Water and Poverty: The Realities

Experiences from the Field

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Contents

Abbreviations

ADB	Asian Development Bank
ADRC	Asian Disaster Reduction Center
APRLP	Andhra Pradesh Rural Livelihood Programme
AWARD	Association for Water and Rural Development
ASA	Association for Social Advancement
BC	backward caste
BHNR	basic human needs reserve
BRAC	Bangladesh Rural Advancement Committee
BWDB	Bangladesh Water Development Board
CAA	Constitutional Amendment Act
CBO	community-based organization
CDSP	Char Development and Settlement Project
CF	community forest
CPR	common pool resources
Danida	Danish International Development Assistance
DAS	Department of Water and Sanitation
DCC	Dhaka City Council
DDOPH	District Directorate of Public Works and Housing
DFID	Department for International Development (United Kingdom)
DFO	District Forest Office
DIO	District Irrigation Office
DPOPH	Provincial Directorate of Public Works and Housing
DRA	demand-responsive approach
DSK	Dushtha Shasthya Kendra
DWAF	Department of Water Affairs and Forestry
DWASA	Dhaka Water Supply and Sewerage Authority
FAO	Food and Agriculture Organization
FO	farmers' organization
FPI	Foundation of Public Interest
FUG	forest users' group
GAP-RDA	Southeastern Anatolia Project Regional Development Administration
GTZ	German Technical Cooperation
GWA	Gender and Water Alliance
GWP	Global Water Partnership
GWP-CATAC	Central American Technical Advisory Committee for the Global Water Partnership
IADB	Inter-American Development Bank
ICZM	integrated coastal zone management
IDE	International Development Enterprises
IFAD	International Fund for Agricultural and Development
ILO	International Labour Organization
IMT	irrigation management transfer
ICZM	integrated coastal zone management
INGO	international nongovernment organization
IRC	International Water and Sanitation Centre
IISD	International Institute for Sustainable Development
INRM	integrated natural resources management
ISDR	International Strategy for Disaster Reduction
IUCN	The World Conservation Union
IWMI	International Water Management Institute
IWRM	integrated water resources management
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JPM	joint monitoring program

Lao PDR	Lao People's Democratic Republic
LPG	liquefied petroleum gas
MARD	Minister of Agriculture and Rural Development
MDB	multilateral development bank
MDGs	Millennium Development Goals
MDT	multidisciplinary team
MOFETC	Ministry of Foreign Economic and Trading Cooperation
MOST	Ministry of Science and Technology
MRL	mountain, river, lake
NGO	nongovernment organization
NRI	Natural Resources Institute
NTFP	nontimber forest products
O&M	operation and maintenance
ODI	Overseas Development Institute
PIA	project implementing agency
PIM	participatory irrigation management
PRA	participatory rural appraisal
PRC	People's Republic of China
PRI	Panchayati Raj Institution
PRSP	poverty reduction strategy paper
PVC	poly vinyl chloride
RDP	Reconstruction and Development Programme
RDT	Rural Development Trust
SAMTAC	South American Technical Advisory Committee
SC	scheduled caste
SDC	Swiss Agency for Development and Cooperation
SEI	Stockholm Environment Institute
SEWA	Self-Employed Women's Association
SHG	self-help group
Sida	Swedish International Development Agency
SIMI	smallholder irrigation market initiative
SRP	Systems Rehabilitation Project
ST	scheduled tribe
TSC	total sanitation campaign
UIB	Upper Indus Basin
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UN-HABITAT	United Nations Human Settlements Programme
UP	Union Parishad
UN-ISDR	United Nations International Strategy for Disaster Reduction
VDC	village development committee
WA	watershed association
WARPO	Water Resources Planning Organization
WC	watershed committee
WDT	watershed development team
WEDC	Water, Engineering and Development Centre
WHIRL	Water, Households, and Rural Livelihoods
WHO	World Health Organization
WLB	Walawe Left Bank Systems
WPI	Water and Poverty Initiative
WSSCC	Water Supply and Sanitation Collaborative Council
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization
WUG	water users' group

Overview

The cases presented here are drawn from "best practice" case study papers produced for the Water and Poverty Initiative, a partnership of leading international organizations intended to create a greater awareness for advocacy and the development of strategies to achieve the potential of water as a key element in poverty reduction. The focus of these case studies is the link between water and poverty reduction.

Each seeks to demonstrate its own examples of practical ways of improving the role of water in poverty reduction. None are comprehensive or complete, all mix success with elements that could be improved, and all demonstrate clearly that water management alone is not enough. The sustainable reduction of poverty relies on a wide range of factors of which water is only one.

In many cases, the initiatives presented here were received with great enthusiasm by the poor communities where they were implemented. This in itself is the best judge of what we should be doing. Poor people are the hardest critics and have little time for actions that do not meet their needs, capabilities, or priorities. That we are able to present such a wide range of effective actions is both important and encouraging.

This richness can be found in the individual case study reports here. In reading the case study papers, ask basic questions such as whose water security is enhanced, what water security problems the poor faced, how they coped, how they were organized, how they made use of new opportunities, which outside actors were involved, what they did, what were the impacts of interventions, and how sustainable are the benefits. You may be interested in reading the accompanying analysis, Water and Poverty Initiative Case Study Papers: What We Can Learn and What We Must Do (Frans and Soussan).

The case studies presented here cover countries and regions in Africa, Asia, and the Pacific. The cases vary considerably in more than one way. For instance, the smallest case contributor is the island state of Kiribati in Micronesia. Its size is only 20% bigger than that of Singapore, and Kiribati has less than 100,000 inhabitants. Another case is from the People's Republic of China (PRC), 10,000 times as big and with a population of 1.28 billion. The case study from Jiangxi Province in Eastern PRC involved some 40 million people.

Only one of the cases—that of the treadle pump—is at the stage where it is being widely replicated. Half of the case studies are experimental while others are at varying more advanced stages of development. Most cases are well established in the sense that they have been operational for several years and have thus stood the test of time. However, a few cases have been initiated only relatively recently and highlight how agencies that have been generally conservative in the past are taking on broader, more participatory, poverty-focused, and holistic approaches to water resource development.

In some cases, one or more government agencies are the key actors from outside the local community, while in others, a nongovernment organization (NGO) took the lead while joint government-NGO action was reported in a few cases, as was international donor initiative and private sector leadership. Most cases involved poor men and women, while some focused on either only women or only men.

Many cases deal with improved access to quality water, or pro-poor economic growth and livelihood improvement. Other cases focus on management of the environment, pro-poor water governance, and community capacity building and empowerment.

Numerous case studies confirm that in schemes that do not specifically aim at reaching the poor, the relatively more prosperous sections of the community reap most of the benefits from water resources.

Several of these case studies indicate that government agencies can deliver expected outputs and are even able to reach the poor efficiently and effectively. Thus, in spite of all the rhetoric against government agencies, there is hope!

The single most obvious idea confirmed in most case study papers is that poverty reduction is possible only if the poor have secure access to safe and sufficient water for domestic and productive purposes. The overview presented here clearly demonstrates that there are many practical and cost-effective ways of making a difference. Improving different aspects of water management can and does have a direct and material impact on poverty.

1

NGO Intermediation: A Model for Securing Access to Water for the Urban Poor

Rokeya Ahmed, WaterAid

Summary

This case study documents how Dushtha Shasthya Kendra (DSK), a nongovernment organization (NGO), helped residents of some of Dhaka's squatter settlements gain access to public water and sanitation services.[1] The program started in May 1996. By April 1998, 32 water points and 5 latrines had been installed, and DSK was planning to construct another 30 water points. In addition, other NGOs who had seen the program's success and wanted to replicate the approach were planning to construct 36 water points throughout the city.

The program's success was largely due to a combination of two features.

- First, DSK used the innovative strategy of acting as an intermediary between poor urban communities and the water utility agency to facilitate water and sanitation provision at regulated prices. Persuading the Dhaka Water Supply and Sewerage Authority (DWASA) to install water points in squatter neighborhoods was an important breakthrough. Previously, DWASA policy was to make connections only to households who could demonstrate legal tenure of their plot. As it is very rare for inhabitants of Dhaka's poorest neighborhoods to have legal tenure, this effectively bars them from official water provision. In addition, DWASA had no way of recovering its costs in this type of neighborhood.
- Second, DSK paid great attention to motivating poor communities, and building their capacity, so that they could manage and maintain the new facilities themselves. This sense of community ownership is crucial to the program's success. Helping develop it has been a considerable challenge, because of previously low levels of social cohesion in the target settlements.

The mediation model has proved effective in the medium term. However, DSK recognizes that what is ultimately needed is a policy change on DWASA's part. If the utility agency were to recognize rights to water irrespective of land tenure, this would remove an important barrier that currently prevents the residents of slum and squatter settlements from gaining access to water services. On a positive note, in 2001, DWASA reduced the security deposit that NGOs have to pay for a water connection in these neighborhoods.

[1] The case study draws on a report by Nilufar Matin, Social Intermediation: Towards Gaining Access to Water for Squatter Communities in Dhaka, May 1999.

Introduction

This case study documents how DSK, an NGO based in Dhaka, developed and implemented a water supply program in some poor squatter settlements. DSK started working in these communities in the late 1980s. Their water and sanitation initiative is part of an integrated program including primary health care, savings, and credit and income generation.

The aim of the project was to develop a replicable model for water supply to the urban poor, based on devolution of management to the communities themselves. The specific objectives were to

- build bridges between the water utility agency and potential user communities, through advocacy and intermediation;
- encourage changes in the local institutional environment to facilitate the supply of water to the urban poor;
- help build capacity in the communities to operate, maintain, and manage water supply facilities; and
- provide technical assistance to communities and the water utility agency to establish and maintain water connections as well as ancillary facilities.

The project has brought about significant changes in power relationships between slum dwellers, landlords, the water utility, and city authorities. DSK's experience shows that social intermediation can be a highly effective strategy to help urban slum dwellers gain access to water.

Background

Dhaka, like other cities in Bangladesh, is undergoing an urban crisis. A 1996 survey found that approximately 20% of the population of the Dhaka Metropolitan Area (1.1 million people) was living in slum and squatter settlements. These neighborhoods, most of which have been existing for several years,[2] are characterized by high levels of deprivation. Basic services, including water and sanitation, are absent or grossly inadequate. About 97% of poor households in Dhaka do not own the plot on which they live.[3] This is important in relation to basic service provision, because access to water and sewerage systems, as well as gas and electricity, is contingent on legal tenure of a plot. In consequence, the urban poor are excluded from public services. An informal water market has arisen, where poor people have to pay higher prices than the better-off, who can access public water supplies.

Stakeholders

The Target Communities

Most settlements where DSK works have existed for 11–30 years. Dwellings are made of impermanent materials such as bamboo, wooden boards, or plastic sheets on rough frames. Roads, open latrines, and drainage are also makeshift.

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[2] According to the Government's "Census of Slum Areas and Floating Population" (Bangladesh Bureau of Statistics 1997), 60% of Dhaka's slum dwellers had lived in their settlements for 5 years or more, and 20% for 15 years or more.

[3] Islam, N., N. Huda, Francis B. Narayan, and Pradumna B. Rana. 1997. *Addressing the Urban Poverty Agenda in Bangladesh. Critical Issues and the 1995 Survey Findings*. Dhaka: University Press Limited.

Some settlements are in low-lying areas outside the flood barriers, where the houses are built on bamboo stilts.

Inhabitants of these neighborhoods work as day laborers, garment factory workers, street vendors, maids, transport workers, and in various menial jobs in the public and private sectors. The average monthly income is taka (Tk)2,000–3,000 ($35–54).

Access to resources is a recurring source of tensions and conflict in these slums. It is common for an area to be dominated by a *mastaan*, or informal local leader, who controls access to employment, shelter, and essential services such as water. Mastaans rely on intimidation and violence to back up their power.

Dhaka Water Supply and Sewerage Authority

DWASA is the statutory body responsible for water supply, waterborne sewerage, and subsurface drainage in Dhaka City. During the course of the program, DWASA officials have shown commitment to meeting the needs of Dhaka's poor residents. However, as has already been seen, their policy on connection means that thousands of the urban poor are barred from accessing their services. DWASA itself also loses because it is deprived of the revenue from these potential consumers and because it suffers heavy system loss[4] through the widespread use of illegal water points.

Dhaka City Council

The Dhaka City Council (DCC) has overall authority over development in the city. With DSK's mediation, DCC has allowed roads to be dug up where necessary, and for water points to be sited on land that DCC itself owns. However, this concession has not involved any change in official DCC policy on the rights of squatters and slum dwellers to housing and related services.

WaterAid

WaterAid is an independent British charity that works in developing countries to bring about lasting improvements to water, sanitation, and hygiene, using local skills and appropriate technologies. Developing capacity is a key element of WaterAid's approach. WaterAid began working on this program in 1996, funding DSK to provide 10 community-managed water points. For the program's second phase, WaterAid is providing funds for another 30 water DSK points, as well as funding other NGOs to replicate the model in other parts of Dhaka. It also supports capacity building and networking among Bangladeshi NGOs concerned with urban water supply and sanitation.

The UNDP-World Bank Water and Sanitation Program

This joint program of the United Nations Development Programme (UNDP) and World Bank aims to assist low-income households in both rural and

[4] System loss was estimated as 56% in the *Dhaka Metropolitan Development Plan 1995–2015*, Vol. 1, p. 30.

marginalized urban areas to gain access to water and sanitation services, by promoting innovative solutions tailored to local needs and conditions. The program prioritizes capacity building and the analysis of policy and institutional environments. It works with partners from government, external support agencies, NGOs, and the private sector.

Swiss Agency for Development and Cooperation

The Swiss Agency for Development and Cooperation (SDC) provides technical and financial assistance, as well as humanitarian aid, to developing countries. SDC has been working with partner organizations in Bangladesh since 1972.

DSK's Early Experience

DSK has been working among slum and squatter neighborhoods of Dhaka since 1988. At first DSK worked with people in two neighborhoods in the Tejgaon area of the city, where the Bangladesh Railway owns the land. When DSK started working in the area, access to safe water was very limited. There were no public water hydrants and women had to fetch water clandestinely, and at awkward times, from nearby factories and offices, bribing gatekeepers and messengers for the privilege. In one neighborhood, people were using a pool of wastewater from a chemical factory. Not surprisingly, during the first meetings between the communities and DSK, residents prioritized access to safe drinking water.

DSK approached DWASA for connections to the mains and offered to act as guarantor for the security deposit and bill payments. DWASA officials eventually agreed to waive their usual policy and sanctioned two water points. The first was commissioned in 1992, with a total capital cost of Tk70,000 ($1,250). This first experience was not altogether successful, as a mastaan, or local powerholder, soon took over the water point, stopped paying the weekly installments to DSK and bribed the DWASA meter readers to report lower than actual readings. However, DSK judged that the initiative was not a complete failure, because 200 households now had access to a water point, and were paying lower prices for water than before.

This experience helped DSK when it went on to commission a second water point in 1994. DSK held intensive discussions with residents of this second settlement, to make sure there was genuine community ownership of the initiative. Two groups, one comprising only women and the other, men, were formed, and these elected a water management committee responsible for managing and maintaining the water points, collecting water charges from users, paying DWASA bills, appointing and paying the caretaker as well as paying the installments to DSK. Four years later, DSK had recovered its initial investment of Tk20,000 ($357), DWASA bills were being paid regularly, and the community was satisfied with the service.

Based on what it had learned from these two initiatives, DSK worked with the UNDP-World Bank Water and Sanitation Program, SDC, and WaterAid to develop a replicable model for sustainable water supply to the urban poor. The pilot project began in 12 communities in 1996.

The Current Program

Selecting Communities

In 1996, DSK began a needs assessment survey of various slum and squatter communities in Dhaka, as the first step to selecting communities to work with. The community selection criteria were

- expressed community demand and willingness to pay for services;
- age of settlement: communities that had been settled for a long time were preferred;
- prior community experience of group-based participatory development approaches;
- proximity of DWASA water mains; and
- freedom from domination by mastaans.

Communities that were used to free water and sanitation services were avoided. Using these criteria, 12 communities were selected for intervention.

Negotiating with Government Agencies

Negotiations with DWASA began in 1996. At the outset, DWASA agreed to grant permission for 12 new water points, provided that the cost for delivering the services could be recovered within the existing institutional framework. Since then, DWASA has not changed its policy on linking access to water and sanitation to property tenure. However, in 2001, it reduced the security deposit that NGOs have to pay for a water connection in a squatter settlement from Tk7,500 ($134) to Tk1,000 ($18), a significant concession.

Community Capacity Building

DSK has worked hard to help develop a strong sense of community ownership. This has been particularly challenging, because of social tensions in the communities, attempts by mastaans to appropriate water point fees, and in some cases, opposition from neighboring agencies and communities who resent the presence of the squatter settlements. Yet it was precisely because of these adverse conditions that DSK realized communities needed to be strengthened, if the project was to have any chance of success.

Once the communities were selected, meetings were held with groups of interested residents, called water hydrant associations. There was no single blueprint for the formation or function of these groups. Rather, this depended on local conditions. In some cases, the association was a distinct body that also undertook savings and credit, as well as health and hygiene activities, whereas in others, the whole user community was referred to as the water hydrant association.

DSK and the communities agreed on their respective duties and responsibilities as follows.

DSK

- Mediate with DWASA and facilitate obtaining legal access to water and sanitation.

- Assist in building community capacity, through the organization of women's savings and credit groups as well as the formation of management committees for water points and latrines.
- Train management committees to manage, operate, and maintain the services.
- Liaise with communities through regular monthly meetings.
- Supervise the installation and management of the water points for 2 years, or until DSK's initial investment had been repaid, whichever was sooner. After that time, DSK would hand over the water points to the communities.

Participating Communities

- Operate water points.
- Undertake minor repairs and ongoing maintenance.
- Collect user fees.
- Appoint caretakers and pay their salaries.
- Pay DWASA bills regularly.
- Repay DSK's capital investment.

Monitoring and Support

Project staff regularly visit communities and water points and continue to help build community capacity to manage the services. For instance, there are monthly meetings between project staff and management committees to review progress and discuss matters such as maintenance, the cleaning of water point sites, bill payment, and conflict resolution within the communities. DSK has also run training courses for management committee members on how to manage and maintain water points, and hygiene.

Water Point Siting and Construction

Finding suitable sites for water points was difficult in most neighborhoods. Settlements are crowded and it was hard to find space for underground reservoirs—necessary because of the lack of continuous water supply, bathing platforms, and, where they were provided, toilets. In most cases, group members offered their houses or part of their houses for the purpose, and were compensated in various ways. Where DCC owned the land where water points were sited, DCC permitted their construction.

DSK procured construction materials locally. Efforts were made to employ masons from communities themselves, but there were not enough skilled workers available. However, DSK was able to employ unskilled laborers from the immediate area. DSK strictly supervised the entire construction process.

Technical Characteristics of the Water Points

The current design for the water points is simple and low-cost. It is the product of trial and error: users have helped modify the original design. The metered

DWASA water line is connected to a covered, shallow underground reservoir. One or more suction hand pumps are used to draw the water from the reservoir. The pumps are surrounded by a platform for water collection, washing, and bathing. To control water use and in the interests of privacy, the platform is fenced in with bamboo matting. Where latrines are provided, these are twin pit latrines with two stalls.

Water Point Management

Management Committees

As women in Bangladesh traditionally take responsibility for obtaining water for their households, DSK wanted to involve women in managing water points as much as possible. Originally, mixed management committees were formed. However, gender relations in Bangladesh tend to be highly unequal, and men usually dominated these mixed committees. All-women management committees were considered, but it was thought that they would face too many difficulties to be able to work effectively. In the end, women-only water management committees were set up in each community, assisted by separate advisory committees consisting of men. This is seen as a compromise, until such time as the women's committees are able to consolidate their strength and act alone.

Charges

The levels at which water charges were set took into account

- prices in local water markets, which determined by the number of illegal connections available for public use;
- the amount to be paid back to DSK to cover its capital investment;
- DWASA's charges; and
- availability of water at each water point.

In some areas, user households that regularly use the water points pay a fixed monthly rate, depending on the number of household members; for instance, a four-member household might pay Tk50 per month, with Tk10 for each additional member. Alternatively, users pay a small fee for each use: about Tk0.50 for a bucket of water, Tk1–2 for bathing, and Tk1 for toilet use, where toilet facilities are provided. One-off payments raise more income than fixed monthly charges.

Caretakers

Caretakers collect fees from users and hand them over to the cashier when the water point closes at night. A DSK representative calls every day to collect the money and put it in the bank. Caretakers are paid Tk500–1,000 per month, depending on the profitability of the water point and the decision of the committee members.

DSK has encouraged the appointment of women caretakers on a rotation basis from the water management committee, but this has not always been possible for various reasons. Sometimes, families who have made land available for the water point do so in return for holding the position of caretaker.

Costs

The total capital cost of constructing 40 water points and 2 latrines amounted to Tk1,507,725 ($26,986) in February 1999. An estimated 6,000 households have benefited. WaterAid Bangladesh calculates that the overall cost per beneficiary (also taking into account recurrent costs such as those related to community mobilization, training, project staff salaries, etc.) has been approximately Tk726 ($13).

Lessons Learned

Low-income urban residents are willing and able to pay for water

The project has demonstrated that even those with low incomes are willing to pay for the capital and recurring costs of a reliable water service. This runs counter to official claims that providing water supplies to the urban poor would require prohibitive subsidies. There are policy implications here regarding the reform of public utilities to make them more responsive to the needs of the poor.

Mediation is an effective midterm strategy

Without DSK's mediation, DWASA would not have sanctioned the provision of water points in these poor urban settlements. This innovative role for NGOs has been key to the project's success.

Secure and sustainable provision will only come through policy change

As a result of DSK's mediation, and the realization that poor urban communities are able and willing to pay water bills on time, DWASA has responded positively to the demands of slum and squatter settlements for water and sanitation. However, this change is still an informal one, based on the goodwill and commitment of individual officials. There has been no corresponding change in DWASA policy, without which Dhaka's urban poor cannot have secure access to water and sanitation.

DSK sees no legal barriers to providing water and sanitation to nonlandowners. The relevant ordinance is quite flexible, allowing the utility to enter into any contract it deems necessary to fulfill its aim of providing water and sewerage services.

Community ownership is vital to success

Good management of the water points and effective cost recovery is closely linked to a community's sense of project ownership. This is particularly so in view of the dominance of the mastaans in these settlements. DSK's experience is that it is difficult for an outside agency such as an NGO to intervene against these powerful and unscrupulous local figures unless the community feels strong enough to resist them. Mobilizing urban communities requires intensive involvement from the implementing agency, and DSK has found it to be a slow process. DSK

has also found that prior community exposure to a credit repayment culture, for instance through savings and credit schemes, is conducive to the timely payment of loans and bills.

Gradually, DSK hopes to transfer responsibilities to communities themselves, including approaching and negotiating with DWASA and DCC. Introducing the communities to these agencies may help establish their right to water and sanitation services. Also, DSK has decided that only by devolving responsibilities to the communities can the program achieve sustainability.

The cooperation of field-level government officials is vital

Clearly, a project like this depends on the commitment of senior managers in key agencies—in this case, DCC and DWASA. It is also essential that field-level officials cooperate in any such initiative. This group of actors is important both for developing the project strategy and for timely implementation.

2

Strengthening the Demand-Responsive Approach: Learning from Program Experience in Niassa Province, Mozambique

Edward D. Breslin
WaterAid

Introduction

In recent years, the demand-responsive approach (DRA) has become the keystone of government and donor water supply policies throughout the world. Funding proposals, country action plans, and implementation manuals are full of references to the DRA, and it is difficult to find international NGOs or funding agencies that do not claim to be implementing projects based on this approach.

This shift from supply-driven water supply interventions to programs focused on demand is easily understood. In general, supply-driven interventions have not succeeded in providing poor communities with sustainable water supplies. Communities that simply "receive" a water point, playing only a minor or symbolic role in project implementation, tend to lack a sense of ownership. The result is that millions of dollars have been wasted, because communities are not committed to maintaining their water supplies.

In response to these problems, the international water sector is increasingly trying to implement programs based on a different approach. Instead of villagers waking one morning to find drilling rigs in their community, the DRA expects them to take the lead in water supply initiatives. Communities have to demand improved services, choose what type of facilities they want, and work out how they will manage them. In addition, they are required to make meaningful contributions to their project in the form of cash, labor, or materials. In the long term, the community must take responsibility for sustaining the new water supply systems.

