts on part of the leadership.

Secondly, some close observers of the WUA feel that the WUA is not experimenting with increasing agricultural productivity, taking on new varieties of seeds, and other activities as it did in its earlier years. In contrast, Ozhar, which came up after being inspired by the success of the Lakshmi Narayan Water Users Association, is much more innovative. Thirdly, their recoveries are on the lower side. While they pay to the Irrigation Department 100% of the dues, internally they are able to recover only about 65-70%.[23] However, the WUA is negotiating with the NABARD (National Bank for Agricultural and Rural Development) that is proposing some support for the introduction of drip irrigation systems; the exact form of support is still to be finalised. They also wish to move into a new office shortly.

The analysis of the institutional history of this WUA sheds some light on the role of WUA leaders and facilitators as intermediaries between the farmers and the bureaucracy. While NGOs do have specific strengths in this role, it is necessary for them to identify the extent to which they would support a local level initiative. It is one thing for the NGO to help an organisation as this one in its infancy, and yet another thing to extend support to it indefinitely. In this case, the NGO withdrew after support in the infancy of the WUA, and the WUA had robust leadership internally to sustain it further. At present, this WUA turns to the NGO only periodically for advice. However, my understanding was that while the initial leadership under Gharonde Sir and Punde was dynamic, the present leadership lacked that sense of vision and dynamism. My own assessment was that the loss of the initial vigour and robustness of the WUA was largely attributable to the change of leadership. While charismatic leadership can impart a resource user organisation its vigour, it makes it vulnerable when the WUA depends entirely on it for its sustenance, as happened in this case.

Operational implications of management turnover

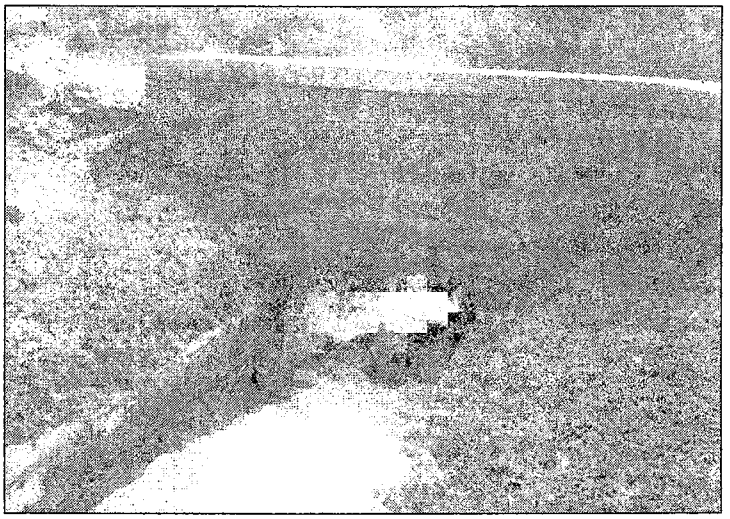
Having described the institutional history of the WUA, I focus more specifically on the impact of management turnover. As

explained in chapter 2, the water distribution system in Maharashtra is shejpali. It is designed to be a partially demand driven system, where farmers make an application indicating the area and the crops that they wish to irrigate. At the same time, for these benefits to be realised, certain operational requirements of this system need to be fulfilled. These requirements are as follows.

On the Mula Minor No. X WUA, water flows from the head - regulator at the head of the Minor through a pipe outlet (Picture 4.1).

It is a gated pipe outlet, with a pipe of a diameter of 1.5 feet. It has a screw type gate, located on the upstream side, that has to be rotated to lift the gate in order to release water from the canal into the minor (Picture 4.2).

PICTURE 4.1 Pipe outlet at the head of the Minor No. X



Then, there are 13 gated pipe outlets along the minor, over a length of 2.2 kms (Picture 4.3). These are pipe outlets with shutter type gates that are located on the upstream side. The diameter of the pipes is 30 cms. Each of these gates has to be lifted to release water from the minor into the watercourse. Thus, for the water distribution function to be performed, this apparatus has to be operated. The head-regulator has to be operated to release water into the minor and each of the gated pipe outlets has to be operated to release water into the watercourses.

PICTURE 4.2 Screw-type gate of the outlet at the head of the Minor No. X

PICTURE 4.3 Gated pipe outlets along the Mula Minor No. X

As noted in chapter 2, an operational implication of the water distribution process arises from the characteristics of the gated pipe

outlets along the minor from which water is released into the watercourses. Hydraulically, these outlets are non-modular structures (Bolding, Mollinga and Straaten 1995; WALMI 1998a). This implies that the discharge depends both on the upstream and the downstream water levels. A stable supply through the outlet requires continuous adjustment of the gate opening and each structure needs individual calibration. Along the minor, since all outlets do not run simultaneously, it causes water levels in the minor to fluctuate considerably. This requires constant adjusting of gates and measurements to ensure that 1 cusec water flows through the pipe outlets. In the case of this WUA, this task is accomplished by installing a Parshall flume on the downstream side of the outlets; a red mark put on the Parshall flume serves as a benchmark to ensure that a stable supply of 1 cusec is maintained through the outlets.

Before the formation of the water users association, the employees of the Irrigation Department operated the gate at the head of the minor as well as the gates along the minor. This system had several drawbacks. Firstly, there was a high dependence on the Irrigation Department to operate the gates. From my interviews with the members of the WUA, it seemed almost as if the gate operation depended upon their whims and fancies. As a result, water supply was unpredictable and unreliable. Secondly, while it conferred control over the outlets with the Irrigation Department, it created opportunities for corruption. Several farmers and founder members admit that these employees of the Irrigation Department had to be bribed to open the gates. "If you gave money to the Paatkari, he would open the gates, if you simply filed an application, he would not", as one member explicitly put it.

This resulted in frequent fights and conflicts among the farmers as they were not sure about when the water would be released, or whether each farmer would get water as per his application. However, there were a few exceptions. Some powerful farmers did not face any difficulty in getting water. Among them was a founder member who openly admits that because of his position and status in the village, the Paatkari and Canal Inspector never gave him any trouble getting water.

With the formation of the WUA, a number of changes have taken place. Firstly, there is a contract between the Irrigation Department and the farmers. As noted in chapter 2, a season-wise quota has been fixed for supplying water to the water users

association on a volumetric basis; when there is less water in the dam, the quota is proportionately cut. The allocation is: 0.434 million m^3 for kharif cropping season, 1.058 million m^3 for rabi and 0.283 million m^3 for hot weather.[24] Thus, the water right of the farmers has acquired a legitimate basis. As one founder member said, "as long as there is water in the dam, the farmers on Minor No. X have a right to it. This can not be said about the Minor No. Y".

The WUA pays the Irrigation Department for water on a volumetric basis and sells it to the farmers on a crop/area basis. The rates that are charged by the Irrigation Department to the WUA are Rs 22 per thousand m^3 in kharif, Rs 33 per thousand m^3 in rabi and Rs 66 per thousand m^3 in hot weather. [25] The crop/area rates charged by the WUA to the farmers are the same as that charged directly by the Irrigation Department to farmers at other places in the state, barring for sugarcane, in which case the rates are fixed by the WUA itself. However, there is some margin that allows for financial viability. A 20% discount is given to the WUA for submitting its bills on time and a 5% discount for early payment. For minor repairs, there is an annual grant of Rs 20 per hectare.

Secondly, the operation of the pipe outlets along the minor was taken over by the Paatkaris employed by the water users association. Thus, control over the operation of these outlets moved from the Irrigation Department to the farmers.[26] Thirdly, earlier, the Irrigation Department used to make the water distribution schedule on the basis of the applications received. Now, this function is performed by the WUA. [27] Thus, with the formation of the WUA, essential water distribution and management functions were "turned over" to the farmers from the Irrigation Department.

Simplified procedures

As noted earlier, a major benefit of the turnover of the system to the farmers has been in terms of the time and effort for making applications for water. Earlier, the farmers had to go all the way to the office of the Irrigation Sub-Division to file their applications for water. This meant not only an involvement of time and effort, but also money (they would have to spend on transport). Now,

these applications are made through the WUA and are submitted to the Secretary of the WUA. Thus, now, they deal with the WUA inside the village itself. Before the formation of the WUA, the Canal Inspector had to deal with every individual farmer to collect fees. Now, he deals only with the WUA. For the Irrigation Department, as well as for the farmers the task of water fees collection has become simpler. For the farmers it has meant greater convenience and for the Irrigation Department a lower administrative burden.

Greater control and flexibility

A major benefit to the farmers in the new situation is that after accounting for evaporation losses, the water quota that is saved in the rabi season can be used in the hot weather season. During the hot weather season, farmers need to irrigate sugarcane and groundnut. This facility was not available to the farmers before the formation of the water users association.[28]

There is another benefit in terms of flexibility. The same quota of water can be taken in two rotations instead of one. When a farmer has already taken water in one rotation, he can still apply for another, if need be, at the end of the rotation, by paying a surcharge of Rs 30 per acre. This facility, again, did not exist before the water users association was formed. During the year

1999-2000, when I was associated with the WUA, there was 1 rotation in the kharif season, 3 rotations in the rabi season and 2 in the hot weather season. During the last kharif irrigation (that took place in August 2000), some farmers had to take water a second time for irrigating millets. This would have been difficult without the WUA since they would have had to make several rounds of the office of the Irrigation Department.

Farmers' perceptions

The bargaining power of the farmers increased with the formation of the WUA. It has meant an assured supply of water in terms of the contract with the Irrigation Department, and within that, greater control and flexibility. The expressions that farmers use to

describe benefits from WUA formation are "assured and guaranteed water supply " and "regular water supply". [29] These are powerful expressions that convey farmers' perceptions of the benefits of forming the water users association. Earlier, there was no surety about when the farmers would get water. Since now there is greater surety about when the farmers would get water, they are able to match the cropping schedule with the water supply. Another common perspective among farmers is presented thus: "now that we know for sure that we will get water, why should we fight amongst ourselves ?"

Thus, what happened with the formation of the WUA is that control over the outlets and regulating devices shifted from the Irrigation Department to the members of the water users association. In this case, there actually occurred a shift in who controlled and operated the technology for water distribution. It was put very effectively in the words of a founder member who said " we only wanted to be the people who would lift the gates". [30]Another senior member echoed the same sentiment when he said, "Earlier the gates used to be operated by the Irrigation Department.. Now our own self-appointed people do so... this makes a lot of difference.." he further went on saying .. "now *we* fix the water rates.. this is also a big achievement for us."

Operation and processes of the WUA

The water users association is run by a Secretary and two watermen, both employed by the Association. The Secretary liaisons with the Irrigation Department, invites and receives water applications and manages the collection of irrigation fees by the farmers. The Paatkaris prepare the water distribution schedule and monitor and supervise the water distribution process.

There is an Annual General Body Meeting and a monthly meeting of the Executive Committee. The latter provides a forum to discuss essential issues, approve budgets and expenditure and discuss proposals among members (See Box 4.5). Present in the meeting are the office bearers and the Board members. Though officially it is open only to the members of the Executive Committee, many other members walk in to lodge complaints or discuss proposals.

BOX 4.5 Monthly meeting of the Executive Committee of the Lakshmi Narayan WUA

29/11/00

I reached the office of the WUA at about 10.15 a.m. There were still no signs of the meeting. Thitte, the Paatkari, was there and so was a dark, fat and heavy man by the name of Sunaone. I started chatting with him.

Ukeerde, a former Sarpanch and the representative of the Rastapur village in the Executive Committee, arrived around 10.35 a.m. He had this silent air of authority about him, and looked very composed. He came and sat on the bed to my left. At 10.45 p.m. arrived Punde, another Executive Committee member and the brother of G A Punde, one of the founder members of the association. At 11 p.m. came Gaekwad, the Chairman, and Dahatonde, the vice Chairman. They sat on the seats that were facing me, next to each other. Gaekwad was a former Sarpanch of the village, and sat with a cold attitude of indifference, as if whatever happened did not really matter to him, but he was there for the people.

They started sharing some light jokes. Most of the conversations took place between Punde and Dahatonde. They were soon joined in the meeting and in the conversations by Jawle, another executive committee member. Meanwhile, a farmer who had just walked in and sat on the corner seat facing me started complaining that some users of bawdi water were emptying the water from their fields on the minor and needed to be stopped from doing so. Sunaone, who was sitting right next to me, started getting up to make an exit, but was urged by Gaekwad and Dahatonde to keep sitting. "Where are you going ? The meeting has just started; keep sitting", he said.

Punde, Dahatonde and the farmers kept talking; while Gaekwad browsed through the newspaper casually. He was, most of the time, indifferent, listening gently to what the others were saying, at other times, just nodding his head. At 11.30 we were still waiting for the Secretary. At this point, arrived the husband of Suman Bai; Suman Bai is the female representative on the Executive Committee. Ever since the reservation policy for women has been introduced, this seat had been reserved for a woman. Suman Bai exercised her right by nominating her husband to attend on her behalf (!!).

At this point entered Dhonde, the representative of the backward classes and came and sat in a corner, a position that was inconspicuous by its very location. He was accompanied by Pehre, the former chairman, and they both sat rather quietly. At 11.30 arrived Veerkar, the Secretary; he came and sat in his office seat. Suman Bai's husband shared a light joke; Gaekwad only participated by sharing in the jokes. Veerkar did not speak in the meeting; but was only making

(Box 4.5 continued)

minutes of the proceedings. In the meanwhile, Punde left the meeting because he had some urgent work.

The first proposal that was discussed in the meeting was that of a water theft. Gharonde Guru, Gharonde Sir's brother, had taken water for irrigating .5 acres of groundnut without applying for it.

He was charged a double rate, as the norm is. He said that he would pay the fine and that was not really the issue but he had actually not committed the water theft. But the others present in the meeting said that he had actually taken water and the members as well as the Paatkari had seen him.

The other issue that was discussed was that some people were releasing water from their bawdis into the minor and they had to be urged to stop doing so. The Forest Department people have also made a proposal that they will plant some trees along the minor for 3 years and they will then hand them over to the association. These trees could be of the choice of the water users association and the revenue would go to the water users association.

At this point, tea arrived and was served to all who were present. I was told that Gharonde Guru took water for irrigating groundnut for .5 acres of land. We were all offered tea. Veerekar paid for the tea. It cost Rs. 21. The Paatkari came in and wiped off the floor for the tea that had fallen on the ground.

The Secretary then presented the expenditure proposals that had to be approved of. Rs 11, 200 had been spent on repairing the minor. Rs 1300 were incurred on the Annual General Meeting and this proposal also had to be passed. Throughout the meeting Dhonde kept sitting quietly. His presence was conspicuous by his silence. Dahatonde, Suman Bai's husband, and Jawle did most of the talking. I turned my eyes towards Gaekwad and found him swinging his key chain in the air in a circular motion.

The following proposals were passed (Veerkar made the minutes and the register was circulated and signed by all those who were present):

1. Gharonde guru would be fined for taking water out of his turn. He would pay double the rate for irrigating one acre of groundnut
2. those who were emptying water from their fields into the minor will be asked not to do so
3. an application will be made to the Irrigation Department for allowing the Forest Department to plant trees along the minor.

Gaekwad lit a cigarette and walked out; he then came in and browsed the newspaper. Members exchanged some light jokes. Veerekar asked me my impressions of the meeting and encouraged me to

(Box 4.5 continued)

record them in the visitors' book. The meeting got over by 12. 30 p.m. and all members made a gradual exit. I got up to interview Veerekar about irrigation in the last kharif rotation, since my observations had left some questions unanswered.

Source: field notes

Conclusion

To summarise, in the case of the Lakshmi Narayan WUA, the formation of the WUA created an institution that better matched the operational requirements that the shejpali system imposes, and in the process, it improved the farmers' control over water. These requirements include making and processing applications for irrigation, operating gated pipe outlets and measuring discharges. An operational weakness of the system of operating gated pipe outlets was overcome by installing measuring devices.

In this case, a transformation of control relations took place with WUA formation, that was very close to the original objectives of the initiators of the transformation process and to general conceptions of IMT. In terms of water control, a technological and institutional change took place, amounting to a change in power, and supported by an enabling process and environment. Changes took place in how water was managed and distributed. I now contrast this case with the Sitapur WUA, where these control relations did not undergo a change with the formation of the WUA. The effects on water management and distribution practices were also limited.

The Sitapur Water Users Association

In the Sitapur WUA, WUA formation was not part of the process of changing control relations between the users and the bureaucracy. There are also no changes in water management practices with WUA formation, in contrast to the Lakshmi Narayan case discussed above. The Sitapur WUA is formed through a

procedure that has little enabling support and environment.

The Sitapur village

Sitapur is a small village in Jind District of Haryana. The village lies at the tail of the Sitapur Minor of the Western Yamuna Canal, about 16 km from its head. The village has a high school, a school for girls, another one till class X, a veterinary hospital, a branch of the State Bank of Patiala, and a cable factory. The village has had electricity supply since 1976. The present Sarpanch of the village comes from the supporting faction of the Lok Dal and O P Chautala, the Chief Minister of the state.

People and society

The village is inhabited by thirty-six castes. The Jaats, who are numerically the largest among them, are the agriculturists. Known for their industriousness, they have led Haryana through India's green revolution. The Brahmans have traditionally been the priests, but also pursue agriculture and have diversified into a wide range of services. The Baniyas are the moneylenders, traders and businessmen. However, they also pursue agriculture and serve in the government and private sectors. A number of smaller communities also inhabit the village.[31]

The total number of households in the village is 925. Of these, 95 households belong to the *Brahmans,* 45 to *Chamaar,* 45 to *Dhanak,* 4 to *Valmeeki,* 18 to *Nai,* 18 to *Kumbhaar,* 21 to *Lohaar,* 4 to *Maniyar,* 5 to *Sunhaar,* 7 to *Baniye,* 4 to *Chimbhi,* 26 to *Jogi,* 32 to Khati, and 6 to *Jheemvar.* The remaining households, about 600, belong to the Jaats.

The Jaats are the most powerful numerically and in social status. The Jaats have the most land and are actively engaged in farming. About 10% of the land is owned by Brahmans, 85% by the Jaats and 5% by the rest. The society of the Jaats is organised into *tholas* (ancestral family units). The village has 3100 electoral votes.

Cropping practices and irrigation

According to the records of the *Patwaari* (village level record keeper), the total land in the Sitapur village is 1098 ha. Of this, 942 ha is cultivable land. 156 ha is non-cultivable. There are two cropping seasons; kharif and rabi. October is the month of the kharif harvest, while April is the month of the rabi harvest. The rabi crops are wheat, *channa* (chick pea), mustard and *burseem* and *jai* (fodder crops). The kharif crops are paddy[32], sugarcane, sorghum, millet, til, udad, moong, arhar and some vegetables.[33] Most of the land in the village is irrigated from the tail of the Sitapur minor of the Western Yamuna Canal. A part of the land is also served by a distributary of the same canal. It is on this part of the land that some sugarcane is grown. Another source of irrigation is groundwater. According to the records of the village Patwaari, there are 45 tubewells in the village.

Along the Sitapur Minor, farmers have started growing paddy over the last two decades. Thus, the outlets are often manipulated to increase discharges for the cultivation of paddy, reducing the discharge at the tail-reaches and adversely affecting the availability of water to the irrigators in this village.

Labour and land-use relations

Apart from private ownership, there are two land use relations in agriculture. Under *saajedaari* (sharecropping), farmer X provides land and water and farmer Y provides labour. They share all other expenses and share the proceeds of the produce in equal proportion. *Thekedaari* is tenancy. Under this arrangement, the land is given out on *theka* (contract) for one year. The farmer who takes the land on theka retains the proceeds of the agricultural produce.

Labour is employed for a variety of agricultural operations including paddy sowing and harvesting, sowing and picking of cotton and cutting of sorghum. The terms of employment could be contractual, per *kila*, (acre, or one fourth of a hectare) or on a daily wage basis. On a daily wage basis, the rate is about Rs.50 for half a day or Rs. 100 for a full day. Sometimes, the rate charged for a full day is Rs. 60 per day plus two meals per day. [34]

Geographically, agricultural labour comes from within the village. It is provided mainly by the Harijans, Chamaars and other

landless. Some small farmers from the Jaat community supplement their incomes by working as labourers on the fields of other farmers. Some farmers cultivate a portion of their lands on their own, and give out the rest on theka or enter into saajedaari arrangements. There is also some migratory labour from the East Indian state of Bihar.[35] *Dangosra* is a labour use relation in which members of one family work on the fields of another family in reciprocation.[36]

The Sitapur WUA

The Sitapur WUA was formed when some farmers whose land was served by the tail of the Sitapur minor approached CADA to get their watercourse lined. As explained in chapter 3, in Haryana, WUA formation has become a condition for getting a watercourse lined. A meeting of all the farmers on the watercourse was called in the village high school. There are three *pannas* (geographical sub-boundaries) in the village whose land is served by the watercourse. From each Panna 2-3 representatives were selected to serve on the Executive Committee.

The association was registered on 17th July 1998. It has 90 members.[37]

In the case of the Lakshmi Narayan WUA, the WUA took over the essential function of irrigation, namely water distribution. So much so that it reflects in the name of the water users association in itself. It is called the *Lakshmi Narayan Pani Waatap Samiti* (*pani* means water and *watap* is distribution). Thus, the WUA is essentially a water distribution organisation. This means that it performs an essential function, repeated from one season to another and from one year to another.

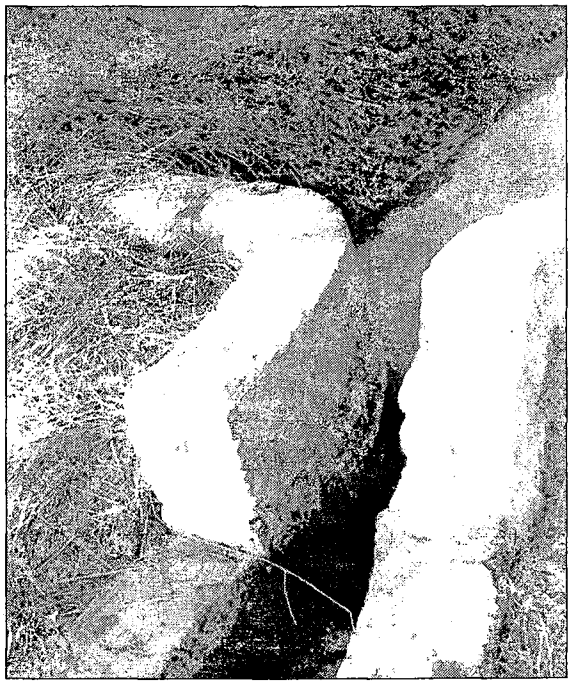
In contrast, the Sitapur WUA has very little to do. Unlike the Lakshmi Narayan WUA, there is no change in the relative roles of the farmers and the Irrigation Department and no role of the WUA in system operation. The only function that the WUA performs is maintaining a lined watercourse.

All that happened when the WUA was formed was that all members whose lands lay along the watercourse paid Rs 50 per hectare of land. CADA paid Rs 450 per hectare. This money had to be put in a bank and the interest that would accrue on it was to

be used for repairing the watercourse in future. This was a condition for getting the watercourse lined. Should there be a need for lining or repairing the watercourse, the members of the WUA are required to approach CADA. CADA would send their staff to assess the situation. Then, CADA would give out the contract for the repair work and the members of the WUA would 'supervise' the repair work.

What has essentially happened is that some duties have been given to the WUA. However, unlike the case of the Lakshmi Narayan WUA, this WUA has no matching rights or powers. The perspective of the Chairman, when I first met him, was aptly put forth by him thus: "They have made me the Chairman, but have not given me any powers."

PICTURE 4.4 Open Flume outlet at the tail of the Sitapur Minor



The tail-end problem

The weak position of the WUA is perpetuated by its location at the tail end of the Sitapur minor. The Sitapur village is located at the tail of the Sitapur minor, about 16 km. from its head. It receives

water from an open-flume outlet (picture 4.4). It suffers from the typical tail-end problem. The members of the WUA do not receive their authorised share of water because farmers upstream along the minor take more than their authorised entitlement.

Along the minor, there are 23 outlets (21 of the Adjustable Proportionate Module type and 2 pipe outlets). It is a common practice along the minor for farmers to draw more than their authorised share by inserting siphons or by breaking the outlets, reducing the supply to the tail reaches (Box 4.6).

BOX 4.6 Interview with Canal Patwaari

05/05/2000

I arrived in the office of the Nahari Patwaari. He explained that the tail of the Sitapur minor is entitled to 1 foot and 8 inches of water; the village does not get its share because the farmers upstream take more than their allocation.

The first reason that the farmers in Sitapur do not get their authorised share is that people steal water by installing siphons upstream, on the minor. They also increase the discharge (on their fields) in two other ways. They lower the crest (base) of the opening of the APM outlets. The crest has an iron plate that is 2 " thick. It is broken by a *khudali* (iron rod). This increases the height of the opening. The other way of tampering with the outlet is by breaking the brick along the side of the iron cast. This is called side bugli. This increases the width of the opening. Both these factors enable them to draw more than their authorised share and reduce the discharge to the tail reaches.

There was another reason for the farmers on the Sitapur minor not getting their authorised share of water. The Sitapur minor was lined in 1985. When this happened, there appeared an imbalance in the surface of the minor.

He went on to explain that at the head of the Sitapur minor there is not a gate but what is called a *kadhi* system. This is a block of logs of wood. These logs are placed to accommodate the desired discharge....

Source: field notes

The authorised share at the tail of the Sitapur minor is 1 foot and 8 inches of water. Through the period that I was associated with it, it never crossed a level of 1 foot, barring a short period of one week during the monsoon rains in the month of July (July 28, 2000). I present below some measurements of the level of water that I took during different periods of my association with the

Sitapur WUA. I confirmed through several interviews with the farmers and the Irrigation Department that this is indeed the usual trend for the rest of the year as well.

Date	*Actual Discharge*	
March 16, 2000	8 inches	(rabi season)
April 16, 2000	1 foot	(end of rabi)
July 29, 2000	2 feet	(Kharif – the monsoon period)
October 3, 2000	6 inches	(between kharif and rabi)

The problem is compounded in the months of September and October when the flow of water is reduced because of the dense growth of weeds and the heavy occurrence of silt along the minor (See Box 4.7).

BOX 4. 7 Visit to the head of the Sitapur Minor

2/10/00

I arrived at the head of the Sitapur minor. In contrast to the short, stunted growth of paddy and jowar in the Sitapur village, there was dense, tall growth of paddy, here. There were some small tracts of land near the canal that had a stunted, scattered growth of paddy. I was told that this land had become unproductive because of overirrigation near the canal. The gauge along the distributary showed a reading of 4 feet 8'. The gauge reader said that at the moment, at the head of the Sitapur minor, they had installed 8 kadhis. The gauge reading at the minor itself could not be made, since the gauge was immersed inside the water flowing through the minor. The flow of water from over the stop logs produced a gushing sound. Along the minor I could see a dense growth of weeds. The beldaar said that at the tail of the minor, water was only about 5 inches. It did not reach the tail because there was a dense growth of *adanga* (weeds) all along. He said that this was the saved water that had been released. It would run like this till Friday. The minor depth was 5 feet 5'..

Before I started to leave, I asked him what he was doing. He was cleaning the adanga along the distributary. I asked him if he would also clean the adanga on the minor, since he himself had pointed out that that was disrupting the supply to the Sitapur village; he said, he would, but only when instructed by the JE. So far he had received no such instructions...

Source: field notes

On April 16, 2000, when I arrived in the Sitapur village, I learnt that a group of village folk had gone up the minor to ask the beldaar to release more water. The water supply at the tail of the minor was only 1 foot. There was an acute scarcity of water and

the farmers complained that their johads (village ponds) were dry and livestock was dying. I learnt that at that point of time, farmers had inserted siphons at four places along the minor. This had disrupted the supply of water to the village. There was some negotiation with the Regulation Beldaar who relented to remove one more kadhi; this released enough water to fill one johad.