This paper explores whether a DRA-inspired water supply policy necessarily creates conditions for more sustainable water supply interventions than traditional supply-driven models. It is based on WaterAid's experience in Niassa Province, northern Mozambique, since 1996. In Niassa, WaterAid has been working with

[1] The key water sector documents in Mozambique are *Política Nacional de Águas* (Direcção Nacional de Águas, República de Mozambique, Maputo, 1995); *Plano de Transição de Água Rural: Estratégias de*

a range of government, private sector, and nongovernment organizations, supporting their efforts to implement the Government of Mozambique's (the Government) National Water Policy and Implementation Manual, which are both based on the DRA.[1] These partnerships have given WaterAid unique insights into the experiences of a range of different water sector actors during the transition from one model to another.

This is valuable experience, because in the process of moving from supply-driven to demand-driven processes, critical tensions are emerging.

Niassa Province is located in the northwest corner of Mozambique and is the most sparsely populated province in the country.[2] It is characterized by poor

Box 1. WaterAid Partners in Niassa

Government
- The Provincial Department of Water and Sanitation (DAS-Niassa) has responsibility for water supply and sanitation development in the province. DAS-Niassa is located within the Provincial Directorate of Public Works and Housing (DPOPH-Niassa).
- The district directorate of public works and housing in Maúa and Nipepe (DDOPH–Maúa and Nipepe) are responsible for water supply and sanitation at the district level.

NGOs
- ESTAMOS implements water supply and sanitation projects in the districts of Lichinga and Mandimba.
- *Ulongo* is the dance, theatre, and cultural association.

Private Sector
- The private sector supports 10 construction companies for water related work.

CBOs
- Local community education program teams in Maúa and Nipepe, made up of activists from the districts, are financed directly by WaterAid.

infrastructure, a weak agricultural economy, and political as well as social isolation. Niassa has some of the worst poverty and social deprivation rates in the country, and a high proportion of the population lacks access to potable water, even compared with other parts of this low-income country.[3]

The paper focuses on three areas. First, it provides a brief overview of the DRA, followed by a short account of Mozambique's switch from supply-driven interventions to DRA-inspired policies. Second, the paper examines partner experiences of applying the new policy in five districts in Niassa over the past 3 years.[4] Which elements of the DRA seem to enhance sustainability prospects

Implementação da Política Nacional de Águas (Ministério das Obras Públicas e Habitação, Direcção Nacional de Águas, Maputo, November 1997); Draft "Manual de Implementação de Projectos de Abastecimento de Água Rural," Departamento de Água Rural, Direcção Nacional de Águas, 1999 and 2000; and Final "Manual de Implementação de Projectos de Abastecimento de Água Rural," Departamento de Água Rural, Direcção Nacional de Águas, December 2001.

[2] The population stood at about 809,800 people in 1997.

[3] República de Mozambique. 2001. *Action Plan for the Reduction of Absolute Poverty 2001-2005 (PARPA)*, April.

[4] The districts are Lichinga, Mandimba, Maúa, Nipepe, and Sanga.

in Niassa, and which need to be modified to enhance them? This section of the paper also explores difficulties encountered during the transition, examining aspects of policies and practices that could undermine sustainability. The third and last section offers some conclusions on how the DRA could be better supported in the future, based on lessons from Niassa Province.

Sustainability is the touchstone by which the DRA must be judged. WaterAid's experience in Niassa suggests that the DRA does indeed offer advantages compared with supply-driven approaches, but that it also has weaknesses in this regard. These insights are relevant wherever water supply actors are attempting to enhance sustainability through the DRA.

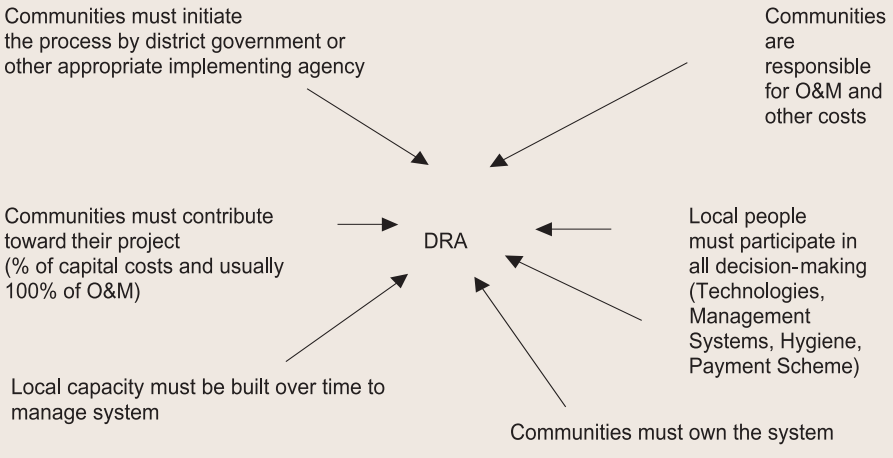
DRA in Mozambique

Both the Mozambican National Water Policy and Implementation Manual are premised on the DRA. The basic principles are that

- water is an economic and social good and needs to be managed as such;
- management should focus on users at the lowest appropriate level, i.e., community level or even at the level of individual water points;
- women are critical players. According to the DRA, they tend to respond more quickly than men do to technical problems at water points, and they have greater capacity in relation to improved water supply than is generally acknowledged within the sector. The DRA sets out to acknowledge and integrate this capacity into water supply services; and
- water resources should be managed in a holistic manner.

Box 2 sets out the defining characteristics of the DRA, all of which are designed to enhance the sustainability of water supply systems. This emphasis on sustainability has proved attractive to funding agencies, many of whom are now pursuing the DRA.

Box 2. Characteristics of the Demand-Responsive Approach



Box 3. The Case of Chimbonila

Chimbonila, the district capital of Lichinga, lies within 25 km of the provincial capital of Lichinga, and is serviced by a tar road. It is, in many respects, unusual for Niassa as population densities are high, families have better access to both resources and income than others living in more isolated parts of the Province.

In 1998, WaterAid financed eight water points with Afridev hand pumps. In 2000, four of these water points were rehabilitated. In February 2002, the Projecto de Desenvolvimento Agrário de Niassa installed an additional Afridev on a borehole near the administrative center of the town.

At the time of writing, only the new borehole and one other water point were operational. The others failed because the operation and maintenance teams were unable to secure enough funds to repair the water points. Some water points were vandalized and one was stolen. Most members of the community had given up on the project.

The main reasons for project failure are

- users of the water points could not collect sufficient funds for spare parts; and
- most community members did not consider the project "theirs" as the water points were imposed on the community.

The Failure of the Supply-Driven Model

Prior to the development of the National Water Policy and the subsequent Implementation Manual, Mozambique's water supply approach was supply-driven. The approach did not succeed in delivering sustainable water supply services, for the following reasons

- The Government and development partners tended to identify project sites without consulting the communities concerned.
- The sole technology on offer was "Afridev" hand pumps. A target community's capacity—whether financial, technical, organizational, or social—to maintain this type of pump was not considered.
- Decision making on issues such as siting was usually confined to a few local leaders, rather than to users in general, so water point locations tended to depend on local politics. Families who lived far from water points continued collecting water from closer, unprotected sources.
- The model of community management was inappropriate, and in practice, did not work. Communities were simply told to form a committee with two men and two women, who would manage the water supply scheme. Alternative management models were not considered.

Few committees could respond to technical problems, or had the power or influence to secure community contributions for spares. The upshot was that, according to government estimates, over 35% of water points in the province are broken. Some districts have much higher failure rates, such as Macula, where 90% of the pumps have broken down.[5] WaterAid found that more than 80% of communities had never repaired their hand pumps.[6] Many water points were only functioning because the Government or funding agencies had rehabilitated them.

[5] DAS–Niassa "Banco de Dados," 2002.
[6] Data collected as part of WaterAid's support program, April 2001.

Changing Direction: From Supply to Demand

The publication of the Government's National Water Policy in 1995 demonstrated its recognition of the problems associated with the supply-driven model. The new policy represented a dramatic rethink, arising from project failures, a lack of sector capacity, and a need to transfer more responsibility to communities.

The new policy and the official manual argue that communities are more likely to sustain water systems if they do the following.

- Initiate the project themselves. This shows that the community is interested in addressing its water problems.
- Make decisions on technologies, management systems, and hygiene programs.
- Contribute cash up-front: communities must contribute 2–10% of the total cost of the water service, to demonstrate their commitment and to highlight their financial and organizational capacity to sustain the project over time.
- Manage systems themselves: communities must accept full responsibility for their water service, by deciding on a tariff structure and paying all operation and maintenance (O&M), as well as repair, costs.

The manual calls for the decentralization of government responsibilities, from national to provincial and district levels, in keeping with DRA principles. The thinking is that people close to the project have a better sense of what is feasible than decision makers and funding agencies further removed from the field.

Lessons from Niassa Province

The challenge facing the Mozambican water sector is to transform the way programs are implemented, based on the new Policy and Implementation Manual. To support this process, WaterAid and its partners (Box 1) have been testing the Implementation Manual in five districts in Niassa since 2000. Most of WaterAid's work in Niassa has been based on two early drafts of the manual, issued in 1999 and 2000, which were replaced by the current manual in 2001. This is significant because the new version of the manual has removed Niassa's most popular and sustainable technology option from consideration, a point that will be elaborated on later in this paper.

This section highlights some key issues that have arisen. It offers our insights into whether or not the DRA, as applied in Mozambique, is leading to more sustainable water services for poor communities.

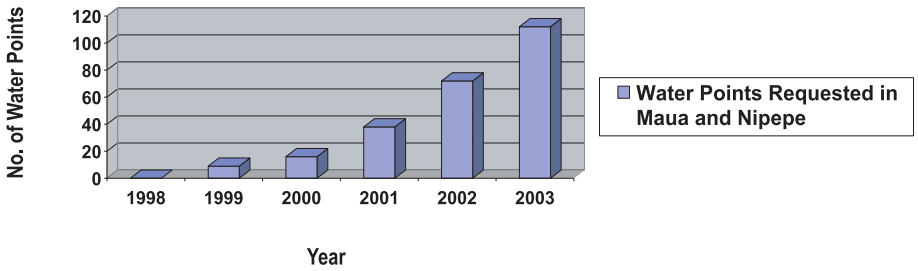
Generating Demand: The Roles of Trust and Guaranteed Finance

Some senior Mozambican government officials fear that the shift in approaches from supply-driven to demand-responsive may lead to a decline in the number of communities serviced per year. A common argument is that communities need a long lead-in time to understand the policy and express demand. Coverage

rates are only 36.6% in Mozambique, and a program that undermines delivery in such a context would be politically and morally misguided.[7]

This is a legitimate worry, but it is not borne out by our work in Niassa. The district-based programs had grown considerably since 2000, when WaterAid partners first introduced the policy. Demand for improved water sources had increased dramatically at district level, as the graph on Maúa and Nipepe suggests (Fig. 1). The demand has in fact outstripped previous targets set by provincial government for these districts. This suggests that, when communities initiate projects by expressing demand, the percentage of people unserved by improved services is likely to be reduced more quickly than by the supply-driven approach.

Figure 1. Water Points Requested in Two Communities



A number of critical factors explain this trend.

- Funds for the work supported by WaterAid were guaranteed to the districts over relatively long periods. This raised the confidence of district government, and as a result, local officials were proactively helping to create demand.
- Community confidence in the process grew. More communities were approaching the government, because they saw that officials were responding to their demands.
- Multiple communication channels for demand creation, and the expression of community demand, were employed, and the following were found to be valuable.
  - Radio: simple messages were used to explain how to apply, coupled with stories told by local people on their project experience.
  - Drama: a drama was developed that explained the DRA principles in a simple yet compelling way. The drama looked at issues relating to applications, community contributions, choices, as well as roles and responsibilities.
  - Workshops: these were organized with traditional leaders, who were influential and had proven themselves invaluable allies for the program.
  - Exchange visits: communities interested in participating in the program were brought to villages that had already taken part, to facilitate information sharing.

[7] Rural coverage data are cited in the Draft Review Report of the Mozambique Water and Sanitation Sector for the African Development Bank by SEED LDA (22/12/01). The report adds that "the review team has serious reservations about the veracity of [these] figures" (SEED: ii).

This combination of proactively generating demand, enhancing community trust through effective responses, and guaranteeing financial support over time seems to lead to increased demand and coverage rates. Several factors threaten this.

- The DRA will not succeed without a strong state that can respond to community demands and manage the process at district level. However, many funding agencies are implementing policies that strip the state, including local government, of its responsibilities, instead of helping build capacity.
- Government and funding agencies still tend to control the program selection process. But WaterAid's experience is that, when communities have actively sought out a project, this creates a greater sense of "buy-in" commitment and energy than when villages are selected by government officials or funding agency staff.
- There is a pressing need to coordinate funding, linked to strategic water supply planning. Provincial and district government are still deterred to some extent from implementing the DRA, because they lack confidence that funding will be available once demand is unleashed. Although they are right to be wary, in WaterAid's view, what lies at the heart of the financing problem is a lack of sector coordination, rather than any shortage of funds. In fact, Niassa is scheduled to receive considerable funding for water supply in 2003, much of it guaranteed for 3–5 years.[8] However, this will come from disparate sources, and is allocated according to the old supply-driven model, whereby district administrations simply choose communities for support. No attempt has been made to develop a strategic, DRA-based, water supply plan that different funding agencies can then finance together. If this were done, the available funding would encourage demand generation, in keeping with government policy.
- In WaterAid's view, government and international funding agencies are using an inflated estimate of the cost of constructing a water point. For instance, hand pumps are generally financed at $4,000, whereas WaterAid and its partners have calculated the true cost at less that $2,000. The result is that the number of communities being provided with an improved water supply is only about half of what it could be.[9]

Strong government leadership is needed to resolve these problems and clear the way for better coverage rates in Niassa.

Community Choice of Technology: A Crucial Factor for Success

Technology choice is a key component of the DRA. This was recognized in the draft implementation manuals issued in 1999 and 2000. Both drafts offered

[8] In 2003, Niassa was scheduled to receive about $100,255 from the Government for improved water supplies. In addition, WaterAid and Ireland Aid are allocating a combined $1,225,000, and other funding agencies (Oxfam Belgium and Foundation for Development Cooperation) are likely to provide smaller amounts.

[9] In 2002, WaterAid and the Provincial Government organized a meeting with utility and private sector representatives to discuss costings for different types of systems. Even when additional costs such as contingencies, transport, administration, and staff overheads were included, the maximum costs for a water point were estimated at $1,167 for a protected well and $1, 923 for an Afridev hand pump. Private contractors bid at these rates. They were able to make respectable profits and invest in new equipment.

Box 4. Sustainability: Comparing Protected Wells with Afridev Hand pumps

WaterAid financed the construction of 39 water points with Afridev hand pumps and 146 protected wells in Niassa, as well as other technological choices for water points. In addition, WaterAid funded the rehabilitation of 37 hand pumps.

After 3 years, only two protected wells had fallen into disrepair because of technical problems that were the community's responsibility. During the same period, 32 of the 39 hand pumps had experienced technical problems or had broken down.

several options, including hand-dug wells with or without a hand pump or other means of extraction, as well as the Afridev pump. Protected wells with a dedicated rope, windlass, and bucket were included for consideration.

Crucially, the current version of the Implementation Manual has narrowed the technology options on offer to one: the Afridev pump. In WaterAid's view, this is a retrograde step, and threatens the key DRA principle of sustainability. The Afridev is an excellent hand pump, and when maintained regularly can provide a valuable service to communities for over 10 years. However, they are expensive to maintain and require readily available spare parts. In Niassa, these are generally beyond communities' reach, because the economy is weak, cash is limited, and spares are hard to come by.[10] Protected wells are now the favored choice of communities throughout the districts supported by WaterAid partners. This is because they are inexpensive to maintain, simple to construct and operate, and communities can buy ropes and buckets from almost any private sector merchant in the province. In fact, protected wells are so popular that many communities with broken hand pumps have asked for them to be replaced by protected wells. Understandably, they prefer a sustainable supply of water from a protected well than a hand pump which, although it may initially supply higher quality water, is unreliable and too expensive to sustain over time.

There seem to be two main reasons why the Government, in its latest Implementation Manual, has ruled out the option of protected wells.

One argument focuses on water quality. The Government is concerned that protected wells can be easily contaminated, and the water infected by diseases such as cholera. While these concerns are understandable, it is important to bear in mind the realities communities face in sustaining their water supplies. A well-maintained, functioning protected well is better than a broken hand pump. In fact, evidence shows that water quality in protected wells with a dedicated rope, bucket, and windlass is actually quite good.[11] Government water

[10] The National Department of Rural Water (DAR) recently estimated that $28 million was lost because 35% of water points were broken ("Princípio de Procura" – Department of Rural Water, Maputo, 2002). This is probably only the tip of the iceberg, as water point failures are generally underreported.

[11] See, for instance: K. Nyundu and S. Sutton. 2001. Community-Led Improvements to Rural Water Sources. Presented at WEDC Conference, Lusaka Zambia, August 2001. Also refer to P. Morgan, E. Chimbunde, N. Mtakwa and A. Waterkeyn. 1996. "Building on Tradition–Zimbabwe's Shallow Wells," in *Waterlines*; S. Sutton, Main Findings, from *Community-Led Improvement of Drinking Water Supplies*, *DFID KAR Study*, Ref. No. R7128, SWL Consultants, 1 July 1998 to 9 September 2001; and *Upgraded Family Wells in Zimbabwe: Household-Level Water Supplies for Multiple Uses,* 2002. World Bank Water and Sanitation Program, *Blue Gold Series*.

Box 5. Acceptable Technologies in the Final Manual

- Hand pumps (only option being promoted and financed now is the Afridev)
- Protected springs (available in only certain parts of Mozambique)
- Rainwater harvesting systems (do not supply water year-round and water quality issues are significant)
- Small piped systems (unaffordable and proving to be unsustainable in many towns let alone rural areas)

supply departments in Malawi, South Africa, Zambia, and Zimbabwe now consider protected wells to be a legitimate technical option. WaterAid's experience suggests that cholera outbreaks are occurring where improved water services have failed. For instance, in the town of Cuamba, WaterAid was working with partners to contain a cholera outbreak in two districts where Afridev hand pumps had broken down, forcing residents to collect water from contaminated sources.[12]

Second, some government and funding agency representatives argue that communities should not be given a range of technical choices because they cannot make an informed choice. This highlights the discomfort many leaders feel with losing control of the decision making process. It flies in the face of both cutting-edge development thinking in general and the DRA in particular. Communities are better placed than government and funding agency officials is deciding which technologies are most suitable for them, because of their intimate understanding of local conditions, economics, and capacities.

Sustainability will remain elusive in Mozambique unless the Government allows other technologies to compete with the Afridev pump. Poor communities are not helped by unsustainable technologies. WaterAid calls for revisions of the implementation manual to offer a range of technology choices that reflect experience in the field.

Are Capital Cost Contributions a Good Measure of Sustainability?

In Mozambique, communities are expected to contribute 2–10% of the costs of their water supply systems. According to DRA thinking, community capital cost contributions are indicators of the financial and organizational capacity of a community to sustain its water points.

- *Interest and ownership*: A community that contributes to the up-front cost of a water system is considered to be demonstrating commitment to the project.
- *Organizational capacity*: Communities are showing, by their actions, that they have the organizational capacity to arrange their contribution, and this is thought to be a proxy indicator of organizational capacity in resolving any future technical and social problems.

[12] In 2001, a cholera outbreak occurred in Maúa and Nipepe. None of the communities with protected wells in these districts were affected, although numerous communities with broken hand pumps reported cases of cholera.

Box 6. Conflict in Lichinga

"Communities" almost never contribute labor. Individuals within communities contribute labor on behalf of the community. Unfortunately, this often leads to conflict as people who excavated a well as their contribution (i.e., without payment) feel that they have contributed more to a given project than others in the village who did not contribute their labor.

In a small village outside Lichinga, a conflict emerged because the families who supplied the labor felt it was unfair that all others benefit from the new water point when they contributed nothing to the project. The conflict boiled over, and led to the vandalization of the water point as families who "paid" with their labor tried to block other families (who contributed nothing) from collecting water from the "community water point." The project was eventually abandoned.

And although this is an extreme example, WaterAid has found simmering conflicts in almost all villages where some paid with their labor and others did not.

- *Future finance for spares*: Capital cost contributions are said to show that the community can gather substantial funds, suggesting that they could do so again when spare parts are needed.

Contrary to these arguments, WaterAid's experience in the province suggests that the link between community capital cost contributions and sustainability may be, at best, tenuous and at worst, spurious.

In Mozambique, communities are often asked to make contributions "in kind," rather than in cash. This is because water sector actors argue that communities are too poor to make cash contributions. For the poorest communities, these contributions are sometimes more symbolic than real. WaterAid partners have explored commonly used in-kind contributions (i.e. labor, building materials such as stone, sand and water, and agricultural products). Unfortunately, none have proved to be of real value in terms of demonstrating sustainability. It is true that communities who make some form of capital contribution feel a greater ownership of their system. This is an important improvement over supply-driven programs. Yet, in-kind or symbolic contributions that have no relationship to sustainability issues say little about whether the community has the financial and managerial means to sustain a water point over time. For instance, the fact that members of a community can dig a well does not mean that community will be able to collect the necessary funds to repair a broken hand pump when needed, and symbolic contributions are of little value when communities need to repair broken systems.

WaterAid is now experimenting with alternative models for linking capital cost contributions to water supply sustainability. WaterAid partners now tend to look for community contributions related to what is actually required to sustain a given system. For instance, in the case of hand pumps, a good sustainability indicator would be the contribution of a rod, a PVC pipe, a spares kit, or a sack of cement.[13] One of the reasons this is a better indicator of sustainability than labor, sand, and so forth is that it helps build community capacity, both to select appropriate technologies and maintain them. Communities learn what is

[13] Likewise, if a group selects a protected well, then the contribution of a rope and bucket (including spares) would be a useful indicator. Contributions for a rope pump could include a rope with the necessary washers (and perhaps a second rope/washer), and a sack of cement.

actually required to sustain a given technology, where they can get these parts and materials and how much they cost.

Rehabilitation: A Threat to Sustainability?

According to government policy, communities are completely responsible for operating, maintaining, and replacing their water supply systems. In practice, however, both government and funding agencies, including WaterAid, consistently undermine this principle by repairing broken water points.[14]

The original justification, a legitimate one, for rehabilitating water points was that many hand pumps had been destroyed during the war. However, these rehabilitations were completed some time ago. There are other valid reasons for rehabilitation in Niassa, notably incorrect installation, either by private contractors or the Government's own rural water supply agency, poor quality hand pumps, and wells being dug too shallow. In all such cases, it is clear that communities should not be required to pay for repairs. However, in practice much of Niassa's water point rehabilitation has been necessary because communities have not been able to sustain them, rather than for any of the reasons above. This is undermining the Government's DRA-inspired policy of promoting "ownership" and responsibility. Communities are unlikely to pay for the rehabilitation of their water point if they know that, eventually, government or funding agencies will repair it free of charge.

In WaterAid's view, asking communities to pay the total cost of O&M is unreasonable.[15] This is especially so where they are not allowed to select a technology. It also discriminates against the poorest communities, and is unlikely to promote substantial improvements in health in the communities concerned. The Government needs to clarify the circumstances in which free repairs are justified, and publish detailed guidelines that make this clear. Although this would signal a departure from official policy, it would be justified, because there are strong health and social justice arguments against asking communities in Mozambique to bear the full brunt of water supply O&M. Also, a change in policy would reflect the reality that few communities will ever be able to replace water points once they are beyond repair. Funds need to be allocated to rehabilitation in an open and transparent way, to ensure that it is always in keeping with policy, timely, and effective.

Inconsistent Policy Implementation Undermines Effectiveness

Perhaps the most important problem with the Government DRA-inspired water supply policy in Niassa is that it is not being fully implemented, even by government actors. For instance, the Government's rural water supply agency is

[14] In the last few years, WaterAid has rehabilitated eight hand pumps and seven Afridev pumps in the province. The Government's Água Rural rehabilitated 10 water points in Niassa in 2002. A forthcoming African Development Bank initiative in Niassa and Nampula is set to rehabilitate approximately 140 water points in Niassa alone.

[15] For instance, water supplies are heavily subsidized in Europe and the United States, where water is artificially low in cost and where new water systems and upgrades to existing systems are always done with state funds.

still using a supply-driven approach, while many funding agencies simply ignore the policy.

Government officials have cited lack of capacity and the need to wait for lessons from a World Bank-funded pilot project, to explain their nonimplementation of the new policy. WaterAid's own program experience, however, suggests that the policy will only come to life when it is actually applied, and the best way of learning is by doing. There is little information on the pilot project in Inhambane Province. In any case, lessons from Inhambane may not be applicable in provinces such as Niassa. This is because of various reasons, including differences in geology, infrastructure and capacity, and the fact that Niassa is unlikely to receive the same level of support as Inhambane.