The farmers in Sitapur village also turn to different levels of administrative and political authority to justify their claim over water, though, with little sustained corrective response. They have written and sent petitions to the SDO, XEN and JE (position holders in the Irrigation Department). They have also made representations to the present and previous Chief Ministers of the state. In September 2000, the Chief Minister of Haryana, O P Chautala, was passing by the village on one of his "*sarkaar aap ke dwaar* " (government at your door-step) programme tours. A large group of farmers assembled along the minor to stop his fleet of cars and to draw their attention. The usual response of the farmers to how effective this strategy is thus:" for some days, water flows as per the desired standard, then it is back to normal".

Another manner of intervention is that the farmers of the village go up along the minor to clear it of weeds. During the monsoons, there is a tendency for a strong growth of weeds and accumulation of silt along the minor. In the first week of October 2000, the irrigators went up the minor, to a distance of about 2 km., to clear it of weeds, to marginally improve the prospects of water. None of the measures described above, however, provide a sustained corrective response.

There is yet another angle to this lop-sided equation between CADA/Irrigation Department and the WUA members. There is a portion of the watercourse that has still to be lined. This is the last, tail-end portion. The WUA has been trying to get the watercourse lined, but to no avail. Excerpts from my interview with the Secretary of the WUA reproduced below (Box 4.8) narrate the story.

The Sitapur WUA was formed simply as a vehicle for project implementation, i.e. WUAs are seen as an agent to secure CADA's policy goal of watercourse lining. Unlike the case of the Lakshmi Narayan WUA, there is no attempt at changing control relations between the users and the bureaucracy. The WUA has been given some functions to perform but there are no real powers; there is no shift in control relations between the users and the bureaucracy.

BOX 4.8 Interview with the Secretary of the Sitapur WUA

2/11/00

I entered the house of Mahaveer's cousin. It was a large, old, pucka house, very typical of Jaat houses in Sitapur, with a large, wooden door and a roof of sal wood. There were four cots spread out across the ground, and it must have been a meeting place for exchanging conversation and playing cards as well, very much like Mahaveer's own house. At the point that I entered, Mahaveer's father was smoking his *hookka* (community pipe), as the usual pastime is, along with four other elderly men. I introduced myself to him. His name was Meeru.

After describing the formation of the WUA, he added that most of the watercourse had been lined in the first go when the water users association was formed. In the next round another few metres were lined. For the lining of the last portion, the four position holders of the WUA (chairman, vice-chairman, Secretary, Treasurer) went to Jind along with some others. The SE, CADA, Jind recommended it to the Chief in Chandigarh; this was done within 6 months of the second round of lining. The Chief Engineer, CADA sanctioned it. After that, however, he retired. Then after this, the new Chief came. He put a stay order and refused on grounds that there was a shortage of funds.

I asked him if they had enough resources to do the watercourse lining on their own. Mahaveer said "... CADA gives a grant that can not be withdrawn for 5 years. There is only some interest on it that is about Rs 2000-3000 and rather inadequate to meet any working expenses. There could be a provision for us to raise some other resources by levying a fee on all the farmers. That can be a good resource base. .....(right now)we can repair the watercourse only through the permission of CADA, by writing to them. We can not act on our own, you see..."

Source: field notes

Thus, left without an independent resource base and with little powers, the Sitapur WUA is little more than an arm of the bureaucracy, carrying out the functions handed out to it, without any real control or powers. Neither is there control over the resource (water), nor an independent resource base to carry out the functions assigned to it. A farmer whose land lies at the tail of the watercourse put it thus... "*saahab* (sir), they took money from me for lining the watercourse.. but my portion of the land is still unlined.. my land is right at the fag end of the watercourse, and

very little water reaches there anyway.. the committee members say that CADA can not get that segment of the watercourse lined.. committee they have formed .. but who listens to us anyway ?"

Assessment and Comparison

The point raised by Wade and Chambers (1980) about managing "the blind spot" is particularly relevant in the case of the Sitapur WUA. Technical and institutional reform below the outlet is meaningless in the absence of effective management of the main system, when there are water thefts along the minor. Forming WUAs in a desperate bid to replicate small-scale community irrigation systems is futile unless there is control over the main system and a balance between the rights and obligations of the Water Users Associations is struck.[38]

Effects of WUA formation on water management and distribution practices

I now show that the effects of WUA formation on water management and distribution practices were also different in the two cases, and that this difference relates to the different technologies for water distribution. As different technologies for water distribution, these systems have a different potential for reform through WUA formation. In the warabandi system of water distribution, the effects of WUA formation on water management and distribution are likely to be very limited, as compared to the shejpali system. In the table below, I trace the specific water management practices and whether they did or did not change after the formation of the WUA in the two cases.

The table demonstrates that the effects of WUA formation are much more significant in the case of the Lakshmi Narayan WUA. This difference, in turn, relates to the different technology for water distribution. Shejpali has a stronger potential for reform through WUA formation than does the warabandi system. The practice of shejpali requires a number of different procedures to be performed at the irrigators' level, ranging from sanctioning and processing of applications to the operation of gated pipe outlets

Table 4.2 Effects of WUA formation: Lakshmi Narayan and Sitapur WUAs

Function	*Lakshmi Narayan WUA in the shejpali system of water distribution in Maharashtra*	*Sitapur WUA in the warabandi system of Haryana*
Maintaining watercourse and field channels	Earlier watercourses were maintained by farmers, now by the WUA	No change. Even after the formation of the WUA, this task is carried out by farmers
Fee fixation and collection	Earlier the Irrigation Department collected from individual farmers; now, the WUA collects and hands over to the Irrigation Department. The WUA also fixes the fees that it charges from the farmers	No change; the task is carried out by the *Lumbardaar* (an employee of the District Administration)
Operation of the head-regulator	Performed by the Canal Inspector (Irrigation Department), but on the request of the Secretary of the Water Users Association in accordance with the water delivery schedule prepared by the WUA	Not applicable. But the overall operation of the system does not change. It is handled still by the Irrigation Department
Operation of outlets	Switch from Paatkari of the Irrigation Department to the Paatkaris employed by the WUA	Not applicable. But the overall operation of the system still remains with the Irrigation department
Water distribution process	Earlier, managed and inspected by the Irrigation Department; now, by the Water Users Association	No change. Carried out by the warabandi process
Maintenance of the minor	Earlier carried out by the Irrigation Department. Now, it is the prerogative of the Water Users Association.	No change. It is the responsibility of the Irrigation Department. However, some times farmers go up the minor to clean it of silt and weeds
Role of WUA	Overall management of water distribution process including filing applications, collecting and paying dues, and supervising water distribution	Maintaining a lined watercourse

Function	*Lakshmi Narayan WUA in the shejpali system of water distribution in Maharashtra*	*Sitapur WUA in the warabandi system of Haryana*
Overall extent of change in water distribution and management practices after turnover	High	Negligible

and measurement of discharges. There is a potential for turning over these functions to farmers.

This scope is limited, or in fact, absent in the warabandi cases. Introduction of volumetric measurement in the warabandi system, while technically possible, would question the whole design principle of it, namely, that of proportional division. This type of measurement would not match the way water rights have been defined in this system, while in Maharashtra volumetric definition of rights at the system level is consistent with volumetric measurement.

As different technologies for water distribution, these systems place different requirements for the organisational structure needed for their operation. A consideration of the technology or the design of canal irrigation and its operational and managerial implications should serve as a starting point for debates on Irrigation Management Transfer and on WUA formation. Policy makers contemplating WUA establishment should address themselves to this question: what is it that can be changed by WUA formation, and what do we want farmers to do by forming WUAs?

In India, irrigation reform has come to be equated with WUA establishment. This analysis and comparison suggests that there is a need to look further than this: under what conditions can WUA establishment be designed as a strategy for reform? As noted above, in shejpali, WUA establishment can be equated more closely with irrigation reform. In warabandi, WUA establishment can hardly be seen as an irrigation reform strategy.

In both the cases of Haryana and Maharashtra, much has been written about "PIM".[39] In both these states, efforts at WUA formation are conveniently clubbed under the title of 'PIM". It is important, however, to distinguish between WUA establishment that is carried

out primarily from an instrumental perspective, and WUA establishment that seeks to actually change control relations between the farmers and the bureaucracy, and to that effect bring about a "turnover" of control, in its technical, social and managerial dimensions.

Another critical difference between these two WUAs was in terms of the process followed for WUA establishment and the enabling and environment that facilitated the process. The Lakshmi Narayan WUA was formed through a more systematic process of convincing the irrigators of the benefits of WUA formation and a step by step process of effecting turnover. In the process and in its operations, it received the support of not only the NGO that was associated with its formation, but also from other organisations in the state, notably CADA and WALMI. Thus, it operated in much more of an enabling and facilitating environment than did the Sitapur WUA. The Sitapur WUA, on the other hand, was formed through a haphazard bureaucratic procedure with little enabling support or a facilitating environment.

Finally, the analysis of the Lakshmi Narayan WUA offers some insights into the temporal dimension of organisational dynamics. As organisations, WUAs could pass through phases of high and low performance. This is shaped in large part by the support that they are able to receive from the external environment as well as by the nature and character of their own leadership. A critical factor, in such a situation, that shapes institutional robustness is the extent to which a WUA can stand up on its own once external support is withdrawn. The Lakshmi Narayan WUA drew some of that strength from its charismatic leadership in the initial years. However, it lost some of its initial vigour and reached a plateau soon after that. Thus, when a WUA comes up through external support, much of its institutional viability is shaped by the extent to which its internal leadership can continue to impart that strength and vitality, once the external support is withdrawn.

Notes

[1] This could be contrasted with new institutionalist definitions of self-governance that focus on rules for resource appropriation from a perspective of sustainability (Ostrom 1990, 1992).

[2] The purpose of the village profiles is to provide a description of the context in which the WUA is embedded. These become relevant when we

contextualise the case of this WUA, to examine the factors that helped sustain it. This is the theme of chapter 5. However, to avoid duplication, the entire case study is presented here. Understanding the village setting is also essential for understanding the position, in the village, of the people who control the governance structure of the WUA. This will become clearer when we learn that position holders in the WUA are the village elite, who hold positions in other government bodies at the village level, hail from the numerically and socially powerful castes and occupy critical positions in village networks. While I provide a complete discussion of this WUA in this chapter, the thematic focus of this chapter is the changing of control relations between the users and the bureaucracy, for which I contrast it with the Sitapur WUA. In the next chapter, I present a discussion of the contextual factors-local leadership and domination by village elite - when I discuss these issues for the Rampur WUA.

[3] Shivaji is known to be the brave leader of the Maratha Empire, who took as his mission the eradication of Muslim rule. He is known for his tussle for supremacy with the Mughal Empire in the Deccan and is considered a hero of the Marathas all over the state.

[4] There is another outlet located on the Mula Right Bank Canal between the two minors that serves some land in the village.

[5] Most of these wells (about 90%) were dug after the Mula Right Bank Canal started flowing, that is, after 1975 (Lele and Patil 1994). Before the advent of the Mula project, there were only 22 wells. Well digging activity got an impetus after 1975, when on the operation of the canal system farmers found a considerable ground water recharge. There are now about 182 wells in the command, a few of them being bore wells.

[6] This is not for a payment. Groundwater sales have not become institutionalised.

[7] However, both these arrangements are gradually on the way out. Leasing out is no longer considered profitable.

[8] The terms of employment include both daily wage labour as well as contractual labour. The wage rate is Rs 35-40 per day for women while for men it is Rs 60-70 per day. When the payment is on a daily wage basis, it is made for 3-4 days at one go. Labour comes mainly from inside the village, but also from the surrounding villages.

[9] As mentioned earlier in the chapter, a large number of other co-operative entities already exist in the village.

[10] As mentioned above, the Shree Ganesh Society is the name of the multi-purpose agricultural credit society in the village.

[11] See the discussion on the block system in chapter 2.

[12] See also the discussion on the policy environment for PIM in Maharashtra in Chapter 3.

[13] This was voiced to me in many of my interviews with members of the catalyst NGO that was involved in establishing this WUA.

[14] SOPPECOM (1997) and Lele (2000) note that WUAs that are being

formed now still face much the same resistance and procedural delays. This is reflective of the (lack of) keenness in the bureaucracy for establishing WUAs.

[15] These quotas, and a comparison with the allocation on the non-transferred canals, have already been mentioned in chapter 2 (see Box 2.1).

[16] These Paatkaris were hired afresh by the WUA. It was not a case of redeployment of Irrigation Department staff.

[17] See the discussion on the shejpali system of water distribution in chapter 2, as also the implications of the gated pipe outlets.

[18] As mentioned earlier, some land served by the minor falls in the neighbouring village of Hastinapur.

[19] For instance, in the hot weather season of 1990, the quota of water that was allocated to the association was exhausted, though one more watering was needed for crop maturity (Lele & Patil 1994). The society represented the case to the concerned officers and got a good response.

[20] I describe the water distribution process further in chapter 6.

[21] See also my observations of his role in the meeting of the Executive Committee (Box 4.5)

[22] Once while I was waiting for the meeting of the WUA to start, GA Punde was passing by on a motorcycle. He stopped to talk to me. I said, "will you not come for this meeting?" " I am a Gandhian", he said. "When I do not approve of something, I boycott it totally.... This chairman.. he is an idiot....He does not know how to run a WUA..."

[23] The balance is met through the reserve of the water users association.

[24] During the year in which I was associated with the WUA, it made a requisition for its full quota for each of the seasons and the full quota was also released to it.

[25] At the time of this research, one US Dollar was equivalent to approximately Rs. 48 (48 Indian Rupees).

[26] An interesting piece of evidence is that in the Annual Report of the Water Users Association, these Paatkaris are listed as sewaks (servants) of the association, while the government employees of the Irrigation Department are typically called adhikaaris (an adhikaari is a position holder or an office bearer).

[27] See the process of making and sanctioning water applications in shejpali in chapter 2.

[28] The WUA has made use of this facility several times in the period of its existence (IIM-A/IWMI 1999).

[29] As noted earlier, the internal processes of water distribution are examined in further detail in chapter 6.

[30] This includes the gates along the minor as well as the gates located at the head of the minor. The latter are opened by the Canal Inspector according to the schedule prepared by the WUA.

[31] These include the Teli, Sunaar, Dhobi, Lohaar, Nai, Chamaar, Sutaar,

Dhanak and Valmiki. Their roles and occupations are described in greater detail in the discussion of the Rampur WUA, where these details are much more relevant.

[32] There are two varieties-basmati and desi.

[33] Very little cotton is produced in the village. In my interviews with farmers, they often complained about the effects of pest invasion and the ineffectiveness of pesticides.

[34] The cost of labour has risen in recent years. This is cited by many farmers as posing a burden and reducing the profitability of agriculture.

[35] The Bihari labour is cheaper. For instance, local labour is paid Rs 550 per acre on a contractual basis for sowing paddy, while the Bihari labour is paid Rs 450 per acre.

[36] This practice is widely prevalent among families that have good relations with each other. It is a sign of friendship and solidarity. Besides, it is also a way of saving money. This activity is common during the harvest of paddy.

[37] All landholders along the watercourse are eligible to be members.

[38] See also Hunt (1989), Ambler (1994) and Maloney and Raju (1984).

[39] See the discussion in chapter 3.

5

Beyond Community

Demythologising participation in irrigation management

In this chapter, the embedded nature of the process of local water management is examined. I describe the organisational dynamics of the Rampur WUA and how they relate to other aspects of social organisation-the division of society into social units, domination by local elite, the reproduction of power relations inside the water users association and the embedded nature of conflicts. The discussion in this chapter shows that the possibilities of the emergence of collective action in situations of local water management are shaped by social relations, especially relations of power. The processes of the WUA can be captured by the village elite, who can use the WUAs to pursue their own interests and agenda. The location of WUA leaders in village networks that allocate resources and inputs can enable them to evade accountability to their members.

In the later part of this chapter, I revert to a discussion of the Lakshmi Narayan WUA presented in the previous chapter. I draw some conclusions from both these cases about leadership and rule implementation and enforcement. I show that rules serve as resources that individuals mobilise to accomplish certain objectives. The ability of individuals to mobilise rules is shaped by social relationships, especially the relations of power. Individuals also shop among different forums to settle disputes; here, too, they mobilise their networks and social relationships.

The Rampur Water Users Association

Before I present a description of the Rampur WUA, the Rampur village is described. This description is essential to understanding the broader context in which the WUA was formed, in particular, the pattern of social organisation and the village networks that allocate resources and inputs. These assume significance later when the reproduction of power relations inside the WUA is examined.

The Rampur village

Rampur is a village in Rohtak District of Haryana. At the entrance of the village are a huge market and a point where several public buses and jeeps start and terminate. A landmark of the village is a huge *Gurudwara* (the house of worship of the Sikhs, a religious community). Legend has it that Guru Gobind Singh, a religious founder and leader of the Sikhs, visited it about 319 years ago, *circa* 1700.

People and settlements

According to the records of the Patwaari, the total population of the village is 10,500. Thirty-six castes inhabit the village. The Jaats, who are the strongest numerically and in terms of land-ownership, are engaged in farming. The Brahmans, traditionally the priests, also pursue agriculture. The Baniyas are engaged in trade and business. Brahmans and Baniyas also serve in the government and private sectors. A number of smaller communities also inhabit the village.[1] According to the records of the village Patwaari, the total number of households in the village is 1250; there are 700 Jaat Houses, 100 Brahman houses, 250 *Harijan* (a term coined by Mahatma Gandhi to describe members of the lower castes such as the Valmiki, who engage in menial activities) houses, and 200 houses belong to the other communities.

The society of the Jaats is organised into tholas or ancestral family units. Several tholas constitute a panna, or settlement, and several pannas make up the village. It is believed that the village was settled five hundred and nineteen years ago by a person called Ram.[2] Ram had three sons; Gangdaas, Kharat and Buddaan. Five

sons descended from Gangdaas: Sotraam, Jagde, Fatiye, Kirpa and Siddaan. The descendants of each of them constitute a thola.[3] Gandhre and Rau thola are two other smaller tholas that migrated into the village. Of these, Buddaan is numerically the most powerful thola, followed by Kharat. The Buddaan thola has about 700 votes in the village.[4] Kharat has 650 votes. Rau have about 250 votes. Fatiye thola has 200 votes. The Siddaan thola has 150 votes. The Gandhre thola has 60 votes.

The village has several *chaupaals*. The village chaupaal is a place where village get-togethers, functions and ceremonies take place. It serves as a place for socialising among men, receiving guests and holding the meetings of the statutory (and other) Panchayats. Local disputes are often settled in village chaupaals. A Managing Committee comprising representatives of the respective tholas looks after each chaupaal. The village has a Temple Committee and a Gurudwara Committee.[5]

Agriculture and cropping practices

According to the records of the village Patwaari, the total land area of the village is 1800 hectares. The cultivated area is 1505 ha. The non-cultivated area is 295 ha. All the cultivated land has been brought under canal irrigation.

The average land holding size is 2 kilas (0.8 ha).[6] There are two cropping seasons; kharif and rabi. October is the month of the kharif harvest, while April is the month of the rabi harvest. The kharif crops are sugarcane, paddy, sorghum, millet and cotton. The rabi crops are wheat, chickpea, mustard, burseem and jai. In 1995, Rohtak succumbed to a flood. The cultivation of chickpea has come down somewhat after the flood, since it cannot stand excess moisture. The cultivation of paddy, on the other hand, increased after the flood of 1995.

As in the case of the Sitapur village, apart from private ownership, there are two land use relations in agriculture. Saajedaari or sharecropping literally means partnership farming. Under this arrangement, one farmer provides land and water and another provides labour. All other expenses are borne in the same proportion and the proceeds of the produce are also shared in the same proportion. Under thekedaari or tenancy, the land is given out on theka for one year. The rate varies from Rs 4000 per acre to

Rs 10000 per acre annually, depending upon the quality of land.[7] The farmer who takes the land on theka keeps the proceeds of the agricultural produce.

Labour relations, markets and inputs

As in the case of the Sitapur village, labour is employed for a variety of agricultural operations. Employment could be contractual (per kila), or on the basis of a daily wage. Agricultural labour comes mainly from within the village. It is provided predominantly by the Harijans, Chamaars and other landless. Some small farmers from the Jaat community supplement their incomes by working as wage labourers. Some farmers cultivate a portion of their lands on their own, and give out the rest on theka or enter into saajedaari arrangements. There is also some migratory labour from the East Indian state of Bihar. Dangosra is a labour use relation in which members of one family work on the fields of another family in reciprocation.[8] These labour use relations cut across tholas.

Farmers buy seeds and fertilisers from the shops of private dealers near the bus stand on the main road. They take loans for agricultural purposes from the local branch of the State Co-operative Bank. There is also some informal lending inside the village @ 2-5 % per month. The rate of interest in the formal (organised) sector is 1.5% per month. Wheat is sold at the Rampur market, while paddy is sold at another market in the neighbourhood, about 10 km away. Sugarcane is sold at the co-operative sugar mills that are located about 20 km away.[9] In my interviews with farmers, they often complained of rising input prices and falling support prices.[10]

Livestock, fodder and fuel

Buffaloes and goats are the main form of livestock.[11] The main sources of fodder for cattle are sorghum, burseem and jai. These crops are grown on the farmers' fields. Sorghum is predominantly a kharif crop. Burseem and jai are rabi crops. Another source of fodder for cattle is *tuda* (residue from the harvest of wheat). Goats are reared over the Panchayat land or on the farmers' fields. Surplus sorghum over and above the household requirements is

sold. The rate varies from Rs 30 to 40 per *murla* (1 murla is 16.5 feet × 16.5 feet). The buyers are those who do not have much land, or enough of it to grow sorghum. Among them are some Jaats and members of the Harijan community. These Harijans depend on the Jaats for their supply of fodder as well as fuel wood and work on their fields.[12]

The main sources of domestic fuel are

(1) cotton harvest residue

(2) LPG (Liquefied Petroleum Gas) cylinders

(3) the dried branches of trees grown on the fields: *Safeda, Kikar* and *Shisam.* These give yield through the year and

(4) dung cakes made from cow dung in the winter season and kept and used for the rest of the year.[13]

Sources of water and irrigation

For irrigation, farmers rely mainly on canal water. Canal water is preferred over groundwater because (1) the latter is saline and (2) canal water is cheaper. There are five canal outlets serving the village, all from a distributary branch of the Western Yamuna Canal. The agricultural fields of this village are located along this distributary. The head of this distributary is about 12 km away.

Another source of water for irrigation are tubewells. Tubewells have depths of 30 to 70 feet. Due to higher salinity at greater depths, they are not dug deeper than this.[14] The discharge of the tubewells falls mainly in the range of 6-8 l/s.[15] Mainly diesel tubewells are used. There is poor electricity availability in the village and the uncertain rate of well success does not justify electric tubewells. The water table shows some seasonal fluctuation: rising after the monsoons (table 5.1), peaking during the winters and lowering again during the arid summer months.

The main sources of drinking water are the piped water supply served through the *tutis* (public taps) and the open wells. Piped water was introduced in the village about ten years ago. This is supplemented by open wells operated manually by a pulley. The village has about 50 open wells.[16] There are also 5 johads in the village. The johads are mainly a source of water for the livestock. They store rainwater during the monsoons and dry out during the summers. The ownership of the johads vests with the village Panchayat. Fishing rights of the johads are auctioned annually.

TABLE 5.1 Water table level of Rampur village

Year / *Month*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
Jan	3.88	1.01	1.63	1.73	1.93	3.13
Feb	3.94	1.14	1.76	2.11	1.98	3.19
Mar	3.88	1.19	1.84	2.33	2.41	3.20
Apr	4.18	1.68	1.93	2.19	2.95	2.73
May	4.31	2.13	2.38	2.4	3.03	3.45
Jun	4.13	2.21	2.43	2.68	2.7	3.43
Jul	3.96	2.10	2.35	2.70	2.65	3.13
Aug	3.91	.18	2.08	3.03	2.78	2.48
Sep	.13	-.28	1.79	2.15	2.81	2.48
Oct		1	1.9	2.93	2.96	
Nov	.72	1.36	3.3	1.78	3.17	
Dec	.85	1.37	3.21	2.07	3.16	

Source: Ground Water Atlas of Rohtak District. Ground Water Cell. Agriculture Department, District Rohtak

Infrastructure, administration and politics

The village Panchayat is the local level administrative unit. It is entrusted with looking after the welfare of the village population. It carries out such tasks as building and repair of roads, maintaining streetlights, and auctioning fishery rights of the village ponds and the Panchayat land. The Sarpanch is a lady who was chosen on the basis of a reservation quota for women. Three parties have a political base in the village; the Indian National Lok Dal, the BJP (Bharatiya Janata Party), and the Bahujan Samaj Party.

The Rampur Water Users Association

The Rampur Water Users Association was formed in September 1998. It has 102 farmers as members with a CCA (Culturable Command Area) of 648 acres (260 ha).[17] The lined watercourse serving the farmers on this outlet had been first built by the HSMITC in 1978. Over time, however, it had been damaged. Cracks had appeared at several places. In 1995, there was a flood

and that served as the *coup de grace.*

Mahaveer Singh, a retired member of the armed forces, whose land lies at the tail of the watercourse, knew a CADA officer at Rohtak as a family relative. His frequent contacts and interactions with him made him familiar with CADA's programme for lining the watercourse.[18] Mahaveer took the initiative and called a meeting of farmers who owned the land along the watercourse and introduced the idea of getting the watercourse lined.

It was explained that CADA would repair the watercourse if all members paid Rs 20 per kila of land and CADA would contribute Rs 180 per kila. This money would be put in a Fixed Deposit and the interest on that would be used for meeting the future repair expenses of the WUA.

At the time of the formation of the WUA, the members deposited a contribution of Rs 13, 120 while the government's share was Rs. 116, 333. Together, this amount, a sum of Rs 130, 453 was put in a deposit in the Punjab and Sind Bank. The CADA office at Rohtak coordinated with their head -office at Panchkula. The necessary paperwork and formalities were completed and the WUA got registered.

Embedding the institution

CADA required the farmers to form an Executive Committee for managing the affairs of the WUA. The Executive Committee was chosen by drawing representation from each of the seven tholas whose land is served by the watercourse.[19] These are the following:

a) The *Buddaan thola.* Naphe Singh was chosen from this thola. He was chosen as the Chairman. Lajpat Rai, affectionately called Lala in the village, was also chosen from this thola.

b) The *Gandhre thola.* Mahaveer, the Secretary of the Water Users Association, belongs to this thola. He has an education above the average and has served the army. Besides, being a tail-ender himself, he takes a lot of interest in the affairs of the WUA. He took the lead in the initial organisation and managed most of the affairs. Effectively, he ran the show. My assessment of him was that he was astute and well informed. He revealed a keen interest in government policies and was also their strong critic.

c) *The Rau thola.* Satbeer was chosen from the Rau thola. Most of the land of this thola, however, lies on another outlet in the

village. Satbeer also represents two other tholas who have some land lying on this watercourse, namely, Jagde and Sotraam.

d) *The Fatia thola.* Om was chosen from the Fatia thola. Some members of the Fatia thola say that he was chosen because he was an elderly person who could give some time to the affairs of the WUA. He is considered the *Chaudhury* (Lord) of the watercourse, implying that he knows how to manage its affairs.

e) *The Kharat thola.* Surajbhaan Pandit comes from the Kharat thola. Ram Singh was also chosen from this thola. The Kharat thola has two sections: the Jaats and the Brahmans *(lachhoo).* Suraj Bhaan Pandit was chosen to represent the Brahmans, while Ram Singh was chosen to represent the Jaats. Suraj Bhaan Pandit was the deputy sarpanch of the village before the Panchayat elections took place in the year 2000. He is affiliated with the Congress Party.

f) *The Siddaan thola.* Tarachand was chosen from the Siddaan thola. Tarachand is a large grower of sugarcane.

Among them, the position holders own one-sixth of the area commanded by the outlet. Naphe Singh has 7 kilas on this outlet, Mahaveer and his two brothers have 24 kilas of land on this outlet, Satbir and his brother have 20 kilas of land, Om has 8 kilas along with his brothers (he only has 1.5 kilas of his own), Lala Lajpat Rai has 36 kilas of land, Suraj Bhan Pandit has .5 kilas of land and Tarachand and his brothers have 33 kilas of land.