The lack of consistency has already led to confusion, conflicts, projects collapsing, and communities losing out, and this is likely to continue. For instance, WaterAid's partners have been applying the draft policy for 3 years, with the support of the Government. Problems emerged when they tried to implement projects in districts where other funding agencies, or the Government itself, were not applying official policy. In Sanga district, eight water points had to be abandoned in 2003 because of conflicts over capital cost contributions.[16] Communities argued, understandably, that it was unfair to ask them to make contributions when neighboring communities had just received hand pumps for free. Similar problems can be expected in future, for example arising from the African Development Bank (AfDB)'s planned initiative in Niassa. AfDB's manual allows communities to consider protected wells as a technical option, in contrast to the government policy, and its process for selecting projects is also different.[17]

Conclusions

Our experience suggests that Mozambique's DRA-inspired policy offers considerable advantages over previous supply-driven approaches. In Niassa, projects are being maintained better, and communities have a greater sense of ownership of their water points than in the past. District and provincial capacity to promote the policy has been supported, through a funding arrangement that creates security and confidence. New community management models are being developed and tested that seem to enhance community control. Costs have come down, meaning that more communities can be serviced. All these advantages mean that the DRA may lead to more sustainable projects than the supply-driven approach. In turn, this should lead to public health benefits.

To build on these advantages, the DRA needs to be developed and refined at both theoretical and practical levels. WaterAid makes the following recommendations.

- Demand needs to be generated proactively. This can be supported by enhancing community trust through effective responses. Guaranteeing financial support over time can also help increase demand and coverage rates.

[16] All the communities had chosen Afridev hand pumps.

[17] República de Mozambique, Ministério de Obras Públicas e Habitação (Final Version, January 2002). *Integrated Water Supply and Sanitation Project for the Provinces of Niassa and Nampula: Project Implementation Manual.*

- Communities must be allowed to choose the technologies that suit their financial, social, and human resource capacities.
- Communities' capital cost contributions should be linked to practical sustainability issues. WaterAid recommends clarifying what is required to sustain each particular system annually and asking communities to contribute at least that to the project. Contributions could be cash, for systems like motorized schemes that require ongoing payments, or specified spares for systems that require ongoing, but somewhat irregular interventions by O&M teams.
- Expecting poor communities to pay all O&M and rehabilitation costs is socially unjust and unrealistic. Water supply actors need to clarify what type of repairs lie outside the responsibility of communities, and respond to such problems timely and effectively.
- As with any government policy, the Government's water supply policy needs to be applied consistently, in order to avoid confusion, unfairness, loss of credibility, and ineffectiveness. This will mean international funding agencies stepping into line and helping support official policy.

All these recommendations are based on WaterAid's practical experience in Niassa Province. Many arise from mistakes with projects WaterAid has funded. For example, the decision to include protected wells as an option was based on field evidence that very few of WaterAid-financed hand pumps were operational, and the evolution of our thinking on capital cost contributions followed evaluations of projects where capital costs were made in kind and yet the projects fell into disrepair. These learning points are offered so that other water supply actors applying, or attempting to apply, DRA principles can use them to enhance their own policy and practice.

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3

Coastal Zone Policies and Livelihoods in Bangladesh

Anjan Datta, Dirk Frans, and John Soussan

The coastal area of Bangladesh is an active delta, rich in water and land resources. The area is also one of high risks to natural and man-made calamities. The area is characterized by a constantly changing geographic and geomorphologic situation. In this region landownership is more skewed than in other parts of the country. There is a relative absence of government and NGO institutions and services, with little integration among those present. The law and order situation is often poor with the elite firmly in control of the economic, social, and political spheres of life. The poor are socially and politically marginalized. While in some parts, the natural resource base, such as the mangrove and other forests, has been irrevocably damaged by human intervention, in the major part, the resource base is still intact and able to support sustainable development in general and poverty reduction in particular.

In the last decades the coastal zone has seen economic growth along with some reduction of the extent and severity of poverty. The preconditions for this were created by the water-management, security- and transport-enhancing infrastructure developed by the Government. The commercial sector and NGOs have made use of these new conditions by speeding up development of the natural and human potential of the coastal zone.

To have a maximum poverty-reduction impact, coastal development should be a process rooted in the simultaneous enhancement of livelihoods and reduction of multiple vulnerabilities. To be effective, the integrated coastal zone management (ICZM) policy under development will have to be based on a process rather than a blueprint approach. It should focus on three crucial points: Facilitating coordination among various actors, complementing structural with non-structural measures, and ensuring more equitable benefit distribution. The ICZM policy must be accompanied by a phased, evolution-type implementation strategy, and time-bound action plan.

Description of the Case Study Area

Physical Setting

The major part of the coastal zone is the active delta of the three largest rivers of Bangladesh, the Ganges, the Jamuna (also known as the Brahmaputra), and the Megna. The coastal area borders the Bay of Bengal and has three distinct geographic sections, the Sundarban mangrove forest in the southwest, the very active delta in the central south, and the narrow coastal strip along the Chittagong and Chittagong Hill Tracts area on the east.

The case study area, Polder[1] 55/1, belongs to the very active delta in the south-central area of the coast. Geographically and socially, the island and subdistrict of Galachipa, part of Pathuakhali district, is representative for a large part of the coastal zone. Until the mid-1960s, the island, like most of the other islands in the delta, was little more than a fertile mud bank, interspersed with an extensive network of natural channels. Although the land was only a few feet above the normal high tide, the rich water and land resources had already then attracted many people from other parts of Bangladesh.

Historical Setting

In November 1970, a cyclone hit the area, which cost the lives of up to 500,000 people (Box 1). A few years before that the Government decided to establish the embankment of the coastal islands through the predecessor of the Bangladesh Water Development Board (BWDB). The aim was to protect the people and their property from cyclonic surges and create better conditions for agricultural production by reducing intrusion of saline water and improving drainage of rainwater. In Galachipa, the work started in 1967 and was completed by 1977. "Polder 55/1," as it is known, protects an area of 10,600 ha. Older people recall the immediate and positive impact of the polder on their lives, including the poverty reduction impact (Box 2).

However, in the 1980s, the quality of the embankment and the drainage structures started to deteriorate. Security went down as the river eroded parts of the embankment. Water management, and with it agriculture in the polder, suffered. Furthermore, changes in agricultural and fisheries technology meant the infrastructure no longer provided for the needs of the population.

In the early 1990s, BWDB took up the rehabilitation of Polder 55/1 under the Systems Rehabilitation Project (SRP). Major components were the rehabilitation of the infrastructure and addition of many new, relatively small structures, to cater for the new demand for irrigation inlets to grow rice in the dry season. The SRP started new institutional arrangements to ensure that in- and outlet structures would be operated as per the demand of the farmers and to ensure preventative maintenance.

At present, early on in the new millennium, the situation in Polder 55/1 remains dynamic. As in the whole of Bangladesh, rice production is no longer as profitable as it used to be. Farmers are therefore shifting from high input rice crops such as irrigated *boro*. At the same time the profitability of dry season crops and fish has gone up, thus changing farmers' choices and to some extent the water management needs.

Around the case study area, as in other parts of the coastal zone, very lucrative shrimp cultivation has taken off. In some adjacent polder, the whole area is already under shrimp cultivation, in others half. In almost all cases, the shrimp business is firmly controlled by a few powerful elite and local farmers have no option but to lease out their land to the shrimp business, often with negative impacts on them and their land.

[1] The Dutch word "polder" is now part of the vocabulary of the Bangladesh water sector. It refers to an area enclosed on all sides by an embankment with in- and outlets to control the water inside the embanked area.

Box 1. Empoldering: People's Perception

Memories of the November cyclone of 1970 are still fresh and alive. Mr. Siddique, 53, of Dakua village in Polder 55/1, recalled: "I had just gotten married when the storm surge hit our village. My wife, other family members and I took shelter in the corrugated iron house of a rich neighbor. In no time the house was full of water and the walls started to collapse. My wife clung on to me but suddenly a wave separated us and drove us out of the house. I managed to grab hold of a branch of a tree and hung on to it all night. I still do not know how she survived. In the morning, when the storm stopped and the water receded, I found my wife. She was unconscious but survived because her saree got caught around a tree. However, I never found my mother and two of my brothers."

The cyclone that hit the area in 1970 had a surge height of up to 9 meters with a wind speed of 200 kilometers per hour. The affected area was reduced to rubbles within a few hours and up to 500,000 people lost their lives.

The general perception of the people about the polder is very positive. According to them the polder changed their lives and the overall situation of the area dramatically. The risk of getting inundated or washed away by a tidal surge is now virtually zero. None of the cyclones and surges since 1970 has created much damage in Polder 55/1. The security of life and property against cyclone and tidal surge is seen as the most remarkable contribution of empoldering.

Positive changes of empoldering

- Security to crops and livestock
- Better conditions for new crops (boro rice and betel leaf)
- Improved year-round road network leading to access to markets, new avenues of employment such as transport and higher enrollment/attendance in schools

Negative impacts of empoldering

- Restricted water flow in the internal channels leading to stagnant water and breeding grounds for mosquitoes
- Dry season scarcity of water, particularly for domestic use, and pollution of the little water that is available
- Loss of capture fisheries

People point out that some of these negative impacts were not there in the beginning. They came about when the new system was not managed properly and the infrastructure started to deteriorate.

Water Resources

Because the coastal zone is a delta, water resources are considerable. The most visible resources are the rivers. Over the last few decades the salinity of the river water has steadily increased, mainly because of a reduced inflow of sweet water in the dry season. This has increased the salinity of the land and the groundwater. The rivers provide an easy means of transport as well as various fisheries resources. The Bay of Bengal features key spawning grounds as well as rich offshore marine habitats.

The rivers and internal channels are usually government-owned land (called *khas* land). Nevertheless, many farmers with land adjacent to the channels have appropriated the land and/or water resources of the channel for their private use. In line with the prevailing law, the Ministry of Youth and Sports leases out stretches of channel for fisheries.

Some parts of the coastal zone have low-lying areas, called *beels*. These used to produce a wide variety of common resources such as reeds, aquatic plants, snails, and fish, which were important resources to support livelihoods of the poorer sections of

Box 2. Empoldering and Poverty Reduction

Local people say that poverty in polder 55/1 has declined. In the pre-polder situation only one rice and some rabi crops were grown. Often intrusion of saline water destroyed the crops. Construction of the polder stopped saline water intrusion and also created conditions for a second rice crop. People say these changes first triggered overall development and poverty reduction in the area.

The accretion of land also helps to reduce poverty. In Galachipa district yearly accretion is around 40-60 ha. The accreted lands are used for grazing cattle and to produce local rice varieties, creating employment for many poorer households. Officially, this land is distributed among the landless households, but given the sociopolitical structure of the region, many of the allotment holders cannot establish their ownership rights over the land.

Local people say that the safety net programs of the government (i.e., food for work, food for education, etc.) have a positive impact on the life of the poor. This is the case even when it is acknowledged that the programs are not free from corruption. Furthermore, government resettlement programs such as "Adarsha Gram" and "Asahrayan" make significant impacts on the life of the poorest of the poor. In Galachipa subdistrict, 3,750 families received a home and homestead plot under these programs, as well as some supports for income generating activities.

Finally the impact of NGOs on poverty reduction is often mentioned. Starting with the Grameen Bank, which launched its program in early 1980s, presently there are over a dozen of NGOs working in the region. They work on various social and economic issues, but microcredit is an integral component of their programs. National level NGOs such as Grameen Bank, BRAC and ASA have large microcredit programs and these three NGOs cover roughly 45,000-50,000 poorer households in Galachipa subdistrict. Much of this credit goes to petty trading, rearing livestock, rickshaw and van pulling, buying of fishing gears and boats, pond aquaculture, and a limited amount, to farming.

society. In many places overdrainage and encroachment have reduced the size of these beels and common access, beneficial particularly to the poor, limited.

The quality of the groundwater varies. In some areas the shallow 10–30 top layer is sweet, followed by a layer of saline groundwater that can extend up to several hundred feet. The deepwater layers are again sweet. Groundwater is used for drinking and domestic use, but not normally for irrigation as sweet river water is available for part of the dry season.

Water-Related Vulnerabilities

The major vulnerability-related events in the coastal area are cyclones (major ones in 1970, 1985, 1991); riverbank erosion; increased water and soil salinity; increased drainage congestion inside polders; and the damage to land, crops, and trees due to saltwater shrimp cultivation.

The coastal belt also suffers seasonal vulnerabilities. In the monsoon and post-monsoon season, drainage congestion is often a problem. This is caused by poor O&M of outlet structures, silting up of channels, construction of roads without culverts, and blocking of channels with cross-dams to make ponds for fisheries. In much of the coastal belt, people now have access to tube wells for drinking water, though coverage, particularly in the newly inhabited areas, is less than elsewhere. In some parts of the coastal area, particularly in Noakhali district, the tube well water is contaminated by arsenic. Drinking this water exposes people to a high risk of cancer and other diseases.

While tube wells are used for drinking, ponds and channels are still used for washing, bathing, and feeding cattle. At the end of the dry season, most water

bodies dry up. In others, the water level gets so low and the contamination so bad, that the water is no longer usable. This results in acute increased health risks for both humans and livestock.

The *aus* and *aman* varieties of rice crops depend on the uncertain rainfall during the pre- and post-monsoon season. In Polder 55/1, the SRP built infrastructure to provide supplementary irrigation, but the infrastructure has not been maintained and is no longer used.

Perceived Trends

There is a general consensus that poverty in Polder 55/1 has declined. The construction of polder is seen as an important contributing factor, increasing security of life and property as well as employment opportunities for poorer sections of society such as the landless.

The people's opinion, confirmed by scientific measurements, is that salinity in the coastal zone is increasing. Two reasons are mentioned, a reduced inflow of sweet water from the rivers at the end of the dry season and the expansion of shrimp cultivation in polders. Crops and people suffer from this salinity.

There is consensus that poor O&M of polder infrastructure has lead to drainage congestion. In Polder 55/1, blocking of drainage channels for fish cultivation has aggravated this trend. As a result, both aus and aman yields and production have decreased.

Initially, water management basically aimed at increased agricultural production. With the profitability of rice production decreasing over the years, and demand for fish and shrimps increasing, there is now in many areas a growing conflict between these different uses. A small, but very powerful group often controls the very profitable shrimp and fish production. As a result of these conflicts, the vulnerability of the poorer sections of society has increased. Overall, the patterns of change in Polder 55/1 show that new vulnerabilities emerge as actions to reduce existing vulnerabilities and wider development trends take effect. This dynamic process needs to be reflected in pro-poor policy development.

Local Water Context

Local Institutions

In most of the coastal belt, the informal village power structure is the single most important institution. This is particularly the case with new land until the area is officially recognized and brought under the official administration. This recognition can take many years and, until that time, local power brokers rule.

Bangladesh has number of political parties and these are well represented in the coastal area. Although technically political parties are formal institutions, at local levels they function closer to the informal power structure. The case study suggests that control over local resources is often more important to the power brokers in the area than party politics. To secure and control access, groups of different parties forget about their differences and unite.

The Union Parishad (UP) is the lowest elected body in Bangladesh and deals with issues that directly effect local people. Elections for the UP are keenly

Box 3. The Elite Dominating Government Institutions

In rural Bangladesh economic power and political power are often mutually convertible. However, as the following examples from Polder 55/1 illustrate, in the coastal zone the rural rich use their economic/political power to such extent that it actually undermines the basic governance structure.

In Galachipa subdistrict there is much newly accreted land, producing rice and rabi crops. However, over the last 5–6 years these lands have been converted into shrimp ponds, at times without the consent of the legal owners. The shrimp cultivators are all rich and politically well connected. The small and marginal landowners tried to resist this process of expanded shrimp culture, but failed. A few years ago they made an appeal to the subdistrict administration for their help. The Upazila Nirbahi (Executive) Officer (UNO) agreed with their demands and, with the support of the police, demolished some shrimp ponds, returning control to the landowners. The rich shrimp farmers objected and complained to higher authority against the UNO. They brought out a *zaru michil* (procession with broom) to have him removed. While demonstrations continued the elite used their high-level political connections to secure the transfer of the UNO. Given the coalition of forces, the UNO was transferred. Since then shrimp culture in the area has continued unabated, with much of the profit siphoned off by a few outsiders.

This incident is not an exception. From March 1998 to May 2002 (i.e., over a period of 4 years) five UNOs served in this subdistrict. Of them only one served in this station for slightly over 2 years while the others served 3–11 months, instead of the normal 3 years.

The second example concerns the allocation of 44 low-lift irrigation pumps by the Department of Agricultural Extension (DAE). Farmers can apply to DAE for pumps and the Subdistrict Council decides the allocation. Initially these pumps were solely used for irrigating boro rice. However, the pumps are now all used for draining out water to harvest shrimp and fish. Since this is against its prescribed use and jeopardizes possibilities for growing crops, DAE objected to this (mis)use. The fishery lobby, supported by UP chairmen (many directly or indirectly involved in shrimp cultivation), did not support the DAE's viewpoint in the Subdistrict Council. With support from the Department of Fishery, they persuaded the UNO to overrule the clause that low-lift pumps are to be rented out for irrigation only. It was decided that pumps could be given to whoever asks for them without raising any question on the purpose. Since this decision was taken shrimp cultivators have used all the pumps.

contested. Traditionally, local elite occupy most UP seats. From 1997, the UP has three seats reserved for women and a few are elected directly to general seats as well. The UP chairman and members protect factional and/or private interests (Box 3).

Until the mid-1980s, few NGOs were active in the coastal zone, but since then, their number and coverage has increased. In Polder 55/1, there are national NGOs such as ASA, BRAC, and the Grameen Bank, and smaller local NGOs and internationally funded activities such as Danida's water supply and sanitation program. The consensus is that NGO activities have helped reduce the severity and extent of poverty.

In many parts of the coastal zone, including Polder 55/1, private commercial business is now well established. Agricultural inputs such as seeds, fertilizer, and pesticides are widely available, though often too expensive in the eyes of the farmers. The commercial sector has invested heavily in road and river transport, contributing to overall development of the zone.

In its Fifth Plan, the Government identifies the coastal zone as neglected, and sets goals to rectify this. The effectiveness of government agencies in coastal areas such as Polder 55/1 has been limited, however, reflecting poor coordination between different agencies and the problems of staffing posts in what are regarded as remote and low prestige areas.

National Policies

Since early 2002, the Government has been developing an ICZM policy and strategy. The Water Resources Planning Organization (WARPO) is the lead agency in this process that is due to be completed by 2005. The approach being adopted in this policy development process reflects radical new thinking about the role of policy in development and the types of approaches that are needed if the goals of reducing poverty and protecting vulnerable people are to be achieved.

Over the last decade, management objectives for the coastal zone have moved beyond the prescriptive use of plans, laws, and administrative modalities that emphasized a sectoral approach, to a more unified one that addresses the coastal system as a whole. In 1999, the Government of Bangladesh, supported by a number of international development partners, started to develop a distinctive approach to coastal zone management. Basing the analysis on earlier work in Bangladesh, and specific assessments in Asia and further afield, it aimed at a thoroughly integrated approach that reflects the needs and interests of all stakeholders and the zone's special challenges.

The overall approach focuses on the integration of development and disaster management policies and activities, in response to the priorities of the communities that are experiencing them. The coastal zone is characterized by many factors that limit development potential and diverse threats from natural disasters. These have tended to be considered separately, but it is now realized that while natural disasters curb sustainable development, a strong development-based program will lessen the impact of disasters and hasten the postdisaster recovery process. It also provides the basis for poverty reduction in the coastal area through the creation of a wider range of sustainable livelihood opportunities for poor people.

This process would be based on the harmonization of existing institutions and a process of subsidiarity, where decisions are devolved to the lowest appropriate level. This is in line with the move in Bangladesh toward decentralization, democratization, and institutional integration. It does not mean that every decision and action is taken at the purely local level. Some issues are national in character and need strong national inputs. However, many issues require the integration of different levels. The key to ICZM is to ensure that the appropriate people are taking the right decisions, in a timely fashion, so that effective implementation has a chance of success.

This approach is reflected in the first government policy paper on ICZM in September 1999, which is the accepted policy framework for coastal development in Bangladesh and as such provides a context within which coastal policy-livelihoods relationships need to be analyzed. This paper built on the analysis of the donor mission discussed above (Soussan et al. 1999) to identify the issue of interdepartmental coordination as a major challenge in coastal areas: "development problems do not occur departmentally; they appear in a complex web of interrelationships needing concerted efforts by more than one agency" (Government of Bangladesh, 1999, page 1).

The paper recognizes that this is a diverse and dynamic area that is nevertheless unified by the range and complexity of vulnerabilities and development challenges that face this zone: "the other special feature of the coastal zone is its multiple vulnerabilities" (Government of Bangladesh, 1999, page 11). A range of

environmental hazards (shocks such as cyclones; and trends such as erosion, mangrove destruction, and saline intrusion) is identified as the focal point of the development challenge of the area. The paper also recognized anthropogenic vulnerabilities such as poor access to markets, institutional weaknesses, and poor service provision as characterizing many parts of the coast.

This analysis is brought together in the definition of ICZM.

> ICZM offers a means of balancing the competing demands of different users for the same resources and of managing the resources to optimize benefits …. it is an effective framework for dealing with the conflicts arising from interactions of the various uses of coastal areas. (Government of Bangladesh, 1999, page 10).

The paper goes on to list the range of issues that an ICZM program should address, including natural hazards, resource opportunities, social and institutional constraints, and development principles such as sustainability and participation. A specific and important feature of the note is the clear decision *not* to establish a special coastal development agency, but rather to base ICZM on *harmonization* of the policies, programs, and capabilities of existing institutions. This means that effective institutional processes for this harmonization are pivotal to coastal development.

The development of the coastal policy in Bangladesh also needs to be seen in relation to policies in linked sectors. In 1998, the Government issued its first National Water Policy, which calls for an integrated approach to water resources management as well as active involvement of direct stakeholders in all stages of the process. The policy gives the highest priority to supplying clean and safe drinking water. Major efforts have been made since the 1980s, but in recent years, these have been undermined by the discovery of arsenic in many drinking water tubewells.

The 1999 National Agricultural Policy aims to make Bangladesh self-sufficient in food. All 18 specific objectives apply to the coastal zone, which is not classified as a special agricultural zone. The policy does advocate a special program for crops suitable for the coastal zone, as well as projects to store tidal sweet water for minor irrigation. The policy recognizes the export earning potential of shrimp cultivation and also the possible environmental impacts. However, it does not mention the conflict between agriculture and shrimp cultivation, although it mentions the need to combine crop and fish culture and prevent waterlogging. The policy advocated "land use zoning," which may be a way to deal with the shrimp issue.

The 1998 National Fisheries Policy gives much importance to coastal and marine fisheries. The policy aims at export over and above self-sufficiency, with quality rather than quantity being the bottleneck. The policy aims at combining rice, fish, and shrimp cultivation, which may lead to conflicts over waterlogged areas. The policy advocates caution to ensure that shrimp production does not damage the mangrove forests. Finally, the policy advocates a ban on marine fishing by trawlers in waters of less than 40 meters deep. However, currently most marine fishing is done in these waters.

Livelihood Patterns

This policy framework, and especially the newly emerging coastal policy process, aims to directly address the vulnerabilities that confront poor coastal communities. How well does it reflect the distinctive livelihood patterns of coastal areas? The stability of people's livelihoods depends largely on their vulnerabilities and the resources that they depend on. In the coastal zone the following main livelihood patterns can be distinguished.

- The large absentee landowners are the main local power brokers. Their livelihood pattern is one of constant adaptation to the most profitable economic activities. Many have left the agriculture sector and moved into other activities. With access to institutional capital, fisheries and business expertise, the international market, and the political power structure, they have found shrimp cultivation a golden opportunity to get rich quickly. The negative environmental impacts of their activities do not affect them as they live elsewhere.
- For large farmers who still live in the coastal zone, most often inside a polder, agriculture has become less profitable due to rising cost of inputs, including labor, and stable output prices, particularly for rice. These large farmers see the potential of shrimp cultivation along with its negative effects and many face the dilemma of what to do. Some have moved into shrimp cultivation while others still continue with farming and some others have moved into sectors such as transportation (often in conjunction with farming).
- Polder 55/1 has a diminishing number of small and marginal farmers as well as tenants. It is quite likely that the same applies to most of the coastal zone. Existing input and output prices, lack of control over water levels, increased salinity, and drainage congestion have made their small and marginal farms economically unviable, and in some cases, unproductive. Many have sold their land and diversified their livelihoods into nonfarming activities. Households send their sons to the city or abroad. Tenant farming, too, has diminished because of the unfavorable tenancy arrangements. In spite of the official tenant laws, landlords, without incurring any costs, still claim two thirds of the output as land rent instead of one third.
- In the past, wage laborers in Polder 55/1, as in the whole coastal zone, would have worked as agricultural laborers, either on a contract or a daily basis. The number of permanent contract laborers has decreased, and large farmers now employ more casual labor. Nowadays, agriculture is no longer the mainstay of the local economy, and many wage laborers have diversified their livelihoods by moving into nonfarming activities as well as self-employment opportunities. Employment opportunities in the coastal zone have increased considerably, but labor supply seems to outstrip the demand in many places. Until about a decade ago, migrant labor from the north would assist during the harvesting season. There is now a reverse flow of laborers seeking work outside the areas.
- The category of self-employed persons has increased considerably. The main driving force is the availability of credit through NGOs. Another factor is the increased road network, which has created opportunities for road transport as well as agricultural and nonagricultural activities. This category includes women who are involved in various home-based income-generating activities

as well as catching shrimp fry in the rivers. Many women and girls are involved in this activity, sometimes as wage laborers, sometimes as self-employed persons.

- Fishers have always been a sizeable group in Polder 55/1 and throughout the coastal zone. Before the empoldering, they used to fish in the rivers and the channels of the island. Since the mid-1970s the common resource fish stock inside the polder has decreased considerably and the fishers now go fishing in the adjacent rivers. From the early 1990s culture fisheries in the channels of the polder have increased. While the elite control this resource, the local fishers have benefited marginally from the additional work this provides to them.

As such, it is clear that the livelihood patterns in coastal areas are changing, with traditional agricultural activities declining and new opportunities emerging. The exclusive focus on agriculture as the main source of livelihoods is no longer appropriate and coastal policies need to ensure that coastal communities, especially the poor, are able to access new opportunities that emerge as the coastal area is more effectively integrated into the rest of Bangladesh. They should also ensure that the many effective coping strategies that local people have developed to deal with the multiple vulnerabilities that they face are supported.

Disaster-Coping Strategies

The main disaster-coping strategy of almost all groups in the coastal zone is diversification of income sources. Instead of households depending on one or two activities, they now spread their working-age adults over different activities, and if possible, localities, thereby ensuring that problems in one area of their livelihoods has a lesser impact on them.

To cope with the possible damage of storms, people protect their homestead by planting trees around it. That strategy is fairly effective when it comes to protecting homesteads and houses, but it is insufficient to protect crops against strong winds.

Farmers have two strategies to cope with the increased salinity. The first is to plant boro late to avoid the time when water is most saline. In practice, the boro crop then moves into the traditional aus seasons and is therefore referred to as braus (as Dr. Hugh Bremmer phrased it). In cases where salinity is extreme, farmers drop boro altogether and only produce *aman*.

Since the 1970s many cyclone shelters have been built in the coastal zone. Initially people were reluctant to use them for cultural and practical reasons. In the last few decades, these shelters have been made multipurpose buildings and are therefore easily accessible in time of need. Also, arrangements have been made for women and men to stay in separate parts of the building during a cyclone. Furthermore, the cyclone warning system has improved and now more people go to the shelters when warned by radio of an approaching cyclone. This effective disaster response system has lessened greatly the specter of the destruction of life and livelihoods during the immediate time of the cyclones.

The main man-made vulnerability is misuse of power by local lords and government officials. This often occurs in relation to shrimp cultivation. In many areas large absentee landlords start shrimp cultivation on new land outside the

embankment, often in and around the major outlet channels of polder. This has resulted in drainage congestion inside the polder. The next step is then to start shrimp ponds inside the polder itself. For this, they allow saline water into the polder, upsetting agricultural production.

Courageous farmers and some government officials have tried to challenge the stranglehold of the local elite over water management in the polder through the courts. The elite have fought back and to date their use of all sorts of pressure tactics have ensured that the power brokers remain in full control. Those who have challenged the local power structure have usually ended up with more trouble. Most of the poor therefore cope with the vulnerability of misuse of power by lying low, keeping their mouth shut, and "minding their own business."

These coping strategies are a key feature of life in coastal areas on which actions to reduce coastal vulnerabilities can be based. Key government programs such as empolderment and cyclone shelters can be very effective, as can programs such as road construction in creating new opportunities. These need to be supplemented by actions to support people's own initiatives, such as tree planting to protect homesteads, and actions to reduce the institutional and governance weaknesses of coastal areas. Finding the right balance between these different spheres of action is critical to coastal policy development in the coming years. What can we learn from what has happened in the past in defining and implementing new approaches for the future?

Historic Interventions in Settling New Coastal Lands

One characteristic of coastal areas of Bangladesh is the emergence of new lands as silts accrete in the delta areas. These new lands are a major resource opportunity, but all too often poor people have had their access to them limited by local power relations. Land development in the coastal zone starts when mud banks fall dry during low tide. Local grass (*uri*) starts growing on these so-called *char*s and they become a productive resource. Absentee landlords have traditionally competed with each other for control over these chars, with families under their patronage instructed to claim the land by settling there and living in huts on poles. Initially, the new land produces only grass, which is cut and sold as cattle feed at nearby markets. As the grass speeds up the deposit of silt, the land gradually rises and buffalos are moved to the new area to graze. During high tide they graze in knee-deep water. The next stage of land development is when the char is planted with rice during the monsoon. When crops are harvested, clashes occur between henchmen of various landlords who claim the land as theirs. It is not uncommon for people to get killed during such clashes.

As the chars are still flooded during high tide the land level continues to increase. In due course, more and more laborers and later on, their families, start settling on the land. At this stage, low-level isles are made between the fields to protect the crops from unwanted riverine water and retain sweet water. At this stage, the chars are still dissected by a network of natural channels. These are a safe haven for fish, and the inhabitants catch the fish for their own consumption and for sale in nearby markets. In some areas the new chars are ideally situated for shrimp cultivation. In such places, shrimp ponds are built with wooden structures that allow the inflow and outflow of saline water.

Traditionally transportation in the coastal belt has been by boat. For short distances pedal power was used while larger boats were powered by wind. From the 1980s onward, there has been a rapid mechanization of all but the smallest of these country boats. As a result, transportation speed has increased considerably, passenger transport over longer distances was, and still is, done by purpose-built launches.

This reality is in some contradiction to the official system for land allocation. As per the Bangladesh law, newly accredited land belongs to the Government. To speed up the process of accretion, the Forest Department plants mangrove and other suitable plants and trees on emerging chars. However, in some cases, the department is unable to do so as others have already claimed the land, as mentioned above.

Where forestation is successful, trees seldom grow to full maturity. At some stage, people from nearby areas start illegally cutting the forest for firewood and later clearing it all to allow settlement, cattle grazing, and later on crop production. At this stage the area usually remains outside the influence of the Government and under control of local lords.

At some later stage, when the char is well established and populated, the Government will establish a foothold in the area, usually by establishing a police outpost. Gradually the various governmental departments will start up their activities such as building roads and cyclone shelters, sinking tube wells, establishing schools, markets, etc. Depending on resource availability, BWDB may study the feasibility of protecting the area by building an embankment around it or linking it with an existing polder.

In the Char Development and Settlement Project (CDSP) in Noakhali district, the Government has actively pursued the policy of allocating new land to genuinely landless households. Already over 4,000 households have received both the land itself and the necessary ownership documents. Claims by 12,000 households are being processed.

Impacts

Short- and Long-Term Impacts

The dominant traditional approach to coastal development in Bangladesh has been through empoldering deltaic lands. The main impacts of empoldering are

- protection against all but a direct hit by a cyclone;
- creation of secure conditions for other infrastructural investments such as roads, schools, marketplaces, cyclone shelters, etc.;
- increased agricultural production by increased cropping intensity and yields;
- increased employment opportunities;
- increased potential for aquaculture in private ponds and leased canals;
- reduced availability of common property resources, i.e., capture fisheries; and
- reduced grazing area for livestock.

In principle most impacts of empoldering are long term and by enabling other interventions such as microcredit, empoldering has a clear poverty reduction

Box 4. Poverty Reduction through Microcredit

Again and again, people with few assets mention how important microcredit is to get them out of poverty. Take Rokan Mia: "I was born landless and started my working life as a cowboy. When I turned 22, I got married. I am now 45, married with three children. I used to work as a farm laborer on a yearly or seasonal contract. As a part of my wage I got free food, some clothing, and wages in kind (i.e. 4–6 bags of paddy, depending on the nature of the contract). My income was sufficient for my wife and me.

Soon our family started to grow with the arrival of our two daughters and a son. I could no longer maintain my family with my wage income. At that time the Grameen Bank started its work in our village. Many women then became members of Grameen Bank-organized groups and received loans for various activities. My wife one day asked my permission to join the group. I was reluctant and did not give my consent. In the meantime I continued my struggle to maintain the family, but found it very difficult to feed the five of us.

Finally, I decided to allow my wife to join the Grameen group. Thanks to the cooperation of our fellow villagers, my wife was included in the group. After a few months, she approached the bank for a loan and that was granted. After two small loans, she approached the bank for a larger sum. This time she received a loan of Taka (Tk)4,000 to be paid back in 52 installments of Tk100 over a period of 1 year. With this money I bought a rickshaw for Tk2,600 and we used the rest to buy a few chickens and for consumption. I quit my job as wage laborer and started to pull a rickshaw.

In a year's time, I managed to repay the loan. Now I own the rickshaw and on average I earn Tk100–150 per day, of which I spend around Tk10 for maintenance of my rickshaw and another Tk10–15, for tea and snacks. With the rest of the income, I maintain the family." Rokan Mia proudly concluded: "One of our daughters and our son now attend a primary school."

impact. As people in the case study area remarked, “now we eat three meals a day and very few people go hungry.” However, if the infrastructure is not operated and maintained properly, these benefits may dissipate or disappear altogether. For instance, in many polders, inappropriate operation and the lack of maintenance of gates and embankment breaches have resulted in saline intrusion and a decline in the earlier positive impacts.

The coastal area was, and to some still is, rich in natural aquatic resources such as reed, wood, snails, fish, etc. and general biodiversity. Human interventions, such as empoldering, have resulted in a reduction of natural habitats such as *beels* (low-lying areas permanently under water) and forests and a reduction in the biodiversity. The development of approaches to land protection and management that maintain the benefits of polders, but do so without these negative environmental consequences, are critical to the new coastal policy process.

Sustainable Operation

Sustainable operation of the infrastructure is necessary if the benefits of empoldering are to last. In the mid-1990s, the Systems Rehabilitation Project (SRP) therefore made an effort to broaden local participation in operating and maintaining the water management infrastructure. In line with the then Guidelines for People’s Participation in Projects, a four-tier system of water users organizations was introduced in Polder 55/1. It was made up of water users groups, linked through water users committees that were federated in water users associations. These organizations were represented in the Polder Committee, which also included officials from relevant government departments.

These groups initiated under the SRP never really became actively involved in operation and water management in Polder 55/1, as in other project areas. The Polder Committee, with more than 50 members, met every few months, but disintegrated after the project came to a close. The local elite (UP members, local religious leaders, and landlords) soon took over operation of the gates and still does so today, and minorities often feel their needs are overlooked. Others complain that gate operation is done only after paying the necessary "grease money." Those outside the inner circle of control feel powerless to change the situation and are utterly frustrated. This is one of the factors why small and marginal farmers move out of farming altogether. In the case study area this has resulted in more and more land ending up in the hands of the big landlords. In polders, where a few people control land and water management, the technical and social sustainability of polders is questionable. As such, the governance conditions under which interventions are developed and operated is a critical factor, perhaps the most critical factor, in determining their effectiveness in contributing to poverty reduction objectives.

Sustainable Maintenance

Alongside sustainable operation, the SRP also attempted to increase the sustainability of maintenance by introducing embankment maintenance groups made up of women. The system worked well, with some changes after the end of the project, until mid-2002, when the system was discontinued and it is uncertain what, if anything, will replace it.

Under the SRP, major work on the embankment remained the responsibility of BWDB. River erosion is the main threat and BWDB must do the necessary rehabilitation and/or embankment retirement. However, the lack of funds or their late release often means that breaches are not closed in time. The case study area, Polder 55/1, is a case in point. The breach of the embankment in the southeast could not be properly closed by mid-2002. If a cyclone hits this point of the polder, the impact on life and property would be disastrous.

One of the effects of the elite controlling gate operation is that people in general do not feel any sense of "ownership" of the polder infrastructure. They are therefore also not willing to contribute to its operation, let alone maintenance. This, together with the lack of government funds for O&M, results in the infrastructure gradually deteriorating and the initial positive impacts disappearing.

Policy Analysis

Because the coastal zone in Bangladesh is so rich in natural resources it has attracted people for centuries, in spite of the clear vulnerabilities of the area. From discussions with top-level government officials, it is clear that the Government rightly sees the coastal zone as one with tremendous development potential, many untapped resources, and much scope for livelihood diversification. This high-level support is a crucial precondition for development.

Discussions also indicate that infrastructural development is no longer considered as an isolated act, but seen as part of the wider system of addressing different problems. Structural interventions must be combined with relevant and

supporting nonstructural interventions and with effective governance arrangements. In relation to natural disasters, this implies community capacity building so that people can cope with immediate natural shocks and recover from losses with dignity. In the case of water management infrastructure such as embankments and regulators, this understanding calls for broad-based O&M. This broad view of development, too, is a major advantage when it comes to using coastal resources for poverty reduction.

Furthermore, there is a move away from a sectoral to a holistic approach in which all aspects of coastal development are structured into the development process, based on core objectives of empowerment and changing governance structures. The Government is particularly interested in linking institutional development in the coastal area with the ongoing wider processes of decentralization and democratization. The Government also sees the focus of the coastal development process as working through existing institutions, specifically improving local government structures and developing more effective interagency collaboration. This view is particularly relevant for wider poverty-focused strategies.

In some places the coastal resource base has been overexploited and permanently damaged—particularly the Sundarbans and other forestry resources—which have not been able to withstand the population's need for more land. In the case of the Sundarbans, the process of deterioration may have now come to a halt with the recognition of the Sundarbans as a World Heritage site and subsequent government action. Apart from these specific instances, as yet, relatively little of the coastal resource base has been permanently damaged. The potential productivity and contribution to poverty reduction of these resources remains strong.

The general public is quite aware of the need to maintain a healthy environment. Living close to nature, they are only too aware of how disastrous the consequences can be if the natural environment is mistreated. Therefore there is still a fairly widespread interest in managing the coastal resources in a sustainable and judicious manner.

There are major concerns over the influence of the powerful local elite, discussed above, and the barriers to effective institutional harmonization (between government agencies and among NGOs). Addressing these concerns, which are essentially about governance issues, is fundamental to the future development of pro-poor policies in coastal areas and demonstrates how these issues cannot be separated from the wider social and political conditions of countries such as Bangladesh.

The first challenge is to ensure that the ICZM being developed follows a process approach, rather than a master plan or blueprint approach. For it to be useful, it should have a "twin-track" character, consisting of activities that are effective in addressing real and immediate needs and contributing to long-term capacity development and structural change in the coast.

The second challenge relates to shrimp production. Rather than dealing with the old question of whether or not there should be any shrimp farming, it is best to assume that it is there to stay. The key question now is how to make shrimp production more equitable in the benefits that go to local people, less environmentally damaging, and more sustainable.

The third challenge is to ensure that the overall approach to coastal development will harmonize policies, strategies, and activities of different agencies and sectors. This should be linked to a process of subsidiarity whereby different decision making levels are integrated, and decisions taken at the lowest appropriate level.

The overall conclusion of this analysis is that better water management is a precondition for coastal resources to contribute to poverty reduction. Water is critical to coastal livelihoods in so many ways, while water-related vulnerabilities are a dominant feature of coastal life. Recent years has seen substantial development in many coastal areas, with activities by the government and private sector together creating employment opportunities and security that have allowed many poor to move out of poverty. Better water management will only achieve its full poverty reduction impact if it is complemented by other activities that make use of the opportunities created, including schemes such as microcredit that are not obviously connected to water resources issues. Above all, the key to coastal development that reduces the vulnerabilities and poverty that so many face is the creation of governance conditions whereby water and other resources can be accessed and managed equitably and sustainably. The existing focus of the coastal policy on integrated approaches that target vulnerabilities and the needs of the poor and address governance issues is extremely encouraging and offers the basis for the transformation of coastal areas in Bangladesh. Only time will tell if this potential will be realized, but essential to it is the continuation of the political support from the center that has characterized recent years.

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4

Gender and Economic Benefits from Domestic Water Supply in Semiarid Areas: A Case Study in Banaskantha District, Gujarat, Western India

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Summary

Combining improved water supply with microenterprise development has much potential to reduce poverty in semiarid areas. This case study, implemented by the Self-Employed Women's Association (SEWA) in Banaskantha district (Gujarat, India), combines the revival of the piped water supply and traditional water sources with a microenterprise development program for female entrepreneurs.

Joint research by the International Water and Sanitation Centre (IRC), SEWA, and the Foundation of Public Interest (FPI) revealed that the time released by an improved water supply enables women enterprise members to make a substantial contribution to the household income, especially at times when other income-generating opportunities are absent, for instance, during drought. In addition, gender relations have changed in favor of these women. Policy-wise, the study suggests the need for

- an integrated, holistic approach to rural development in which women influence the design and operation of the service so that it meets their domestic and economic requirements;
- involving CBOs, NGOs, and other institutions with experience in improving water supply and supporting microenterprise development in reformulating current policies;
- using the development of women's enterprises combined with the improvement of domestic water supply as a major entry point for rural poverty reduction programs;
- delinking water and poverty by providing income-generating opportunities that depend less, or not at all, on water and are demand-driven;

- the Government, SEWA, and other institutions to provide drought relief work in the form of craftwork at times when other economic opportunities are at their lowest; and
- gender programs to start addressing women's immediate gender needs and link them with the improvement of gender equality between, and also among, the sexes (e.g., for women of different ages and positions in the family).

The final recommendation is to find ways to scale up SEWA's efforts and implement similar programs elsewhere.

Introduction

Every day, innumerable women still spend substantial amounts of time carrying domestic water for the family. Water collection reduces the time left for income-generating work and is a drain on household labor resources (Kamminga 1991). Domestic water projects are generally designed with only such domestic uses in mind. Common objectives are improving welfare and health. This places domestic water projects firmly in the social or health sector and not in the sector of economic development. Yet if women's water collection were valued at paid labor, it would have high economic costs (McPherson and Jackson 1975). Women themselves see domestic water services also as an opportunity for economic development. Especially where gains are substantial, "Poor women … feel [that] time spent ... should contribute primarily to the family income" (van Wijk 1998: 118).

SEWA is a trade union registered in 1972. It is an organization of poor, self-employed women workers, who earn a living through their own labor or small businesses. SEWA organizes women laborers for full employment and self-reliance so they have a regular income, food security, and access to health and child care for themselves and their families. As self-reliant, autonomous actors, these women make their own decisions and control their economic activities independently.

SEWA initiated activities in Banaskantha[1] to, among other objectives, improve the domestic water supply through better management of the piped water supply as well as the revival of traditional water sources such as ponds. However, improving only the water supply is not enough to reduce poverty. Commenting on the goal of the Santalpur Rural Water Supply Scheme (SRWSS) implemented earlier, SEWA commented that the goal "was not simply the supply of water for its own sake. The availability of water was meant to unlock the human potential that had dried up with the decrease of water supply. However, the scheme had assumed that with the provision of water, the rest would take care of itself" (SEWA 1999: 15). In a wider review of improved rural water schemes, Kamminga had come to a similar conclusion: "Considering [the] widespread constraints for women in most rural areas, additional measures will be indispensable in many cases to create the right conditions for women to increase their incomes" (1991: 11). SEWA therefore directed its efforts not only toward improving and reviving the existing water supply, piped water supply, and traditional water sources, but also toward helping poor women get organized, build their capacity, as well as

[1] The Banaskantha district has recently been split into two. This research was carried out in the newly created district of Patan, but for consistency's sake the old name of Banaskantha is used here.

start and run microenterprises. SEWA also aimed to empower the women by making them self-reliant in decision making.

A more reliable domestic water supply combined with increased economic opportunities and a supportive environment not only has a direct impact on the income of the poor, but also reduces their vulnerability during difficult times. This case study illuminates this potential, and to serve as a model for others, it will attempt to

- showcase the impact of effective water management on poverty reduction and thereby highlight important policy recommendations;
- assess the relevance of an accessible and reliable water supply for the productive uses of time and water by women in semiarid regions; and
- examine the impact of income-generating activities by women on gender relations within their households and communities.

Given the success of the SEWA approach, there is a need to scale up SEWA's efforts. Therefore, preconditions for scaling up need to be identified and to be introduced in the design of similar projects and programs.

Research Objectives and Methodology

This case study is based on the findings of a study conducted by IRC, Delft; SEWA, Ahmedabad; and FPI, Ahmedabad. That study had economic and gender objectives.[2] Overall, it aimed to look at how domestic water projects may be adjusted to maximize benefits from productive uses of water and time, thus maximizing the poverty reduction impact. Specifically, it sought to assess the economic value of improved water supply (especially for women), and study the impact on gender relations in households and communities. Besides census data and enterprise accounts, the study mainly used participatory rural appraisal (PRA) methods to collect data on time use, gender, and enterprise economics.

Participants were women from 11 SEWA-supported microenterprise groups in nine villages and from five control villages (with comparable socioeconomic conditions, according to the 1991 census) where SEWA was not active.[3] The five different types of enterprises covered are crafts, dairying, salt farming, gum collection, and tree and fruit plantations. Women from these enterprises took part in designing the tools, analyzing the data, and discussing the findings and conclusions. SEWA and FPI field staff implemented the present study, funded by the Swedish International Development Cooperation Agency (Sida).

The Setting and Problems in the Context

Banaskantha

While the state of Gujarat, located on the western coast of India, has a relatively high per capita income, its economic future is threatened by an ever-growing water shortage. In 1999, a large part of the state suffered from the worst drought in 50 years. On

[2] Additional data were collected on the impacts of the earthquake in Banaskantha (Verhagen, Joep, and SEWA. March 2001); economic impacts of improved water supply (Verhagen, Joep, and SEWA. November 2000 and August 2001).

[3] In 10 other villages, women enterprise leaders were interviewed.

average, droughts occur in the area every 3 years. Low-income families are usually the hardest hit by droughts and other natural disasters that erode interim development gains, leaving many trapped in an interminable cycle of poverty.

Banaskantha is one of the most underdeveloped districts in the state. Over 90% of the population live in villages, many of which lack even the most basic infrastructure. Rain-fed agriculture and dairy production are the main economic

I was married when I was still a child and I have two sons and two daughters. I work in the saltpans from November "til April and earn rupees (Rs) 40.00 ($0.80) per day. Half of this I have to spend on transportation to the saltpan and back. It is very hard work especially when it gets hot. The remaining part of the year I work on our own land, but when there is drought we migrate to find work elsewhere.

Before we got piped water supply, I fetched water from the well and the pond. It took me about 1 hour to fetch a pot (5 liters) of water. The standpost is much nearer, but there is water only once a week. When the government tanker comes, there is always a huge crowd and often there are quarrels about water. Some days it takes me so much time to get water that I cannot go to the saltpan, so I lose the income of that entire day.

About 8 years ago, I became a SEWA member. There are many SEWA members in our villages and together we are strong. Alone, I will not go to the government, but together we can go to demand for more water tankers, for example. I take part in many SEWA activities and give health and cleanliness training to our girls.