The major benefit of forming the WUA has been that responsibility has been ascertained for repairing and maintaining the watercourse. A benefit cited by all the members is that the watercourse is better looked after. The WUA has emerged as a fine imposing body, imposing fines on those who break the watercourse.

Elite dominance and power structures

However, the formation of the WUA has strengthened the existing power structures among the members of the watercourse. Three large, powerful farmers, who already have a power base inside the village, have acquired some more powers. They share this power mutually to their benefit. There is no transparency and no sharing of information. There is also some arbitrary exercise of power. The activity of the WUA has come to be dominated by three position holders; Mahaveer, the Secretary, Naphe Singh, the Chairman, and

Tarachand. These farmers represent tholas that are numerically the strongest on this watercourse, namely, Gandhre, Buddaan and Siddaan.

The close association of Mahaveer, the Secretary, and Naphe, the Chairman, inside the WUA is akin to their association outside the WUA. They have been friends for the last 30 years, ever since Mahaveer left the army. Mahaveer is usually found in the home of Naphe, smoking hookka and playing cards, even when Naphe himself is not there.[20] The Buddaan thola and the Gandhre thola, to which Naphe and Mahaveer respectively belong, live adjacent to each other. The fields of Naphe and Mahaveer are also located next to that of each other.[21] Mahaveer and Naphe have strong ties with the local police.

The "lord like" position of these position holders in the WUA is akin to their "lord like" position in the village society and in the social networks. These three farmers are economically powerful and the relations of economic dependence of which they are a part reproduce themselves in the working of the water users association. They are large owners of land, and lend money to other members of the water users association. They take land on theka outside the geographical boundaries of the village. Two members of the Siddaan thola take a tractor on hire from Tarachand. There is some land (36 kilas) that belongs to the Pracheen Sri Ram Mandir (the village temple) that is put to auction every year. In the year preceding the one in which I carried out my fieldwork, Tarachand was cultivating a part of this piece of land (12 kilas).

Mahaveer and his two brothers on the one hand and Naphe and his sons on the other, are parties to the auction of the 36 acres of Panchayat land that takes place every year. Mahaveer and his brother Balu have been cultivating the Panchayat land for the last 8 years, even when the same person cannot (officially, in principle), cultivate it for more than 2 years at one go. It is shown in some one else's name, but is cultivated nevertheless by them. Among the 36 kilas of Panchayat land that are auctioned every year are 12 kilas of land that are to be cultivated by the Harijans. In principle, this land is to be sown by the Harijans and the proceeds from the auction of the land are to be used for the welfare and upliftment of the Harijans. This land is taken over by Mahaveer's family.

The Harijan and Chamaars view this act as a threat to their security in the village, but do nothing about it because they depend upon the Jaats for their supply of food grains and fodder. They

work on their fields as agricultural labour for cash or for food grains (See Box 5.1 below).

BOX 5. 1: Interview with village watchman

05/05/2000
While I was waiting for the Patwaari, I noticed this frail looking man. He was short, dark and walked with a slight limp, a brown stick in hand. He kept silent all the while Mahaveer (the Secretary of the WUA) was there. Later, when Mahaveer left, he spoke up. He said that he was the village watchman. Harijans in the village own some 12 kilas of land. These plots have been registered four times in their name. The Jaats do not let this land remain with them. This land is shown as belonging to the Panchayat and is put to auction every year." If this happens", he said, "the Harijans would soon have to leave the village". The Chamaars provide field labour to the Jaats. If the Jaats themselves do this auction, they will be sent to jail", he said. "So, they put pressure on us to take the auction. Later, they take the land from us and pay us and then sow it themselves. We are not allowed to sow it."
He explained that the BDO (Block Development Office) holds the auction. He and his fellow men get fodder and grass from the fields of the Jaats. They also work on their fields in exchange for food grains. Sometimes, the Jaats promise some rate and give some other (lesser) rate. For example, he continued, " once I had taken a contract to cut 3 kilas (acres) in exchange for some grains. They refused to give grains. I reported to the chowki (police station). The policeman said that I could take the grains from him but should not fight with the Jaats. If we fight with them, our children will suffer. How will we feed them ? ....".

Source: field notes

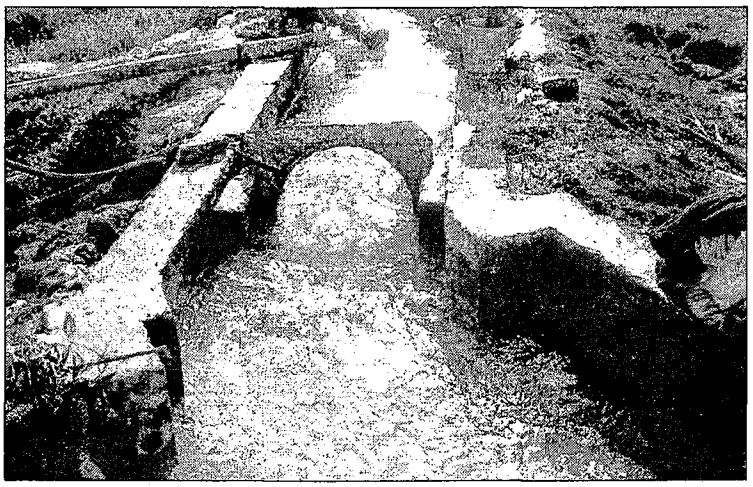
Poor accountability and transparency

My association with the WUA confirmed that (1) there was no transparency in the working of the water users association (2) there was no mechanism for the accountability of the three position holders to other WUA members and that (3) the other members were isolated from the "committee". For all practical purposes, what we would like to call the water users association is only the management committee, popularly called "the committee". This "committee", further, is essentially only Mahaveer, Naphe and

Tarachand. The perception among the other members of the WUA is that it is "their committee". There is some vague sense of aura about them; some sense of mystery as if "we do not know what they are up to." In some cases there is also a negative sentiment."…. if they ever impose a fine upon me, I will never pay it. Why should I? They never told us where our money went. They never call us for a meeting… have they ever told us what they are up to?"

The response of the members of the Executive Committee to this allegation about poor transparency is that there is an annual audit. Mahaveer says that the biggest stumbling block to the effectiveness of the water users association is the *unpadhta* (illiteracy) of the members. His perspective is "…..If they want information, they can come and ask me.. I will not go house to house, giving them information.." The Executive committee looks down upon the other members for their being "illiterate" and "incapable of managing the watercourse".

PICTURE 5.1 A Chaukhat or turnout



The leadership is very autocratic. These three position holders use the funds of the WUA to meet their own ends.[22] For instance, they use them to get the watercourse serving their fields repaired or for getting their own *chaukhats* (turn-out) installed or repaired (Picture 5.1). Other members of the WUA also made appeals to them to replace their chaukhats, but to no avail. The watercourse

has been lined only till the point where Mahaveer's fields are located. The extreme tail end of the watercourse, further down from Mahaveer's fields, is still unlined. The tail-enders always protested against the management committee, and in particular Mahaveer, when I spoke with them. There is another portion of the watercourse that does not serve the fields of either Mahaveer, Naphe or Tarachand. That also still lies unlined. When other members request the position holders for installing *chaukhats* or lining the watercourse, they are turned down on the pretext that "the funds have been exhausted" or, "there are no funds allocated for this purpose". There was also a meeting and training programme offered by HIRMI but other WUA members did not know about it.

Embedded conflicts

I now describe three specific conflicts inside the WUA. These episodes describe the embedded nature of conflicts. The first conflict is an expression of a family feud within the Gandhre thola between Mahaveer and Jaswant, another member of the WUA. The other two are an expression of a conflict between the Kharat and Buddaan tholas in the village.

As noted above, the watercourse has only been lined till Mahaveer's fields. The fields of Jaswant and Ram Kumar, two other WUA members from the Gandhre thola, lie further down from the fields of Mahaveer. Jaswant and Ram Kumar often asked Mahaveer to get their watercourse lined, but he did not heed to their requests. Besides, there is some unevenness in the surface of the watercourse, because of which the full flow of water does not reach their fields.[23]

During one of the irrigation turns, Jaswant and Ram Kumar asked their sons to break the watercourse. When this act of breaking the watercourse was noticed, Mahaveer called a meeting of the Executive Committee and the WUA members in the village chaupaal. Also present were the village elderly and the members of the local Panchayat. It was decided that this loss of breaking the watercourse had to be made good. Jaswant and Ram Kumar would have to pay a fine of Rs 1100 each.[24] They were given a period of 15 days to deposit the fine.

Some of Jaswant's supporters urged Mahaveer not to fine him.

Jaswant even said that he would get the watercourse repaired. But it was to no avail. Mahaveer had threatened that if Jaswant did not pay the fine, he would report the case to the police. Jaswant paid the fine under the fear and threat posed by Mahaveer. Jaswant and some other members of the Gandhre thola complained to me that they did not know where the fine went and how it was used. They complained that there was no explanation for the amount of Rs 1100; how it was arrived at and what use it was put to. Later, Jaswant was given the assurance by Mahaveer that the amount would be returned but that never happened.

The father of Jaswant (Munshi Ram) retaliated by filing a case in the Consumer Redressal Forum of the Civil Court at Rohtak. He filed a case against Mahaveer, alleging that water was not reaching his fields and his fields had had to be left devoid of any cultivation. Mahaveer appeared in the Civil Court. In 1998, the lined watercourse had been repaired. Much to his ingenuity, Mahaveer produced a copy of the mal (payment for the water fees to the Irrigation Department) for the previous years that had been made by Jaswant. This served as proof that the water actually had been reaching Jaswant's fields and he had been irrigating in the past. A representative of the Civil Court paid a visit to the chak. He observed that water from the watercourse was indeed irrigating all the fields that lay adjacent to Jaswant's fields. This included fields at the tail end that were at a slightly higher level. Jaswant's claim was thus proved to be a false one. The members of the Executive Committee view this episode with great sarcasm.

As what would be a sequel to this conflict, Munshi Ram, the father of Jaswant, lodged a complaint on the following grounds through a letter dated September 11, 2000 to the District Collector. The application read thus[25]: "On outlet No. X, some members of the village committee withdrew Rs 90, 000 from CADA for repairing the watercourse length of 37 kilas. They repaired 20 kilas of the watercourse, but 17 kilas still remain. When we enquired from them, they said that the funds have been exhausted. The committee members have Rs 40000 with them. But this money has not been accounted for correctly.... Therefore I request you that some action be initiated and some accountability be instituted against these people. And that the concerned higher-level officer should inspect the watercourse. If no action is taken against this request, I will proceed to the office of the Chief Minister, Chandigarh. Because on account of the watercourse not being

repaired, some land has been left uncultivated in the recent years. Date 11/9/00"

I discovered during the later phases of my research that there has been a long-standing family feud, going down several generations, within the Gandhre thola between the families of Mahaveer and Jaswant. They do not work on each other's fields (do not enter into dangosra arrangements) and do not socialise with each other. These two families have been engaged in a tussle inside the water users association. Every time I visited Jaswant's family, they complained about Mahaveer. When I went to Mahaveer's family, they asserted that their complaints were false. During one of my meetings with Mahaveer and Naphe in the farmer's house, I said.. "some members are very unhappy with your committee". Mahaveer's instant reply was... "I am sure one of them must have been Jaswant and his friends."

Imposing a fine by Mahaveer was essentially an expression of this hostility; perhaps the episode of breaking the watercourse was an excuse for expressing this vengeance on Mahaveer's part. Mahaveer justified the imposition of the fine on the grounds that the byelaws of the water users association empowered him to do so. I confirmed through my reading of the byelaws and discussions with CADA officers that no such rule exists. Thus, a rule, namely that a fine can be imposed for breaking the watercourse (when actually no such rule exists) was taken as a resource to turn to for expressing another hostility.

The second expression of this conflict was when Jaswant's father filed a case against him in the civil court. As the third expression, Jaswant's father lodged a complaint against Mahaveer to the District Collector. An alternative would have been to take the complaint to CADA. However, the concerned CADA officer is a family relative of Mahaveer (see the discussion on the formation of the WUA). In fact, he had played an important role in the formation of the water users association itself. That factor, perhaps, affected Jaswant's and his father's choice of forum. Thus, individuals turn to different forums for resolving disputes. The choice of these forums is influenced by their networks and social relationships.

A management shuffle

I now describe two other conflicts inside the water users

association. In the village, there has been a tussle for superiority between the Kharat and Buddaan tholas that are numerically the strongest. The Kharat thola views the Buddaan, Siddaan and Fatiye tholas with ridicule, calling them 'B S F' and refuses to even recognise the Gandhre thola as a thola, on account of its small size.[26] Inside the WUA, the Kharat thola has been alienated from Buddaan, Siddaan and Fatiye.

The WUA ran with the Executive Committee described in the earlier section of this chapter for some time. Soon, however, one of these members, Ram Singh, who represents the Kharat thola, had a fight with Mahaveer. Mahaveer had hired some labourers for repair work on the watercourse. Ram Singh, who is also on the Executive Committee, offered to provide some labour. Mahaveer paid some *dehaadi* (compensation) to the other labourers but did not offer anything to Ram Singh, on grounds that his services had to be honorary. Ram Singh insisted. Mahaveer asked him to quit. He wrote to the concerned CADA officer and told them that he had asked him to leave. "He was very old anyway", says Mahaveer.

According to Ram Singh, he did have a fight with Mahaveer on the dehaadi issue but he was still on the committee and had not been thrown out. "He cannot throw me out," he would say. Other members of the Kharat thola said that if Ram Singh were thrown out, he would have to be replaced by another person from the Kharat thola. I learnt at the later stages of my research that in the village, there has been a tussle for superiority between Kharat and Buddaan tholas. Asking Ram Singh to quit was essentially an expression of this conflict.

There was another conflict inside the WUA that was representative of a conflict between the Kharat and Buddaan tholas. As noted earlier, the WUA position holders take part in the auction of the Panchayat land. For the year 2000, Bhoru Pandit won the auction of cultivating 12 acres of the Panchayat land. Bhoru Pandit belongs to the Kharat thola and owns a bicycle shop in the market of Rampur village. This land lay between Naphe Singh's land and that taken by him in the auction from the Panchayat. Naphe did not allow him to take water from the watercourse that passed by from his fields. Bhoru Pandit had to dig an extra field channel through 8 kilas to bring water to his fields. Then, Naphe tried to take water for his fields from this field channel and Bhoru Pandit stopped him.

The episodes described above point to the embedded nature of

conflicts inside the water users association. They suggest that they are a reflection of other conflicts in society. They also show that individuals shop among different forums to resolve these conflicts, mobilising their own networks and social relationships.

Role of leadership and interface with the bureaucracy

However, in Mahaveer, the WUA does have a good and dynamic leader, in terms of the interface of the members with the Irrigation Department and the bureaucracy. Mahaveer is astute and well informed. He reveals a grasp of contemporary issues well above that of his peers and has very strong opinions on political and administrative matters. He is critical of the current government and the effects of the agrarian policy environment on farmers in Haryana.

The essential role of the WUA Executive Committee, led by Mahaveer, is lobbying for resources. The association approaches the MITC for a remodelling request, and pursues it for action.[27] The MITC gives a tender and the WUA supervises the repair work.

The first request for remodelling the watercourse was made in June 2000. Mahaveer went to the office of MITC, Bhiwani. Some officers came from Bhiwani and inspected the watercourse and surveyed it. The Superintending Engineer, MITC, Bhiwani sanctioned the remodelling and recommended it to the head office of the MITC in Chandigarh. The second recommendation came from the Principal Director, HIRMI. It has now been finalised by the MITC head office, i.e., by the Chief Engineer, Chandigarh. However, Mahaveer had to make several rounds of the offices. "This is not England, this is India. Here you have to chase a person to get some work done", as he bluntly puts it.[28]

MITC gave the tender for remodelling the watercourse and the role of the Executive Committee was to supervise the remodelling work. Mahaveer said that they told MITC to invite the bids and that would prevent other WUA members from pointing fingers over the Executive Committee. This was another expression of the distrust that prevailed between him and the other members of the water users association.[29] When my period of research was drawing to a close, work on remodelling the watercourse had already started. Mahaveer worked very hard and spent the hot days of summer supervising the work. Thus, occasionally, he did step out

of his own personal motives in the larger interest of the water users association.

Conclusion

The case of the Rampur WUA gives some insights into the embedded nature of the processes of local water management. The embeddedness comes out in (1) the manner in which the Executive Committee is constituted, by drawing representation from the tholas whose lands are served by the watercourse (2) the reproduction of power relations inside the WUA and (3) the embedded nature of conflicts inside the WUA. The most important insight from this case study is in demythologising "community".[30] In the case of this WUA, the information and power are shared by the three position holders to the exclusion of others. They use the resources of the WUA to further their own ends or to get the watercourses serving their fields repaired. Thus, there is little sense of "participation". Further, there are conflicts inside the WUA that are embedded in other conflicts in the village society. What is called "Participatory Irrigation Management" in current policy discourses is not necessarily about community management.

Discussion and Comparison with Lakshmi Narayan WUA

I now discuss some contextual factors that helped shape and sustain the water users associations, both in the cases of Rampur well as the Lakshmi Narayan WUA, which is discussed in the previous chapter.

Role of leadership

In theorising about the actions and behaviour of WUA leadership in both these cases, it could be argued that the behaviour of leadership in the WUAs is shaped by their strategic locations in village networks, their belonging to dominant castes and groups as well as their position in other village bodies and organisations. WUA leadership is embedded in the wider social, economic and political context.

The local leadership often comes from people who are influential in the society. In the case of the Lakshmi Narayan WUA, leadership came from people who also held, or had held in the past, positions on other influential village bodies, such as the village multi-purpose co-operative credit society, the sugarcane co-operative factories and the village Panchayat. Two of the present members also have political affiliations. In fact, one of them has, at some point of time or the other, held positions in virtually all the local level organisations: the sugarcane co-operative factory, the multi-purpose village credit co-operative society and the village Panchayat.[31] Similarly, in the case of the Rampur WUA, one of the members was a former Deputy-Sarpanch. Those people who already have a power base in the village society seek to consolidate it by aspiring for positions on the management board of the water users association, or aspiring for interlocking leaderships.[32]

Leadership serves as an intermediary between the farmers and the bureaucracy and would stand out as a strong contextual factor shaping and sustaining the organisational effort. In particular, it plays an important role as a catalyst in an organisational effort and in lobbying for change. This role is exercised by (1) convincing farmers of the benefits of collective organisation (2) bearing the organisational burden in terms of negotiating for management transfer and (3) lobbying for change and representing the case of farmers to the Irrigation Department. This is true in the case of both the Rampur Water Users Association as well as the Lakshmi Narayan Water Users Association.

This role assumes importance particularly when the formation of water users associations involves a shift in the equation between the bureaucracy and the water users, as it did in the case of the Lakshmi Narayan Water Users Association. In this case, the WUA leadership participated in several rounds of negotiation with the Irrigation Department to finalise the terms of contract under which management turnover took place. This was an uphill task since there was resistance from the bureaucracy that created several hurdles in the process by postponing dates for meetings and insisting on several formalities, such as the production of several documents. There was also a time when the WUA faced a financial crisis. The leadership went around convincing the members to pay up their dues.

In the Rampur case, too, leadership plays a lobbying role. The Secretary follows up with the bureaucracy for remodelling the

watercourse. This entails making several visits to the offices of the government organisations, building contacts and following up when necessary. When the remodelling work on the watercourse started, Mahaveer worked very hard to supervise the activity. In fact, in this case, the success of the WUA has come to hinge upon the personality only of Mahaveer. What is interesting is that even though the relationship between Mahaveer and the other WUA members is not always favourable, outwardly, Mahaveer is a strong liaison with the irrigation bureaucracy.

Influence of patterns of social organisation: the expression of social relations and the relations of power

General patterns of social organisation, such as organisation by castes and groups, local politics and domination by those already in positions of prestige and power find expression in the processes of local water management. Representation and dominance are important aspects of the processes of local water management.

In the case of the Executive Committee of the Lakshmi Narayan WUA, membership mainly draws from the upper caste Marathas and Brahmans (Dahatonde, Jawle, Shelke and Ukeerde). These castes are the more powerful castes in the village, numerically and in terms of land ownership. Similarly, in the case of the Rampur WUA, the society of the Jaats is organised into tholas or ancestral family units. The membership of the Executive Committee was constituted by drawing representation from each thola.[33] The leadership is concentrated among three position holders. They are three large farmers, who take part in the auction of the village Panchayat Land and lend money to other smaller farmers and provide agricultural implements and tractors on hire.

There is a divergence between what legal provisions empower WUA members to do, and what they actually do. In the case of the Rampur WUA, the secretary used a rule (that does not exist in principle, or on paper) to penalise a member with whom he has had a personal animosity. Thus, rules serve as resources that individuals mobilise to accomplish certain objectives. Actors also differ in their ability to mobilise rules, and this ability is shaped by social relationships and the relations of power.

Expanding the numbers and coverage of WUAs

I now devote some attention to contextualising the success of the Lakshmi Narayan Water Users Association, contributing to some thinking on discussions of expanding the numbers and coverage of water users associations. To begin with, as explained earlier, the WUA gained through a very effective leadership under Gharonde Sir and G A Punde. Combined with the support of the NGO, this coalition served to lobby on behalf of farmers and effected the management turnover. Though there was initially resistance among the Irrigation Department, it finally relented and did extend support.

It becomes easier to contextualise this case when we place it in comparison with the Mula Minor No. Y, in the vicinity of this minor, in the same village. Some land in the village is served by the Mula Minor No. Y, where a WUA has not been formed. Here, the farmers apply for irrigation to the office of the Irrigation Department at the irrigation sub-division. They have to travel a distance of about 4 km. The Irrigation Department makes the irrigation schedule and hands it over to the farmers. The Canal Inspector from the Irrigation Department monitors the water distribution. The repair and maintenance of the minor is still the responsibility of the Irrigation Department.

The farmers on Mula Minor No. Y wait for the Irrigation Department to open the gate, both at the head of the minor as well as along the minor. There are frequent cases of water disputes. Sometimes, some farmers who do not apply for water also take it when the rotation is on. This generates conflicts. There is some sense of anarchy; the larger, more powerful farmers, who are able to bribe the Paatkari, are able to take water first. It is easier for the Dahatonde and Jawle farmers, who are socially and numerically powerful, to bribe the Paatkari and to take water out of turn. The Paatkari stands to gain from the *status quo*. The Paatkari wields some power because of his position and ability to release water, that is, he has some control over the water distribution mechanism. This provides him a mechanism to extract illicit payments from farmers. There is no uniform set of rules. There are also water thefts at night. The opening of the head regulator can be increased by rotating the screw using a radial or spanner.

The Secretary of the Lakshmi Narayan WUA tried to form a water users association on the Minor No.Y. My understanding of

the situation, based on my interviews with farmers and the Secretary, and observation of the irrigation process on the Minor No.Y, is that there is resistance from the larger and powerful farmers who thwart these efforts. They stand to gain from the *status quo*, by appropriating water through a mechanism for illicit payments to the Irrigation Department Paatkari. Besides, they make good use of their position of privilege to exercise other forms of power, or building obstructions on the canal to take water. These actors, who gain from the status quo, resist the formation of the WUA.

SOPPECOM tried to form a federation of WUAs along the distributary, but attributes its failure to the absence of support from the Irrigation Department. Thus, there is resistance from the Irrigation Department as well as the farmers who gain from the *status quo* and see a change as a threat to their current position.[34]

One factor that emerged from my discussions with those who have been associated with the Mula Minor No. X as well as other places in its vicinity is that in this case, the WUA has not been factionalised. At many other places, the fact of farmers coming from different political parties creates factionalism and prevents them from coming together. In the Mula Minor No.X case, this has not happened in its day-to-day functioning. From my discussions with other observers of the PIM process, particularly the Irrigation Department, there are about 20-odd WUAs on the Mula Right Bank Canal, but none has survived for as long as the Mula Minor No. X. The reason that was cited most often for this is that they have become politicised. Their members come from different political groups, and they refuse to co-operate.[35]

The point that needs emphasis from this discussion, as well as the discussion in the preceding chapter is that there are always local contextual factors that shape the processes of local water management and influence the conditions under which collective action would, or would not emerge. Further, the case of the Rampur WUA suggests that forming WUAs may not always be a valid policy prescription, if WUAs are dominated by village elite who can mobilise them for the furtherance of their own interests and agendas.[36] An important challenge, then, is in devising mechanisms for instituting and ensuring accountability of local level governance structures to their members. Otherwise, the creation of organisations for local governance could simply create new centres of control.

Notes

[1] These include the Teli, Sunaar, Dhobi, Lohaar, Nai, Chamaar, Sutaar, Dhanak and Valmiki. Traditionally Telis have been engaged in extracting oil. Sunaar are the jewellers. Nai are the barbers. Dhobi are the washermen. Lohaar are the blacksmiths and make and sell agricultural implements. Sutaar are the carpenters. Dhanak are the weavers. Mochi make and repair shoes. Chamaar work with leather. Valmiki, also called Chuhre or Bhangi, are the scavengers. These groups have no land, or very little of it. Most of them have moved outside their traditional occupations and work as labourers on agricultural farms or in construction work. Some of them pursue animal husbandry or petty trade. They also run tea-stalls and fruit and vegetable shops. A few of them serve the government and the private sector.

[2] Most villages in Haryana derive their name from the earliest known inhabitant, or the person who settled the village. Legend has it that Ram came to this village with his wife; they saw a lion and a goat drink water from the same pool, a rare sight by all means, and thought that this would be a wonderful place to settle down. This would have been circa 1500 A.D.

[3] The members of a thola live together geographically and their agricultural lands are located adjacent to that of each other. They are also together on social occasions as marriages and childbirth in the family.

[4] These are electoral votes for the administrative bodies at the village, district, state and national levels.

[5] These committees look after the upkeep and maintenance of the temple and gurudwara, respectively. The temple committee also carries out the annual auction of the temple land for cultivation.

[6] 1 kila is 1 acre. 2.5 acres make one hectare.

[7] The land next to the canal commands the highest price, on account of proximity to source of water.

[8] As noted in chapter 4, this practice is widely prevalent among families that have good relations with each other. It is a sign of friendship and solidarity. This activity is common during the harvest of paddy.

[9] At present levels of input and output prices, sugarcane cultivation was cited by the farmers as being the most profitable, followed by paddy and wheat.

[10] Farmers would often describe their main problems as (1) the absence of real control over the source of irrigation (2) uncertainty about input prices (3) uncertainty about output prices and (4) the occurrence of pests and disease. Another factor that had increased the element of risk facing the farmers in this village was that earlier the Government of Om Prakash Chautala, the Chief Minister of the state, had promised waivers in energy and water prices. This was done at the time of the state government elections in the year 2000. They were now told that the waivers would be

withdrawn.

[11] Buffaloes are predominantly a source of milk, used for direct domestic consumption as also for making lassi (buttermilk) and ghee. Some surplus is sold to the dudhiyas (milkmen) and taken to Delhi. They are also a source of domestic fuel (uple, or dung cakes, made from cow dung). Goat milk is used mainly for self-consumption. Goats are kept by the members of the lower castes; dhanaks, chamaars and chuhres.

[12] The price of jowar fodder varies by season. In the dry season, the rate is about Rs 30 per murla. During the rest of the year, it is about Rs 20-25 per murla. Burseem is sold at the rate of Rs. 90 per murla. Jai is sold at the rate of Rs. 30-40 per murla. These sales are confined to the winters.

[13] Dung cakes are used mainly for heating water and milk while fuel wood from the Kikar, Shisam and Safeda trees is used for other cooking activities. Dung cakes are sold at the rate of Rs 1 each. All varieties of fuel wood are sold at Rs 80-90 per quintal. These rates stay the same through the year.

[14] Data on water quality for Rampur is presented in chapter 6.

[15] This data was obtained from the office of the Ground Water Cell of the Agricultural Department, Rohtak.

[16] The open wells are usually dug near the johads to benefit from proximity to them. However, with the introduction of piped water supply, the use of open wells is on the decline. In principle, different communities draw water from different wells in the village. However, it is no longer unusual to see the Chamaars and Harijans draw water from the same well as the Jaats and the Brahmans.