Kokuben Ramabhai Ahir (woman, age 40)
member of a salt enterprise in Madhutra

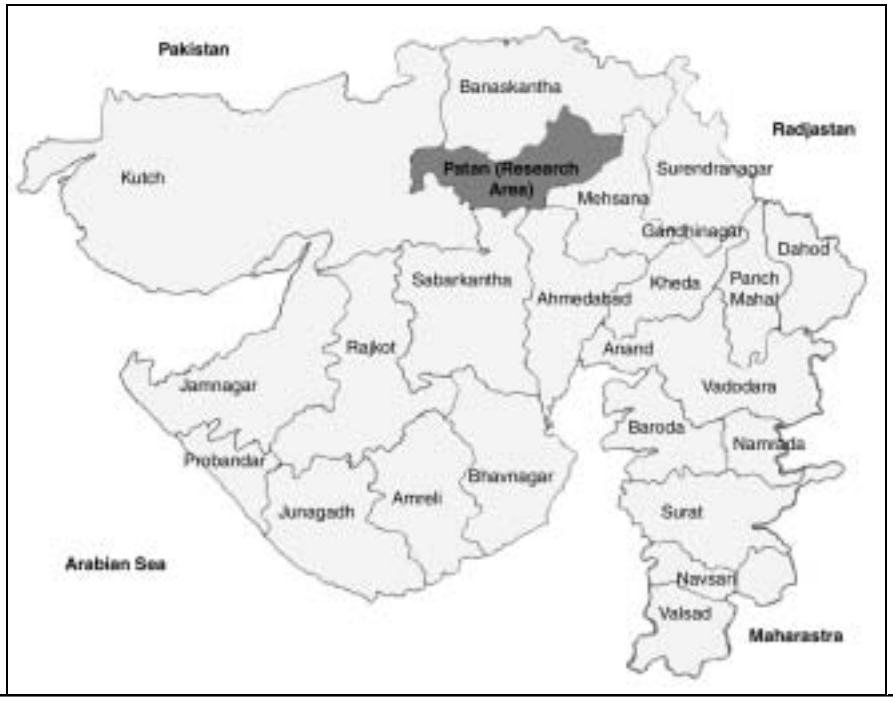

Table 1. Impacts of the Earthquake and Drought on Livelihoods

	Activities	Embroidery	Salt	Dairy	Gum	Planting	Agriculture
	% of Villages	52	52	60	35	29	100
Earthquake	Not Affected	0	8	48	6	43	15
	Temporarily Halted	40	32	28	47	14	42
	Halted	60	56	21	47	43	39
Drought in Previous Year[a]	Not Affected	Na	Na	24	24	14	3
	Affected	Na	Na	72	71	86	85

Na = not available.

Note: Figures do not add up to 100%, as missing values are not shown.

[a] The data were collected in the month of March, before the start of the summer. Hence it was decided to collect data on the drought of previous year.

activities in this desert region. Consequently, when monsoon rains fail, entire communities are forced to migrate in search of employment and fodder for their livestock. Furthermore, excessive groundwater harvesting by a small group of rich farmers and a haphazard government water policy in the region has led to the rapid decline of the groundwater table. Overextraction and poor maintenance makes the water in many wells saline and unsafe for drinking.

Natural and Man-made Disasters[4]

Natural and man-made disasters form an integral part of the life of the poor and in many cases keep them trapped in the vicious circle of poverty. Banaskantha is no exception to this.[5] On 26 January 2000, the state of Gujarat and a large part of India experienced the most violent earthquake of the last 50 years. The epicenter of this quake was located 20 km northeast of Bhuj. Kutch and the neighboring districts of Surendranagar, Rajkot, and the research area, Patan, were badly affected by this earthquake.

The earthquake and the drought had a detrimental impact on the livelihoods of the local communities in Patan (Table 1). Prior to the earthquake, most of the people's livelihoods—especially agricultural activities—were already in a precarious

[4] The section on the impacts of the earthquake and the drought are based on an impact assessment in 48 villages in Banaskantha carried out by Joep Verhagen and SEWA in March 2001.

[5] During the 5-year period 1997–2001 Banaskantha witnessed the following disasters: floods (1997), malaria epidemic (1997), cyclones (1998 and 1999), droughts (2000 and 2001), and an earthquake (2001).

Table 2. Impacts of the Earthquake and Drought on Domestic Water Supply (%)

		Wells	Ponds	Standposts	Bore Wells
% of Villages with Water Sources		60	100	88	40
Earthquake	Not Affected	7	31	33	32
	Temporarily Affected	21	13	38	16
	Affected	66	52	24	47
	Missing Values[a]	7	4	5	5
Drought	Not Affected	0	0	31	68
	Temporarily Affected	0	2	62	16
	Affected	90	90		5
	Missing Values	10	8	7	11

[a] The high percentage of missing values is explained by the difficult circumstances in which the data had to be collected that where prevalent during the period shortly after the earthquake.

situation because of the two consecutive droughts that hit large parts of Gujarat. The earthquake all but stopped the remaining economic activities in the villages.

A more detailed analysis reveals that the earthquake has caused permanent damage to people's livelihoods. Many households have not only lost their standing crops and the seeds for the upcoming agricultural season, but also their tools and the few irrigation facilities available have been damaged. Crafts women lost their working and storage place.

The water supply was badly affected by the drought and the earthquake (Table 2). Almost all traditional water sources had already dried up before the earthquake, which caused structural damage to many wells and ponds. Although piped water supply was restored in some villages, water tankers remained the sole sources of drinking water in many villages.

Additional data reveal that 60% and 78% of the respondents consider that their water supply and livelihood, respectively, are have deteriorated compared with conditions prior to the earthquake.[6]

Findings

Time Activity Profiles

Time activity profiles of women from enterprise and control villages were used to derive insights into women's use of time. They distinguished domestic,

[6] As the data were collected during a drought period, it is probable that these figures reflect the combined impacts of the ongoing drought and the earthquake.

economic, personal, and developmental activities, and water collection for reproductive and productive use was assessed separately.

Even with the pipeline, water collection was time-consuming. On average, women from both types of groups spent 3 hours of their 15–16-hour working day to fetch water. Daughters spent nearly 1.5 hours, sons, 12 minutes, and husbands, 15 minutes per day. In other words, on average a household spent nearly 5 hours a day on collecting water. This is high since, at least on paper, all households have year-round access to piped water, provided to reduce the drudgery of water collection. In reality, the piped water supply is of a substandard quality and often breaks down for longer periods.

When the piped water supply breaks down, women need to spend substantially more time on fetching water: 2.54 hours and 2.30 hours in summer and monsoon, respectively. Most of this time comes at the cost of time spent on income-generating activities, 1.56 and 1.48 hours in summer and monsoon, respectively. The extra time spent is in spite of the fact that people have to buy water and do not bathe.

Women contribute to household income through

- expenditure-saving activities—including working on own agricultural land, and
- income generating activities—either by hiring themselves out as daily wage laborers, or by doing microenterprise work (e.g., handicrafts, dairying, collecting gum, or making salt).

The data showed that women from enterprise villages spend more time on income-generating work than women in control villages. (Table 3). It is particularly relevant that microenterprise activities provide family income at crucial times—during summers (and droughts)—when other income sources are absent.

Table 3. Women's Activity Profiles in Enterprise Households and Control Villages (N = 16 villages)

Type of Activity		Summer		Monsoon	
		Enterprise Villages	Control Villages	Enterprise Villages	Control Villages
Reproductive Activities	Others	4.3[a]	5.1[a]	5.2	5.0
	Water Collection	2.8	3.5	2.8	2.5
Total Productive Activities	Income Generating Expenditure Saving Water for Productive Activities	7.5[a] 1.1 0.4	5.4[a] 1.9 0	3.4[a] 3.6[a] 0.3	0.1[a] 7.2[a] 0
Total Personal Activities		7.5	8.2	8.6	9.8

[a] The time taken by women in enterprise villages and in control villages was statistically significantly different at the 5% level.

I was desperate when I became a widow: my livestock died, I had to sell my jewelry, I lost all my land to a moneylender, and I was not earning more than about Rs100 ($2) per month. About 10 years ago, SEWA started working in our village and helped us set up a fruit plantation. Around that time, we also got piped water supply. The time I saved from fetching water, I would spend on the plantation. My income increased to around Rs450 ($9) a month, so I was able to send my children to school. Also my status in the village improved—the moneylender will give me a loan whenever I ask for it and I am no longer scared to speak during village meetings.

After the earthquake, things became very bad. We have water for only 2–3 hours every 14 days. There are a lot of quarrels about water. One day, a man even attacked the women to get more water. Our plantation still works, but I do not know what will happen if it does not rain this year again.

Neemuben Amardan Gadhvi (woman, age 39)
Leader of fruit plantation in Zandala village

Economic Impacts

Two calculations were made: the costs of reduced water collection time and the potential benefit of reduced water collection time.

Costs of Breakdowns

For women already employed in economic activity, the indirect costs of water collection time when the piped water supply broke down were calculated. This cost (either as potential income lost or as cash costs incurred to collect water) was calculated at an average of Rs50 ($1) per woman per month, during the 3 summer months. Extrapolating the loss to all SEWA micro-enterprise members in the two blocks, the inadequate O & M of the water service constitutes a total loss of Rs6 million ($120,000) annually for 40,000 SEWA members in Patan.

Each woman also lost, on average, 7 hours of time per month in summer, for reproductive and/or personal activities.

Benefits of Reduced Collection Time

If water supply is improved, so that women spend only 1 hour per day collecting water, women could use this time saved either for income-generating activities or for domestic, social, and developmental activities. The subsequent time gains, calculated on the basis of the time-activity profile, can be allocated either to *productive activities* or a combination of *reproductive and personal* activities.

Consequently, two alternative upper bounds have been calculated:

- The maximum additional income a woman can earn assuming time saved is devoted to *economic activities*; and
- The maximum time that is freed for *personal and reproductive activities*: Calculations showed that additional annual income could be between Rs750 ($15) and Rs5,520 ($1,104) per woman (depending on the economic options available). Alternatively, each woman might gain between 45 and 152 8-hour days annually for domestic, social, and developmental activities.

To further substantiate these findings, data were collected on how women would allocate time savings from an improved water supply. It was found that the women would allocate 72% of these time savings to income-generating activities, provided that sufficient economic opportunities are available. This underlines the need for integrated approaches toward poverty reduction in semiarid areas, which address water supply as well as microenterprise development.

Women were asked to estimate economic gains from past improvements of the water supply. It was found that the average economic gains of past improvements of the water supply are over Rs150 ($3) per month per household. These improvements include the revival of traditional water sources[8] as well as piped water supply.

Gender Impacts

Changes in Gender Relations

In all villages, gender relations have changed in favor of women. But for members of women's enterprises, progress has been significantly greater, in terms of possession of assets and participation in decision making and community management activities. Also, these women received significantly more help from husbands, sons, and daughters during a breakdown of the water supply in summer than the women in the control villages. Part of these changes can be attributed to the ongoing changes in society as a whole that are taking place. However, part of these changes can be traced back to SEWA's continuous efforts as well as to the increased economic activities of the women, especially at times of income stress.

Because gender relations concern women and men, male team members interviewed the men. The responses were used for a content analysis. At first, they were surprised to be asked and had problems discussing gender, but they soon warmed to the issue and gave many and very specific reactions. Only two reactions were negative, e.g., women could visit places that men could not. In the control villages, the men mentioned a few more negative changes, but almost all were still positive. A few men referred to improvements in women's traditional gender roles, such as better management of the house and greater cleanliness of children.

The majority mentioned economic benefits for the family as a whole, greater equality between the sexes (better communication between spouses, husbands helping more), and women's empowerment. Interestingly, quite a few poor males mentioned how the empowerment of poor women had also empowered them: they were undertaking new activities and also received more respect in the village.

Control Over Time and Income

A certain degree of control over time and income is essential for the women to use time savings for income generation. If the husband controls the entire household income and spends additional income on personal things, such as alcohol, there is no incentive for the women to generate more income even when time is available.

[7] These include roof rainwater harvesting, construction of plastic lined ponds, desilting of wells, and so on.

The study assessed three levels of control over time: women alone decide; they decide together with someone else in the household, and someone else decides. In both groups, 90% of the women had some control over their time use, either solely or together with another household member (husband, mother-in-law, etc.). Approximately 10% had no say still. They are probably unmarried and/or recently married young women who, according to local custom, still have a subordinated position in the household.

Control over income from women's work has been analyzed using a similar method as for time use. Three income categories were analyzed: enterprise income, income from other sources (such as agricultural labor and government relief work), and overall household income. Since women in the control villages had not started any independent entrepreneurial activities, it emerged that women's enterprise members had significantly more control over their own income and over the household income than the control group. However, some 9% of women entrepreneurs had no say in the spending of the income that they had generated. This is probably the same group that does not have any control over their time.

> Before we got a standpost in our village, I had to walk 4 kilometers to fetch water at the pond in the next village. I would go in the night to fetch water, come back, take a short rest, and then start cooking breakfast for my family. Water from that pond would often make us sick as well.
>
> Now it takes me just 1 hour a day to fetch water. I don't get tired and I have much more time to collect gum. SEWA negotiated with the Forest Department to get higher prices for our gum and I earn around Rs300–400 ($6–8) per month. Nowadays, I also travel to other places and my husband no longer stops me from doing so.
>
> Our drinking water situation is much better. But we still do not have enough water for our livestock. So maybe this year my husband has to migrate with our cattle to find water and fodder.
>
> Ratanben Marfabhai Thakor (woman, age 35)
> member of gum collection enterprise in Parsund village

Conclusions and Policy Recommendations

Water Supply

The study found that improving domestic water supply is not just a *welfare issue* provided out of pity for women's drudgery in water collection, or for "soft" concerns like improving health, hygiene, and sanitation, but it also yields *economic* returns. Conditions are

- that the water supply provides the time savings, quantity, and reliability of water required for economic use; and
- that the water project is linked with a microenterprise program that provides the right enabling conditions, such as organization and training of women, market research, marketing, quality control, and microcredit facilities.

Policy recommendations include a strong need for the following:

- *an integrated, holistic approach* to rural development, which is in contrast to the *sectoral approach* that is currently adopted by the central and state governments; and

- CBOs, NGOs, and other institutions with experience in improving water supply and supporting micro-enterprise development to be involved in the reformulating current policies. These institutions should also be used as *pathfinders in pilot exercises* before scaling up holistic rural development to a larger scale.

Poverty Reduction

From the findings, the following became clear.

- Women provide income to the family *in four ways*: by doing agricultural work on the land of the household, by engaging in expenditure-saving activities (e.g., fodder collection and vegetable gardening), by working as daily wage laborers, and doing microenterprise work);
- Work in microenterprises provides family income at times when this is *especially essential* (e.g., in the dry season when income from other sources is absent). The production is a valuable source of income for poor families and a means for women to meet their practical and strategic gender needs.

Conditions are

- a reliable improved water supply with amounts of water and predictability of delivery adjusted to women's needs; and
- a micro-enterprises support program that goes beyond training, but covers the whole range of requirements and assists the microenterprises in pooling their resources for crucial higher level services, such as training, quality control, marketing, market research, and market capital.

Unfortunately, water services are at their worst during the dry season and women, as primary stakeholders, have currently *no influence* on the reliability and distribution of water in comprehensive water supply schemes.

Policy recommendations include a need for

- improving the water supply as part of a holistic, rural development approach in which women have influence on the design and operation of the service so that it meets their *domestic and economic* requirements;
- the development of women's enterprises combined with the improvement of domestic water supply—and not just improvements in the resource base (e.g., soils, irrigation water, crops, and forests—should become *major entry points* for rural poverty reduction programs); and
- delinking *water and poverty* by providing income-generating opportunities that depend less, or not at all on water, and are based on market demand especially as the total amount of water in semiarid areas is limited.

Drought Management

The project found also that money spent on *drought relief work* in the form of craftwork can be economically viable. Craftwork does not need water, and women appreciate that it can be done at home in combination with their other tasks and at flexible hours. In this sense, it compares favorably with the current type of government relief work, which is inflexible, physically demanding, and has lower returns.

Policy recommendations include that the Government, SEWA, and other institutions should provide drought relief work in the form of craftwork *at times when other economic opportunities are at their lowest*.

Gender Relations

Overall, and in all study villages, gender relations have changed in favor of women during the last 10 years. On many essential indicators—such as possession of assets, participation in decision making, and community management activities—progress has been greater for members of women enterprises than for women in the control villages, reflecting the impact of the work of SEWA and BDMSA.

During a breakdown of the water supply in summer, women, who are members of an enterprise, receive significantly more help from other household members (husbands, sons, and daughters) than the women in the control villages. SEWA women also have a significantly greater say over the use of their time and over their own and the family's income.

The research showed that a combination of *antipoverty* and *women's empowerment* strategy for rural development also leads to greater *gender equality*. In the semi-structured interviews, only a few husbands stressed the *welfare* benefits of women's income-generating projects (e.g., the value of these projects for women's traditional gender roles such as better management of the house and greater cleanliness of the children).

Almost invariably the men in the study villages saw these changes as positive. The groups in the women's enterprise villages saw more changes than those in the other villages. Asked about the kind of changes, all groups described specific improvements in women's domestic roles and gave instances of greater equality between women and men within households. In addition, the groups in the women's enterprise villages also always gave examples of poverty reduction from women's work and more often gave instances of women's empowerment as a group.

Policy-wise it is recommended that gender programs should start addressing women's immediate gender needs and link these with the improvement of gender equality not only between the sexes, but also among them (e.g., for women of different *ages and positions* in the family).

Scaling Up

This case study demonstrates that the integrated approach followed by SEWA does lead to an improvement of the quality of life for both men and women in semiarid areas such as Banaskantha. However, there is a need to initiate similar programs on a larger scale.

For this purpose, NGOs and other institutions with experience in such effective poverty reduction efforts have to be involved in reformulating current policies to incorporate these major changes. The reformulation of policies should be based on identified preconditions for success. These institutions should also be used as pathfinders in pilot exercises before scaling up the operation.

Second, many NGOs do have the capacity to mobilize local communities and collaborate with them in an effective manner. However, often they lack the technical and managerial capacity to implement projects at a much larger scale.

Finally, part of the government drought relief funds should be spent on providing *craftwork for poor women,* as long as this can be based on and adjusted to real market demands and with an efficient plan for managing and marketing their output.

Policy recommendations include:

- Concrete programs could be upscaled by increasing the responsiveness of local government agencies toward demands from CBOs and NGOs. Presently, too much time and managerial resources are required to attain the much-needed collaboration from local government institutions;
- Resources should be made available to build the capacity of NGOs in technical fields and if necessary they should have easy access to tailor-made technical and managerial assistance;
- Institutions experienced in organizing such drought relief work in the form of craftwork for poor women should be involved in reformulating policy.

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5

Agricultural Water and Poverty Linkages: Case Studies on Large and Small Systems

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Summary

This paper uses case studies to examine the linkages between agricultural water and rural poverty, and demonstrates how rural household deprivation of agricultural water leads to other socioeconomic deprivations.

There are five key interrelated dimensions of the agricultural water/poverty reduction relationship: production, income/consumption, employment, vulnerability/food security, and overall welfare. In general, irrigation access allows poor people to increase their production and incomes and enhances income diversification opportunities, reducing vulnerability caused by seasonality and other factors. Nonetheless, irrigation benefits may accrue unevenly across socioeconomic groups.

A framework for conceptualizing the impact of irrigation on rural poverty is provided, taking into account household status as well as the direct and indirect impacts of irrigation. Using this framework, the first study analyzes the impact of improved community/household access to irrigation on poverty in large-scale surface irrigation systems in Sri Lanka and Pakistan. The study finds that

- agricultural water/irrigation access reduces chronic poverty incidence;
- irrigation's impact on poverty is highest where landholdings are equitably distributed;
- effective rural poverty reduction requires that agricultural water/irrigation development be targeted at poor communities/areas/localities; and
- unequal land distribution is associated with inequitable distribution of agricultural water benefits.

The paper examines a study of water and poverty in six Asian countries. Key preliminary findings indicate that

- land and water resources are important determinants of rural poverty;
- there is significant inequity in the distribution of water across irrigation system reaches;
- the incidence of poverty at tail reaches is higher than elsewhere in irrigation systems, an outcome worsened when land distribution is unequal.

Finally, the paper outlines case studies of poverty reducing intervention strategies for agricultural water. In particular, a study of the pro-poor benefits from providing small-scale treadle pumps is examined, as are localized examples of pro-poor irrigation management, including an institutional/technology bundling in Pakistan, a community initiative in Indonesia, cropping shifts in India, and the Dual Canal and Bethma systems in Sri Lanka.

Introduction

The purpose of this paper is to examine the linkages between agricultural water and rural poverty. The paper demonstrates, through a series of real world case studies, how rural household deprivation of agricultural water leads to other socioeconomic deprivations, and how improved access can reduce the vulnerability of the poor. After presenting background information on the connection between agricultural water and poverty, the paper provides a framework for conceptualizing the impacts of irrigation on rural poverty, taking into account both direct and indirect effects as well as household status. The paper then presents a series of case studies, based on empirical data, examining the relationship between agricultural water and poverty. The case studies are based on the most recent research on agricultural water and rural poverty conducted by the International Water Management Institute (IWMI). The paper concludes with several examples, based on recent fieldwork, of agricultural water sector practices—initiated both through community action and external intervention—which have had a significant impact on rural poverty.

Background

Poverty is complex, multidimensional, and is the result of myriad interactions between resources, technologies, institutions, strategies, and actions. The multidimensional character of poverty has been reflected in a wide array of papers, poverty reduction strategies, and policies.[1] Although water provides only a single element in the poverty equation, it plays a disproportionately powerful role through its wide impact on such factors as food production, hygiene, sanitation and health, vulnerability/food security, and the environment. Indeed, development agencies, groups, and experts worldwide are increasingly recognizing the important role that water can have on poverty.[2]

Within the water and poverty debate, agricultural water holds a unique place. While solutions to other dimensions of the water and poverty problem such as sanitation, hygiene, and potable supplies, generally call for increased expansion of services, the agricultural water/irrigation problem requires drastic improvements in existing services. Furthermore, agriculture is now the world's largest user of water, consuming 80–90% of annual utilized supplies and providing livelihood for most of the world's poor.

Within agriculture, water is a vital resource for many productive and livelihood activities, and many developing countries have promoted water resources development over the last 5 decades to improve social outcomes. Huge investments

[1] UNDP, 1997; Asian Development Bank, 1999; World Bank, 2000; Dutch Ministry of Foreign Affairs, 2001; Government of The Netherlands: Ministry of Foreign Affairs, 2001; OECD-DAC, 2001.

[2] World Commission on Dams, 2000; Water Supply and Sanitation Collaborative Council, 2000; Zoysa, Lipton et al., 2001.

have been made in water resources to achieve such broad objectives as economic growth, rural and agricultural development, national food security, famine protection, and land use intensification. While irrigation development can have negative impacts on the poor under some circumstances, agricultural water/ irrigation has been regarded as a powerful factor for providing food security, protection against adverse drought conditions, increased prospects for employment and stable income, and greater opportunity for multiple cropping and crop diversification. Access to reliable irrigation can enable farmers to adopt new technologies and intensify cultivation, leading to increased productivity, overall higher production, and greater returns from farming. This, in turn, opens up new employment opportunities, both on-farm and off-farm, and can improve income, livelihoods, and the quality of life in rural areas. Overall, irrigation water—like land—can have an important wealth-generating function in agriculture, specifically, and in rural settings in general.

There are five key interrelated dimensions of the relationship between access to good agricultural water, socioeconomic uplifting in rural communities, and poverty reduction. The dimensions are production, income/consumption, employment, vulnerability/food security, and overall welfare (Figure 1).

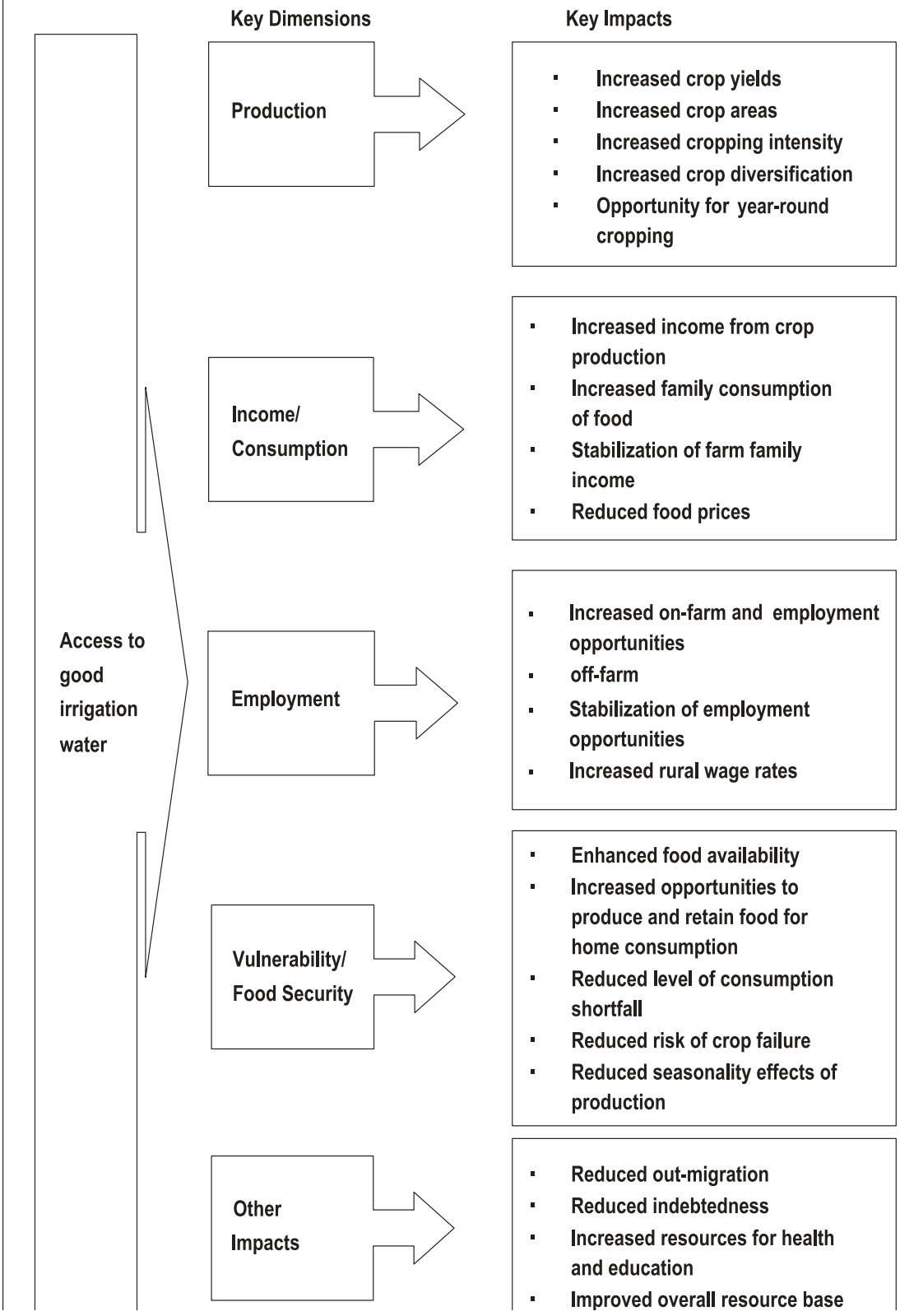
In general, access to good irrigation allows poor people to increase their production and income, and enhances opportunities to diversify their income base, reducing vulnerability caused by the seasonality of agricultural production as well as external shocks. Thus, access to good irrigation has the potential to contribute to poverty reduction and the movement of people from ill-being to well-being. While there is an enormous literature on the impact of irrigation on poverty reducing intermediate variables, particularly from South Asia, no review is made here. Rather, recent case studies are presented to identify the conditions under which access to agricultural water can have significant poverty-reducing impacts. Before reviewing the case studies, it is useful to have a conceptual framework for considering the potential impacts agricultural water can have on various segments of the rural population.

There is a common perception that the benefits from irrigation accrue primarily to large landholders. However, to understand the impacts of irrigation on the rural sector in general and the poor in particular, it is important to consider both the nature of rural households as well as the direct and indirect impacts irrigation services can have on the rural economy. As a conceptual framework, we can think of the rural population as comprising four groups

- the landless dependent on the non-agricultural sector;
- the landless dependent on agriculture (e.g., agricultural workers);
- smallholders; and
- large holders.

Given that water is generally linked to land, the direct benefits of irrigation, in terms of increased farm output, will tend to accrue in proportion to the size of landholdings, with large holders benefiting more than smallholders, and smallholders benefiting more than the landless. However, the landless can still directly benefit from increased irrigation services. For instance, those working in the agriculture sector can experience an expansion in employment opportunities and agricultural wages, enhancements to livestock and poultry raising, and

Figure 1. Agricultural Water and Poverty Reduction: Key Dimensions



improved opportunities in other noncrop, water dependent rural enterprises (e.g., brick making).

As with direct benefits, the indirect benefits of irrigation services will also not accrue evenly across household sectors. To the extent that irrigation increases crop production, food prices will decline due to increased overall supplies. For both categories of the landless, any fall in prices will result in an increase in real incomes and food security as well as increased employment and other opportunities via the multiplier effect in both local and regional economies. Smallholders will also receive indirect benefits from price declines to the extent that they are net food buyers whereas large holders—net food sellers—may experience low or negative indirect impacts. While the exact distribution of irrigation benefits among these various classes within any agricultural system is an empirical question and will be dependent on equity in land distribution, the important point is that direct and indirect effects must be considered to comprehensively understand the impact of irrigation on the rural poor. While the case studies presented here account for both direct and indirect impacts of irrigation on poverty, the focus is on more localized impacts. The cases do not explore the broader economy-level impacts of irrigation on poverty through multiplier effects.

Impact of Agricultural Water on Poverty: Large-Scale Surface Systems

The case studies begin with an examination of the relationships between poverty and agricultural water at the irrigation system level. The two studies presented examine how access to irrigation water, household location within an irrigation system, and other variables are related to poverty. A better understanding of these linkages can help determine strategies, which can be employed within existing irrigation systems for poverty reduction.

An Analysis of Selected Irrigation Systems in Pakistan and Sri Lanka

This first case study is based on a recently completed analysis of agricultural water and poverty in Pakistan and Sri Lanka.[3] The purpose of the research was to assess the impact of improved community/household access to irrigation (through the rehabilitation and/or development of irrigation infrastructure) on poverty reduction. The study was undertaken during 2001–2002, in Sri Lanka's Uda Walawe Left Bank Irrigation System, part of the Ruhuna Basin and an IWMI Benchmark Basin, and in Pakistan's Mandi Bahauddin and Gujrat districts, located in the upper portion of the upper Indus basin. Both study sites are representative of large-scale surface irrigation systems.

Context

The study site in Sri Lanka, the Walawe Left Bank Systems (WLB), is in the Walawe Ganga basin about 200 km southeast of Colombo. The study area is located in the dry zone within a scheme that is part of Sri Lanka's larger land

[3] Hussain, Marikar, and Thrikawala, 2002; Hussain, Jehangior, and Ashfaq, 2002.

resettlement policy. Within the scheme, significant investments have been made to establish irrigated land settlements for resettlement of poor, landless families from the more crowded wet zone and provide opportunities for livelihood enhancement through irrigated farming. By 1998, some 328,000 ha of land had been developed under irrigated settlements and about 200,000 poor families had been resettled in several schemes. The land settlement policy of the Government has had a multipronged strategy. Irrigation development was coupled with an expansion of other physical and social infrastructure. Many settlement schemes are now prosperous agricultural areas forming the cornerstones of agricultural production in Sri Lanka. The irrigated settlements within the scheme can be regarded as good examples of the use of water resources development in reducing poverty.

Within the WLB study site, about 12,000 ha of land provide direct and indirect support to the approximately 17,000 families settled in the system (including families encroaching lands in the area). Many families have been relocated from other districts. Each settler was given a parcel of 1–2 ha for cultivation of paddy and other field crops, in addition to land allotments for homesteads. The WLB has been developed in phases, gradually moving from upstream to downstream development. Recently, infrastructure in the upstream and midstreams of the WLB system was improved or rehabilitated to increase water availability in these reaches, as well as in downstream areas where new infrastructure is being developed.

The settlement is a mix of new and old settlers. Land distribution is fairly equal and there is public and private landownership. Paddy is the major crop, followed by other field crops including bananas, chilies, and onions. Overall cropping intensity is around 200%. Surface supplies are the only source of water for crop production. Average annual rainfall in the area is around 1,500 millimeters (mm).

The study site in Pakistan is located in the upper portion of the Upper Indus Basin (UIB). Irrigation systems were initially developed in Pakistan's Upper Indus during the colonial period. After independence, new works were initiated, particularly during the 1960s, including construction of dams and link canals to further expand the network of irrigation infrastructure. Since the late 1970s, efforts have been directed at improving efficiency of water use, with the focus on increasing conveyance efficiency at the tertiary level (where 40–60% of water is believed to be lost) through so-called on-farm water management programs. The core objective of these programs was to reduce water loss and improve access to water for crop production. Major components of the programs included development/improvement of tertiary level infrastructure and the formation of water users associations. In the study sites within the UIB, the On-Farm Water Management Program was implemented during the mid-1990s.

Settlements in the Pakistan study area are well established. As in other parts of the country, most land is privately owned, and there is significant inequity in the distribution of landownership. Wheat, rice, cotton, and sugarcane are major crops grown in the area. Overall cropping intensity, which ranges from 120% to 150%, is fairly low as compared with other Asian countries. Shared use of surface and groundwater is common, and inequity in distribution of surface water is widely observed. Average annual rainfall in the area is 800 mm. The area of

the two districts selected for study is over 0.5 million ha and is home to over 3 million people.

Study Approach

In the absence of data availability prior to development/improvement of irrigation systems within the study sites, the research employed a "with" and "without" approach. Comparisons were made between sample areas with

- well-developed/improved infrastructure,
- less developed/unimproved infrastructure, and
- neither infrastructure nor irrigation.

The study used primary data collected through household-level surveys conducted three times during 2000–2001. The sample included 858 households in WLB and 720 households in UIB and used a detailed multi-topic questionnaire. In addition, the study employed a participatory poverty assessment approach to obtain qualitative information and data from the communities. Poverty was measured using monetary (incomes and expenditures) as well as nonmonetary indicators (under-5 mortality, dependency ratio, body mass index, housing quality, access to services, and agricultural performance). Further dynamics of income poverty were measured using the concepts of chronic or permanent poverty (defined as a state where household income/consumption is constantly below poverty line within a given time) and transient or temporary poverty (defined as a state where the household's average income/consumption is above the poverty line but occasionally falls bellow the poverty line within a given time).

The selected study areas were divided into subareas or strata based on numerous criteria including availability of irrigation infrastructure, infrastructure condition (improved or unimproved), cropping patterns, and the nature of water supplies (perennial or nonperennial). A multistage sampling procedure was adopted for selecting households in each stratum. The overall approach to comprehensively assessing the impacts of access to irrigation/infrastructure on poverty, covering both its spatial and temporal aspects, consisted of

- comparing various strata representing the state of infrastructure development, quantifying the differences in the value of relevant variables by developing a socioeconomic profile for each strata;
- developing and quantifying key indicators of poverty covering both monetary and nonmonetary dimensions of poverty;
- using econometric analysis to estimate the household income/consumption smoothing effects of irrigation infrastructure development; and
- using econometric analysis to identify and quantify key determinants of household income/expenditure/poverty, including quantification of the impact of irrigation infrastructure development on these variables.

Key Results

In Sri Lanka's WLB system, study results indicate that household income and expenditure levels are higher in areas with access to irrigation infrastructure, vis-à-vis to those without. Household average monthly expenditure in areas with

irrigation infrastructure access is 24% higher than in areas with no access to irrigation infrastructure.

This is largely because areas where households have access to irrigation exhibit:

- higher cropping intensities and double cropping;
- higher crop productivity and overall production; and
- higher employment opportunities and wage rates.

For example, the agricultural wage rate in areas where households have access to irrigation is over Rs200 ($2.22) per day compared with Rs173 ($1.92) per day in areas with no irrigation.

The study also indicates that

- production activities in areas with access to irrigation infrastructure also provide support to households in nearby areas with no irrigation infrastructure, reducing levels of chronic poverty in these areas;
- access to irrigation infrastructure enables households to smoothen their consumption, with higher incomes received over extended period of time (resulting from higher productivity, crop diversification, and double cropping); and
- upgrades/improvements in infrastructure help improve crop productivity and help save water, resulting in more water available for downstream users (who are generally poorer compared with upstream households) and helping to improve equity in water distribution as well as incomes.

The results of the study suggest that the incidence, depth, and severity of poverty, as measured by both monetary and nonmonetary indicators, are highest in areas where households do not have access to irrigation/infrastructure and lowest in areas with access to established irrigation infrastructure and with adequate water supplies. Incidence of chronic poverty is highest in areas without access to irrigation infrastructure (typical rain-fed areas) vis-à-vis areas with access to irrigation infrastructure. As shown in Table 1, the rain-fed extension area had the highest level of chronic poverty, with one fourth of households living below the poverty line throughout the year. Overall, the highest chronic poverty is found among nonfarm households and in areas with no access to irrigation infrastructure, and lowest in areas with access to irrigation infrastructure and adequate water supplies. The study concludes that access to irrigation contributes to food security, balanced diets, and reduced vulnerability and poverty at the household and community levels.

Similarly, in Pakistan's UIB, the study indicated that access to irrigation/ infrastructure reduces the incidence of chronic poverty. Improvements in irrigation infrastructure have helped increase availability of water for crop production, resulting in higher cropping intensity, and crop productivity (up 5–25%) and improved crop incomes (with increases ranging from 12% to 22%). However, the overall impact of irrigation infrastructure improvements on poverty is found to be only marginal (with the incidence of chronic poverty only 0.8% less in areas with improved irrigation infrastructure than in those without) because of several factors including

- inequity in distribution of resources, particularly land, with those having larger landholdings benefiting more compared with small landholders and the landless; and

Table 1. Poverty Head Count (based on income) in Uda Walawe Left Bank Area, 2001

	Sevanagala Irrigated	Sevanagala Rain-fed	Kirribanara	Sooriyawewa	Extension and Rain-fed Area	Ridyagama	Irrigated All	Rain-fed All	Farm	Nonfarm	All
Incidence of Poverty (No. of Observations)	167	60	151	229	105	146	693	165	724	134	858
Total Poverty (%)	71	88	85	87	84	75	80	85	82	77	81
Chronic Poverty (%)	9	10	13	11	25	6	10	19	11	16	12
Transient Poverty(%)	62	78	72	76	59	69	70	66	71	61	69
Nonpoor (%)	29	12	15	13	16	25	20	15	18	23	19
Household Annual Expenditure (Rs)	64,360	59,024	67,243	64,907	49,398	94,283	71,473	52,898	69,856	57,341	67,901
Household Annual Income (Rs)	11,2062	11,1281	71,202	81,523	66,080	132,945	97,467	82,517	99,814	66,377	94,592
Value of Household Assets (Rs)	18,232	13,694	17,240	19,517	8,532	32,394	21,418	10,436	20,165	14,795	19,339
Value of Household Agricultural Assets (Rs)	17,415	1,752	21,731	18,837	10,484	27,749	21,002	7,309	19,811	10,575	18,369
Housing Index	74.4	73.6	78.9	73.3	69.2	84.6	77.2	70.8	77.5	67.8	76.0

Note 1: Sevanagala area is located at the upstream of the system (in the irrigated part of Sevenagala, irrigation infrastructure is well developed/improved/lined); Kirribanara is located in midstream where infrastructure is recently improved/lined; Sooriyawewa is located further downstream where infrastructure is recently improved/lined; extension and rain-fed area is located further down to Sooriyawewa where irrigation infrastructure is being provided now; and Ridyagama is located adjacent to Sooriyawewa and extension and rain-fed area, where there is irrigation infrastructure but unimproved.
Note 2: $1 = Rp90 in 2001.

- poor governance in the water sector (poor infrastructure condition, including improved infrastructure, due to inadequate maintenance, and unreliable water supplies due to lack of proper planning and water theft), which tends to negate any antipoverty impacts of improvements in infrastructure.

The study indicates that the incidence of chronic poverty is higher among nonfarm households (64.2%) than among farm households (6.5%). The majority of these nonfarm households, constituting over 39% of all households, are landless.

Why are the antipoverty impacts of irrigation development greater in Sri Lanka than Pakistan? As highlighted in Table 2, the primary reasons are related to inequity in landholdings coupled with infrastructure improvements that were not targeted at the poor.

Table 2. Reasons for Differences in Antipoverty Impacts of Irrigation in Sri Lanka and Pakistan

Selected Systems in Sri Lanka	*Selected Systems in Pakistan*
• Inequity in land distribution is low	• Inequity in land distribution is high
• Landlessness is limited	• Landlessness is high and increasing
• All irrigation infrastructure was improved without regard to landholding size	• Most irrigation infrastructure was improved in areas with large landholdings
• Irrigation infrastructure was improved uniformly	• In most cases, irrigation infrastructure was not improved uniformly
• Irrigation infrastructure improvement has resulted in increased crop productivity and incomes, and the poor have benefited the most	• While irrigation infrastructure improvement has increased crop productivity and incomes, much of the benefit has gone to non-poor (large landholders)
• Infrastructure improvement was targeted at the poor	• Irrigation infrastructure improvement was not targeted at the poor

The case study concludes that

- access to agricultural water/irrigation can significantly reduce the incidence of chronic poverty;
- the impact of irrigation on poverty is highest where landholdings are fairly equitably distributed;
- for effective poverty reduction, agricultural water/irrigation development must be targeted at the poor communities/areas/localities; and
- in situations where land distribution is highly skewed, such as in Pakistan, the benefits of agricultural water will continue to be inequitably distributed unless fundamental measures are taken, such as land redistribution.

Analysis of Selected Irrigation Systems in Six Countries

On a broader scale, IWMI is currently undertaking a study on water and poverty in 19 selected irrigation systems in six countries—Bangladesh, People's Republic of China (PRC), India, Indonesia, Pakistan, and Viet Nam. The overall goal of the project is to promote and catalyze equitable economic growth in rural areas through pro-poor irrigation interventions. The immediate objective is to determine realistic options to improve the returns to poor farmers in low-productivity irrigated areas within the context of improving the overall performance and sustainability of established irrigation schemes. The key hypotheses being tested in the study include the following.

- Canal reaches receiving less irrigation water have lower productivity and a higher incidence of poverty.
- Under existing conditions, small, marginal, and poor farmers receive less benefits from irrigation than large and non-poor farmers.
- The greater the degree of O&M cost recovery, the better is the performance of irrigation management.

- Participatory irrigation management (PIM) and/or irrigation management transfer (IMT) leads to improved irrigation system performance, which in turn reduces poverty.
- An absence of clearly defined water allocation and distribution procedures, and absence of effective and clear water rights (formal and informal) adversely affects the poor more than the non poor.
- There is scope for improving performance of irrigation systems under existing conditions, with effective and improved institutional arrangements.

The following are some of the preliminary findings of the study.

In selected irrigation systems, the incidence of rural poverty is highest in Bangladesh and Pakistan and lowest in the PRC. Estimates also suggest that the incidence of rural poverty is decreasing over time in all study countries except Pakistan.

In rural settings, land and water resources are important determinants of poverty. Past development of land and agricultural water resources in the six countries have played an important role in significantly improving household, community, and regional food security and in reducing the incidence of chronic poverty through increased productivity, employment, wages, and income, and by increasing consumption of both food and nonfood items. Preliminary results of the study suggest that there are strong linkages between agricultural water and poverty. However, most irrigated agricultural systems are still home to large numbers of poor.

Inequity in the distribution of land and water resources is highest in selected systems in South Asia—most inequitable in Pakistan and only marginal in the PRC and Viet Nam. In South Asia, much rural poverty is among

- landless households where household members are unskilled, without opportunities in nonagricultural sectors, and depend on agriculture for wage labor, and
- small landholders because of both water and nonwater-related constraints (e.g., information, technology, inputs, etc.).

In South Asia, landlessness is increasing rapidly with population increases. The rate of landlessness is rising faster in Pakistan than in other countries. In Pakistan, in the absence of nonagricultural/industrial sector development, fundamental land reform is essential to make significant reductions in rural poverty. Improvement in the governance and management of irrigation/agricultural water would provide some indirect benefits to the landless poor and would provide considerable benefits to poor smallholders.

Crop and water productivity levels in PRC, Indonesia, and Viet Nam, where landholdings are generally smaller, are fairly high with cropping intensities ranging from 200 to 300%. However, there is considerable scope to increase economic productivity of both land and water in these countries through crop diversification and value added to farm produce. On the other hand, crop productivity levels are generally low in South Asia, particularly in India and Pakistan, with substantial variations in productivity across households, communities, and systems. There is considerable scope to increase both the physical and economic productivity of land and water through interventions in the water and nonwater sectors.

The study finds significant inequity in water distribution across head, middle, and tail reaches of the systems studied. Inequity in water distribution exists even in systems in the PRC and Viet Nam where there is less inequity in land distribution. Inequity in water distribution translates into productivity differences, with lower productivity at tail reaches or downstream. For instance, in 10 distributaries studied in Pakistan, wheat productivity varied from 1,680 to 3,459 kg/ha at the head to 1,236–2,965 kg/ha at the tail. The study further found that, as a result of less access to water and lower productivity, poverty incidence at tail ends is higher than at head and middle reaches.

The problem of tail reach poverty exists mostly where there are neither alternative water sources (e.g. groundwater) nor alternative sources of employment (nonagricultural enterprises, market towns, etc.). These findings so far support the hypothesis that command areas of specific canal reaches receiving less irrigation water per ha have lower productivity and a higher incidence of poverty. Poverty incidence increases with reduced irrigation water access (tailends) or when there is no access at all (rain-fed areas), a situation worsened in low, dry season harvests.

Overall, the study findings suggest that the causes of poverty are complex and multidimensional. In rural agricultural systems, which support the livelihoods of 60–80% of the population, water availability and access may be a necessary, if not sufficient, condition for poverty reduction. Agricultural water deprivation leads to unacceptable socioeconomic conditions, including a lack of the basic food and nonfood supplies needed to fulfill human physical needs as well as ill health, lack of education and skills, and lack of reasonable living conditions. Any one of these factors can push the already poor and vulnerable into even deeper distress. Conversely, a considerable part of rural poverty can be reduced through improved access to water with well-planned and targeted interventions.

Institutional reforms and related interventions in the water resources sector are presently under way at the broader level in all the study countries, although progress is slower in South Asia than elsewhere. Reforms cover three major aspects: legal and regulatory measures, participatory management, and finance. Laws governing water use have been established in most countries, but there is often either overlapping authority or gaps in authority, lack of funding for enforcement, and lack of clarity regarding land and water rights.

The need for participatory agricultural water management has been recognized for transparent and effective water management, for sharing of information, and for building awareness among farmers of the importance of saving water. However, PIM or IMT through the formation of water users associations is still in the experimental stage. Results achieved so far are mixed. Early results from the study suggest that either IMT and/or PIM has the potential to create a conducive environment for improving performance of irrigation, including equity in distribution of water and improved access to water by the poor. In South Asia, for instance, there are indications that IMT and/or PIM (although implemented on only a limited scale) has led to a reduction in agricultural water-related corruption, disputes, and water theft.

Water charge recovery rates have increased (e.g., the recovery rate increased to 88–95% in systems where IMT was implemented in Indonesia and Pakistan). Along with improvements in water management, infrastructure improvements

have also taken place. Also, confidence, awareness, and empowerment of farmers have improved through meetings and dialogues over water-related issues.

Given the scale and period of implementation of these reforms, it is too early to evaluate the full range of impacts. However, observations and preliminary findings of the study suggest that IMT and/or PIM efforts are likely to be successful where

- distribution of land is fairly equitable;
- irrigated agricultural systems are relatively small and manageable; and
- communities within the systems are fairly homogenous (e.g., not divided historically into lower or upper castes).

In areas where these conditions do not apply, it will take a relatively long time before the reform initiatives have a chance at successful and effective implementation. Enforcement of strict regulatory measures will remain crucial to avoid any negative impacts on the poor that might emerge when these initiatives are implemented.

Based on preliminary findings of the study, two sets of interventions are identified to increase the benefits of irrigation water to the poor:

- broad interventions for improved management of agricultural water to improve agricultural water/irrigation system performance that would have both direct and indirect positive impacts on poverty; and
- targeted interventions that would have direct positive impacts on poverty.

  The interventions relate to the following aspects:
  - institutional, legal, and regulatory policy;
  - management, allocation, and participation;
  - infrastructure and technology;
  - economic and financial; and
  - research, knowledge, information, and capacity development.

The initial menu of identified interventions is presented in Box 1.

Impact of Agricultural Water on Poverty: Small-Scale Systems

In recent years, there has been an upsurge in the adoption of irrigation technologies for smallholders such as low-cost pumps, treadle pumps, low-cost bucket and drip lines, sustainable land management practices, supplemental irrigation, and recharge and use of groundwater and water harvesting systems. This wide range of technologies, collectively referred to as "smallholder water and land management systems," attempts to create opportunities for the poor and small landholders in accessing presently unusable water supplies, which in turn leads to increased production and income. Emerging evidence suggests that access to agricultural water through these technologies offers tremendous potential to improve the livelihoods of millions of the poorest. Thus identification and promotion of these technologies present significant opportunities in the fight against poverty.