[17] All landowners whose lands are served by this outlet are eligible to be members.

[18] See the discussion on the policy environment for WUAs in chapter 3.

[19] This means that the structure of the Executive Committee was essentially patriarchal. I thank Margreet Zwarteveen for bringing this point out in one of my discussions with her.

[20] It is a common tradition and pass time among men to sit together, smoking the hookka and playing cards. The place where they sit is usually the part of the house that is called the gher; it is a courtyard in the house, with an open space and some space for tying and feeding buffaloes. Women are not allowed to enter the gher, though with time, this restriction seems to fade away.

[21] As noted earlier, the village settlement pattern corresponds to the location of the farmers' fields.

[22] These funds comprise the share money that is deposited in the name of the WUA. See the discussion in the section on WUA formation.

[23] Along the watercourse, there is a depression, over which water tends to accumulate and the full flow does not reach the fields of the tail-enders. Towards the end of my fieldwork, work had started on remodelling the watercourse and Mahaveer was confident that this snag would be

corrected.

[24] These amounts could be seen written in Mahaveer's diary. I was very impressed with Mahaveer's meticulous attention to detail.

[25] This has been translated from the original application that was written in Hindi.

[26] Note also that the numerical distribution of the members across tholas on this outlet is different from that in the village.

[27] See also the discussion on the role of the MITC in Chapter 3.

[28] This presents an interesting contrast with the Sitapur case described in the preceding chapter where the WUA could not succeed in getting the last segment of the watercourse lined. The WUAs differed strongly in terms of the ability of their leaders to mobilise resources.

[29] This "distrust" came out in many of my interviews with the WUA members, particularly other members of the Gandhre thola as well as many other farmers who were alienated from the working of the water users association.

[30] "Community" and "participation" have been glorified in recent discourses on irrigation management. See, for instance, Groenfeldt (2000) and Hooja and Joshi (2000).

[31] Carter (1976) notes that power in rural Western Maharashtra has been concentrated in the hands of relatively few persons and a large majority of those who hold power are members of one small section of the population. "Power in the countryside is distributed unequally " (Carter 1976: 3). In Maharashtra, the sugarcane revolution in the early 20th century gave a new stature to the rural elite. This elite comprises large sugarcane growers who vie for top positions in sugarcane co-operatives as also the State Legislative Assembly and enjoy a prominent place in local politics (Attwood 1992; Baviskar 1995; Attwood and Baviskar 1995b). In Haryana, the green revolution gave a new position to the rural elite. For a discussion of the social effects of the green revolution, particularly, the widening of income disparities, see Paul (1989) and Kumar (1989). For a discussion of patterns of rural leadership in North India, see also Sharma (1979) and Mehta (1972).

[32] See also Kloezen (2002). Kloezen in Mexico found that WUA leaders tried to make use of their political power to become re-elected as WUA leaders, even when this was not allowed in principle. They also used their position as WUA leaders to further expand the economic and political networks on which the existence of the WUA depended.

[33] This means that the Executive Committee had representation from only the Jaats. There was one representative from the Brahmans (the lacchoo section of the Kharat thola).

[34] See also the discussion in chapter 3.

[35] Sometimes, though, they simply come from different factions, which may not necessarily be affiliated with different political parties.

[36] See also Agrawal and Gibson (1999) and Kumar (2002).

6

Mediating Scarcity by Design

Water distribution, water rights and equity in protective irrigation

This chapter examines the process of water distribution in the outlet command areas of the WUAs that I studied. It describes the irrigation practices in warabandi and shejpali. The analysis shows how irrigators seek to overcome a constraint that is posed by a system of designed scarcity. They mobilise rules and social relationships to improve flexibility in water deliveries as well as to get extra water.

The irrigation practices among the members of the Rampur WUA under the warabandi irrigation regime are first described. My own empirical observations of equity within the command of the outlet are presented. In chapter 6, I have referred to the domination of the WUA by the village elite; in this chapter, I show that this domination does not spill over into the water distribution process. Finally, a discussion of the water distribution process in the case of the Lakshmi Narayan WUA is presented. It is shown that WUA formation in shejpali can have equity enhancing effects. This is not true of warabandi. The chapter concludes with a discussion of the different forms of interaction between irrigators and engineers that develop in the water distribution process and that irrigators mobilise to improve their access to water.

Irrigation under Warabandi: Responses to Scarcity by Design

Chapter 2 has described the genesis and characteristics of protective irrigation. To briefly recount the basic tenets, the

purpose of protective irrigation is to divide a supply thinly over a large area, rather than to match supply with demand. Thus, the aim is to optimise production per unit of scarce water (Jurriëns, Mollinga and Wester 1996). Protective irrigation systems are characterised by high duties and low irrigation intensities. Cropping intensity is supposed to be low.

Since protective irrigation systems seek to maximise productivity per unit of water, while farmers seek to maximise productivity per unit of land, there is an inherent conflict between farmers' objectives and government objectives. Initially, the combination of the warabandi system with light crops such as wheat allowed the systems to work as designed. Later, however, with the onset of the green revolution and the introduction of HYVs (High Yielding Varieties) of seeds and the consequent commercialisation of agriculture, this pattern got disrupted. The initial high design duties became inadequate. Farmers wanted to irrigate in two seasons instead of one. They also wanted to irrigate all their land as against the low planned intensities, or at least more than planned. There was an increase in productive irrigation and rice cultivation (Jurriëns 1993).

In this backdrop, two factors are significant in understanding the design characteristics of canal irrigation in Haryana. First, since irrigation is protective in nature, the aim is to ration out water through a system of rotations through the warabandi system, rather than to match supply with demand. Second, the control and operation of the system are totally centralised. A fall-out of these factors is that in principle, farmers have no control over the availability of water from the main system, or their ability to match water supply with crop water requirements.[1]

In my research, however, farmers were observed to employ a number of strategies to increase control over water supplies.[2] These strategies are as follows:

1. engage in time exchanges
2. supplement canal irrigation with tubewell irrigation
3. tamper with outlets
4. insert siphons over the canal or distributary. This takes the form of a water theft or a bribe to the canal patroller
5. apply for a rice shoot

I describe each of these below. The first of these, namely the time exchange, improves flexibility of water application and may

bring about some efficiency gains. The other four enable an irrigator to get extra water.

Time exchanges

The most common response to a system of scarcity is a time exchange. That is, a farmer who needs water outside his turn borrows from another farmer and returns it another time. This deviation is justified on the basis of *bhaichaara* based organisation. *Bhai* means "brother" and *bhaichaara* is indicative of a feeling of brotherhood, friendship and affection. While the water right is constituted through state law, it is realised, often, through a different normative system, namely, that of bhaichaara. This points to the existence of legal pluralism in the process of water distribution, that is, to the existence of different normative systems with regard to the same set of activities.[3]

Under the warabandi system, a period of one-week (168 hours) is divided in proportion to the size of the land holdings falling under one chak, the area served by one *mogha* (outlet). Each piece of land, then, is supposed to receive water for a fixed time and day of the week. An irrigator's water right is determined in proportion to the size of his landholding.[4] The pucka warabandi schedule is supposed to determine the water distribution below the outlet. It is framed by the Irrigation Department and it has a legal basis in Section 55 (A) of the Haryana Canal and Drainage Act of 1974. It specifies the time period and day for which an irrigator will irrigate his land. In local language, it is said to be manjoor *shuda* (approved, having been sanctioned by law).

In practice, within the overall framework of the warabandi schedule, farmers follow a distribution pattern that is based on their mutual understanding, cooperation or bhaichaara. Farmers explain bhaichaara as "being born from the same womb", "familial ties", "a feeling of friendship", and "a sense of brotherhood".[5] It is used in several contexts, such as a bhaichaara Panchayat, referring to the local Panchayat, a loose informal congregation of village elderly. A bhaichaara committee is the one that is formed on the basis of mutual consent rather than through the force of law.[6] When I asked the Secretary of the Rampur Water Users Association to explain what bhaichaara is, he said, "it is when we give up our own self-interest for a greater common good."

As a rationing response to distribute scarce water, a farmer only gets to irrigate for a fixed time period on a particular day of the week. This is often inadequate to irrigate his crop, or the entire area covered by it. So, he seeks to fill this gap by borrowing an irrigator's share on the basis of bhaichaara and returns it another time. This borrowing is an effort on the part of the farmer to more closely match water supply with crop water requirements. [7] Time exchanges on the basis of bhaichaara form an optimisation strategy through which farmers cope with a regime of water scarcity created by a system of water rationing.[8]

BOX 6. 1 Visit to Kishan's fields

While I was sipping my tea at the *dhaaba* (village eating joint), a man called Kishan introduced himself. He had .5 kilas of his own land and had taken 16 kilas of land on theka.[1] We then reached his fields at about 10.45 a.m and started walking towards the point where his field channel took off. His *awsara* (turn for taking water) started at 10.50 a.m. When we reached the head of his field channel, he showed water flowing to his neighbour's fields. A small embankment of mud lay across the head of his field channel. All he had to do was to break that embankment and insert that mud over the head of his neighbour's field channel so that water would start flowing to his fields instead. They conversed with each other and I started inspecting his fields. Kishan said then that we should go back. I was surprised, I looked at my watch and said 'but your awsara has started.. it is past 10.50. I have come to see you irrigate'. 'No, he said, pointing to his neighbour, he is taking my share of 50 minutes today'. At this point in time, his neighbour intervened, " next time, I will give him my 50 minutes. Then, he will have a total of 1 hour and 40 minutes to irrigate." I was quite impressed. The transaction of a time exchange had taken place in front of my eyes with great felicity and smoothness and I was amazed at how little effort was involved in it. We then started walking further down and there was another mogha that belonged to the village.....

It is rather difficult to precisely estimate how widespread this mutual exchange is. However, it is more common for crops such as sugarcane and paddy in kharif and wheat in the rabi season. These crops are the relatively more water consumptive crops. When I asked farmers about how often they engaged in these swaps, I got such responses as "saahab, that we do 24 hours..." or "..what is

there in it, saahab, that is always on." What is also interesting is the collective toleration of this practice by the bureaucracy. The attitude of the irrigation bureaucracy as summed up in the words of a Zilledaar is thus.."Yes, time exchanges are prohibited under the Haryana Canal and Drainage Act.. but we do not interfere with what they (the farmers) do on the basis of their own bhaichaara".[9] It is not uncommon for a farmer to lend his entire water share to another farmer (see Box 6.1).

A time exchange takes a more specific form in the nature of accumulating time-shares. Some farmers have a very small size of landholdings such as 1 acre or half an acre. Several such smaller farmers accumulate their timeshares and irrigate by turns. For instance, if farmer A, B and C have 1 acre each and the entitlement is 15 minutes per acre, then in one irrigation week, A borrows from B and C and irrigates for 45 minutes, in the next week, farmer B irrigates and then, in the following week, farmer C irrigates.

Time exchanges also cut across seasons. For instance, if in the kharif season farmer A has grown paddy and farmer B has grown sorghum, farmer A, with greater water requirement borrows from B. In the rabi season, if farmer B has grown wheat, and he has an extra water requirement, he takes the share back from A. One response of the tail-enders in terms of time exchanges is to skip irrigation in one season (kharif) and accumulate water shares so that one crop (wheat) can be grown in the rabi season. In kharif, they concentrate on crops such as millet, cotton and sorghum. These are the less water consumptive crops and farmers also rely on kharif rains for their cultivation.

In chapter 5, I have made a reference to the organisation of the society of the agriculturists into tholas. I found the institution of time exchange to cut across tholas, though it was more common among the members of a thola, owning adjacent pieces of land. As one irrigator described the practice *" bhai ka diya, bhai ka liya"* (taken from brother, returned to brother). These characteristics of time exchanges can be summarised as follows:

(1) They cut across tholas: they are more common among members of adjacent pieces of land, but they also take place among members whose fields are distant on the watercourse.
(2) They cut across outlets. Farmer A, who irrigates from outlet X would exchange his time slot with farmer B, who irrigates from outlet Y.
(3) Sometimes, the negotiation and decision about the exchange

takes place before the dates on which the distributary is run. Sometimes, it takes place after the irrigation has started and sometimes, it is quite spontaneous, i.e., at the spur of the moment.

(4) Time-shares cut across seasons. The tail-enders accumulate their time shares by skipping irrigation in kharif and irrigating from rainfall, crops such as sorghum, millet and cotton. They give their timeshares to those who need water in kharif, say, for paddy cultivation. Then, they use their accumulated time-shares to irrigate wheat in the rabi season.

I summarise my argument as follows:

The water distribution process in the warabandi areas of Haryana is supposed to be governed by the pucka warabandi schedule. This schedule lays out the time and day of the week for which a farmer takes water and effectively determines his water right. This schedule has a legal backing under the Haryana Canal and Drainage Act of 1974. The rigidity of the warabandi schedule means that there may be a mismatch with the actual water requirements of crops. Further, with small land-holdings, turns may become very short and field application efficiency can become low. Therefore, farmers devise a way to make the system more flexible to get a better match with crop-water requirements and increase the efficiency of water use.

Thus, we could argue that the institution of time exchange arises because of (1) a well-defined water right, through the pucka warabandi schedule, that defines the basic unit of exchange (2) the protective nature of canal water supplies, that allocates water scarce relative to demand, creating a practical problem for field irrigation (3) the rigidity in the turn allocation and the small size of land-holdings that lead to short irrigation durations which become unpractical and inefficient and (4) the existence of plural legal repertoires.

Other transactions in canal water

While water rights are tied to land, a transaction in a water right could take place along with or exclusive of the land. For instance, some farmers give their land on a tenancy arrangement for a year to others.[10] This is done along with the warabandi share of water.

The rate at which they give out the land includes the water share. This arrangement is known as giving land on theka. It is a common practice among smaller farmers to take land on theka. Larger farmers also give out their land on theka in smaller parcels or fragments at the same time to more than one smaller farmer or simultaneously cultivate their own land and those of other farmers.

This *status quo* of the water right is maintained under saajedaari agreements. In this case, the landowner provides the piece of land and the concomitant share of water. The landowner and the partner each contribute for other agricultural inputs in equal proportion and the produce is shared equally between the two as well. Sometimes, however, a farmer who does not depend on the canal water for irrigation may sell his water share to another farmer, for the whole year, while he continues to irrigate his land from other sources. This may be the case when a farmer has access to his own source of groundwater. The other kind of sale of water right is for a specific turn, when a farmer does not need to irrigate during that turn. This rate varies. Some farmers are quick to point out that this rate depends upon the 'demand' for water. During the summers water selling does take place at the rate of about Rs 200 per hour; during the winter season, it could be about Rs.100-150 per hour. This sale is not for the period of the entire year, but only for one round of irrigation. I also noticed one case where transactions in surface and ground water were combined. Farmer A took water from farmer B' s tubewell and in return gave his surface water right for one irrigation turn.

Thus, there are two kinds of water sales. The first is for the entire year, when the farmer chooses not to irrigate from the canal at all and the second is a sale for a specific turn, when a farmer does not need to irrigate for that turn. Once again, it is interesting to note that statutory law as in the case of warabandi does not provide a basis for a sale. But this sale does take place, outside the purview of statutory law.[11]

The institution of time exchange is a more popular form than a water sale.[12] While there are water right sales, they are confined. A farmer prefers to lend his water share instead of selling it, since lending creates a prospective future claim to water. When a farmer borrows a timeshare of a fellow farmer, he is under an obligation to return it. On the other hand, a water right that is sold is either an irrigation turn that is given up, or the entitlement for an entire year

foregone. A farmer's response to whether he would sell his water share was "how would I fill *my* stomach then?"

Supplementing canal irrigation with ground water irrigation

The second response to a system of 'scarcity by design' is to supplement canal irrigation with groundwater irrigation. Farmers usually wait for the canal, since it is much cheaper. They usually have information on when the distributary would be running the next time. If, however, they need to irrigate outside that schedule, they use tubewell water. Similarly, when the distributary is 'on' and they feel that their share is inadequate relative to their requirement, they supplement it by tubewell water, that also rushes through the same watercourse.

The general practice is that when the canal is 'off' and irrigation is needed, farmers run their own tubewell and when they do not have their own tubewell, they buy groundwater. For instance, during the rabi season (2000-01), the first wheat irrigation was from the canal, while the second and third were from the tubewell. Some farmers who earlier used to buy groundwater dug their own tubewells for greater surety over the supply of water.

The nature of transaction in groundwater depends on the relationship between the buyer and the seller. Groundwater is usually sold at the rate of Rs 40 per hour.[13] Alternatively, the buyer provides the required amount of diesel. There is also a third form of arrangement, a contractual year basis: the seller provides groundwater at the rate of Rs.1000 per acre per annum.

Some of the tail-end farmers do not receive water from the canal, or very little of it, and so have to fully depend upon tubewells.[14] When they do not have their own tubewells, they have to buy from those who do. An interesting issue is that when tail-enders take tubewell water, it is from a tubewell that is located near the head reaches. Tubewells near the tail reaches have saline water. At the head reaches, on the other hand, the groundwater is of a superior quality because of proximity to the canal.

The Groundwater Cell of the Agriculture Department, Rohtak, monitors the water quality through observation wells. The parameter used is electrical conductivity (e.c). The following classification is observed:[15]

0-2000:	fresh
2000-4000:	marginal
4000-6000:	marginally saline
above 6000:	saline

For an observation well in Rampur village, the electrical conductivity was found to be 4600 (October 2000), placing it in the 'marginally saline' category. This water has high concentration of salts of calcium and magnesium. The observation well mentioned above is located in the interior of the village (about 3 km from the canal). Water till a distance of about half a kilometre from the canal is sweeter because of seepage from the canal that washes down some of the salts.

Water thefts along the canal

Another way of obtaining additional water is through water thefts. In the case of the Sitapur WUA, I have described the nature and practice of water thefts along the Sitapur minor in chapter 4 and how they reduce the supply of water to the tail reaches. In the case of the Rampur WUA, water thefts take the following form.

The outlet providing water to the Rampur Water Users Association is the *pipe cum hawdi* type outlet. It has a pipe at the bed level of the canal that opens into a *hawdi* (a circular embankment) (see pictures 6.1 and 6.2). It is a cement pipe with a diameter of 1.5 foot. It comprises three pipes each of which is 8 feet long. The hawdi is made of bricks and cement.

At the other end of the hawdi is an iron cast called the APM, (the Adjustable Proportionate Module) from which water flows into the watercourse. Water first flows from the pipe into the hawdi and then opens into the watercourse through the APM (see Picture 6.3).

The pipe is placed at the bed level on both sides of the canal.[16] Thus, the water level in the hawdi is the same as that in the parent canal. If it is placed at a higher level and the water level in the parent canal is low, then water would not flow through the pipe

The APM is a semi-modular outlet.[17] The dimensions of this outlet are in proportion to the area to be irrigated. This particular outlet has a height of 4" and width of 3".

PICTURE 6.1 The pipe connecting the canal with the hawdi (view from the distributary canal)

PICTURE 6.2 The hawdi of the outlet (on watercourse side)

PICTURE 6. 3 The watercourse taking off from the hawdi

A water theft can take place by inserting a rubber siphon over the hawdi of the outlet, opening over into the watercourse. Thus, water is taken in excess of the water that flows from the hawdi into the watercourse. Another way is to break the brick along the side of the iron cast in the APM. This is called *side bugli.* Both these activities increase the discharge flowing from the hawdi into the watercourse. When an APM is installed without the hawdi, similarly, the brick can be broken from the side of the APM cast pipe.

When either of these acts comes to the notice of the Canal Patroller or Mate who serves as a watchman on the canal, he is supposed to report it to the JE (Junior Engineer). The JE is supposed to issue a penalty and the SDO and Canal Patwaari inspect the site. The Patwaari then issues a *Tawan* (statement of offence) case. The XEN (Executive Engineer) gives a hearing and takes a decision. The XEN is empowered to levy a fine to the tune of as much as 30 times the water rate. However, the convicted can

make an appeal to the Superintending Engineer for a reconsideration of the case.

During my association with the Rampur WUA, water thefts did take place, and went unreported and/or unnoticed. During my interface with the Sitapur WUA also, I noticed water thefts along the minor, as I moved along the minor. A farmer's version of this phenomenon was thus.." a rich farmer can bribe the Beldaar to allow him to insert a siphon.. a small farmer simply steals water by inserting it..."

Creating a water right: applying for a rice shoot

Apart from these strategies, a farmer has the opportunity of creating a water right. Under warabandi irrigation, a farmer can actually *create* a water right by making an application for a rice shoot. A rice shoot is a temporary pipe outlet, given for paddy irrigation, during the months of July-September, when surplus water is available, following the monsoons. During the monsoon season of the year 2000, a total of 16 rice shoots were sanctioned along the length of the Sitapur Minor.[18] At the end of the season, the Irrigation Department removes the rice shoots.

Equity in Irrigation

I now turn attention to a discussion of equity in water distribution in the Rampur WUA. I studied equity at two levels. The first is in terms of the difference across the command of the outlet, in terms of equity in the head-tail differences. The second was equity at the interpersonal level, in terms of the relationships between the elite, large farmers (the WUA leaders) and the other WUA members.

Equity across the head and tail reaches

To gauge equity across the head and tail reaches, I relied on the cropping pattern as an indicator. The main crops in the head reaches are paddy, sorghum, burseem, wheat and some mustard. There is no sugarcane since it is vulnerable to a threat from the *nilgai* (the blue bull)[19] and some primates inhabiting the adjacent

jungle plantations. There are no millets and cotton because they cannot withstand proximity to the canal. In the middle reaches, it is the same cropping pattern but there is also sugarcane. At the tail reaches, there are mainly the less water consumptive crops such as mustard, millets, cotton, sorghum and some wheat.

The other difference between the head-enders and the tail-enders is in terms of vegetables. Some head-enders grow some seasonal vegetables as spinach, carrots, radish, onions, garlic and potatoes. The tail-enders do not grow any vegetables. Some mustard is cultivated along with the wheat, while some springs up on its own.

In the tail reaches, there is a heavy concentration of the less water consuming crops such as mustard in the rabi season and cotton, millets and sorghum in the kharif season. This is because not only does the water from the canal not reach the tail-end as effectively as it reaches the head, but the groundwater is also more saline than at the head reaches, where it is of a better quality because of proximity to the canal. At the head reaches, good quality groundwater is found at a depth of 15 feet to 150 feet. At the tail reaches, it is saline even at a depth of 15 feet.

Thus, the tail-enders are worse off than the head-enders for the following reasons:

(1) some water is lost through seepage before reaching the tail-enders
(2) the last segment of the watercourse is still unlined
(3) there is an unevenness in the surface of the watercourse: in the middle reaches, there is a depression where water tends to accumulate during the course of irrigation
(4) the groundwater is also of a quality inferior to the head reaches where some percolation from the canal washes down the salts

Coping strategies of the tail-enders include the following:

1) buy tubewell water from the head reaches and convey it to the tail reaches
2) sow cotton, millets and sorghum and wait for rains
3) skip irrigation in one season (kharif) and accumulate water shares so that one crop (wheat) can be grown in the rabi season. In kharif, concentrate on crops such as millet, cotton and sorghum

In the year preceding my fieldwork, some tail-enders had sown sugarcane but it could not mature, for want of water.[20]

The location of a farmer's fields at different points along the

watercourse translates into a different set of opportunities that he has in terms of crop choices. At the tail reaches, only two crops can be grown and the rotation followed is wheat/cotton, wheat/ millet or wheat/sorghum. The head -enders follow this practice: they harvest wheat in April/May. They sow sorghum between then and the onset of the monsoons (July/August). In July/August, they sow paddy. They harvest paddy in October and sow wheat in November/December. Thus, they take three crops on the same piece of land. In the middle reaches farmers grow sugarcane and three other crops by following a rotation of wheat/sorghum/paddy.

Equity across large and small farmers: does elitist domination spill over into water distribution?

In the case of the Rampur WUA, I did not notice any evidence of elitist domination extending into the water distribution process. Even when members of the Executive Committee deviated from the warabandi schedule, it was on the basis of a time exchange or a water sale. I did not notice evidence of their forcefully taking other members' water shares. During my observation of the water distribution process, there were episodes where Executive Committee members bought the water time-share of another member, or borrowed it to return it the next time. Further, farmers who otherwise complained about the Executive Committee members themselves asserted that this domination did not spill over into the water distribution process. "They can not take our water share... nobody can force it on us..we will not let them", they would assert, sometimes angrily.

According to the village elderly, there used to be chaos before the warabandi schedule was made.[21] They report that when there were no water distribution rules in the form of warabandi, some large and powerful farmers would dominate the water distribution process. After the introduction of warabandi, there is more structure and order to human interaction as far as resource sharing is concerned.

The manner in which warabandi works in the fields - through mutual negotiation and the adjustment of watches - makes it a self-monitoring system. The only deviations from the warabandi schedule are on the basis of convenience and bhaichaara. If one

does not need water, when his turn is, he sells his share or lends it to somebody else; but there is no interlocking of these transactions with other transactions such as credit, or agricultural equipment or inputs.

Tholas shape irrigation practices only to the extent that families belonging to one thola have their lands lying on a certain location. A farmer belonging to any thola does not necessarily have a certain access to water. While time exchanges are more common among the members of a thola, they do cut across tholas and categories of farmers. Thus, in my assessment, the water share defined in terms of a time slot is meaningful, in that it is recognised as a proper water right. It is this right that is sold, bought, lent, borrowed, or exchanged. This right is the basic unit of transaction. However, the time exchange has its basis in the notion of bhaichaara, or friendship/brotherhood.

Thus, in the case of the Rampur WUA, the inequity in water distribution is mainly through the head/tail difference at the outlet level as a result of technical factors related to the canal and the better quality of groundwater available at the head.

Water Distribution in the case of the Lakshmi Narayan WUA

There are three cropping seasons in Maharashtra: the rabi season or the winter crop season from October 15 to February 28, the hot weather season from March 1 to June 30 and the kharif or rainy season period from July 1 to October 14. In the rabi season, farmers irrigate wheat, chickpea and sugarcane. In kharif they irrigate pearl millet, sugarcane, sorghum, cotton, lentils and some fruits and vegetables. In the hot weather season, they irrigate mainly groundnut and sugarcane.[22]

Rabi is the main irrigation season. Kharif is the rainy season and farmers also take water from the rains and the role of irrigation is largely supplemental in this season. Typically, in the Mula Minor No. X case, in the rabi irrigation season, there are three to four rotations, in the hot weather season, there are two, and in the Kharif season, there is only one.

The Water Users Association calls for applications from the farmers (both members and non-members) for supplying water immediately after getting the information from the Irrigation Department on water availability for each season. This water

availability is in terms of the sanctioned quota agreed upon in the memorandum of understanding between the Irrigation Department and the WUA. When there is less water in the Mula dam, this quota is to be proportionately cut. The allocation, as also mentioned in the earlier chapters, is: .434 million m^3 for Kharif cropping season, 1.058 million m^3 for rabi and .283 million m^3 for hot weather. These quotas are fixed to irrigate 94 hectares in kharif, 120 hectares in rabi and 62 hectares in the hot weather season.[23]

The Secretary of the WUA issues a notice to all members and non-members indicating the date by which they are required to file their applications.[24] These applications are made in a prescribed form. The farmers are required to indicate the crops that they wish to irrigate and the area under each. It is important to note that there are no crop restrictions applicable to the irrigators in the WUA case, unlike the cases with normal shejpali. This is a fall-out of the terms and conditions expressed in the Memorandum of Understanding between the Water Users Association and the Irrigation Department.[25]

The applications are scrutinised. After scrutiny of applications, sanctions are issued for water supply if the farmer has paid the previous charges. The applications are arranged outlet-wise. The total quantity of water requested is compared with the sanctioned quota or the quantity of water agreed to be released by the Irrigation Department (in case of short replenishment in the reservoir). In case the water quantity required can be accommodated from the available water, all the applications are sanctioned, provided the past dues have been paid. If, however, the demand is more, a proportionate cut is applied in sanctioning the water for irrigated crops.[26]

Demands are arranged outlet-wise and the period of supply for each outlet is worked out considering the AI/DC (area irrigated per day cusec) as 2.4. However, the AI/DC ratio is modified considering the distance of the fields from the outlet to allow for seepage losses. This adjustment is called the *correction factor.* The water is supplied at one cusec at the rate of 10 hr per ha. The entire discharge from one outlet is allotted to one farmer at a time.

The number of outlets required to be opened on each day of the 'on' period is worked out to calculate the discharge in the minor, and adding the seepage losses at 12% or one cusec (whichever is more), the discharge required at the head of the minor on each date is worked out for placing the indent with the

Irrigation Department.

The sanctions are again arranged outlet-wise, and the outlet that has to run for the longest period is first identified. The minor is required to be run for this period. Thus, the period for which the minor is run is not necessarily the same period as that for which the canal is to be run; but within the schedule of the canal, this period corresponds to the period for which the outlet with the largest demand is run. The WUA requests the number of days and the exact dates for which the minor is to be run within the schedules of the main canal. The other outlets which are required to be run for shorter periods are clubbed in such a way that the total running period of the clubbed outlets is the same or less than the longest period. The number of outlets that would be running on each date is then identified.

The Paatkaris of the WUA then prepare individual schedules for the supply of water to farmers. This is known as the pali patrak. A schedule is prepared for each outlet. These schedules show the name of the farmer, gat number, area sanctioned, area to be irrigated during the rotation, time allotted, and the starting and completing time for irrigation. The final water distribution schedule, the pali patrak, is put on the notice board of the office of the water users association.[27] The outlet that has the greatest demand is opened first, since it needs to run for the longest time. Water to the field is delivered indicating the time allocation with a constant discharge of one cusec.

Each farmer is issued an irrigation pass indicating the time from which he has to take water. On each outlet, distribution starts from the tail and each farmer takes water one at a time. So, for instance, if a farmer is issued a pass from 10 a.m. to 6 p.m., it authorises him to take water uninterrupted during this time. This is the basis of his 'water right' or entitlement. When his turn is over, he invites the next farmer to take water, as indicated in the palipatrak. Some times, farmers also exchange their turns. If, for example, a farmer's turn is from 10 a.m. to 4 p.m. and his land is still not ready for irrigation, he can exchange his slot with another farmer. This happens outside the formal distribution schedule prepared by the water users association and is based on the mutual understanding among the irrigators.[28]

The Paatkari monitors the water distribution system and keeps the keys of the outlets along the minor. The keys of the minor head outlet stay with the Canal Inspector from the Irrigation

Department. The Paatkari is paid by the WUA. All water applications are submitted to him before the start of the season. He gives a notice of the water distribution schedule ten days in advance. The keys of the outlets are retained by the Paatkaris.[29] They also supervise that farmers complete the irrigation in the allotted time and keep a watch on irrigation offences and are supposed to report irrigation offences to the WUA.

As the water distribution proceeds, the outlets are opened to accommodate a discharge of 1 cusec and a red mark put on the Parshall flume serves as a benchmark for measuring the discharge.[30] When the irrigation rotations are over, the Paatkari shuts the gate and puts a lock to prevent tampering. Thus, as also explained in chapter 4, this technical innovation of installing measuring devices and the institutional innovation of the WUA Paatkari to monitor these discharges essentially overcomes an operational weakness of the system, namely, that the outlets require constant adjustment and measurement for maintaining discharges.

I did not notice incidences of breaking the lock on the outlets or of water thefts during my association with the WUA. According to the Canal Inspector of the WUA, the farmers do not manipulate to increase the discharge. The Paatkari measures, so there is no need to manipulate discharge, either at the head of the minor or along the minor. If the farmers broke the pipe, they would have to repair it. So it would pose a burden on the farmers and the WUA.

Thus, three functionaries of the WUA play an important role in the water distribution process as it proceeds: the Secretary, and the two Paatkaris. The Secretary essentially performs a liaison function with the Irrigation Department, receives water applications from farmers and issues water passes and sanctions. He also informs farmers about rejections and sanctions. He also performs other functions such as keeping records of the meetings of the WUA and entertaining visitors.

The Paatkaris prepare the water distribution schedules for each rotation and each outlet. This is transmitted to the Irrigation Department through the Secretary. The Paatkaris prepare the water distribution schedule for the minor and the outlets, open the outlets for one cusec flow, monitor the water distribution process and report irrigation offences.[31]

The role of the Canal Inspector from the Irrigation Department is to release water at the minor head. His role ends there. A *gauge patti* (standing wave flume) is installed at the minor

head to measure discharges.

A panchanama is supposed to be issued on additional area irrigated over and above sanctioned, unauthorised irrigated area and area that could have been irrigated from wastage. However, in practice, it is not usually issued, since it is considered "psychologically damaging. "[32]Those who take water out of turn or without applying for it, are charged double the normal rate. I refer to one case below, in which a farmer took water out of turn and was made to pay double the normal rate for irrigating cotton.

What does scarcity by design mean for the Lakshmi Narayan WUA?

The formation of the Lakshmi Narayan WUA enabled the irrigators to get more water than the designed allocation (see Box 2.1 in chapter 2). Thus, this WUA was very much a preferred WUA. When the new allocation is considered along with the rainfall, water is actually "not scarce" on the Minor No. X. It is, in fact, enough for a crop like sugarcane.

Besides, other features resulting from the memorandum of understanding conferred several benefits to the WUA. In the non-transferred canals, the Irrigation Department gives preference to crops such as wheat, pearl millet and groundnut. The area of sugarcane that may be irrigated on the canals is sought to be controlled. One implication of forming the WUA has been that there are no crop restrictions and the farmers are free to plant and irrigate sugarcane or any other crop.

As indicated in the Memorandum of Understanding, the WUA has been allotted quantities of water for each season. During scarce periods, the Irrigation Department proportionately cuts the amount. The Lakshmi Narayan WUA usually demands the entire volume of water allocated according to the MOU (IIM(A)-IWMI 1999). Within the overall rotational plan and its allocation, the WUA requests the delivery of water according to its own schedule during the season. The WUA can request the discharge and days of delivery of water in each rotation. This ability to control deliveries allows them to match the crop water requirements more closely with water supplies. The Canal Inspector of the Irrigation Department releases water to the canal when requested by the WUA waterman. This facility is not available to members of the

Mula Minor No. Y or the other non-transferred canals. The IIM(A)-IWMI (1999) study showed that the duration of the rotation and the discharge at the head of the minor showed greater variation and range on the Mula Minor No. X than on the Minor No. Y, showing that the WUA had taken advantage of the greater flexibility that management turnover conferred.[33]

Another provision is that the water not taken by the WUA during the rabi season may be used in the hot weather season after a 30% deduction for evaporation losses. This facility is useful for the irrigation of sugarcane, particularly if ground water levels are low and for the cultivation of high value crops. The WUA has taken advantage of this facility several times beginning in 1991-92 (IIM(A)-IWMI 1999). This facility, again, does not exist for the non-transferred canals.

There have been several changes in the area irrigated and area under different crops since the formation of the WUA. The net area irrigated increased from 190 ha in 1989-90 to 361 ha in 1995-96 (IIM(A)-IWMI 1999). The gross area irrigated rose from 257 hectares to 580 hectares. The quantities of water received by the WUA after the transfer in 1989 are also much higher than before transfer (*ibid.*). Further, the WUA is able to use most or all of its annual allocations. Over the period 1985-1995, the irrigation intensity on Minor No. X increased from 55% to about 100%.

Major changes have also taken place in the cropping pattern in the command of the WUA *(ibid.)*. The area under sugarcane increased from 15% to more than 50% of the gross irrigated area. The area under wheat, which used to be a major crop earlier has come down from 30% to 15%, though it is still the most important rabi crop. The area under oilseeds has also reduced substantially from about 35% of the gross irrigated area to less than 3% in 1994-95.

The primary reason for the increase in the area in the Mula Minor No. X case is the expansion in the area cultivated in the kharif and summer/hot weather seasons. There has also been an increase in the area under sugarcane cultivation, because the restrictions on sugarcane area that apply to the non-transferred canals disappear. The WUA permits farmers to use canal waters to irrigate sugarcane. The flexibility in the cropping pattern and the greater confidence farmers have regarding the irrigation schedule has encouraged farmers to undertake relatively remunerative sugarcane cultivation.

On the flip side, it could be argued that one expression of the 'scarcity by design ' in the case of the Lakshmi Narayan WUA is in terms of the sanctioned quotas. The season-wise volumetric quotas, while they provide a legitimacy to a 'collective' water right, provide the outer limit within which the farmers' requests are to be sanctioned. The WUA members confirmed that they got what they applied for; that is, their requisitions were met within the sanctioned quotas, as long as they filled the application form in time and had paid their previous dues. One reason that this system works is that not all their requirements are met from the canal. Farmers typically supplement canal irrigation by irrigation from bawdis. Similarly, when the canal irrigation is off, in between the rotations, they irrigate through their bawdis. This is especially true for fruits and vegetables, which require waterings much more frequently than the set schedules of the canal can provide.[34]

Thus, as in the warabandi cases, one way of coping with 'scarcity by design' is to meet the gap through ground water irrigation. This is also one of the conditions of possibility in the WUA, that is, one of the reasons that this system works is that all demands do not depend upon it. Similarly, for pearl millet in the kharif season, farmers typically wait for the rains. The crop needs water 15-20 days after sowing in June/July; they irrigate from the canal only when rains fail to deliver. It usually needs 2 waterings before its harvest in November or December.

The other expression of scarcity is when the sanctioned quotas are proportionately cut when there is shortage in the reservoir. For instance, in the year 2001, there had been 15% of average annual rainfall. One fall-out of this "scarcity" was that during rabi 2001-02 there would only be 2 rotations instead of the usual 3-4.

Equity in the Case of the Lakshmi Narayan WUA

In the case of the Lakshmi Narayan WUA, the total number of farmers on the Mula Minor No. X is 400, out of which 112 own less than 1 hectare, 206 between 1 to 2 hectares and 82 farmers own more than 2 hectares. Thus, at the outset, there is some inequality in the land-holding size.

Starting off with 114 members initially, the number of members had risen to 350 by 1999, when I started research on this WUA. The main reason cited by the new members for joining was

a financial incentive: non-members had to pay 30% more than the members for taking water from the minor. The main reason given by the others for not taking the membership is that they have their own bawdis.[35] Among the members of the water users association, the largest land-holding size is 3.15 hectares and the smallest land-holding size is .06 *gunthas,* or 3×2 meters (one guntha is 33 feet × 33 feet).

As in the case of the Rampur WUA, the first benchmark that I used for gauging equity was to study the cropping pattern along the minor. I focussed mainly on the tail reaches and contrasted them with the middle and head reach farmers. I made sure that my farmer interviewees cut across different groups and communities: the numerically and socially stronger Dahatondes and Jawles and the smaller groups of Christians, Muslims and other Maratha communities. I interviewed farmers belonging to both the villages served by the minor, Gowda and Hastinapur.

Sugarcane is grown both at the head and the tail reaches; wheat/pearl-millet is the dominant rotation at the head as well as the tail reaches. In fact, there is one farmer who has 12 acres of land at the tail, all devoted to sugarcane cultivation. He irrigates mainly through the canal. The only difference observable in the cropping pattern is in terms of fruits. However, this difference is because of the variation in the soil type. The soil at the tail reaches is of the heavy, black cotton type unfit for fruit cultivation. It is suited only to the cultivation of such crops as sorghum, pearl-millet, wheat, cotton and sugarcane.

A related issue, though, is that most of the land of the Marathas and Malis, the socially and numerically powerful, is located along the head reaches. Another issue is that farmers also depend upon groundwater, especially for fruits and vegetables, and access to groundwater is an important factor shaping the cropping pattern along with the soil type. There was one farmer near the tail reaches who said that he grew only chickpea in the rabi season and no wheat and sugarcane, because he did not have access to a bawdi.

Farmers' perceptions

The second criterion I used for gauging equity was my own observation of the process and assessing farmers' perceptions. In my own observation of the irrigation and water distribution

process along the minor No.X, I did not notice a case of a complaint in whether the water was distributed equitably. All farmers were satisfied with the distribution process and there was no complaint. The farmers said that they received water in the quantities that they applied for, as long as they applied in time and paid their dues as well. When the distribution starts, the Paatkaris supervise water release in outlets and adjust the gates to ensure 1-cusec flow and lock the gates to prevent tampering. A red mark is put on the Parshall flume that is used to indicate the release of 1 cusec. I made some random observations of the process while it was on and found it to work satisfactorily.

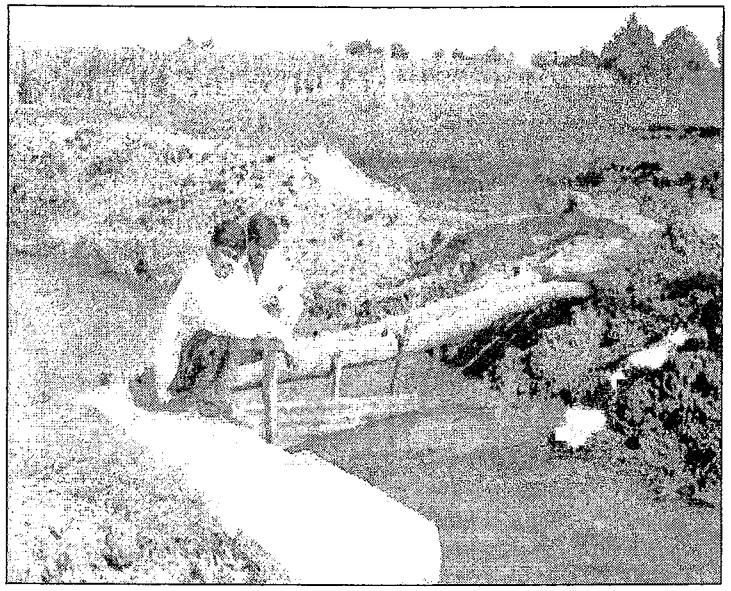
However, there was one incident during my association with the WUA in which Gharonde Guru, the brother of Gharonde Sir, took water out of turn for irrigating groundnut in the kharif season of 2000.This case was discussed in the meeting of the Executive Committee held in August 2000 and it was decided that he would have to pay double the normal rate for irrigating for groundnut.[36]

In the case of the Lakshmi Narayan WUA, another level of equity is in terms of the comparison of water distribution before and after the formation of the WUA. I have shown in chapter 4, how before the formation of the WUA, the Paatkaris had to be bribed to open the gates, both at the head of the minor as well as along the minor. Since the powerful and the elite had a greater capacity to bribe the officers, that pattern was inequitable. To that extent the removal of the opportunity for illicit payments at present could be considered an equity enhancing effect of the formation of the WUA.

Equity is, however, a more important issue along Minor No. Y, located 2 km away in the same village, and where the same conditions exist as did on the Mula Minor No. X before the WUA was formed. On this minor, resource appropriation has been pre-empted by the rural elite.[37] The difference between the Mula Minor No. Y and Mula Minor No. X cases is that in the latter, there is a more institutionalised mechanism where defaulters are penalised; on the other hand, in the Minor No. Y case, these practices themselves have acquired more of an institutionalised dimension. On the Minor No. Y, the water distribution is more inequitable since it favours the pre--emption of the resource by the rural elite. This occurs at two levels. The first is the ability of the elite to exercise power through illicit payments for water and the second is through a flagrant violation of rules, for example, to take water by

building obstructions along the minor (picture 6.4).

PICTURE 6.4 Building diversions along the minor



A conceptual critique of the basis of water distribution

My critique on the equity front in both the above cases is at a more fundamental, conceptual level. Both in warabandi and shejpali, the water distribution principle is not equitable since it is based on land, command area and/or crops grown. This translates into practice as follows: 'you can only have so much water, because you have only so much land'. On the other hand, it could be based on a principle where all would get water irrespective of their land-holding. This could either be an equal water right to all households, or in proportion to the size of the family, with some per capita requirement. The pattern of water distribution, as practiced in the case of the Lakshmi Narayan WUA, as also in the warabandi system practiced in Rampur and elsewhere in Haryana, reproduces the inequality that is created by the pattern of land ownership. A system of water distribution that is based on the land-ownership pattern is inequitable.

In Haryana, the Jaats are the strongest numerically, socially and

economically. They have the most land (a rough estimate according to the village Patwaari was that 85% of the land in the Sitapur village belongs to the Jaats). Since warabandi confers water rights in accordance with the size of the land holding, they get most access to water. Tying a water right to land perpetuates the already existing skewed pattern of resource ownership and social and economic domination. Social and economic power as measured by position in the caste hierarchy and asset ownership is, thus, reproduced in access to water.

Analysing the Irrigator-Engineer Interface

Before concluding this chapter, I provide some more insights on the engineer-irrigator interface as captured through my fieldwork. The irrigator-engineer interface is yet another means through which the irrigators' access to water is mediated. The usual stereotype of the irrigation bureaucracy in the irrigation literature is that of the rent-seeking bureaucrat or the engineer not trained in aspects of social and human organisation. Observations of the irrigation process provide a viable opportunity to examine other dimensions of the farmer-bureaucracy interface more closely.

In this section, I present a typology of the irrigation engineer as captured through the irrigator-engineer interface (see box 6.2). This typology does present the irrigator-engineer interface as yet another means through which the irrigators' access to water is mediated. Here, too, irrigators differ in their ability to mobilise social relationships in the pursuit of their goals. Besides, a closer analysis of these forms of interaction may be useful in analysing the role of the irrigation engineer as an agent of change, as well as farmers' perceptions of it. Reform in irrigation requires action on the part of both these actors.

BOX 6.2 Typologies of the Irrigation Engineer as captured through the Irrigator-Engineer interface

The facilitator

The facilitator is the irrigation engineer who a farmer turns to for help and advice. He is a friend who gives advice on how to handle a difficult situation. For instance, the case of the farmer presented below (Case A) who went to the Irrigation Office at Rohtak for help when

(Box 6.2 continued)

he could not get enough water for his fields. He was advised to build a small bandha (embankment) around his outlet.

Case A

I headed along the Sitapur minor. I asked this farmer, Balbeer Singh, to show me the outlet. There was a graduated scale along the opening; when the outlet is run at no.7, it is a sign that the government is giving full water, he said. At No. 5 or No.6, it means that it is saving water. No. 8 is the right share of farmers at that point. Rarely does the water flow at that level. There is also a penalty for breaking the outlet. It could be Rs 25 per kila, or any multiple thereof, depending upon the mood of the EXEN or the SDO. The rate can be increased and the penalty is to be paid at the time of filling the maal. Once he went to Rohtak with a group of 5-10 farmers in order to complain about water. The SDO suggested that he should build a bandha; when that did not work, he broke the outlet (from the way he described it, it seemed that it was an open flume). When the farmers are honest, they install an open flume, otherwise they install an iron cast outlet, he said. The nahari patwari came and inspected the situation. He had to pay the fine along with the abiana. The officer was in a good mood so he did not fine much; otherwise he could have fined even more..... .
Similarly, when I was sitting in the CADA office one day, two farmers approached the CADA officer for advice (Case B below).

Case B

As I stepped out of the CADA office, two farmers were getting out of the office. They had earlier spoken to Mr. Sharma who had suggested that they speak to the SDO instead. They said that somebody had filed a case against them on the grounds that the lining of the watercourse was blocking the supply of water to his land. They had to appear in the court and they came to ask Mr Sharma for advice. My understanding was that Mr Sharma was very sympathetic towards them and advised them to go and attend the hearing and to then see what happens. The two men were very scared but finally went back consoled and comforted. The SDO as well as Mr Sharma advised them that the best thing to do would be to attend the case and see what happens. If there was a problem, they could come back to them ....

The gracious provider

When a farmer applies for a rice shoot, it is his hope that it will be sanctioned. Thus, his perception is.." I have applied for a rice shoot.. now it is up to SDO saahib to sanction it...if he wants, he can sanction

(Box 6.2 continued)

it. we will have to see..' Thus, a farmer's ability to irrigate depends upon the agency of the Engineer. This role also came out when I asked farmers how long the canal would be run. They would say.."that depends upon the wishes of the government.."

The whimsical tyrant
An irrigation engineer is a whimsical tyrant, a person whose wishes will decide how much a farmer will be fined for breaking the outlet. A person whose wishes and "mood" determine the penalty (Case A, above).

The bribe taker
When there is a gated control structure, there is an avenue for bribe taking. In the Mula Minor No. X case, the Paatkaris that operated the gates before the formation of the WUA would fall in this category. This is an opportunity created by a certain kind of water distribution technology. In the warabandi cases, such opportunities are limited, because gated control structures exist only at the level of the distributary. However, the form that bribe-taking takes in warabandi irrigation is when the beldaar is bribed for allowing the farmers to insert a siphon for taking water out of his turn.

Conclusion

This chapter has described the water distribution process in the outlet commands of the WUAs that I studied. In a system of water distribution that is in principle, centrally controlled, farmers seek to improve their control over water supplies through a number of strategies; by engaging in time exchanges, digging tubewells or by buying ground water, applying for a rice shoot and by interfering above the outlets as well as by tampering with outlets. The analysis of their coping strategies shows that they mobilise different normative systems to overcome a constraint of water scarcity. The analysis of equity in warabandi irrigation suggests that there is inequity in water distribution at the outlet level because of technical factors related to the canal and the variation in the quality of the groundwater. However, even while there is elite domination at the level of the working of the WUA, it does not spill over into the water distribution process.

The analysis of water distribution in shejpali reinforces the theme of chapter 4. The operation of shejpali requires a number of operations and procedures to be carried out, and there is a case for transferring these functions to irrigators to improve the manner in which these practices are carried out. It is interesting to note that in the Lakshmi Narayan case, the formation of the WUA enabled the irrigators to get much more water than the designed allocation. Hence, the WUA has emerged as a means of getting more water. The WUA formation improves the control of the farmers over the quantity and timing of water supply. These possibilities are absent in warabandi irrigation.

The analysis of equity in the two WUAs suggests that in shejpali, WUA formation can potentially have equity-enhancing effects by bringing a measure of order to how water is distributed. There is a possibility that WUA formation curbs opportunities for illicit payments and secures greater equity across head and tail reaches. In warabandi irrigation, the effects of WUA formation on equity in water distribution are likely to be very limited; in fact, they would be negligible.

Notes

[1] See the assessment of the warabandi system in chapter 2.

[2] For a similar discussion of responses in Pakistan, see Wahaj (2001). See also Bandaragoda and Rehman (1995), Bandaragoda and Firdousi (1992) and Merrey (1986b).

[3] See the discussion on legal pluralism in chapter 1.

[4] For instance, in the chak under the Rampur outlet, each kila of land is allocated 14.5 minutes of irrigation.

[5] This is similar to the notion of biradari observed by Bandaragoda and Firdousi (1992) and Merrey (1986a, 1986b) in Pakistan. Bandaragoda and Firdousi (1992) describe biradari as a socially evolved institution that forms part of the institutional framework for water management in Pakistan. This kinship relationship serves important economic and social functions in rural life, and tends to promote cooperation and conflict resolution. Merrey (1986b) notes that roles and norms through which irrigation is carried out are embedded in the larger social structure especially the kinship-based biradari system and an appreciation of this embeddedness is necessary in designing irrigation management interventions. See also a discussion of the concept of izzat, or honour, in Merrey (1986a). See also Wahaj (2001).

[6] Similarly, a farmer that I spoke to said that his elder brother had brought

up his son and daughter, all because of his bhaichaara with him.

[7] Taking water for a longer period of time enables a farmer to get the full irrigation spread out properly in the plot of land. Thus, the possibility of a deviation on the basis of bhaichaara based organisation makes it possible for a farmer to make his water right more effective by making field application more efficient.

[8]For Pakistan, Bandaragoda and Rehman (1995) note that modified rotation schedules display a greater degree of flexibility. Water users along a watercourse change their turns to suit their preferences and convenience.

[9] For Pakistan, Bandaragoda and Firdousi (1992) note "the overriding effect of socially evolved informal institutions over the application of formal rules and management decisions" (Bandaragoda and Firdousi 1992: xv). "...The tradition of biradari in many parts of Pakistan remains a strong social norm, often operating against the formal rules of irrigation" (Bandaragoda and Firdausi 1992: 24). See also Meinzen-Dick and Bakker (2001): local norms and practices may differ from all of the other types of "water law".

[10] In Rampur village, this rate varies anywhere from Rs 4000 to Rs 10000 per kila for a year, depending on the quality of the land. The land located near the canal commands the highest price, as much as Rs. 10, 000 per kila.

[11] Another practice among farmers who do not need water when their turn is on is to keep the outlet closed. This is prohibited under the Haryana Canal and Drainage Act of 1974.

[12] Bandaragoda and Rehman (1995) make the same observation for Pakistan, namely, that for the canal surface water supply to the watercourse, exchange is more common than selling. Meinzen-Dick (1996a) notes that sales in canal water are less common than sales in groundwater.

[13] This amount is independent of the quantity. It is an hourly rate.

[14] I wanted to measure the seepage loss towards the end of my fieldwork, but work had started on remodelling the watercourse, and the watercourse was in a topsy-turvy condition, so I would no longer get a measure of what was normally lost on the way.

[15] This is expressed as the concentration range of total dissolved solids in milligrams per litre.

[16] The pipe makes the canal and the hawdi communicating vessels.

[17] This means that the discharge depends on the upstream water level only. In this case, it depends on the water level in the distributary.

[18] Interview with Gauge Reader at the head of the Sitapur Minor, September 19, 2000.

[19] The blue bull, the largest of the antelopes, is so called because it resembles a bull, and has a blue colour.

[20] The tail-enders do not sell their water share. Tail-enders' reliance on

tube well water is also quite high. They have to leave their land fallow when the water does not reach them effectively. Some land is left fallow for want of water.

[21] It was difficult to get a date exactly on when warabandi came to the village. The village elderly often said that the introduction of warabandi coincided with the time that watches were introduced. Before that, the time for taking water was approximated by the position of the sun and the moon.

[22] There are 2 varieties of sugarcane; Adhsali, an 18-month crop, that is sown in July-August and harvested in November-December and Suru, a 12- month crop, planted in November and harvested in November-December. Both jowar and bajri are staple food crops in Maharashtra. They are grown for subsistence. Wheat is grown both for subsistence as well as for the market. Sugarcane and groundnut are commercial crops.

[23] A comparison of the allocated quotas with the designed allocation on the MRBC as well as the designed allocation in the Rampur WUA was presented in chapter 2.

[24] Unlike in warabandi irrigation farmers have an option to apply or not to apply for water in a season.

[25] Refer to the terms and conditions presented in the Memorandum of Understanding that is signed with WUA formation between the WUA and the Irrigation Department in chapter 3.

[26] Normally, smaller demands of up to .5 ha are admitted in full, and cuts are applied to the demands for larger areas.

[27] Earlier a notice was also put on the individual outlets. But it was often torn by village children. So, the practice was discontinued.

[28] It is interesting to note that with the specification of the time for which a farmer is to take water in this system, it comes very close to how the warabandi system works on the field (below the outlet) in North West India. In fact, during my interviews with the farmers, when I asked one of the farmers how he took water, he pointed to his watch and said, "according to time."

[29] When the WUA is not formed, this task is done by the Paatkari from the Irrigation Department.

[30] This Parshall flume is located on the downstream side of the pipe outlets.

[31] Their duty is also to repair and maintain the field channels. Repairs include desilting and deweeding. They also submit item-wise accounts and state the quantity of material used for construction on each field channel and minor and inform the society's office of any repairs needed to maintain the design flows in the field channels and to carry out repairs after approval (Lele and Patil 1994). They keep daily water accounts. At the end of the rotation, they prepare a completion report on water used: Outlet and area wise, area irrigated, AI/DC, seepage losses, etc and submit to the society's office. The WUA hires labour for cleaning the

watercourses.

[32] This point emerged in an interview with one of the Paatkaris of the WUA. I was sitting in a teashop and interviewing him. As soon as I mentioned about the panchanama, there was sort of a furore. It seemed to be a real act of shame and dishonour to be issued a panchanama.

[33] If all canals were given the same treatment as Mula X, the operational schedule at the system level would automatically become more rigid. It would have to be streamlined, as large canals need more time to adjust to changed quantities. Therefore, the flexibility in the Mula minor No. X case depends on the fact that it is one of the few WUAs working on these conditions.