Poor smallholders and landless households around the globe are the main beneficiaries of microirrigation technologies. These technologies are particularly suited to small, poor, and even landless households as the costs self-select the poor

Box 1. Preliminary Menu of Interventions to Irrigation Water for the Poor in Surface Irrigation Systems

Broad Interventions

- Improve institutional environment and governance in the agricultural water sector.
- Involve communities in the management of agricultural water resources.
- Encourage public-private partnership in managing agricultural/irrigation water resources.
- Establish effective regulatory measures and mechanisms for transparency and accountability among service providers and water users.
- Establish clear water rights and water entitlements in the systems by introducing effective and enforceable legal frameworks with flexible provision for seasonal water use.
- Promote full O&M cost recovery to improve and maintain system performance (from which the poor benefit directly or indirectly) and to redistribute benefits of irrigation through larger contribution from the non poor for improving productivity of landless and marginal farmers.
- Introduce systems of advance payments of water fees by users to improve on collection rate.
- Promote shared management of surface and groundwater to help reallocate water to areas where groundwater is of poor quality.
- Develop, improve, and/or line canal infrastructure in areas where groundwater is not suitable for crop production.
- Introduce season-wise planning for equitable distribution and efficient use of available water resources.
- Improve markets for inputs and outputs.
- Improve economic value of water through diversification of both crop and non crop farm outputs.
- Promote cropping pattern changes from high water-consuming crops to low water-consuming, but high-value crops (e.g., paddy to high-value crops).
- Clearly recognize and incorporate rural poverty concerns and the need and importance of pro-poor interventions in national and subnational-level policies and plans.

Targeted Interventions

- Promote pro-poor institutional arrangements, including
  - Involving the poor/smallholders in water management decisions, i.e., establishing and strengthening water users associations (WUAs) with due representation of the smallholders and the poor; and
  - Establishing and strengthening separate WUAs of tailenders in situations where there are significant head-tail inequities in water distribution.
- Establish guaranteed minimum water rights for smallholders in drought and scarcity conditions to ensure household food security.
- Especially where there is significant inequity in land distribution, establish pro-poor water allocation/distribution rules that will allocate more canal water per unit of area for smallholders as compared with large farmers. Give priority in water allocations to areas and command reaches where poverty incidence is higher.
- Promote canal water reallocations to canal command areas or reaches where groundwater is of poorer quality, mostly tail ends where incidence of poverty is relatively higher.
- Develop pro-poor (discriminatory) pricing systems such as differential pricing for larger areas beyond specified ceiling per farm household.
- Create employment opportunities for the poor, including the landless, by involving them in O&M, water fee collection, and other supervisory activities.
- Increase productivity and value of water in ways that favor the poor, such as promoting crop diversification toward high-value crops on smallholder farms through the provision of necessary incentives, information, and support.
- Target technological support, such as providing high-quality seeds, fertilizers, credit, and agricultural equipment to land leveling for the poor communities in canal commands.
- Provide monetary and technical support to install pumps or other water-lifting devices for communities in command areas or canal reaches that are relatively poorer but have good quality groundwater.
- Prioritize command areas or reaches with relatively greater poverty incidence for infrastructure rehabilitation and upgrading, and for new infrastructure for storage and distribution of water.
- Improve markets for the inputs purchased and outputs produced by the poor.
- Build capacity of smallholders and the poor through information and training programs.
- Develop databases on poverty, location, incidence, and depth of poverty, and monitor poverty regularly.
- Encourage research on agricultural water and poverty.

Box 2. Small Irrigation Technologies and Poverty Reduction

The Case: The Global Initiative for Smallholder Irrigation is the world's most ambitious poverty reduction plan aimed to enable 2 million rural poor households a year to take a major step on the path out of poverty. The approach exploits the fact that small, low-cost, and affordable irrigation technologies that can fit small plots and even be useful for landless households, self-select the poor and have strong *land and water augmentation effe*cts. The pro-poor technologies successfully tested so far include treadle pumps, rope and washer pumps, low-cost drip and micro sprinkler, and bucket kits. The poverty reduction objective would be achieved through production of high-value crops, expansion of markets for the outputs produced by the poor, and job creation enabled by smallholder irrigation. The initiative is expected to benefit 30 million poor and landless households around the globe, and would bring 1 million ha under cultivation each year over 15 years. These technologies have so far been successfully tested in several countries in eastern Asia (People's Republic of China), South Asia (Bangladesh, India, and Nepal), Latin America (Brazil, Nicaragua, and Mexico), and Africa (Kenya and Zambia). We present here a summary of issues and lessons learned from case studies undertaken on smallholder irrigation in India and Nepal (Winrock International and IDE 2001).

Major Beneficiary	• All those who often are deep down or below the poverty line including poor rural households and landless families
Core Pro-Poor Intervention(s)	• Here the private sector is the key player in the promoting and marketing irrigation technologies and providing other related inputs to the poor. An initial price subsidy enables private sector entrepreneurs to mass-market these technologies among the rural poor and landless. • Poor landless households use horticultural kits for income generation. • The package consists of bucket kits, seed, fertilizer, pest control, and other information. • Wealth creation becomes possible by growing high-value crops like papaya mixed with other vegetables, bitter gourd on the fence, and pumpkins on the roof.
Opportunities to Serve the Poor	• Poorest households with land as little as 40–100 m^2 and water as meager as 2–10 buckets a day can earn $100 per year in net income. • Virtually all rural families have access to that much land and water and therefore, virtually all rural poor stand to benefit from this pro-poor intervention. • Intervention has the potential to improve health and nutrition as well as generate new income for the landless.
Cross-cutting Issues	• Access to low-cost drip irrigation technology • Access to credit • Access to inputs • Access to markets • Access to additional water • Active involvement of private sector to mass-market these pro-poor technologies
Pro-Poor Policy Implications	• Landless families are too poor to afford even these low-cost kits; therefore, seed capital or access to credit is vital. • There is a need to shift from subsistence to market-oriented horticultural production.
Equity Assessment	• Small irrigation technologies have strong potential to self-select the poor. • The technologies offer a "win-win" gift for the poorest and landless households around the globe.

Source: Winrock International and IDE. 2001. *Study on the Dissemination Potential of Affordable Drip and Other Irrigation Systems and the Concrete Strategies for Their Promotion*.

and have a strong land and water-augmentation effect. Box 2 presents an overview of potential antipoverty impacts of microirrigation technologies worldwide.

Treadle Pumps in South Asia's "Poverty Square"[4]

A treadle pump is a foot-operated device that uses bamboo or flexible pipe for suction to pump water from shallow aquifers or surface water bodies. Since it can be attached to a flexible hose, a treadle pump is useful for lifting water at shallow depths from ponds, tanks, canals or catchment basins, tube wells, and

[4] Shah, Tushaar, M. Alam, Dinesh Kumar, R.K.N. Nagar, and Mahendra Singh. 2000. Pedaling Out of Poverty: Social Impact of a Manual Irrigation Technology in South Asia, IWMI Research No. 45. Colombo: IWMI.

other sources up to a maximum height of 7 meters (m). It performs best at a pumping head of 3.0–3.5 m, delivering 1.0–1.2 liters (l) per second.

Recent research by IWMI suggests that treadle pump technology has had a tremendous impact in improving the livelihoods of the poor in Bangladesh, eastern India, and the Nepal Terai (the heartland of the Ganga-Brahmaputra-Meghna basin), South Asia's so-called "poverty square." This region, which contains 500 million of the world's poorest people and is characterized by tiny landholdings, is underlain by one of the world's best groundwater resources, available at a depth of 1.5–3.5 m.

The treadle pump is truly a pro-poor technology. It is cheap and affordable at $12–30, is easy to install, operate and maintain, and has no fuel costs. Treadle pump technology has the unique property of self-selecting the poor and positively impacting their livelihoods. Based on an extensive 1998 survey of 2,400 households in parts of Bangladesh, eastern India, and Nepal Teri, a study by Shah et al. suggests that

- for poor smallholders constrained by limited land, treadle pump technology works as a land augmenting intervention, enabling users to raise crops in both summer and winter, thereby increasing overall cropping intensity;
- treadle pump technology enables farmers to grow high-yielding varieties such as Chinese rice and high-value crops such as vegetables); and
- the technology increases crop yields. For instance, in Uttar Pradesh and north Bihar, treadle pump users had average potato yields of 16–17 t/ha, a level 60–70% higher than those of diesel pump users.

As a result of improvements in these intermediate variables, the study estimates that farms using treadle pump technology see an average increase of $100 per year in annual net income with gross incomes of $300–400 per acre quite common. Net incomes with use of the technology did, however, vary across households and regions. International Development Enterprise (IDE), a US-based NGO that developed and promoted the technology, claims to have sold 1.3 million pumps since the mid-1980s in Bangladesh, and 200,000 in eastern India and the Nepal Teri since the mid-1990s. IDE indicates that, "eastern India and the Nepal Teri have an ultimate market potential for some 10 million treadle pumps. If and when IDE does saturate this market potential, it will have probably accomplished one of the world's biggest and best-targeted poverty reduction interventions, by increasing the net annual income of South Asia's poorest rural households by a billion dollars" (Shah, et al. 2000).

Examples of Pro-Poor Interventions

The case studies presented above demonstrate linkages between agricultural water and poverty at the system and household levels as well as the implications for poverty reduction. Based on the results of our recent fieldwork, we now outline examples of intervention strategies that have a potential for increasing the benefits the poor receive from irrigation systems, thereby improving the lives of the most vulnerable.

Institutions and technologies: Pakistan's Chaj Subbasin

> A major breakthrough in wheat yield: When the crop assessment official announced from the rostrum that the average wheat yield had gone up to 51.62 maunds per acre, the jampacked **pandal** for the "farmers' day" broke into loud and spontaneous clapping (Dawn, 26 April 2000).

In 1998, the Food and Agriculture Organization (FAO) introduced productivity enhancing interventions (for experimental and demonstrative purposes) at selected sites in Punjab. The interventions included creating new institutional frameworks (organizing farmers into farmers organizations) and supplying technological packages (providing inputs such as new seed varieties, fertilizers, farm equipment, information on timings and quantities of input use, and introducing measures such as laser land leveling). The farmers organizations (FOs) were provided the following inputs/services:

- farm implements and equipment for use by members as well as for renting out to nonmembers, with revenues used to build and strengthen the FO Fund;
- fertilizers and improved seed varieties to members at half the cost under the condition that the inputs be used at the recommended quantity and time;
- laser land leveling for members; and
- agricultural extension services through the appointment of an agricultural extension advisor.

This combined technological and institutional intervention package resulted in significant improvements in overall farm management, cropping intensity, and crop yields. Land leveling enabled farmers to save water and increase the irrigated area by 15–20%. IWMI's study in the Chaj area suggests that wheat yields have significantly increased (more than doubling from 2 t/ha to over 4 t/ha), resulting in improving food security at both the community and household levels. This example shows how the interactions of institutions and technologies can create an enabling environment and opportunities for the poor to improve their livelihoods and food security as well as reduce poverty.

Community Initiatives: An Example from Indonesia

Pasir village, situated near Semarang in Central Java, is located at the tail end of the middle reach of the Klambu Kiri irrigation system. The village is home to 2,050 residents, has a total area of 929 ha and average landholdings of 0.3–0.6 ha. The village is fully agriculture dependent, with no industry or other non-farm activities. Given its location within the irrigation system and with no suitable quality groundwater available, the village was once faced with the classical tail-end problem of water shortages. However, the village took the initiative collecting funds from community members to build infrastructure that will divert and use drainage water previously flowing to the sea. With the increased availability of water, land is now cultivated three times a year.

About two thirds of the area are cultivated with high-value crops, such as onions and chilies, with the remaining third in paddy. Crop yield is high at 7–8 t/ha for onions, 1 t/ha for chilies, and 6–7 t/ha for paddy with production taking place at reasonably profitable rates. Traders come to the area to buy produce that is then

transported to Semarang and even Jakarta. Demand for labor has significantly increased, especially during sowing and harvesting seasons, with wage rates ranging from Rp20,000 per day for female labor, to Rp40,000 per day for male labor. The availability of water and the increased economic productivity of water through crop diversification have brought enormous prosperity to the village. Poverty has disappeared, the village is fully food secure, and no village residents are now accepting food from the government social safety net program.

Response to Water Scarcity: Madhya Pradesh, India

In Madhya Pradesh, India, farmers have adopted unique cropping patterns in response to water scarcity. In most parts of the state during the rabi season, farmers allocate a significant part of their farm area to less water and fertilizer demanding wheat varieties (e.g., non-Mexican varieties requiring only 1–2 irrigations per season as compared with Mexican high-yielding varieties requiring 4–5 irrigations per season). While the yield of the less water-intensive varieties is generally lower than high-yielding Mexican varieties, production costs are lower and sales prices higher (due to a taste preference for breads made with traditional varieties), resulting in overall returns similar to or even higher than those from high-yielding varieties. The major pro-poor feature of the technology is the cultivation of traditional varieties, which require less water and lower cost of production.

An Innovative Approach to Promote Equity: The Dual Canal System in the Ruhuna Basin, Sri Lanka

Upstream-downstream inequity, commonly known as "head-tail" inequity, in water distribution is a classical problem in most surface irrigation systems. There is evidence that the problem exists even in relatively small systems such as those in Sri Lanka (smaller relative to systems in, for instance, India and Pakistan, where the problem of inequity is much more severe). In the absence of alternative sources of water (e.g., groundwater), head-tail inequity in water distribution translates into differences in productivity levels and inequity in farm incomes, with those having better access to water (e.g., head-enders) generally economically better-off than those at the tail end.

In response to growing water scarcity, and specifically to address head-tail problems in the Walawe Left Bank (Ruhuna Basin) of Southeast Sri Lanka, an innovative approach known as the "dual canal system" was introduced in the tail-ends of the existing irrigation systems and in a newly developed area further downstream that forms part of Sri Lanka's resettlement program.

Under the dual canal system, mini-water storage tanks with a command area of about 80 ha were designed based on the topography of the area. Some tanks have their own catchments while others are fully fed by distributary or branch canals. Each tank has four sluice gates to regulate water supplies in four lined distributaries, two each for paddy and upland crops. Farmers in the paddy canal command are given 1 ha of land while upland crop farmers are given 0.8–0.9 ha (returns from upland crops are higher than those from paddy). In addition, each farmer is allotted 0.1 ha for a homestead. Farmers in the paddy canal command can cultivate paddy, a water-intensive crop, or less water-intensive upland crops,

while farmers in the upland canal command can only cultivate upland crops (with the exception that a small paddy plot is allowed for home consumption to ensure household food security). Water supplies in paddy canals is 24 hours, while that in upland crop canals is for only 12 daytime hours. The system promotes user participation in water management. While the system is quite new and its success and effectiveness remains to be seen, overall water management within the system is considered better than in conventional canal systems and early indications suggest that the approach has significantly improved the equity of water distribution, with almost all benefits accruing to poor areas.

Community Sharing of Land and Water: The Bethma System in Sri Lanka[5]

Dry zone villages in Sri Lanka have traditionally been located near man-made tanks. Water was distributed from the tank outward, toward paddy fields divided into three echelons where each household in the village maintained holdings. During water-rich periods, water was distributed to all fields within the system, while in drier periods the echelons farther from the tank were allowed to go fallow. This arrangement, known as the Bethma system, helped ensure not only optimal use of available water supplies, but also maintained equity across households. A variation on the traditional system is currently being followed in modern systems managed by the Mahawelli Authority of Sri Lanka in an effort to promote long-term equity among farmers and ensure household food security. In normal years, land use rights are not allocated according to the Bethma system. However, in dry years those farmers located further downstream in the irrigation systems with locational disadvantage in water access are temporally reallocated to land in the upper reaches. Simultaneously, those farmers whose plots were located in the upper portion temporarily sacrifice some of their holdings, thereby sharing the costs of any water shortage. While not equivalent to the former system, the use of concepts from the traditional Bethma system provides an innovative example of how traditional concepts can be used to increase equity in modern irrigation systems.

Enhancing Antipoverty Impacts of Irrigation

Based on the material presented in the case studies and a review of global literature, we identify the following factors that will determine the direction and magnitude of antipoverty impacts of irrigation. While impacts of irrigation on poverty reduction will vary by agro-climatic regions and institutional settings, these are essentially the generic conditions that will determine the magnitude of the impact of any irrigation intervention on poverty

- (in)equity in land distribution;
- irrigation infrastructure condition/management;
- irrigation water management/allocation, and distribution policies, procedures, and practices;

[5] Extracted from note on Inter-temporal Reallocation of land to address the problem of Water Scarcity: The Case of Bethma in Sri Lanka by Samad, Madar, Parakrama Weligamage and Bandula Senaviratne. Note prepared for the Dhaka Meeting on Water and Poverty Initiative, led by the Asian Development Bank, 22–26 September 2002.

- type of irrigation technology;
- quality of irrigation water;
- production/cultivation technologies; cropping patterns, extent of crop diversification; and
- support measures (e.g., input and output marketing, information, etc.)

The antipoverty impacts of irrigation can be enhanced by creating conducive conditions that could achieve *functional* inclusion of the poor. These conditions include

- equitable access to land;
- integrated water resources management;
- access to and adequacy of good quality surface and groundwater;
- modern production technology;
- shift to high-value market-oriented production;
- opportunities for the sale of farm outputs at commensurate prices but at low transaction costs; and
- opportunities for nonfarm employment.

To the extent these conditions or enabling environments are lacking or imperfect, on-ground benefits of irrigation to the poor would continue to be discounted. For instance, in settings with high degree of inequality in land distribution, irrigation would have lower impact on poverty, as water rights and potent benefits are virtually tied to landownership. Lack of ownership or formal land titles and poor-insensitive land tenure systems, as is the case in many developing countries, result in *self-exclusion* for the poor, such that benefits of public irrigation accrue mainly to fewer landholders. Even if landholdings are equitable, as is the case in irrigated land resettlements in Sri Lanka, when irrigation resources are poorly managed, or access to complementary production inputs (agro-chemicals and credit) is poor, the impact of irrigation interventions on poverty is likely to remain small. Even if the first two conditions are met, but canal water supplies are inequitably distributed or inadequate, and opportunities for conjunctive use of groundwater are constrained due to its poor quality or high abstraction costs, possibilities for reaching out to the poor through irrigation will remain minimal. A shift from low-value subsistence production to high-value market-oriented production is the next step to the road out of poverty, as it is a key driver of income diversification and risk management. Similarly, newer production technologies and crop varieties, geared to suit small farmers and fit small plots, are a must for pulling the poor out of poverty through irrigation. Even if all these aforesaid conditions are met, when poor farmers remain unable to sell their bumper harvests in distant markets, due to market imperfections or high transaction costs, actual benefits of irrigation to the poor will fall short of their potential. Existence of employment opportunities outside the farming sector, especially in areas with high land-to-man ratios, would further help diversify incomes, minimize risk, and reduce poverty. In short, it is the "package" that matters for effective poverty reduction and not the mere supply of irrigation water.

Concluding Remarks

There are strong direct and indirect linkages between irrigation and poverty. Direct linkages operate via localized and household-level effects, and indirect linkages operate via aggregate or national-level impacts. Irrigation benefits the poor though higher production, higher yields, lower risk of crop failure, and higher and year-round farm and nonfarm employment. Irrigation enables smallholders to adopt more diversified cropping patterns and to switch from low-value subsistence production to high-value, market-oriented production. The transition to the market economy integrates the poor into land, labor, and commodity markets and empowers the poor by putting them at a level playing field with other market entities, including the non-poor. Increased production makes food available and affordable for the poor. The poor and the landless are main beneficiaries of low food prices as they are net buyers of food.

Indirect linkages operate via regional, national, and economy-wide effects. Irrigation investments act as production- and supply-shifters, and have a strong positive effect on growth, benefiting the poor in the long run. The magnitude of indirect benefits could be many times more than the direct and household-level benefits. Further, irrigation benefits tend to fall more squarely on the poor and the landless alike in the long run, although in the short run, relative benefits to the landless and land-poor may be small, as the allocation of water often tends to be land-based. Allocating water to the land and not to the households, is inherently biased against the landless. Despite that, the poor and the landless benefit, in both absolute and relative terms, from irrigation investments. Recent advances in irrigation technologies, such as microirrigation systems, have strong antipoverty potential.

Ongoing studies in Asian countries document strong evidence that irrigation helps reduce permanent and temporary poverty. Further, it helps reduce poverty in its worst forms, namely chronic poverty. This supports the view that irrigation is productivity enhancing, growth promoting, and poverty reducing.

The benefits of irrigation to the poor can be intensified by affecting broader level and targeted interventions simultaneously. Interventions should focus on reaching out to the poor through improved economic, policy, institutional, and governance measures. Generating a knowledge base through multicountry studies on constraints to productivity in irrigated agriculture is the first step to help identify the opportunities to serve the poor.

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6

Integrated Management of Water, Forest, and Land Resources in Nepal: Opportunities for Improved Livelihood[1]

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Summary

Successful activities by both forest users' groups (FUGs) and water users' groups (WUGs) make important contributions to the livelihoods of the people in Nepal. This study explores the possibility of integration or establishing linkage between these two that could have direct impact on reducing poverty at local level. The findings of this study are based on fieldwork carried out in two catchments in western Nepal. Initial field study found that FUGs and WUGs have high impact on local livelihoods, community affairs, and socio-institutional aspects. There were no significant differences observed in FUG and WUG management at the two catchments except for the kinds of conflicts/ problems that are inherent in big and small irrigation systems. The positive impacts of these institutions could be multiplied considerably if the two can be integrated or their activities coordinated or linked at the catchment level. It is observed however, that challenges do exist, which need to be addressed to cash in on the opportunities for the integration of these two institutions.

Introduction

Integrated natural resources management (INRM) at the catchment level has been evolving together with concepts of integrated water resources management

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(IWRM). Despite the increased thrust in international meetings and policy forum on the need of basin-level planning and application of IWRM, literature that provides a solid understanding of the integration process at the catchment level in developing countries is limited. In addition, actual cases of the IWRM framework at local level are inadequate in South Asia including Nepal, albeit the consensus at the national policy-making bodies for the need of IWRM framework exists.

In this context, this study tries to document the existing interaction process that links FUGs and WUGs at the catchment level and explores the possibility of integrating their activities. It is believed that the integration of activities of FUGs and WUGs at the catchment level could lead to better management of these resources for the increased and wider benefit to the community. The integration/ linkage is also expected to resolve various existing intra- and interinstitutional conflicts and hence facilitate other developmental activities that support rural livelihoods. The major objective of the study is to learn community-based strategies for the sustainable management of water, forest, and land resources at the catchment level, through the experience of FUGs and WUGs, to identify potential areas for action research based on this assessment.

Research Approach

The research was conducted in two irrigation systems—Begnas irrigation system and Bhanushera irrigation system in Kaski and Tanahu districts, respectively, at the two catchments in the two districts[6] of Gandaki River Basin in Western Nepal (Figure 1). Research sites were selected in consultation with respective district irrigation offices (DIOs) and district forest offices (DFOs). The irrigation system was taken as the selection unit because of the impracticability of studying a large number of FUGs and WUGs present in the catchment due to the exploratory nature of the study and availability of resources.

During the field visit, quantitative and qualitative data were collected at the catchment and household levels. Quantitative data focused at generating information at the household level. A questionnaire consisting of inquiries on household livelihood status and their relationship with FUGs and WUGs was designed. A total of 30 households were surveyed by appointing two local facilitators in the Begnas Irrigation Project area. The information for the Bhanushera Irrigation Project was collected through group discussions and secondary sources. Qualitative data mainly focused on collecting information from community stakeholders during group discussions. Direct observation of the local conditions of the resources that entailed visiting forest and irrigation canals also formed part of the qualitative assessment. Few PRA methods like resource mapping, oral histories on resource use pattern, and land use changes, etc. were also utilized.

Profile of the Study Sites

The Irrigation Systems

The construction of the Begnas irrigation system with a command area of 580 ha was initiated in 1984 and was completed in 1988 by the Department of Irrigation (DOI) under loan assistance from ADB. Three-tier WUGs are formed to manage this irrigation system and management transfer to the user groups is under way. The canal network of this irrigation system did not include the 157

Figure 1. Location Area of Study Sites

ha of land at the tail end, which has continued to be the most contentious issue in the catchment.

The Bhanushera irrigation system on the other hand, is a small farmer managed irrigation system (FMIS) with a total command area of 20 ha. Two years ago, DOI assisted in renovating and extending the canal network at the request of users, after which the users formally registered WUGs. The community now manages the entire system and there are no management controversies among users.

The Forest Users Group

Seven FUGs were studied, including five in Begnas and two in Bhanushera—all near the irrigation systems. The profile of the FUGs (Table 1) indicates that some FUGs were as old as 12 years and some were recently formed.