[34] There are 142 groundwater structures in the command of the Minor No X. It is important to note that most of these wells were dug after the project waters were introduced: at present, too, they gain from recharge through the canal waters.

[35] This is a paradox since most of this well water is from recharge from the canals.

[36] See chapter 4.

[37] See chapter 5.

7

Conclusion

Reform in Indian canal irrigation has been considered "necessary and inevitable" (Mollinga 2000: 91). In this book it has been shown under what conditions WUA formation would be an appropriate strategy for irrigation reform. It has also been shown that collective action in canal irrigation is shaped by technology and social relations. Collective action is a sociotechnical process. In the following sections of this chapter, the main conclusions of this book are summarised. In the first part of this chapter, the main policy conclusions are presented. In the second part, the theoretical framework is revisited. The chapter concludes with a discussion of some avenues for further research on protective irrigation and on irrigation management reform.

An Agenda for Reform in Canal Irrigation

Proposals for reform in Indian canal irrigation usually cut across a range of closely related themes. There is an emphasis on correcting the incentives facing the users and providers of water through pricing, financial accountability, autonomy and privatisation, and water rights reform and market creation (Saleth 1996a, 1996b; Rao and Gulati 1994; Mitra 1996, 1998). Other recurring themes are securing greater co-ordination and integration within the water sector as well as its mainstreaming into overall development programmes, making technical improvements in system management, and devolution of functions and powers to user groups to secure decentralisation (Mollinga 2000; Vaidyanathan 1999). One limitation of these proposals is that they tend to be

uniform, taking technology as a black box. On the other hand, a different range of policy options will be effective under warabandi and shejpali irrigation, taking account of the differences in the technology for water distribution.

Pricing

Pricing irrigation water to reflect its scarcity value through the elimination of subsidies has been a major theme in canal irrigation reform (GOI 1987; Gulati and Chadha 1999). It is argued that underpricing of agricultural inputs creates wasteful use. However, if the policy goal is efficiency and water saving, as it usually is, then pricing will be an ineffective tool in the warabandi irrigation of Northwest India (Punjab, Haryana and Uttar Pradesh). Here, a farmer draws a fixed water share (regardless of the price that he pays). A farmer's appropriation of water is limited by the warabandi system of water rationing, and mediated by borrowing on the basis of bhaichaara. Raising the price of water will not, *per se*, cause a farmer to use less of it.[1]Similarly, if the goal is resource generation for the upkeep of systems, then, under the present institutional set-up, it would be ineffective. Resources go into the state exchequer, rather than into the State Irrigation Department. Thus, pricing of irrigation water will be an ineffective tool for canal irrigation reform in Northwest India, where the warabandi system of irrigation is present. The more effective strategies for water saving and equity would have to focus on preventing farmers from taking more than their protective share of water, by tampering with outlets, for instance, so that tail-end farmers receive their entitlement (as in the case of Sitapur). This is more of an accountability issue that calls for responsible governance at the local level. Pricing in itself, will not be a potent tool to accomplish these goals.

The switch from crop/area basis of pricing to volumetric pricing may not be a practical one in the warabandi system, though it is a practical strategy in shejpali. With gated pipe outlets, the installation of measuring devices such as the V-notch and the standing wave flume make it possible to implement volumetric deliveries and pricing to user groups below the outlets. In Haryana, with ungated pipe outlets, open flumes and APMs, that are designed to receive a proportionate discharge of water from the

main system, volumetric supplies to user groups may not be a practical strategy. If the formation of user groups and volumetric supplies has to be introduced in the warabandi areas, it would have to be at the level of the distributary.[2]

Irrigation Management Transfer

It has been shown in this book that the scope of functions that can be transferred to water users is very limited in warabandi irrigation. In the shejpali areas of Western India, with gated pipe outlets, there is a possibility that WUAs take over the water distribution function, improve water control, and curb opportunities for illicit and extra water payments. There is also a possibility of changing control relations between the users and the bureaucracy and putting in place a set of mutual accountability relationships. In the warabandi areas, on the other hand, the scope for transfer of powers to users or for changing control relations between the users and the Irrigation Department is much more limited. As shown in chapter 4, WUA formation will have very limited effects on water management and distribution practices in warabandi irrigation, except when allocation and distribution at higher levels would come under farmer governance.

Property rights and market creation

The creation of water markets through the institution of well-defined, tradable property rights is often advocated as a policy option in canal irrigation. The premise is inspired by fundamental neo-classical economics: well-defined, secure property rights in water, will, through an invisible hand, lead to a situation where water is allocated to the highest valued uses and a price will emerge that is a market clearing equilibrium price. Further, this price, when it is constituted through the interface of the forces of demand and supply, will convey the scarcity value of water (Rosegrant and Binswanger 1994; Meinzen-Dick and Mendoza 1996; Anderson and Snyder 1997).

The case for market creation through a regime of well-defined, tradable property rights is built on many grounds. Firstly, it is argued that excessive resource depletion and environmental

degradation are the result of misleading price signals, which result from the absence of markets in resources and environmental assets. Establishment of secure property rights should lead to the emergence of markets and scarcity prices for the resource in question. With exclusive and secure property rights, resource depletion is internalised (Panayotou 1994). Once the water rights systems are set up, it is argued, water markets in water scarce areas will establish the market value of water, which is also a reflection of the opportunity cost of water (Kemper and Olson 2000).

Secondly, secure property rights are advocated on grounds that they could empower users (Rosegrant and Binswanger 1994). Security of tenure could lead to long term investments in water saving, cause users to consider the opportunity costs of water and to use it efficiently, and gain additional income from the sale of water and internalise externalities. It would be more responsive to changes in water values as demand patterns and comparative advantage change. Thirdly, it is argued that when water can be made available to meet demand through water markets, it reduces the need for constructing costly supply oriented infrastructure and leads to a more rational and economically viable allocation of water resources (Kemper and Olson 2000).[3]

These arguments are challenged by the sceptics of markets (Young 1986; Bolding, Mollinga and Straaten 1995; Moore 1989). It is argued that water markets of the kind envisioned by neo-liberal enthusiasts would not emerge in canal irrigation. Several factors restrict trade in water; the inhibiting supply characteristics include mobility, economies of large size, uncertainty and variations in supply and availability of alternative sources of supply. Other factors include high costs of storage and conveyance and high transaction costs relative to likely gains from potential exchange. Apart from economic values, communities associate a certain sense of security and control with water over and above its direct economic significance, which may cause the emergence of a market to be 'sluggish'.[4]

Under conditions of protective irrigation, where water is 'scarce by design', as in the case of warabandi irrigation in Haryana, the possibilities of water markets emerging are very limited. While there are some sales, they are confined geographically. The basis of a water sale is a surplus. A farmer chooses to sell his water right only after he has met his own requirements. When a farmer's water right is inadequate relative to his requirement, as is the case here,

there is no saleable surplus. Thus, the basis for the sale of a water right is limited.

Farmers have a psychological resistance to selling their water share. It is something that is just "not done". When a farmer does not need his water share, he chooses to lend it instead of selling it. This is because lending his water share creates a basis for a future claim, since the borrower is obliged to return it. Further, where groundwater supplies are inadequate and/or of an inferior quality, as they are in the case of the Sitapur and the Rampur villages, dependence on canal irrigation shall continue to be high. Thus, while theoretically the argument in favour of market creation may sound neat and appealing, this argument acquires a new dimension when placed in the context of the design characteristics of canal irrigation.

Proposals for water rights reform and market creation need to take account of existing notions of property rights, rather than start from a premise that no property rights exist, or that they are ill-defined or insecure. Any new system of water rights that is imposed will articulate with existing systems and notions of water rights. It is important to be conscious of how this articulation would take place, and what its effects are likely to be.

Presented below is a matrix for policy reform in Indian canal irrigation. It summarises how the potential for reform varies with the design across warabandi and shejpali irrigation.

A policy matrix for reform in Indian canal irrigation

Policy Instrument	*Water Distribution System*	*Effective*	*Practical*	*Comments*
Pricing	shejpali	Yes	Yes	Introduction of volumetric supplies to user groups and installation of measuring devices at the head of gated pipe outlets is possible. This can create incentives for efficient water use if fixed quotas are agreed upon and incentives for savings introduced (e.g. water saved in this season can be used in the next).

	warabandi	No	No	Volumetric pricing cannot be introduced. Outlets are designed to receive proportional supplies from the main system. An increase in the price of water will not cause the farmers to use less of it.
Rights Reform	shejpali	Yes	Yes	Well-defined water rights at the level of user groups can be instituted by agreeing on quotas (according to season, e.g.) to be supplied to them. The users can then evolve a basis for sharing water.
	warabandi	No	No	Water rights already exist at the level of the community (chak) and the individual (the war share, or awsara).
IMT	warabandi	No	Yes	At the moment, water user associations are being formed below the outlet. At this level, there is an effective warabandi system and there is cooperation in cleaning the watercourses and field channels. The management problems are above the outlet.
	shejpali	Yes	Yes	User groups taking over the control over gated outlets can improve their control over water and make the bureaucracy accountable by entering into a contract for volumetric water supplies.

Analysing policy implementation

Chapter 3 examined the process of policy implementation for establishing WUAs in Haryana and Maharashtra. The experience of these states was briefly compared with that of other Indian states where PIM reforms are at different levels of formulation or implementation.

The major critique of the PIM process in Haryana is that (1) it is not part of an overall irrigation sector reform strategy (2) it does not result in any redefinition of control relations between the users and the bureaucracy and (3) it does not involve the Irrigation Department.

At the moment, PIM is an ineffective strategy in Haryana. There is no perceptible change in the equation between the farmers and the Irrigation Department and there is no reorientation of the bureaucracy. In a system that is predominantly supply driven and centrally controlled, there is no improvement in the control that farmers have over the availability of water. Neither is there an improvement in resource generation, nor an effect on the savings of water. The only benefit comes from lining the watercourse that reduces the seepage losses. This, however, is a technical improvement resulting from lining the watercourse but does not have anything to do with the formation of the water users association.

The issue that deserves emphasis is that the more important management challenges in Haryana are above the watercourses: tampering with outlets, inserting siphons to extract more than the protective entitlement and bribing the employees of the Irrigation Department for being allowed to do so. By focussing on institutional change exclusively below the outlet, the Irrigation Department has evaded the real management issues. There is some complacency in the state within the Irrigation Department on grounds that there is no need for PIM since the warabandi system itself is a form of farmer participation. The point that needs appreciation is that warabandi is a system of water distribution, in which farmers are involved. There *is* a need for reform, but it is needed at a level that is different from where it is concentrated now. Whether this should be achieved through a greater accountability of the Irrigation Department or by building farmers' organisations at that level is another question. However, the way warabandi works, through a centralised operation, does limit the

effective transfer of control that is possible to the farmers. Warabandi is more difficult to decentralise than shejpali.[5]

A contrast between the Lakshmi Narayan WUA and the Sitapur WUA suggests that forming WUAs in a desperate bid to replicate small scale community irrigation systems or as project implementation vehicles is futile unless there is control over the main system and a balance between the rights and obligations of the Water Users Associations is struck.[6] Technical and institutional reform below the outlet is meaningless in the absence of effective management of the main system. The point raised by Wade and Chambers (1980) about managing 'the blind spot' is indeed relevant in the case of the Sitapur WUA.

Chapter 3 has examined why PIM does not spread in the state of Maharashtra. Maharashtra has a rich tradition of cooperatives, known for their number, viability, variety and durability (Attwood and Baviskar 1995a, 1995b). In such a state, why does PIM not spread at the rate at which cooperation spills over in all other agrarian sectors? Within the state, there is resistance among the actors - the bureaucracy as well as the farmers - who stand to gain from the *status quo* and resist efforts at WUA formation. NGOs have made efforts to replicate PIM initiatives. However, they are limited in their ability to push them forward beyond a certain scale.

The PIM "model" in the shejpali system in Maharashtra is a more meaningful one than in Haryana in that it seeks to alter the relationship between the users and the bureaucracy and creates a relationship of mutual accountability between them. Further, it seeks to improve the control that farmers have over water availability. The stumbling block in Maharashtra is the absence of a consistent strategy or policy approach, which leaves much to chance and to the discretion of the concerned officers.

There is a wide variety of factors promoting management transfer across the states of India; there is as much variety in the extent of functions transferred to user groups as well as the *modus operandi* of effecting turnover (Brewer *et al.* 1999; Hooja and Joshi 2000; Parthasarathy 1998; Mollinga 2001b). However, a critical question, that has received very little attention, and which deserves much more place in the discourses on the subject, is whether the formation of water users associations does result in the creation of mutual accountability relations between the users and the bureaucracy. That is, does this effort make the bureaucracy accountable to user groups by improving their control over water

supplies, or do WUAs essentially remain arms of the bureaucracy carrying out functions delegated to them, with little or no matching powers and rewards?[7]

Another important question is whether state governments are clear about why they wish to implement PIM reforms and whether there is some internal reflection of what PIM seeks to achieve. When a policy or a "model" is imported from abroad, or pushed down a government's throat as a reform conditionality in an effort to replicate success elsewhere, it is likely to face impediments when it does not find support among the affected constituencies, as has been the case in Haryana and Maharashtra.

However, as shown in chapter 3, the experience with PIM reforms in the states of Gujarat and Karnataka has some interesting insights to offer. In Karnataka, the formation of Sahayog, an NGO, provides a platform where reform proposals are debated and negotiated (Mollinga 2001b). This has served as a mechanism to monitor the implementation process. Gujarat has some interesting experiences to offer through the initiation of Process Documentation Research (Parthasarathy 2000; Shashidharan 2000). Both these mechanisms provide useful means of a feedback process on the implementation of PIM reforms. They are a welcome move from the quantitative targets resorted to by the bureaucracy to monitor farmer participation in "their" programmes.

In India, Andhra Pradesh has provided an example of a big bang approach to management transfer, much on the lines of Mexico and Turkey (Peter 2000; World Bank 1999b; Parthasarathy 1998). What the Andhra 'model' has to offer in terms of learning is not so much the scale and the much hyped about 'political will ', but that there is an effort to integrate different elements of the reform process into a holistic strategy. Creating resource user organisations, a threefold increase in the price of water, reorienting user-bureaucracy relationships and improvements through physical rehabilitation have been carried out as elements of a comprehensive reform approach. This is where the Andhra experience contrasts with that particularly of Haryana.

That there is an integration of different elements of reform places the experience of Andhra Pradesh in much the same line as that of Maharashtra. The difference is in the approach. Unlike Andhra's drastic, big bang approach, Maharashtra's slow, but steady approach emphasising gradual expansion of the numbers and geographical coverage of WUAs means that it would take a long

time before PIM is on a scale that makes a tangible difference to the accomplishment of policy objectives such as resource generation, improving financial recoveries or lowering the administrative burden on the Irrigation Department. The experience of Maharashtra and the neighbouring state of Gujarat is similar in that they both move through gradual NGO initiatives at organising farmers for management turnover, when in both states farmers have themselves experimented with institutional forms in other sectors that have been replicated steadily in their surrounds. On the PIM front, however, as in other states, farmers have only been the recipients of reform (Mollinga 2001b). A general critique of the PIM policy process is that the process itself has not been participatory enough (Mollinga 1998a, 2001b).

A Theoretical Framework for Institutional Analysis in Canal Irrigation

The theoretical framework for this book, as noted in chapter 1, highlights two levels of interaction (1) between the users and the bureaucracy, mediated by technology, social relations and rules for water distribution and (2) among the users, where, too, the interactions are mediated by technology, social relationships, and rules for water distribution.[8]

Technology, water control and self-governance

It has been shown in this book that technology, or design, is an important element in analysing the organisational behaviour and dynamics of water users associations. Design influences the extent to which water management and distribution practices can change through WUA formation and the extent to which the relationship between the users and the bureaucracy can be altered. Therefore, it has implications for the extent to which decentralisation can be effected in canal irrigation and vibrant, self-governing resource user organisations can develop to that effect.

The design characteristics of canal irrigation have implications for (1) the extent of devolution of powers to user groups and (2) the extent to which turnover of control can be effected through Irrigation Management Transfer. For these reasons, the discussion of technology is important in discussions of Irrigation Management

Transfer, and technology should be seen as a key element in a theoretical framework for the study of WUAs.

Influence of patterns of social organisation and reproduction of power relations

This research suggests that understanding social relations, patterns of social organisation and power structures within a community is essential for understanding the processes of local resource management. General patterns of social organisation, such as organisation by castes and groups, local politics and domination by those already in positions of prestige and power find expression in the processes of local water management. In the case of the Executive Committee of the Lakshmi Narayan WUA, membership drew from mainly the upper caste Marathas (Dahatonde, Jawle, Shelke and Ukeerde). These castes are the more powerful castes in the village, numerically and in terms of land ownership. Similarly, in the case of the Rampur WUA, the society is organised into tholas or ancestral family units. The membership of the Executive Committee was constituted by drawing representation from each thola. The activities of the WUA were dominated by representatives of the tholas who were numerically the strongest on the watercourse.

This research also generates some insights on the role of WUA leadership in the processes of local water management. This role is exercised by (1) convincing farmers of the benefits of collective organisation (2) bearing the organisational burden in terms of negotiating for management transfer and (3) lobbying for change and representing the case of farmers to the Irrigation Department. Further, the local leadership often comes from people who are already influential in the local society. In the case of the Lakshmi Narayan WUA, leadership came from people who also held, or had held in the past, positions on other influential village bodies, such as the village multi-purpose co-operative credit society, the sugarcane co-operative factories and the village Panchayat. Two of the present members also have political affiliations. In fact, one of them has, at some point of time or the other, held positions in virtually all the village level organisations: the sugarcane co-operative factory, the multi-purpose village credit co-operative society and the village Panchayat.

Understanding local power relations is essential for understanding the processes of local water management. In the case of the Rampur WUA, leadership is concentrated among three position holders. They are three large farmers who take part in the auction of the village Panchayat land and lend money to other smaller farmers and provide agricultural implements and tractors on hire. Their lord-like position in the WUAs is an extension of their lord-like position outside the WUA and their location in village networks that allocate resources and agricultural inputs. They share information and power mutually, to the exclusion of others. They use the resources of the WUA to further their own interests or to get the watercourses serving their fields repaired. Their location in village networks enables them to evade accountability to WUA members. There is a constant sense of distrust between the management committee and the other members of the water users association. When there is a local level mechanism for the management of water, it may not necessarily mean that this structure is egalitarian, transparent and accountable.

A perspective on rules and law

Rational choice theorists who study local resource management lay much emphasis on rules for resource management and appropriation (Ostrom 1990, 1992; Tang 1991, 1992). This research supports the view that rules are important in that they serve to enable and constrain human behaviour; however, they are mainly mobilised as resources by individuals to achieve particular objectives. Besides, individuals differ in their ability to mobilise rules as resources. This ability is shaped by social relationships.

An inter-disciplinary perspective on rules in canal irrigation also shows that rules are an expression of a certain configuration of technology and social relations. In warabandi irrigation, for instance, the water distribution rule of sharing water in proportion to the size of the land-holding is a particular system of rationing scarce water that defines water rights in proportion to the size of the land-holding. Further, this water distribution 'rule' is mediated through lending and borrowing on the basis of bhaichaara, and to that extent is embedded in social relations. A different design principle in shejpali is associated with a different definition of a water right.

The analysis of warabandi irrigation points to the existence of legal pluralism in water distribution, that refers to the existence of several, often contradictory normative orders pertaining to the same social field (Benda Beckmann, F von 1988, 1999; Spiertz 2000; Merry 1988; Griffiths 1986; Spiertz and Wiber 1996, Bruns and Meinzen-Dick 2000). The analysis of the water distribution process under warabandi suggests that there is more than one normative system that forms the basis of water distribution. While a farmer's water right is defined by the time for which he is to take water in the warabandi schedule, farmers deviate from this schedule and justify the deviation on the basis of bhaichaara based organisation.[9]

Along a continuum of bureaucratically driven, user-based and market allocation, Meinzen-Dick and Mendoza (1996) explain the water distribution process under warabandi as being bureaucratically driven. However, this research suggests that the water distribution process under warabandi is an interface of bureaucratically driven and user-based modes of distribution. Further, when there are some localised sales, all three forms of water allocation can co-exist. I have also explained the emergence of the institution of time exchanges at the interface of the technical characteristics of canal irrigation and plural legal repertoires.

An Agenda for Further Research

I conclude this chapter with a discussion of the areas where there is scope for further research.

Reorienting the bureaucracy

An important focus in the literature on water users associations has been on the effects of PIM on cost recovery, financial viability and agricultural productivity. This is not surprising since the pressures for reform have been driven by a need to redefine the role of the state, generate resources and conform to pressure from multilateral organisations and donors. Thus, research has focussed on the conditions under which WUA formation could take place in canal irrigation.[10] There is a need for further research in understanding the spirit of reform behind PIM. This would call for qualitative,

process-based research that seeks to capture the processes through which policies for WUA establishment are implemented.

Further research is needed in understanding the interface between users and the bureaucracy and whether the nature of this relationship undergoes a transformation with the formation of water users associations. The role of the irrigation bureaucracy in PIM processes needs to be further examined. A question that perhaps needs much more careful attention is whether the formation of the water users association makes the bureaucracy accountable to water users, and improves the effectiveness with which water is supplied.

Accountability and processes of local water management

Another area for further research could be in understanding the management processes of water users associations to gauge whether local level governance structures are institutions of mass civil society participation. Within a community that manages a natural resource like water, there is a case for research on who participates, who takes major decisions and whether local level governance structures are transparent and accountable to their members. The observations and analysis of the processes in the Rampur WUA support the contention that there may be a myth about community. *The grass is not always green at the roots.* A methodological implication from this point as well as the preceding one is that there is a case for qualitative, process-based research that seeks to capture interactions in different arenas, at different levels and among different actors.

Coping with scarcity by design

There is scope for further research in understanding how farmers cope with scarcity under protective irrigation systems in India. In both the shejpali and the warabandi cases, there are coping mechanisms. In the shejpali case, this mainly takes the form of supplementing through irrigation from wells. In the warabandi case, time exchanges, supplementing through groundwater irrigation, buying a water share or tampering with outlets are responses to a system of water rationing. In particular, the forms

that they take are influenced by prevailing patterns of social relationships (such as bhaichaara in the warabandi case, that forms the basis of a time exchange). Further research and documentation of the coping mechanisms under conditions of protective irrigation is, therefore, another area for further research.

Mainstreaming discussions on technology

Discussions on technology need to be mainstreamed into discussions on Participatory Irrigation Management and irrigation sector reform. Policy-makers and academics need to be conscious of the implications of technology - the design characteristics of canal irrigation as well as the physical manifestations of it, such as outlets and hydraulic structures - for reform proposals. In other words, the black box of technology needs to be opened with far greater seriousness in debating canal irrigation reform proposals.

Analysing the irrigator-engineer interface

There is a case for ethnographic research and analysis of the forms that the irrigator-engineer interface can take. This is essential because the irrigation bureaucracy can be a catalyst of change and to that extent understanding the forms of interaction between the irrigators and the bureaucracy is essential. The case of the Mula Minor No. X WUA presented in chapter 4 suggests that there is a way out of the 'anarchy syndrome' in canal irrigation (Wade 1988). The installation of volumetric devices at the head of the minor leads to the creation of mutual accountability relations between the irrigators and the irrigation bureaucracy and the 'prisoners' dilemma situation' can be overcome. Assessing the prospects for reform in canal irrigation, thus, requires us to take a more positive view of the bureaucracy itself as a facilitator of change, as well as the technological and social conditions under which this may happen.

Notes

[1] Simply put, under warabandi irrigation, water consumption cannot be tied to the price of water, because entitlements are expressed as shares

and not as volumes.

[2] That may not be viable considering the large areas served by distributaries. Effecting volumetric supplies to farmer groups at that level will require co-ordination across outlets.

[3] Reidinger (1994) argues that three conditions must hold for water markets to function effectively: water rights must be clearly specified and legally enforceable, water supplies should be reliable and delivered on a volumetric basis and there must exist some form of water users organisation.

[4] See also the discussion on the impacts of market-oriented reform policies in Mexico (Kloezen 2002). Kloezen argues that cost-recovery, financial autonomy and water pricing and marketing need to be seen as socio-political constructs. The behaviour of actors in settings of market creation is not purely guided by conditions of economic rationality, but also shaped by social and political factors. For a similar analysis of the mixed effects of market creation in Chile, see Bauer (1997). Bauer shows how sales in canal water tend to be limited on account of several geographical, local and cultural factors.

[5] See also the discussion of the concept of hydraulic decentralisation in Mollinga (1998a).

[6] See also Hunt (1989), Ambler (1994), Goldensohn (1994), Bymes (1992), Mollinga (1998b) and Maloney and Raju (1984).

[7] See also Narain (2000).

[8] This could be contrasted with new institutional economics approaches to collective action that focus essentially on rules for resource appropriation and management. See, for instance, Ostrom (1990, 1992) and Tang (1991, 1992).

[9] That there are normative repertoires outside state law that shape the process of water distribution is also seen elsewhere in the literature (Meinzen-Dick 2000a; Moench 1998; Vermillion 2000; Merrey 1986a, 1986b).

[10] See, for instance, Uphoff (1986), Meinzen-Dick (1996b, 2000b), Ambler (1994), Maloney and Raju (1994), Gulati, Meinzen-Dick and Raju (1999), Meinzen-Dick, Raju and Gulati (2000, 2002), Brewer et al. (1999), Shah (2000), Vermillion (1999), and Kolavalli and Brewer (1999).

References

Agarwal, A and S. Narain eds. 1997. *Dying Wisdom: rise, fall and potential of India's traditional water harvesting systems.* New Delhi: Centre for Science and Environment

Agrawal, A and C. C. Gibson. 1999. Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* 27(4): 629-649

Ailawadhi, R.K. and R.Bansal. 2001. Participatory Irrigation Management in Haryana. Paper written for the Sixth International Seminar on Participatory Irrigation Management. October 21-26, 2001. Beijing

Ambler, J. S. 1994. The language of farmer water users associations: rethinking irrigation organization development in India. In *India: Irrigation Management Partnerships,* eds. M. V. K. Sivamohan & C. Scott, 15-33. Hyderabad: Booklinks Corporation

Anderson, T.L. and P. Snyder. 1997. *Water markets: priming the invisible pump.* Washington, D.C: Cato Institute

Apte,D.P. 1995. Alternative dairy production and marketing systems. In *Finding the middle path: the political economy of cooperation in rural India,* eds. B.S. Baviskar and D.W. Attwood, 176-198. Boulder: Westview Press

Attwood, D.W. 1987. Irrigation and imperialism: the causes and consequences of a shift from subsistence to cash cropping. *Journal of Development Studies* 23(3): 341-366

Attwood, D.W. 1992. *Raising cane. The political economy of sugar in Western India.* Boulder: Westview Press

Attwood, D.W. 1995. Does competition help co-operation? In *Finding the middle path: The political economy of cooperation in rural*

India, eds. B.S.Baviskar and D.W.Attwood, 199-216. Boulder: Westview Press

Attwood, D.W. and B.S. Baviskar. 1995b. Fertile grounds in Western India. In *Finding the middle path: the political economy of cooperation in rural India*, eds. B.S. Baviskar & D.W.Attwood, 43-71. Boulder: Westview Press

Attwood, D.W. and B.S.Baviskar. 1995a. Viewpoints. In *Finding the middle path: the political economy of cooperation in rural India*, eds. B.S. Baviskar & D.W.Attwood, 3-31. Boulder: Westview Press

Ballabh, V. 2002. Emerging water crisis and political economy of irrigation reforms in India. Paper prepared for workshop on *Asian Irrigation in Transition. Responding to challenges ahead.* April 22-23, Asian Institute of Technology, Bangkok, Thailand.

Bandaragoda, D.J. 1998. *Design and practice of water allocation rules: lessons from warabandi in Pakistan's Punjab.* Research Report 17. Colombo: International Irrigation Management Institute

Bandaragoda, D.J. and S. Rehman. 1995. *Warabandi in Pakistan's canal irrigation systems: widening gap between theory and practice.* IIMI Country Paper Pakistan No. 7. Colombo: International Irrigation Management Institute

Bandaragoda,D.J. and G.R.Firdousi. 1992. *Institutional factors affecting irrigation performance in Pakistan: Research and policy priorities.* Colombo: International Irrigation Management Institute

Bauer, C.J. 1997. Bringing water markets down to earth: the political economy of water rights in Chile, 1976-95. *World Development* 25(5): 639-656

Baviskar, B.S. 1995. Leadership, democracy, and development: Cooperatives in Kolhapur district. In *Finding the middle path: the political economy of cooperation in rural India*, eds. B.S. Baviskar and D.W. Attwood, 157-175. Boulder: Westview Press

Baviskar,B.S. 1980. *The politics of development: sugar co-operatives in rural Maharashtra.* Delhi: Oxford University Press

Benda Beckmann, F von 2001. Between free riders and free raiders: Property Rights and soil degradation in context. In *Economic Policy and sustainable land use. Recent advances in quantitative analysis for developing countries,* eds. N.Heerink, H. van Keulen and M. Kuiper, pp. 293-316. Heidelberg-New York: Physica Verlag.

Benda Beckmann, F von. 1988. Comment on Merry. *Law and Society Review* 22 (5): 897-901

Benda Beckmann, F von. 1989. Scapegoat and magic charm: law in development theory and practise. *Journal of Legal Pluralism and*

Unofficial Law 28: 129-149

Berkoff, D.J.W. 1990. *Irrigation Management on the Indo-Gangetic Plain.* World Bank Technical Paper Number 129. Washington, D.C: The World Bank

Bhatti, M.A. and J.W. Kijne. 1990. *Irrigation allocation problems at tertiary level in Pakistan.* ODI-IIMI Irrigation Management Network Paper 90/ 3c. London: Overseas Development Institute

Bhogle, S.G. and R.B. Bharaswadkar. 1994. *Prospects for multifunction organizations to improve irrigated agriculture. A call for information from network members.* ODI/Irrigation Management Network. Network paper 32. London: Overseas Development Institute

Bhutta, M.N. and Vander Velde, E.J. 1992. Performance of secondary canals in Pakistan Punjab: research on equity and variability at the distributary level. In *Advancements in IIMI's research: 1989-91. A selection of papers presented at internal program reviews,* 235-262. Colombo: IIMI

Blair, H. 2000. Participation and accountability at the periphery: democracy and local governance in six countries. *World Development* 28(1): 21-39

Bolding, A, P.P. Mollinga and K.V. Straaten. 1995. Modules for modernisation: colonial irrigation in India and the technological dimension of agrarian change. *The Journal of Development Studies* 31(6): 805-844

Brewer, J, S. Kolavalli, A.H. Kalro, G.Naik, S.Ramnarayan, K.V. Raju and R. Sakthivadivel. 1999. *Irrigation Management Transfer in India: policies, processes and performance.* New Delhi and Calcutta: Oxford and IBH Publishing Company

Brewer, J. D. and R. Sakthivadivel 2000. The impact of Participatory Irrigation Management on performance of maintenance: a Maharashtra case. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L.K. Joshi and R. Hooja, 628-651. Jaipur and New Delhi: Rawat Publications

Bruns, B. R. and R.S. Meinzen-Dick. 2000. Negotiating water rights: implications for research and action. In *Negotiating Water Rights,* eds. B.R. Bruns and R. S. Meinzen-Dick, 353-380. International Food Policy Research Institute, Washington, D.C. New Delhi: Vistaar Publications

Byrnes, K. J. 1992. *Water Users Associations in World Bank-Assisted Irrigation Projects in Pakistan.* World Bank Technical Paper Number 173. Washington, D.C: The World Bank

Carter, A.T. 1975. *Elite politics in rural India. Political stratification and alliances in Western Maharashtra.* Delhi: Vikas Publishing House

Chambers, R, N.C. Saxena, and T. Shah. 1989. *To the hands of the poor: water and trees.* New Delhi: Oxford and IBH Publishing Company

Chaudhry, M. A. and R.A.Young. 1990. Economic impacts of alternative irrigation water allocation institutions: Pakistan's *warabandi* system. In *Social, economic and institutional issues in third world irrigation management. Studies in water policy and management No. 15,* eds. R.K. Sampath and R. A. Young, 395-410. Boulder: Westview Press

Chithelen, I. 1985. Origins of co-operative sugar industry in Maharashtra. *Economic and Political weekly* XX(14): 604-612

Chopra, K and S. Bathla. 1997. Water use in the Punjab region: conflicts and frameworks for resolution. Revised version of paper presented at the IDPAD seminar on Managing Water Scarcity: Experiences and Prospects. October 1997: Amersfoort

Chopra, R. 1995. The Mhaisal movement: A farming cooperative. In *Finding the middle path: the political economy of cooperation in rural India,* eds. B.S.Baviskar and D.W.Attwood, 217-233. Boulder: Westview Press

Coward, E.W, Jr. 1986. State and locality in Asian irrigation development: the property factor. In *Irrigation management in developing countries. Current issues and approaches. Studies in water policy and management No. 8,* eds. K.C. Nobe and R.K. Sampath, 491-508. Boulder: Westview Press

Crosby, B.L. 1996. Policy implementation: the organizational challenge. *World Development* 24 (9): 1403-1415.

Dev, S.M. 1996. Experiences of India's (Maharashtra) Employment Guarantee Scheme: Lessons for Development. *Development Policy Review* 14(3): 227-253

Dev, S.M. and B.L. Mungekar. 1996. Maharashtra's agricultural development: a blueprint. *Economic and Political Weekly* XXXI (13): A-38-48

Dhawan, B.D. 1988. *Irrigation in India's agricultural development. Productivity, stability, equity.* New Delhi: Sage Publications

Dhawan, B.D. 1989. *Studies in irrigation and water management.* New Delhi: Commonwealth Publishers

Dreze, J and A. Sen. 1989. *Hunger and public action.* New York: Oxford University Press

Drèze, J. 1995. Famine prevention in India. In *The political economy of hunger. Selected essays.* eds. J. Drèze, A. Sen, and A. Hussain, 69-178. Oxford: Clarendon Press

Dubash, N. 2002. *Tubewell capitalism: Groundwater markets and agrarian change in Gujarat.* New Delhi: Oxford University Press

Economic Development Institute 1998. *Handbook on Participatory Irrigation Management* compiled by David Groenfeldt. Economic Development Institute of the World Bank. April 1998.

Gandhi, P.R. 1979. Management of irrigation in Maharashtra- *shejpali* system in the south and *waharabandi* system in the north. *Irrigation and Power.* October 1979: 395-408

Giddens, A. 1979. *Central Problems in Social Theory. Action, Structure and Contradiction in Social analysis.* London: Macmillan

Giddens, A. 1984. *The Constitution of Society. Outline of the theory of structuration.* Cambridge: Polity Press

Gilmartin, D. 1994. Scientific Empire and imperial science: Colonialism and irrigation technology in the Indus basin. *The Journal of Asian Studies* 53(4): 1127-1149

GOI/MOWR. 1987. *National Water Policy.* Ministry of Water Resources. New Delhi: Government of India.

Goldensohn, M D. 1994. *Participation and empowerment: an assessment of Water Users Associations in Asia and Egypt.* Arlington: ISPAN

Government of Haryana, U.d. Draft State Water Policy. 14 pp.

Government of Haryana. 1998. *Evolving strategy for implementation of pilot programme for establishing WUAs in Haryana.* 3 Volumes. Institute of Resource Development and Social Management. (IRDAS). Chandigarh: Department of Irrigation

Government of India. 1972. *Report of the Irrigation Commission.* New Delhi: Ministry of Irrigation and Power.

Government of India. 2000. *Ninth Five Year Plan 1997-2002.* New Delhi: Vidhi Publishing

Government of Maharashtra, 1992. *Cooperative Water Users' Association Guidelines, Irrigation Department.* Government of Maharashtra. India.

Griffiths, J. 1986. What is legal pluralism ? *Journal of Legal Pluralism and Unofficial Law* 24: 1-56

Groenfeldt, D. 2000. Introduction: A global consensus on Participatory Irrigation Management. In *Case studies in Participatory Irrigation Management,* eds. D. Groenfeldt and M. Svendsen, 1-2. World Bank Institute Learning Resource Series. Washington, D.C: The World Bank

Gulati, A and R. Chadha.1999. India poised for take-off? Reforms in trade, industry and agriculture. Stock taking and future challenges. In *Indian economy since independence*, ed. U Kapila, 1999-2000 edn., 1021-1027. Ghaziabad: Academic Foundation

Gulati, A, R. Meinzen-Dick, and K.V. Raju. 1999. From top-down to bottoms up: Institutional reform in Indian canal irrigation. National Workshop. Mimeo. Delhi: Institute of Economic Growth

Gustafson, W. E. and R.B. Reidinger. 1971. Delivery of canal water in North India and West Pakistan. *Economic and Political Weekly* VI (52): A-157- 162

Hakim, C. 1987. *Research design: strategies and choices in the design of social research.* Contemporary Social Research Series 13. London: Allen and Unwin

Hogwood, B. W. and L.A. Gunn. 1984. *Policy analysis for the real world.* Oxford: Oxford University Press

Hooja, R and L.K. Joshi. 2000. Introduction. In *Participatory Irrigation Management: Paradigm for the 21st century,* eds. L.K. Joshi and R.Hooja,,Vol. 1, pp. 1-16. Jaipur and New Delhi: Rawat Publications

Hooja, R and P.S.Kavdia. 1994. *Planning for sustainability in irrigation. Command Area Development and Indira Gandhi Canal Project.* Jaipur and New Delhi: Rawat Publications

Horst, L. 1987. Choice of irrigation structures: the paradox of operational flexibility. In *Proceedings of the Asian Regional Symposium on irrigation design for management,* 45-60. Kandy, Sri Lanka.

Horst, L. 1998. *The dilemmas of water division. Considerations and criteria for irrigation system design.* Colombo: International Irrigation Management Institute

Hunt, R.C. 1989. Appropriate social organization? Water Users Associations in bureaucratic canal irrigation systems. *Human Organisation* 48 (1): 79-90

IIM (A)-IWMI.1999. Maharashtra IMT Impact Assessment. A collaborative Study by Indian Institute of Management, Ahmedabad and International Water Management Institute, Sri Lanka. January 1999.

Institute of Social Sciences. 1999. *Status of Participatory Irrigation Management in India.* ISS Manuscript Report 13. New Delhi: Institute of Social Sciences

IRDAS-WALAMTARI. 1999. *Participatory Irrigation Management. A*

hand book for farmers' organisations and field functionaries. Hyderabad: Institute of Resource Development and Social Management and Water and Land Management Training and Research Institute

Jairath, J. 1985.Technical and institutional factors in utilization of irrigation: a case study of public canals in Punjab. *Economic and Political Weekly* XX (13): A-2-10

Jairath, J. 1999. Participatory Irrigation Management: experiments in Andhra Pradesh. *Economic and Political Weekly* XXXIV (40): 2834-2837

Joshi, P.K. and N.K. Tyagi. 1991. Sustainability of existing farming system in Punjab and Haryana- some issues on groundwater use. *Indian Journal of Agricultural Economics* 46(3): 412-421

Jurriëns, M and P. Wester.1994. Protective irrigation in India. Reprinted from the ILRI Annual Report 1994. ILRI Reprint No. 95. Wageningen: International Institute for Land Reclamation and Improvement

Jurriëns, M and P. Wester. 1995. *Warabandi revisited: to abandon or to improve a basically sound water delivery scheduling method ?* Reprinted from the ILRI Annual Report 1995. ILRI Reprint 96. Wageningen: International Institute for Land Reclamation and Improvement

Jurriëns, M. and W.Landstra. 1990. *Water distribution: conflicting objectives of scheme management and farmers.* ILRI Annual Report 1989, 38-46. Wageningen: International Institute for Land Reclamation and Improvement

Jurriëns, M., P.P. Mollinga, and P. Wester. 1996. *Scarcity by design. Protective irrigation in India and Pakistan.* Liquid Gold Paper 1. Wageningen: Wageningen Agricultural University and International Institute for Land Reclamation and Improvement

Jurriëns, R and P.P. Mollinga. 1996. Scarcity by design: Protective Irrigation in India and Pakistan. *ICID Journal* 45(2): 31-53

Jurriëns, R. 1993. Protective irrigation: essence and implications. *Water Management in the next century. 15th Congress on Irrigation and Drainage.* Volume 1-A, 333-348. The Hague: International Commission on Irrigation and Drainage

Kemper, K.E. and D. Olson 2000. Water pricing. The dynamics of institutional change in Mexico and Ceara, Brazil. In *The political economy of water pricing reform*, ed. A. Dinar, 339-357. World Bank. Washington, D.C. New York: Oxford University Press

Khan, M.Y. 1991. *Irrigation water management in Indus River System of Pakistan.* International Commission on Irrigation and Drainage. Special Technical Session 1991,Vol. I-C, 298-311. Beijing

Kijne, J. W. and E.J. Vander velde.1992. Salinity in Punjab watercourse commands and irrigation system operations. In *Advancements in IIMI's research. 1989-91. A selection of papers presented at Internal Programme Reviews,* 139-175. Colombo: International Irrigation Management Institute

Kloezen, W and P.P.Mollinga. 1992. Opening closed gates: recognising the social nature of irrigation artefacts. In *Irrigators and engineers: essays in honour of Lucas Horst,* eds. G. Diemer & J. Slabbers, 53-63. Amsterdam: Thesis Publishers

Kloezen, W.M. 2002. *Accounting for water. Institutional viability and impacts of market-oriented irrigation interventions in central Mexico.* Ph.D. dissertation. Wageningen University

Kolavalli, S and J.D.Brewer. 1999. Facilitating user participation in irrigation management. *Irrigation and Drainage Systems* (13): 249-273

Korten, F.F. and R.Y.Siy, Jr. eds. 1989. *Transforming a bureaucracy. The experience of the Philippine National Irrigation Administration.* Connecticut: Kumarian Press

Kulkarni, D.N. and S.Y. Kulkarni. 1994. Formation of WUAs in Maharashtra: procedural dynamics. In *India: Irrigation Management Partnerships,* eds. M.V.K. Sivamohan & C. Scott, 53-68. Hyderabad: Booklinks Corporation

Kumar, M.P. 1989. Crop economics and cropping pattern changes. *Economic and Political Weekly.* XXIV (51 & 52): A-159-166

Kumar, S. 2002. Does "participation" in common pool resource management help the poor ? A social cost-benefit analysis of Joint Forest Management in Jharkhand, India. *World Development* 30(5): 763-782

Latif, M. 1993. Water allocation and distribution dilemma at farm level. *15th Congress on Irrigation and Drainage. Water management in the next century.* Vol. I-C R: 73-103

Lele, S. N. and R.K. Patil. 1994. Farmer participation in irrigation management: A case study of Maharashtra. Society for People's Participation in Ecosystem Management, Pune. New Delhi: Horizon India Books

Lele, S.N. 2000. Participatory Irrigation Management in Maharashtra: A case study. In *Participatory Irrigation Management.*

Paradigm for the 21st century, eds. L. K. Joshi and R. Hooja, Vol. 2, 618-627. Jaipur and New Delhi: Rawat Publications

Levine, G and E.W. Coward, Jr. 1989. *Equity considerations in the modernization of irrigation systems.* ODI-IIMI Irrigation Management Network Paper 89/2b. London: Overseas Development Institute

Majchrzak, A. 1984. *Methods for Policy Research.* Applied Social Research Methods Series Volume 3. Beverly Hills: Sage Publications

Malano, H.M. and P.L.M. Hofwegen. 1999. *Management of irrigation and drainage systems: A service approach.* IHE monograph 3. Rotterdam: A A Balkema

Malhotra, S. P., S.K. Raheja and D. Seckler. 1984. Performance monitoring in the *warabandi* system of irrigation management. In *Productivity and Equity in Irrigation Systems,* ed. N. Pant, 69-83. New Delhi: Ashish Publishing House

Malhotra, S.P. 1988. *The warabandi system and its infrastructure.* CBIP Publication No. 157. New Delhi: Central Board of Irrigation and Power

Maloney, C and K.V. Raju. 1994. Principles of farmers' organisation for water management: from participation to management. In *Managing Irrigation Together. Practice and policy in India,* eds. C Maloney add K.V. Raju, 15-31. New Delhi: Sage Publications

Maloney, C. 2000. PIM projects in Andhra, Kerala and West Bengal: Policies to escalate support services. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L. K. Joshi and R. Hooja,Vol. 2, 652-683. Jaipur and New Delhi: Rawat Publications

Martin, E.D. and R.Yoder. 1987. *Institutions for irrigation management in farmer-managed systems: Examples from the hills of Nepal.* Research Paper Number 5. Colombo: International Irrigation Management Institute

Mathur, P.C. and S.K. Sibal. 2000. Participatory Irrigation Management: Integration with system rehabilitation. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L.K. Joshi and R. Hooja, Vol. 2, 431- 452. Jaipur and New Delhi: Rawat Publications

Mehta, S.R. 1972. *Emerging pattern of rural leadership.* New Delhi: Wiley Eastern

Meinzen-Dick, R and M. Mendoza. 1996. Alternative water

allocation mechanisms: Indian and international experiences. *Economic and Political Weekly* XXXI (13): A-25--30

Meinzen-Dick, R, K.V. Raju and A. Gulati. 2002. What affects organization and collective action for managing resources ? Evidence from canal irrigation systems in India. *World Development* 30(4): 649-666

Meinzen-Dick, R, K.V. Raju, and A. Gulati. 2000. Conditions for collective action in canal irrigation systems. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L. K. Joshi and R. Hooja, Vol.1, 115-143. Jaipur and New Delhi: Rawat Publications

Meinzen-Dick, R. 1996b. Policy trends in farmer participation. Paper presented at Workshop on Institutional Reform in Indian Irrigation. National Council of Applied Economic Research. November 6, 1986. NCAER-IFPRI collaborative Project. New Delhi.

Meinzen-Dick, R. 2000b. Towards new partnerships in Indian Irrigation. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L. K. Joshi and R. Hooja, Vol. 1, 35-56. Jaipur and New Delhi: Rawat Publications

Meinzen-Dick, R. and M. Bakker. 2001. Water rights and multiple water uses. Framework and application to Kirindi Oya Irrigation System, Sri Lanka. *Irrigation and Drainage Systems.* 15(2): 129-148

Meinzen-Dick, R. S. and B. R. Bruns. 2000. Negotiating water rights: Introduction. In *Negotiating Water Rights,* eds. B. R. Bruns and R. S. Meinzen-Dick, 23- 55. International Food Policy Research Institute, Washington, D.C. New Delhi: Vistaar Publications

Meinzen-Dick, R.S. 1996a. *Groundwater markets in Pakistan: participation and productivity.* Washington, D.C: International Food Policy Research Institute

Meinzen-Dick, R.S. 2000a. Public, private and shared water: Groundwater markets and access in Pakistan. In *Negotiating Water Rights,* eds. B.R. Bruns and R. S.Meinzen-Dick, 245-268. International Food Policy Research Institute, Washington, D.C. New Delhi: Vistaar Publications

Merrey, D.J. 1986a. Reorganising Irrigation: local level management in the Punjab (Pakistan). In *Irrigation Management in Pakistan: Four papers* by D.J. Merry & J Wolf, IIMI Research Paper No.

4, 26-43. Colombo: International Irrigation Management Institute

Merrey, D.J. 1986b. The sociology of *warabandi*: a case study from Pakistan. In *Irrigation Management in Pakistan: Four papers* by D.J. Merry and J. Wolf, IIMI Research Paper No. 4, 44-61. Colombo: International Irrigation Management Institute

Merrey, D.J. 1996. *Institutional design principles for accountability in large irrigation systems.* Research Report 8. Colombo: International Irrigation Management Institute

Merry, S. E. 1988. Legal Pluralism. *Law and Society Review* 22 (5): 869-896

Mitra, A. K. 1986 . Underutilization revisited: surface irrigation in drought prone areas of Western Maharashtra. *Economic and Political Weekly* XXI (17): 752-756

Mitra, A.K. 1996. Irrigation sector reforms: issues and approaches. *Economic and Political Weekly* XXXI (13): A-31--37

Mitra, A.K. 1998. Development and management of irrigation in Maharashtra: with special reference to Major and Medium surface irrigation schemes. *Economic and Political Weekly* XXXIII (26): A-80-95

Moench, M. 1994. Approaches to groundwater management: to control or enable. *Economic and Political Weekly* 29(39): A-135-146

Mollinga, P. P and A.Bolding, 1996. Signposts of struggle: pipe outlets as the material interface between water users and the state in a large-scale irrigation system in South India. In *Crops, people and irrigation: water allocation practices of farmers and engineers,* eds. G. Diemer and F. P. Huibers, 11-33. London: Intermediate Technology Publications

Mollinga, P. P. 1998a. *On the waterfront. Water distribution, technology and agrarian change in a South Indian canal irrigation system.* Ph.D. diss. Wageningen Agricultural University

Mollinga, P.P .1998b. Participation as a political process. In *Farmers' participation in Water Management. Proceedings of the 2nd Netherlands National ICID day,* ed. Gerrit van Vuren, 63-68. Rotterdam: A A Balkema

Mollinga, P. P. 2000. The inevitability of reform: towards alternative approaches for canal irrigation development in India. In *Participatory Irrigation Management. Paradigm for the 21st century,* eds. L. K. Joshi and R.Hooja, Vol. 1, 67-97. Jaipur and New Delhi: Rawat Publications

Mollinga, P.P. 2001a. Water and politics: levels, rational choice and South Indian canal irrigation. *Futures* 33: 733-752

Mollinga, P. P. 2001b. *Power in motion: a critical assessment of canal irrigation reform, with a focus on India.* IndiaNPIM Working Paper /Monograph Series No. 1. New Delhi: Indian Network on Participatory Irrigation Management

Moore, M. 1989. The fruits and fallacies of neo-liberalism: the case of irrigation policy. *World Development* 17(11): 1733-1750

Nagaraj,N, W.M. Frasier and R.K.Sampath. 1999. Groundwater institutions in US and India: sustainable and equitable resource use. *Economic and Political Weekly* XXXIV (26): A-93-104

Najam, A. 1996. NGO accountability: a conceptual framework. *Development Policy Review.* 14 (4): 339-353

Narain, B. 1922. *Indian Economic Problems. Part II. Source Book for the study of Indian Economic Problems.* Lahore: The Punjab Printing Works

Narain, V. 2000. India's water crisis: the challenges of governance. *Water Policy* 2(6): 433-444

Ostrom, E. 1990. *Governing the commons. The evolution of institutions for collective action.* Cambridge: Cambridge University Press

Ostrom, E. 1992. *Crafting Institutions for Self-Governing Irrigation Systems.* Institute for Contemporary Studies. San Francisco

Palakudiyil, T. 1996. A study of a Cooperative Lift Irrigation Society in Western Maharashtra. In *Cooperative Management of Natural Resources,* eds. K. Singh and V. Ballabh, 141-155. Institute of Rural Management, Anand. New Delhi: Sage Publications

Panoyotou, T. 1994. *Economic instruments for environmental management and sustainable development.* Environmental Economics Series Paper No. 16. Prepared for the United Nations Environment Programme 's Consultative Expert Group Meeting on the use and application of Economic Policy Instruments for Environmental Management and Sustainable Development, Nairobi, February 23-24, 1995.

Pant, N and R.K. Verma. 1983. *Farmers' organisation and irrigation management.* Ashish Publishing House: New Delhi

Pant, N. 1999. Impact of Irrigation Management Transfer in Maharashtra: an assessment. *Economic and Political Weekly* XXXIV (13): A-17- 26

Pant, N. 2000. Impact of Irrigation Management Transfer in Maharashtra. In *Participatory Irrigation Management. Paradigm for*

the 21st century, eds. L.K. Joshi and R. Hooja, Vol. 2, 579-617. Jaipur and New Delhi: Rawat Publications

Parthasarathy, R. 1998. *Reforms in irrigation management: Bottoms-up versus top-down models.* GIDR Working Paper No. 104. Ahmedabad: Gujarat Institute of Development Research

Parthasarathy, R. 2000. Participatory Irrigation Management Programme in Gujarat: institutional and financial issues. *Economic and Political Weekly* XXXV (35) & (36): 3147-3154

Patil, R.K and D.N. Kulkarni. 1984. Ensuring equity in irrigation systems. A case study of a farmer group managed system. In *Productivity and Equity in Irrigation Systems*, ed. N. Pant, 99-208. New Delhi: Ashish Publishing House

Paul, S. 1989. Green revolution and income distribution among farm families in Haryana: 1969-70 to 1982-83. *Economic and Political Weekly* XXIV (51 & 52): A-154-158

Paul, S. 1992. Accountability in public services: exit, voice and control. *World Development.* 20 (7): 1047-1060

Pendse, M. D. and S.G.Bhogle.1994. Participatory Irrigation Management in Maharashtra: training and action research. In *India: Irrigation Management Partnerships*, eds. M. V. K. Sivamohan and C. Scott, 35-52. Hyderabad: Booklinks Corporation

Peter, R. 2000. Management of irrigation systems by farmers in Andhra Pradesh. In *Participatory Irrigation Management. Paradigm for the 21st Century*, eds. L.K. Joshi and R. Hooja, Vol. 2., 455-482. Jaipur and New Delhi: Rawat Publications

Raju, K.V., R. Meinzen-Dick, and A. Gulati. 2000. Policy trends in Participatory Irrigation Management. In *Participatory Irrigation Management. Paradigm for the 21st century*, eds. L.K. Joshi and R. Hooja, Vol. 1, 172-213. Jaipur and New Delhi: Rawat Publications

Rao, C. H. H and A. Gulati. 1994. Indian agriculture: emerging perspectives and policy issues. *Economic and Political Weekly* XXIX (53): A-158-169

Rao, P.K. 1984. Productivity and equity in irrigation systems in India: analytical and empirical issues. In *Productivity and equity in irrigation systems*, ed. N. Pant, 3-11, New Delhi: Ashish Publishing House

Reidinger, R. B. 1974. Institutional rationing of canal water in Northern India: conflict between traditional patterns and modern needs. *Economic Development and Cultural Change* 23(1): 79-104

Reidinger, R.B. 1994. Observations on water markets for irrigation systems. In *Water Policy and Water Markets. Selected Papers and proceedings from the World Bank's Ninth Annual Irrigation and Drainage Seminar.* eds. Guy le Moigne, K. W. Easter, W. J. Ochs and S. Giltner, 55-63. World Bank Technical Paper No. 249. World Bank: Washington, D.C

Rinaudo, J. D., P. Strosser, and S.Thoyer. 1998. *Distributing water or rents ?Examples from a public irrigation system in Pakistan.* Working Paper Cemagref, Groupement de Montpellier. Division Irrigation WP 98-01

Rosegrant, M.W. and H.P.Binswanger.1994. Markets in tradable water rights: potential for efficiency gains in developing country water resource allocation. *World Development* 22(11): 1613-1625

Saleth, R.M. 1996a. *Water institutions in India: economics, law and policy.* Institute of Economic Growth. New Delhi: Commonwealth Publishers

Saleth, R. M. 1996b. *Privatising water resource management.* Mimeo. Delhi: Institute of Economic Growth

Sawant, M. M, R.E.Barrett, D.J. Molden and T. S. Sheng. 1991. *Assessment of conjunctive use in Maharashtra Minor Irrigation Systems.* ODI Irrigation Management Network. Network Paper 3. London: Overseas Development Institute

Sen, B. 1974. *The Green Revolution in India. A perspective.* New Delhi: Wiley Eastern Private Limited

Shah, A. 2000. Participatory Irrigation Management for water rights in Sindh, Pakistan. In *Water for Food and Rural Development. Approaches and Initiatives in South Asia,* ed. P.P. Mollinga, 233-246. New Delhi: Sage Publications

Shah, T. 1993. *Ground water markets and irrigation development. Political Economy and Practical Policy.* Bombay: Oxford University Press

Shah, T. 1997. The deepening divide: Diverse responses to the challenge of groundwater depletion in Gujarat. Paper presented at the IDPAD 'Dealing with scarcity' conference, Amersfoort, the Netherlands, October 1997.

Sharma, S. S. 1979. *Rural elites in India.* New Delhi: Sterling Publishers

Shashidharan, E.M. 2000. Civil society organizations and irrigation management in Gujarat, India. In *Water for food and rural development. Approaches and initiatives in South Asia,* ed. P.P. Mollinga, 247-265. New Delhi: Sage Publications

Sivamohan, M.V.K. and C. Scott. 1992. *The Command Area*

Development Programme in India: A policy perspective. ODI/IIMI Network Paper 20. London: Overseas Development Institute

SOPPECOM. 1997. Draft Report on Action Research Programme taken for scaling up Participatory Irrigation Management and conjunctive use of water in Maharashtra. Pune: Society for People's participation in Ecosystem Management

Spiertz, H. L. J. 2000.Water rights and legal pluralism: some basics of a legal anthropological approach. In *Negotiating Water Rights,* eds. B.R. Bruns and R. S. Meinzen-Dick, 162-169. International Food Policy Research Institute, Washington, D.C. New Delhi: Vistaar Publications

Spiertz, H.L. J and I.J.H. de Jong. 1992. Traditional law and irrigation management: the case of Bethma. In *Irrigators and engineers: Essays in honour of Lucas Horst,* eds. G. Diemer and J. Slabbers, 185-201. Amsterdam: Thesis Publishers

Spiertz, J and M. Wiber. 1996. The bull in the China chop. Regulation, property rights and natural resource management: an introduction. In *The role of law in natural resource management,* eds. J. Spiertz and M. Wiber. 's Gravenhage: Vuga Publications

Stone, I. 1984. *Canal irrigation in British India. Perspectives on technological change in a peasant economy.* Cambridge: Cambridge University Press

Strauss, A. and J. Corbin. 1990. *Basics of qualitative research: Grounded theory procedures and techniques.* New Delhi: Sage Publications

Tang, S Y. 1992. *Institutions and collective action: Self-governance in Irrigation.* Institute of Contemporary Studies. San Francisco, CA.

Tang, S.Y. 1991. Institutional arrangements and the management of common-pool resources. *Public Administration Review* 51 (1): 42-51

Thomas, J.W and M.S.Grindle. 1990. After the decision: implementing policy reforms in developing countries. *World Development* 18(8): 1163-1181

Tilak, M.B.G and B.S.Rajvanshi. 1991. Operation of Irrigation Systems in India. *International Commission on Irrigation and Drainage. Special Technical Session 1991.* Vol. I-B, 1-13. Beijing

Turral, H. 1995. *Devolution of management in public irrigation systems: cost shedding, empowerment and performance. A review.* Working Paper 80. London: Overseas Development Institute

Uphoff, N. 1986. *Improving international irrigation management with farmer participation. Getting the process right. Studies in water policy and*

management No. 11. Boulder, Colorado: Westview Press

Vaidyanathan, A. 1999. *Water resource management. Institutions and irrigation development in India.* New Delhi: Oxford University Press

Vanderlinden, J. 1989. Return to legal pluralism: twenty years later. *Journal of Legal Pluralism and Unofficial Law* (28): 149-159

Vermillion, D.L. 2000. Water rights in the state of nature: emergent expectations in an Indonesian Settlement. In *Negotiating Water Rights,* eds. B.R.Bruns and R.S.Meinzen-Dick, 56-82. International Food Policy Research Institute, Washington, D.C. New Delhi: Vistaar Publications

Vincent, L. 1997. Irrigation as a technology, irrigation as a resource: a sociotechnical approach to irrigation. Inaugural lecture. December 11, 1997. Wageningen University.

Vos, J. 2002. *Metric Matters. The performance and organisation of volumetric water control in large-scale irrigation in the North Coast of Peru.* Ph.D.. Diss. Wageningen University.

Vyas, V.S. 1994. Agricultural policies for the nineties: issues and approaches. *Economic and Political Weekly* XXIX (26): A-54-63

Wade, R and R. Chambers. 1980. Managing the main system: canal irrigation's blind spot. *Economic and Political Weekly* XV (39): A-107-112

Wade, R. 1976. Water accounting in irrigation projects: a technique from Maharashtra. *Economic and Political Weekly* August 28, 1976: 1436-1439

Wade, R. 1988. The management of irrigation systems: how to evoke trust and avoid prisoners' dilemma. *World Development* 16(4): 489-500

Wahaj, R. 2001. *Farmers actions and improvements in irrigation performance below the mogha. How farmers manage water scarcity and abundance in a large scale irrigation system in South-Eastern Punjab, Pakistan.* Ph.D. Diss. Wageningen University.

Water and Land Management Institute. 1998b. *Operation and management of irrigation systems in Maharashtra state.* Publication No. 20. 4th Edn. Aurangabad: WALMI

Water and Land Management Institute.1998a. *Water distribution practices in Maharashtra State.* Publication No. 22. Aurangabad: WALMI

Whitcombe, E. 1983. Irrigation. In *The Cambridge Economic History of India*, ed. D. Kumar, Vol. 2, c.1757- c.1970, 677-737. Cambridge: Cambridge University Press

Wijayratna, C.M. and D. Vermillion. 1994. *Irrigation Management Transfer in the Philippines: strategies of the National Irrigation Administration.* Short report series on locally managed irrigation. Report No. 4. Colombo: International Irrigation Management institute

Woodman, G.R. 1998. Ideological combat and social observation. Recent debate about legal pluralism. *Journal of legal pluralism and unofficial law.* Number 42, Special issue: 21-57

World Bank. 1991. *India Irrigation sector review. Volume I: Main Report. Volume II: Supplementary Analysis.* Report No. 9518-IN. Agriculture Operations Division. India Country Department. Asia Region.

World Bank. 1993. *Haryana Water Resources Consolidation Project. Sectoral Environmental Assessment.* Prepared for World Bank India Agriculture Operations Division and India Resident Office. August 1993.

World Bank. 1994. *A guide to the formulation of Water Resources Strategy,* eds. Guy Le Moigne, A. Subramanian, M. Xie and S. Giltner. World Bank Technical Paper Number 263. Washington, D.C: The World Bank

World Bank. 1996. The World Bank Participation Source Book. Washington, D.C : World Bank.

World Bank. 1999a. *The Irrigation Sector. India Water Resources Management.* South Asia Rural Development Series. The World Bank,Washington , D.C. New Delhi: Allied Publishers

World Bank. 1999b. *Transferring Irrigation Management to farmers in Andhra Pradesh, India.* World Bank Technical Paper No. 449, by K. Oblitas and J. R. Peter in association with G. Pingle, H.M. Qaddumi & J. Perera. Washington, D.C: The World Bank

World Bank. 2000. *Case studies in Participatory Irrigation Management.*, eds. D. Groenfeldt and M. Svendsen. World Bank Institute. Washington, D.C: World Bank

Yin, R.K. 1984. *Case study research: Design and methods. Applied Social Research Methods Series Vol. 5.* Thousand Oaks: Sage Publications

Yoder, R. 1994. *Locally managed irrigation systems. Essential tasks and implications for assistance, management transfer and turnover programmes.* Monograph Number 3. Colombo: International Irrigation Management Institute

Young, R.A. 1986. Why are there so few transactions among water users? *American Journal of Agricultural Economics* 68(5): 1144-51

Zwarteveen, M.1999. Trends in participatory water management. A review of the literature. Prepared for IWACO. September 1999

Summary

This research is on water users associations in canal irrigation. The policy objective of this research is to contribute to debates on Irrigation Management Transfer and irrigation reform. The theoretical objective is to contribute to an inter-disciplinary understanding of water users associations as shaped by technology, or the design of canal irrigation and social relationships. From this perspective, there are two sub-questions: First, what are the implications of the design of canal irrigation for establishing WUAs and second, what are the internal organisational dynamics of WUAs, or how do WUAs behave as organisational entities?

To answer these questions, research was carried out in two Indian states. The first was Haryana, in Northwest India, that has the warabandi system of water distribution, and the second was Maharashtra, in Western India, that has the shejpali system of water distribution.

The first issue investigated in this research is whether, and how, technology -or the design of canal irrigation - matters in establishing WUAs. The physical layout of a system places requirements on the operational and organisational structure. That shapes the nature of human organisation that fits with the design of canal irrigation. The levels and nature of control that irrigation system operation confers influence the extent to which control relations can be changed between the users and the bureaucracy. The warabandi system of water distribution has a different potential for reform through WUA establishment than does shejpali.

The second issue is the embeddedness of the processes of local water management. This pertains to the internal organisational dynamics of water users associations. In this context, aspects as the internal power structures among members, WUA leadership,

domination by village elite, and equity in participation and water distribution have been examined.

The third issue is the implementation of policy reforms aimed at establishing WUAs. In both the study states, Haryana as well as Maharashtra, the implementation of policy reforms for establishing WUAs has been studied. One of the assessments is that there are wide variations in the perceptions of the concerned actors about WUA formation. Another assessment is that some actors support and push these initiatives forward; others retard it. The pace of reform is shaped by the outcome of the interactions among them.

The theoretical contribution of this research is in generating insights into the processes of collective action and local water management. To that extent, this should be relevant to those supporting, catalysing or examining local level action for resource management-donors, funders, NGOs, government agencies, and academics. From a policy perspective, this research would be relevant to those studying the implementation of irrigation sector reforms and establishing water users associations.

The research design relies predominantly on qualitative research tools, such as participant observation or ethnography, semi-structured interviews, key informants, and studies of written records. It involves comparative studies.

This book has seven chapters. Chapter 1 provides a review of the research questions and issues examined as well as a discussion of research design and methodology. It summarises the main contributions of this research in relation to the existing literature and the prevailing understanding of water users associations.

In chapter 2, the warabandi and shejpali systems of water distribution are described. This serves two objectives. First, this chapter describes what these forms of water distribution entail. The second objective of this chapter is to provide a brief review of the state of research in these two systems. It provides the technological context of this research.

In section 1 of this chapter, the concept of protective irrigation is introduced. The chapter describes its genesis as a specific form of irrigation under colonial times with certain policy objectives, namely, to supply limited quantities of water over large areas to a large number of farmers, to guard against crop failure and social and political unrest, rather than to match water supply with crop water requirements. The technical design, organisational and socio-economic characteristics of protective irrigation are discussed.

In Section 2, the warabandi system of irrigation prevalent in Northwest India and Pakistan is introduced. A preliminary discussion of its basic premises and operation is presented. Some of the literature on the experience with warabandi is reviewed to assess its merits and demerits. In Section 3, the historical evolution of the forms of protective irrigation in Maharashtra is traced. The shejpali system of water distribution is described. It is compared with the block system.

The chapter concludes in section 4 with a discussion of some of the discourses surrounding protective irrigation. The relevance of this understanding to appreciating irrigation management concerns in general, and for this research in particular, is explained.

Chapter 3 is the first of the empirical chapters. This chapter provides the legal and policy framework under which the WUAs that were selected for research function. It describes the process of policy implementation for WUA establishment in Haryana and Maharashtra.

An overview of the policy environment for WUA formation in both the states is presented. This is followed by a discussion of the implementation process. The perceptions of different actors involved are described. The bottlenecks in policy implementation are discussed. This is followed by a comparison of the experience of both these states with other states where policies for WUA establishment are at different levels of formulation or implementation. It is shown that very little effort has been made in these states for garnering support for the policy intervention, or for ensuring that the necessary resources are available. This is necessary not only here, but also elsewhere, where reform is being contemplated.

Together, chapters 2 and 3 provide the technological and policy context of the discussion of the case studies that follow in chapters 4, 5 and 6 and the discussion of the potential for irrigation reform that is presented in chapter 7. Further, the issues that are presented in chapter 3 get strengthened in chapters 4, 5 and 6 through the more intensive observations across 3 WUAs that were selected for the main research phase.

Chapter 4 addresses the research question: how does technology, or the design of canal irrigation, matter in establishing WUAs? It is shown that discussions of technology are important in the debates on Irrigation Management Transfer, since the design of canal irrigation influences the extent to which water management

and distribution practices can be changed through WUA formation and the extent to which control relations between the users and the bureaucracy can be altered.

The process and motivations guiding WUA establishment as well as the effects of WUA establishment on water management and distribution practices are described. A contrast is presented between two water users associations. In the former case, the formation of the water users association is aimed at improving the control of the farmers over the availability of water and securing a greater accountability of the Irrigation Department to the farmers. The formation of the WUA is designed as a strategy to empower farmers, as control over system operation moves from the bureaucracy to the water users association. The Irrigation Department enters into a contract with the water users association for supplying volumetric quotas of water for each season as per the schedules drawn by the latter. The formation of the WUA has specific effects on water management and distribution practices that were similar to those conceived of by the initiators of the turnover process. It is carried out through a step-by-step process with the support of an NGO.

In the latter case, there is no intention of changing control relations between the users and the bureaucracy. Control continues to vest outside the WUA, technically in the main system and organisationally with the irrigation bureaucracy. There is no reorientation of the bureaucracy. There is no change in the balance of power between the bureaucracy and the farmers. The WUA is assigned some functions, but there are no corresponding powers or rights. The WUA is little more than an arm of the bureaucracy with no shift in the balance of power between the two. The effects of WUA formation on water management and distribution practices are very limited.

It is shown that this difference relates to the technology for water distribution. The warabandi system of water distribution that is prevalent in Haryana itself limits the scope for functions that can be transferred to irrigators, and the extent to which control relations between the users and the bureaucracy can be altered.

Chapter 5 focuses more closely on the following of the research questions, namely on an exploration of the organisational dynamics of the water users associations studied. The embedded nature of the processes of local water management is described. The organisational dynamics of the third of the studied WUAs are

presented. It is described how they relate to other aspects of social organisation-the division of society into social units, domination by local elite, the reproduction of power relations inside the water users association and the embedded nature of conflicts. It is shown that understanding the internal processes of social organisation, domination and subordination, power relations and local conflicts is necessary for understanding the processes of local water management. Further, decentralisation can breed new centres of control and totalitarianism, though they may be located at a different, though, more local, level. Patterns of elite dominance can prevent the emergence of collective action among the members of the WUA.

To understand the internal dynamics of the water users associations, it was necessary to look at the internal processes of water distribution and at equity, from that perspective. This is the subject of the next chapter, chapter 6. In this chapter, irrigation practises among the members of the WUA in the warabandi cases in Haryana are first described. These practices are described as a response to a regime of 'scarcity by design'. Empirical observations regarding equity within the command of the outlet are presented, and the responses of tail-enders in coping with inequity are described. In chapter 5, a reference has been made to the domination of the WUA by the village elite; in this chapter, it is examined if this domination spills over into the water distribution process. Finally, a discussion of the water distribution process and of equity in the WUA in the shejpali case is presented.

In chapter 7 the summary and conclusions of this research are presented. It is shown that understanding the technical design characteristics of canal irrigation is important for understanding the prospects for policy reform initiatives. The potential for reform varies with the technology for water distribution. Shejpali and warabandi systems have a different potential for reform. Three sets of policy reform measures are described: water rights reform and market creation, pricing, and Irrigation Management Transfer. The chapter concludes by discussing some avenues for further research on protective irrigation and irrigation management reform.

Nederlandse Samenvatting

Dit is een onderzoek naar de rol van watergebruikersgroepen (Water Users Associations, WUA's) bij kanaalirrigatie. Het onderzoek beoogt een bijdrage te leveren aan het debat over Irrigation Management Transfer en hervormingen in de irrigatiesector. In theoretische zin beoogt het bij te dragen aan interdisciplinaire benadering van de invloed van technologie op watergebruikersgroepen, met andere woorden, het analyseert de manier waarop een irrigatiesysteem is ontworpen haar weerslag heeft op de sociale verhoudingen. Vanuit dit perspectief kom ik tot twee subvragen: Ten eerste, wat is de weerslag van het ontwerp van een irrigatiesysteem op de vorming van WUA's, en ten tweede, wat is de interne organisatiedynamiek van WUA's, dat wil zeggen, hoe gedragen WUA's zich, gezien als organisaties?

Om die vragen te kunnen beantwoorden heb ik onderzoek uitgevoerd in twee deelstaten in India. Allereerst Haryana in noordwest India, waar voor de waterverdeling het *warabandi*-stelsel gemeengoed is, en ten tweede Maharashtra in west-India met het *shejpali*-stelsel.

Het eerste onderzoeksthema belicht de vraag of en hoe technologie – dat wil zeggen, het ontwerp van irrigatiestelsels – van invloed is op de vorming van WUA. De fysieke context van een stelsel stelt eisen aan de operationele en organisatiestructuur. Dat is vervolgens weer van invloed op de manier waarop mensen zich organiseren in relatie tot het ontwerp van het kanaalirrigatiestelsel. De niveaus en wijze waarop een irrigatiesysteem wordt beheerd is van invloed op de mate waarop je iets aan de verhoudingen tussen gebruikers en bureaucratie kunt veranderen. Het *warabandi*-stelsel heeft een ander potenteel om hervormingen door de oprichting van

watergebruikersgroepen te realiseren dan *shejpali.*

Het tweede thema is de inbedding van lokaal waterbeheer. Dit thema heeft betrekking op de interne organisatiedynamiek van Water Users Associations. In deze context is gekeken naar aspecten als de interne machtsverhoudingen tussen leden van de WUA, de leiding, overheersing door de elite in een dorp, en de mate waarin participatie en waterverdeling eerlijk is geregeld.

Een derde thema is de implementatie van beleidshervormingen waarbij WUA's worden opgezet. In beide case studies, Haryana en Maharashtra, is dit bestudeerd. Een van mijn bevindingen is dat de percepties van de kant van de betrokken actoren over de oprichting van WUA sterk uiteenlopen, en dat sommige actoren dit soort initiateven steunen en stimuleren, terwijl andere ze tegenhouden. De interactie tussen die groepen bepaalt hoe snel de hervormingen zich kunnen voltrekken.

De theoretische bijdrage die dit onderzoek levert bestaat uit het genereren van inzichten in collectieve-actie-processen bij lokaal waterbeheer. Dit kan relevant zijn voor mensen die initiatieven voor lokale actie voor lokaal waterbeheer steunen, als katalysator fungeren of onderzoeken -donoren, financiers, NGO's, overheidsinstanties en academici. Vanuit beleidsperspectief zou dit onderxoek van belang kunnen zijn voor hen die de implementatie van hervormingen in de irrigatiesector steunen en Water Users Associations willen opzetten.

Het ontwerp van onderzoek berust voornamelijk op kwalitatieve methoden en technieken als participerende observatie of etnografie, halfgestructureerde interviews, gesprekken met belangrijke informanten en documentonderzoek. Het betreft vergelijkend onderzoek.

Het boek telt zeven hoofdstukken. In hoofdstuk 1 behandel ik de probleemstelling en onderzoeksthema's als ook het onderzoeksontwerp en de methodologie. De belangrijkste uitkomsten van dit onderzoek worden er in samengevat in relatie tot de literatuur en gangbare inzichten in het functioneren van watergebruikersgroepen.

In hoofdstuk 2 beschrijf ik twee soorten waterverdeling: *warabandi* en *shejpali.* Dit dient twee doelen: aangeven wat deze vormen van waterverdeling inhouden en een bondig overzicht bieden van de stand van onderzoek voor deze systemen. Dit vormt de technologische onderzoekscontext.

In paragraaf 1 van dit hoofdstuk wordt het concept *protective*

irrigation voor het voetlicht gebracht. Het hoofdstuk behandelt de ontstaansgeschiedenis ervan als specifieke vorm van irrigatie in het koloniale tijdperk dat tot doel had voor een groot aantal boeren een beperkte hoeveelheid water beschikbaar te maken over een groot landbouwareaal. Het technisch ontwerp, de organisatie en de socio-economische eigenschappen van *protective irrigation* komen aan de orde.

In paragraaf 2 wordt het *warabandi*-stelsel in Noordwest-India en Pakistan geintroduceerd. De basispremissen en werking komen aan de orde. De paragraaf biedt een greep uit de literatuur over de voor- en nadelen van *warabandi.* In paragraaf 3 achterhaal ik de wordingsgeschiedenis van vormen van *protective irrigation* in Maharashtra. Het *shejpali*-systeem komt aan bod in vergelijking met het blokstelse.

Paragraaf 4 sluit het hoofdstuk af met een bespreking van het discour rond *protective irrigation.* Ik leg erin uit waarom dit van belanmg is voor kwesties rond het beheer van irrigatiestelsels in het algemeen en voor dit onderzoek in het bijzonder.

Hoofdstuk 3 is het eerste empirische hoofdstuk. Het behandelt het juridisch beleidskader voor de WUA's die ik voor mijn onderzoek heb geselecteerd. In dit hoofdstuk beschrijf ik hoe de implementatie van het beleid voor de vorming van WUA's verloopt. De percepties van de verschillende actoren komen erin aan de orde, en de knalpunten voor beleidsimplementatie. Daarna volgt een vergelijking tussen de ervaringen die in beide deelstaten zijn opgedaan en die in andere staten waarin op verschillende niveaus beleid wordt gemaakt en geimplemneteerd voor de vorming van watergebruikersgroepen. Het blijkt dat er in desze staten maar heel weinig moeite is gedaan een draagvlak te scheppen voor deze beleidsinterventie, en zeker te stellen dat de vereiste middelen beschikbaar zijn. Dit is niet alleen hier van belang maar ook elders waar men over hervormingen nadenkt.

Hoofdstuk 2 en 3 vormen samen de technologische en beleidscontext voor de *case studies* in hoofdstuk 4, 5 en 6 en voor hoofdstuk 7, waarin het potentieel voor irrigatiehervormingen wordt behandeld. Tevens worden de thema's die in hoofdstuk 3 aan de orde komen onderbouwd in hoofdstuk 4, 5 en 6 met behulp van grondigere observaties in de drie WUA's die voor de belangrijkste onderzoeksfase zijn geselecteerd.

Hoofdstuk 4 behandelt de onderzoeksvraag: op welke manier

is technologie, of het ontwerp van kanaalirrigatie, van belang bij het opzetten van WUA's? Het laat zien dat het van belang s de rol van technologie te betrekken bij het debat rond Irrigation Management Transfer, aangezien de manier waarop het kanaal wordt ontworpen van invloed is op de mate waarin het opzetten van watergebruikersgroepen een verandering kan bewerkstelligen in de praktijk van waterbeheer en –verdeling en de de verhoudingen tussen gebruikers en bureaucratie. Het hoofdstuk beschrijft de beweegredenen die ten grondslag liggen aan de oprichting van WUA's en de effecten daarvan op de praktijk van waterbeheer en –verdeling en de praktijk ervan. Twee WUA's worden met elkaar gecontrasteerd. In de eerste gevalsstudie is de watergebruikersgroep opgezaet met het doel de boeren meer controle te geven over de beschikbaarheid van water en de machtsoverdracht het Ministerie van Irrigatie aan de boeren te vergroten. Het is een strategie om boeren meer macht te geven, naarmate de controle over het systeem van de bureaucratie naar de WUA verschuift. Het Ministerie van Irrigatie gaat een contract aan met de WUA waarin voor elk seizoen de levering van waterquota wordt geregeld volgens een door de WUA opgesteld plan. Het effect dat de oprichting van de WUA sorteert op de praktijk van waterbeheer en –verdeling lijkt sterk op wat de initiatiefnemers van de overdracht voor ogen hadden. Het proces verloopt stap voor stap, en wordt door een NGO begeleid.

In het tweede geval is er geen sprake van een wijziging in de controleverhoudingen tussen gebruikers en bureaucratie. De controle blijft in technisch opzicht bij het hoofdstelsel, qua organisatie blijft de irrigatiebureaucratie de touwtjes in handen houden. De bureaucratie oriënteert zich niet anders, de machtsverhouding tussen gebruikers en bureaucratie blijft gelijk. De WUA krijgt enkele functies maar geen bijbehorende rechten en bevoegdheden. De WUA is weinig meer dan een tak van de bureaucratie. De oprichting van WUA's heeft dan ook maar heel weinig effect op de praktijk van beheer en verdeling.

Ik laat zien dat dit onderscheid te maken heeft met de technologie achter de waterverdeling. Het *warabandi*-systeem dat in Haryana de overhand heeft kent maar beperkte ruimte toe aan het soort functies dat kan worden overgedragen en de mate waarin de machtsverhoudingen tussen gebruikers en bureaucratie kunnen worden veranderd.

Hoofdstuk 5 gaat dieper in op de volgende onderzoeksvragen: een verkenning van de organisationele dynamiek van Water Users Associations, waaronder die van de derde hier onderzochte WUA. Het hoofdstuk beschrijft de manier waarop lokaal waterbeheer is ingebed – hoe ze zich verhouden tot andere aspecten van de wijze waarop de maatschappij is georganiseerd: de manier waarop de maatschappij in eenheden is opgedeeld, de lokale elite heerst, de machtsverhoudingen worden gereproduceerd binnen de Water Users Association en conflicten maatschappelijk zijn ingebed. Een goed begrip van de manier waarop lokaal watermanagement werkt, vereist inzicht in de interne dynamiek van maatschappelijke organisatie, overheersing en onderwerping, machtsverhoudingen en lokale conflicten. Decentralisatie kan tot gevolg hebben dat nieuwe controlepunten ontstaan en tot totalitarisme leiden, zij het op een ander, meer lokaal niveau. De manier waarop de elite heerst kan collectief handelen van de WUA-leden in de weg staan.

Om de interne dynamiek van de Water Users Association goed te begrijpen was het belangrijk de interne processen te beschouwen en vanuit dat perspectief naar kwesties rond rechtvaardige verdeling. Dit is het thema van hoofdstuk 6, waarin allereerst de praktijk van irrigatie bij de leden van de watergebruikersgroepen in het *warabandi*-systeem in Haryana wordt beschreven in reactie op een regime van 'ontworpen schaarste'. Het beschrijft hoe de controle over verdeelwerken raakt aan rechtvaardigheidsvraagstukken. Werd in hoofdstuk 5 al gerefereerd aan de manier waarop de lokale elite WUAs domineren, in dit hoofdstuk wordt bekeken of die overheersende rol zijn weerslag vindt in het waterverdelingsproces. Tenslotte komen dezelfde vragen van eerlijke waterverdeling in *het shejpali*-systeem.

In hoofdstuk 7 geef ik samenvatting en conclusies van dit onderzoek. Ik laat zien dat een goed begrip van de technische karakteristieken van de wijze waarop een kanaal wordt ontworpen van belang is voor een juiste inschatting van de kansrijkheid van initiatieven tot beleidshervorming. Het potentieel voor hervormingen varieert naar rato van de technologie voor waterverdeling. Zo herbergen *shejpali* en *warabandi* niet hetzelfde potentieel voor hervorming in zich. Ik beschrijf drie maatregelenpakketten: waterrechten en marktwerking, prijsstelling, en Irrigation Management Transfer. Aan het eind van het hoofdstuk worden enkele richtingen aangegeven voor nader

onderzoek naar *protective irrigation* en hervormingen binnen de irrigatiesector.

Curriculum Vitae

Vishal Narain was born on August 31, 1972 in Delhi, India. In 1993, he graduated with a B.A. (Hons.) Economics degree from the Sri Ram College of Commerce, Delhi University. After that, he went on to study at the Institute of Rural Management, (IRMA), Anand, Gujarat, where he earned his Post-Graduate Diploma in Rural Management in 1995. Later that year, he joined the Tata Energy Research Institute, TERI, New Delhi, to serve their Policy Analysis Division. In 1999, he got selected for a grant from the Ford Foundation to pursue a Ph.D. programme at Wageningen University, the Netherlands, with the Departments of *Irrigation and Water Engineering* and *Agrarian Law* (now rechristened the *Law and Governance* group), under their programme on *Matching Technology with Institutions.*

For his Ph.D. research, Vishal conducted field research in the states of Haryana and Maharashtra in India. He worked with an ethnographic approach, combining an understanding of social and legal anthropology with a practical understanding of irrigation design and technology. Vishal's further research interests are policy implementation and institutional transformation in irrigation, organisational development and change for natural resource management, and water rights reform and market creation.