Existing Land Use Pattern

The studied catchments are undergoing rapid land use changes enforced by new market pressures in the region. The total area is much larger (1,130 ha) in the

Table 1. List of FUGs Studied in the Two Catchments

Catchment	Name of FUG	District	Location	Date of Formation	Area (ha)	Total Members (HHS)	Forest-Dependent Population (%)	Main Forest Species[a]
Begnas	SaunePani Bareli	Kaski	Lekhnath Muncipality–9	1990	16.0	NA	50	Sal, Chilaune, Katush
	Syankhudi Simle	Kaski	Majthana–6	1990	29.8	52	50	Sal, Chilaune,Katush
	Panch Bhaiya	Kaski	Lekhnath Muncipality–11	1997	235.3	378	75	Sal, Chilaune, Katush
	SaunePani Thantdanda	Kaski	Lekhnath Muncipality–8	2001	NA	NA	20	Sal, Chilaune
	Malmul	Kaski	Lekhnath Muncipality–13	1996	115	170	25	Sal, Chilaune
Bahnu-shera	Ahal Danda	Tanahu	Bandipur VDC–4	1994	156.6	150	90	Sal, Chilaune, Katush
	Chandisthan	Tanahu	Bhanu VDC–5	2002	35.7	135	100	Sal. Chilaune

NA = data not available.
[a] Castanopsis indica (katus), Schima walichii (chilaune), Artocarpus intergra shorea robusta (sal).

Begnas catchment than that of the Bhanushera catchment (75 ha). The construction of irrigation systems and delineation of community forest area have also brought changes in land use pattern in the catchment.

The forest area in both catchments indicates users' awareness of resource conservation and utilization as it covers almost one third of the area. The irrigation intensity in Begnas area is almost double compared with the latter. This shows that land resource is more productively used in the Begnas catchment due to availability of irrigation facilities and there is possibility of productive use of land through irrigation expansion in Bhanushera.

Land Tenure and Farm Size

In the catchments, land tenure and farm size distribution determine the well-being of a farmer. A farmer with no land or small size of land is often the poorest. Though large landholding is not always the representative of the rich, it certainly indicates that the farmer is socially and economically better positioned than others in the community. Table 2 depicts the land tenure and farm size distribution in the two catchments.

Among the total 550 households in the Begnas catchment, a large proportion (65%) owns the land and a majority (58%) are small farmers having less than 0.5 ha of land. The percentage of large (1.0–1.5 ha) and medium landholders

Table 2. Land Use Pattern in the Study Sites

Land Use Type	**Area** (ha)		**Land Use** (%)	
	Begnas Catchment	Bhanu Shera Catchment	Begnas Catchment	Bhanu Shera Catchment
Irrigated Land	580	20	51.33	28.57
Rain-fed Land	154	20	13.63	28.57
Forest/Scrubland	315	20	27.87	28.57
Grazing Land	81	15	7.17	14.29
Gross Command Area	1130	75	100.00	100.00

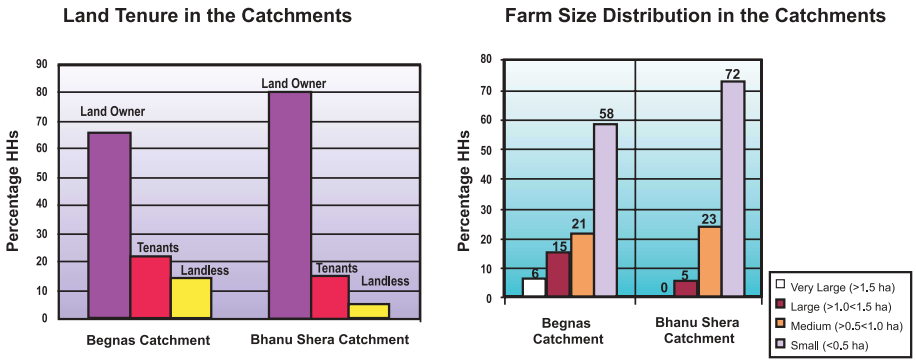
Source: District Irrigation Office, Kaski and Tanahu districts.

(0.5-1.0 ha) is also significant, with 21% and 15%, respectively. Likewise, many households are tenants (21%) and landless (14%). Nevertheless, the percentage of very large owners is quite small (6%). From the data of 53 households in the Bhanushera catchment, it can be derived that comparatively, there are numerous landowners in this catchment (79%), majority (72%) of which have small land, indicating more equitable access to land resource. The percentage of large farmers having more than 1.0 ha of land is negligible in this catchment.

The presence of a large number of small landholders in both catchments explains that a majority of households have low food sufficiency levels. Small landholders in the catchments either share crop or rent farmlands from large landholders for additional supply of food to their families. A large percentage of small landholders is hence also indicative of the poverty level of the catchments and their dependence on natural resources.

Ethnically, the community in the Begnas catchment is more homogenous as one upper caste (Brahmin) group is dominant (57%) followed by other upper caste groups (23%). Therefore, these groups are more influential in decision making in the community. In this particular case of a dominant group prevailing, other caste groups appear to accept that major decisions regarding community affairs are made by the dominant group. In contrast, the community in the Bhanushera catchment is more heterogeneous, and Newar and Magar (38% and 32%, respectively) are in the majority compared with the two upper caste groups. Thus, the dominance of one group is not prevalent, indicating a more egalitarian decision-making process in the community.

Figure 2. Land Tenure and Farm Size Distribution



Source: Field survey 2002.

Impacts of FUGs and WUGs

The success stories of FUGs and WUGs indicate that these groups have considerable impacts on livelihoods, environment, community, and socio-institutional aspects in the village. An effort was made to assess the effects of these changes.

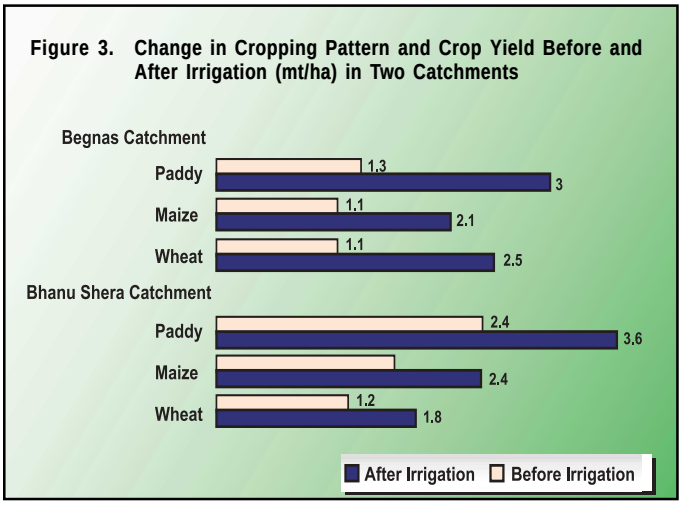
Livelihood Impact

At both catchments, agriculture has predominance in maintaining household living. In the Begnas catchment, 86% of households had agriculture as the main income source. Besides agriculture, 23.3% and 16.6% of households have small-scale businesses and services, respectively, as auxiliary income source. In Bhanushera catchment, 90% of the respondents (from group discussion) had agriculture as the main source of income and 25% of them had other auxiliary sources of income such as small-scale businesses and private/government services.

Agricultural production shows a significant difference before and after the irrigation system. Before the construction of the irrigation canal in the Begnas area, paddy production was only 1.3 metric tons per hectare (mt/ha), but soon after construction of the irrigation canal the production increased to 3.0 mt/ha. Correspondingly, production of maize and wheat also increased. The results are similar for Bhanushera catchment where renovation of the traditional irrigation system helped increase the production of paddy and other crops significantly.

WUGs in the catchments reported that increased availability of irrigation water has resulted in good agricultural productivity. Cropping pattern of rice, wheat, and maize as main crops however has not changed, but cropping intensity has increased after the irrigation scheme was constructed. Cropping intensity in the Begnas catchment has increased to 200% from 129% after the completion of the irrigation scheme (DIO, Kaski District) and improved farming systems through active promotion from NGOs and international NGOs (INGOs). This is supported by the increase in the use of chemical fertilizers, as reported by the respondent households in the Begnas catchment. From the 30 surveyed households, it was found that on average, a household uses chemical fertilizer in

Figure 3. Change in Cropping Pattern and Crop Yield Before and After Irrigation (mt/ha) in Two Catchments



Source: Field survey 2002.

the ratio of 0.4 kg per *doko* (equivalent to 25 kg) of animal manure. Few farmers have initiated large-scale coffee production and fruit farming.

Poorer families in the catchments reported that after improvement in the irrigation system, opportunity for wage employment (mainly in big landholders' farmlands) has increased. Besides, renting land from big landholders by poor and small farmers has increased due to less involvement of people from upper class in agriculture activities. Due to increased opportunity of wage employment, they have been able to buy more food. However, their overall living conditions have not changed significantly.

The requirement of fodder, firewood, litter, and timber determines the household's dependence on forest resources. In the Begnas catchment, 38% of the FUG member households reported that they are highly dependent on forest resources. They make frequent visits to the forest to gather firewood and fodder. Respondents also indicated that they could bring as much quantity of firewood for household consumption as they need, but they cannot sell firewood in the market. About 42% of households claimed to be partially dependent. They mostly bring fodder for livestock and occasionally (once in a year) apply to the FUG committee for timber. The rest of the member households (20%) expressed that they are not dependent on the forest at all. They use LPG or biogas for cooking, do not keep livestock, and have modern houses of bricks and cement. They have taken membership to FUGs for unforeseen benefits that may arise in future. The less dependence in forest products is also due to the tree plantation, as 60% of the total respondents (30) reported to have more than 10 trees on their own land. The presence of many trees can be attributed to the large landholding size. This further shows that farmers with large holdings tend to be less dependent on forest resources compared with small farmers and the landless. *Alnus nepalensis* (utis), *Castanopsis indica* (katus), *Schima walichii* (chilaune), *Artocarpus intergra* (katahar), *Shorea robusta* (sal), are the type of trees chiefly planted by households, which are mainly for fodder and timber.

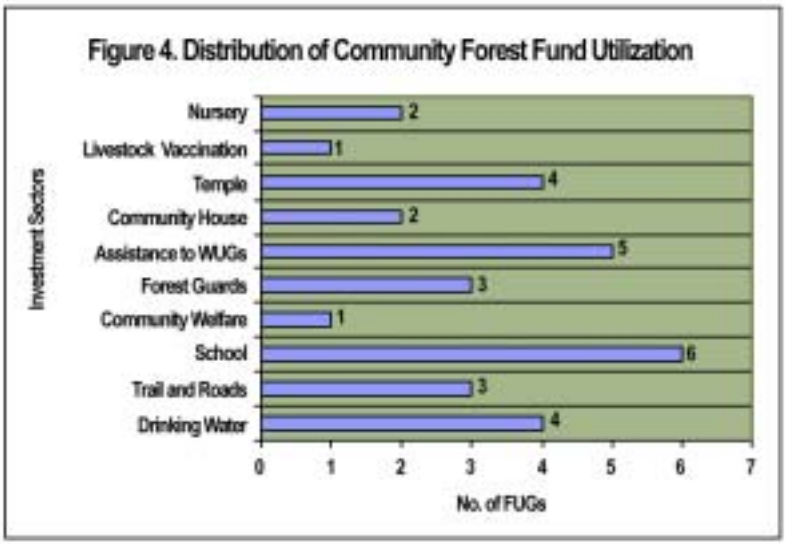
At the study sites, households including those who have switched to LPG for cooking were still bringing firewood from the forest for cooking livestock feed.

Income generation for the poor family from nontimber forest products (NTFPs) in forests has also not been achieved at the study sites. Consultation with FUGs revealed that there is high potential for income generation from NTFPs in forests of both catchments. Different kinds of herbs and sal leaves could be a very good income source for the poor. However, the FUG members cannot identify important and useful herbs in the forest and also do not know the extractable limits for the ones they can identify. In some cases, they are unaware of the market values of NTFPs they extract. This has led to underutilization of NTFPs and hence, a potential income source for improving the livelihood of the poor is being lost.

Community Impact

Of the seven FUGs studied in the two catchments, six had invested some amount of their fund for upgrading and building infrastructures of local schools. Another major investment of the community forest (CF) fund (five FUGs in total) was found to go into assisting WUGs. FUGs either contributed cash or supplied timber from forests for maintenance of irrigation canals in the village. Drinking water and temple construction were the other main sectors where four FUGs had already made some investments. The CF fund was used for either maintaining the already existing drinking water scheme or launching a new one. Most drinking water sources that originated from CFs were protected by FUGs. Similarly, the community also prioritized trail and road construction and the appointment of forest guards where considerable CF fund was utilized by three FUGs. One of the FUGs was well ahead of the others in investing in community welfare and livestock vaccination programs in the village. A community welfare program was targeted to assist poor users who could not go to health posts during illnesses or spend even on death rituals.

The largest portion of the WUGs' collective funds was used for regular O&M of the irrigation system. Irrigation systems need year-round maintenance, which leaves WUGs less opportunity to invest in development programs in their villages. The discussion above indicates that the FUGs' role in income generation through



Source: Field survey 2002.

investment in various community activities has been beneficial for poor households in the community. Further, their contribution to the maintenance of irrigation systems has had a direct bearing on the livelihoods of the people dependent on agriculture. Investments in other social and economic activities have promoted cohesion among various groups, as well as furthered social development in the community. This is important in coordinating and integrating WUG and FUG activities in the future, which would have direct impact on the livelihood of the people.

Environmental Impact

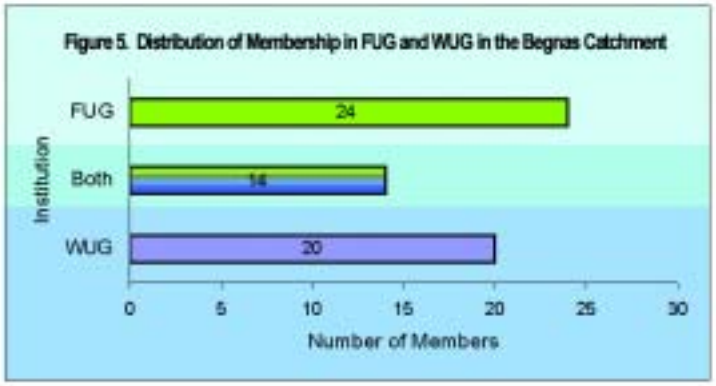
Environmental impact was measured in changes in resource quantity and quality before and after the emergence of FUGs and WUGs. Oral histories from elderly persons at the study sites provided valuable information on changes in resource use patterns and conditions. These insights formed the basis for assessing ecological impacts. With agricultural intensification at study sites, small irrigation systems management by communities are increasing in number. Correspondingly, informal WUGs are also increasing. In Begnas and Bhanushera catchments, users affiliated to WUGs and FUGs reported that water availability and forest conditions have improved over the years. User groups in their villages have started regular O&M of the canal system and regulation of forest products. Overharvesting of grass and fodder, irregular and illegal felling of trees have declined in both catchments. Users indicated that after the forest was handed over to them, it became thick and that firewood, fodder, and leaf litter availability in the forests has increased. In the Malmul FUG of the Begnas catchment, a separate grass committee within the FUG has been formed to regulate the distribution of grass among users due to its increased demand. Many users have started planting fodder and timber trees in their farmland, which has reduced the pressure on community forests.

Socio-Institutional Impact

Membership in WUG and FUG

At the study sites, communities consisted of members who were affiliated with either one or both the institutions. Since there were many FUGs in a catchment, households had membership in at least one FUG, whereas only those households having land in the command area were members of the WUG. Considering this, members of FUGs and WUGs were overlapping. Figure 5 presents how WUG and FUG members overlap in the Begnas catchment.

Of the total 30 respondents in the Begnas catchment, nearly 50% are common members of both FUG and WUG. Unlike WUG membership that requires landholding in the command area as the principal criterion for membership, FUG membership is flexible, allowing membership to various categories of households (e.g., forest-dependent households that live close to the forest and partially or nondependent households that live far from the forest). Many FUG member households become members even though they are not dependent on forests for firewood and fodder. Many seek FUG membership due to consideration of future requirement of timber for construction. As FUG membership requires only an entrance or membership fee, many households become members. The



Source: Field survey 2002.

cost of participation of these households is, therefore, only the membership fee that they pay to the FUG. However, the cost for members that do not contribute actively into the management of forest is higher than those who are actively involved in forest management. Participation in group meetings in FUGs was higher (87.5%) compared with the WUG (60%), indicating users interest in the FUG due to the wide range of activities it is undertaking for the community's benefit.

Gender Participation

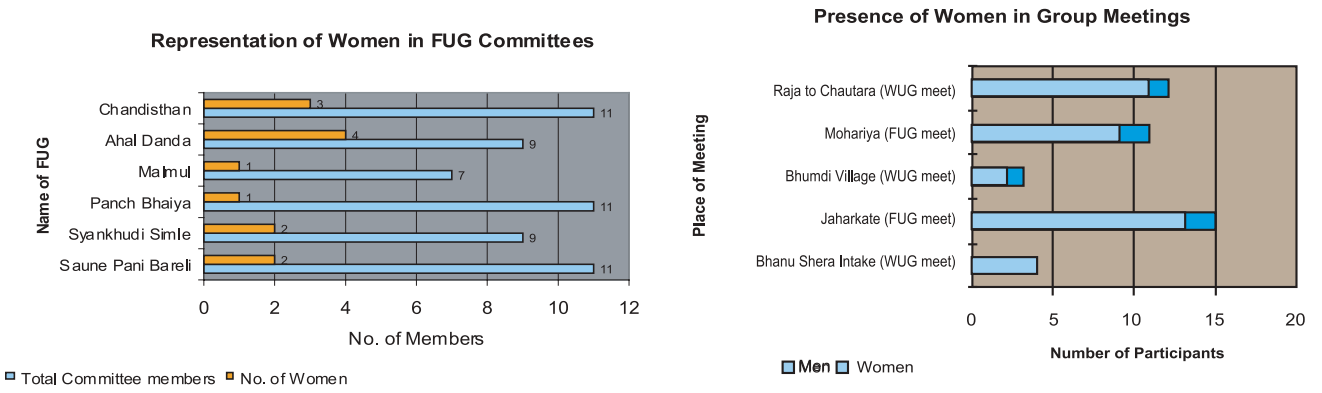
Equality in the roles of men and women in FUGs and WUGs was primarily determined by their representation in the committee and their role in the decision-making processes. The inclusion of women in one third of the total committee positions has been a rule in recent years. This rule, however, has been least followed by the majority of FUGs and WUGs at the study sites (Figure 6). In only two FUGs in the Bhanushera catchment do women hold one third of positions on the committee, and positions held by women were mainly that of ordinary members with less responsibility. Men filled the important positions such as that of chairperson, secretary, treasurer, etc.

Women's representation in WUG committees is no better than in FUGs. Only in the subcommittee of the Begnas WUG (Begnas-1) does the committee comprise onethird women. One WUG committee (Begnas-3) does not have a single woman member. In spite of existing rules that require one third of the committee to be women, both in FUGs and WUGs, women are under-represented and do not meet this quota. Besides these issues on numerical representation of women in committees, women's participation in meetings where they were present was reported to be negligible. From member households, mostly men attend committee and general assembly meetings. In only one of the surveyed households did the respondent say that his wife attends the meetings. This trend of only men attending meetings was evident during group discussions where women's presence was minimal. Where women were present, they did not speak until questions were specifically directed at them.

Equity in Benefit Sharing

The successful institutionalization of FUGs and WUGs depends on how effectively equity issues, mainly usufruct rights and benefit sharing among users, are addressed

Figure 6. Distribution of Women in FUG and WUG Committees



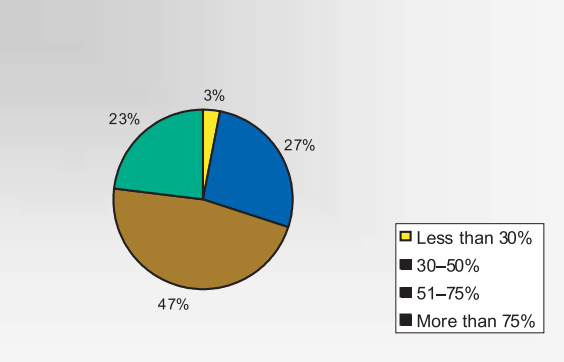
Source: Field survey 2002.

by them. At study sites, usufruct rights and benefit sharing mechanisms in FUG and WUG were complex and differed in nature. As land tenure rights are a prerequisite for getting benefit from irrigation water, equity between members with small and big landholdings and users at the head and tail is the chief concern. For instance, in the Begnas catchment, very few households (3%) reported that less than 30% of their land receives irrigation (Figure 10). However, a majority reported inadequate irrigation received (51–75%) in their field and nearly 25% of households reported having received irrigation for more the 75% of their land. Interestingly, 50% of the total (30) respondents indicated that they are not satisfied with the present management of the irrigation system in their village. It was interesting to note that all upstream farmers (15 respondents) expressed their satisfaction and downstream respondents expressed dissatisfaction.

There are fewer satisfied users at head end while dissatisfied users at tail end are reflective of the unequal access to the resource use. According to the users, this situation was partly due to lack of adequate consultation by DOI with the users while designing the project. Addressing the issue of inequality is more important in increasing the participation of the users in resource management. Initiation of on-farm water management practices in consultation with the farmers could help address this issue.

In FUGs, usufruct rights and benefit sharing among different members varied according to their differing dependence level on forest. Some users were highly dependent on forests and hence were actively involved in overall management. There were other sets of users who were partially dependent on forests. Few users were not dependent on forests at all. Benefit sharing by these different sets of users depends on the kind of contribution they give to forest management. Partially dependent users that do not actively contribute labor into forest management are liable to pay more cash for fodder and timber. Also, highly dependent users have priority over partially dependent users for getting any forest products. It is usually the poor in the society who are more dependent forest resources, as they are unable to spend for getting forest resources. Therefore, they also contribute more to the management of the forest.

Figure 10. Adequacy of Irrigation in Farmers' Fields



Source: Field survey 2002.

In some FUGs in the catchment, the equity issue appeared to be an inherent mechanism of a social change process. Some users who earlier were dependent on forest, in the course of the social change process, are no longer dependent on forest. Many members come from richer households who hold important positions in the FUG committee. After they opted out either from the committee or FUG, normally poor users who highly depend on forest take the opportunity to be a representative in the FUG committee.

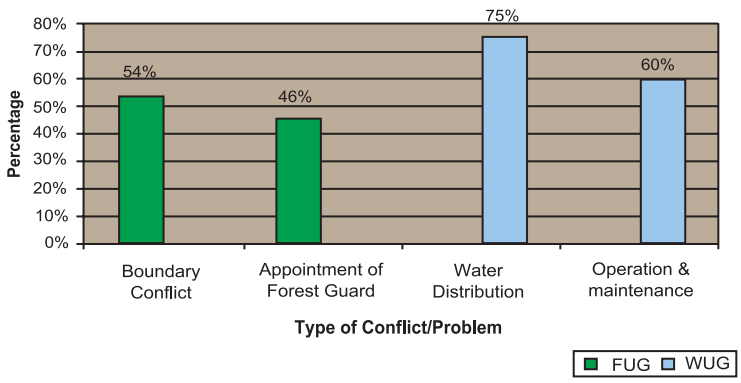
Intrainstitutional conflicts

Intrainstitutional conflicts or problems within FUGs and WUGs were of differing nature, most of which arose from the respective resource nature of forest and water. Of the total 24 FUG members at the study sites, a majority (54%) cited boundary conflict as the major problem existent in their FUGs (Figure 11).

Boundary conflicts arose mainly from the encroachment of forestlands by adjacent private landholders. In one FUG, members said that landless immigrants from different parts of the country encroached on the forestland.The rest of the respondents (46%) mentioned problems like the rising number of temporary users due to market expansion, irrigation canal, and road construction through middle of forestland, etc. In another case, a new FUG was formed after it separated from a previous FUG. The reason for the separation was the users managing the forests came from two different hamlets (wards) of the same village development committee (VDC), reflecting the effect of political boundary in the management of the forest.

A majority (75%) of WUG members cited water distribution among users to be the main problem. Conflict over equal or fair distribution of water between head- and tail-ender communities was existent in two of the three WUGs studied. The respondents also indicated that community cohesion for the O&M of the irrigation canal was another major problem in the WUGs. Members were reluctant to contribute cash or labor for the maintenance of the irrigation canal in the case of the large irrigation system, Begnas IP. This sort of problem was not exhibited in the small irrigation system, Bhanushera. Majority of the users believe that the

Figure 11. Conflicts in FUG and WUG



Source: Field survey 2002.

DIO that had invested in the canal construction should maintain the canal system, indicating their reluctance or inability to contribute to the system's O&M.

Interinstitutional Conflicts

Under the current situation of resource management at the study sites, sectoral institutions were increasingly found to enter into conflicts with each other. For instance, within the boundary of the Chandisthan FUG in the Bhanushera catchment, the Karnalitaar WUG also has its source and alignment passing through this community forest. Users of the Chandisthan FUG think that careless lying of hume pipes on the Karnalitaar irrigation canal is the main cause of landslides in their forest. Coordination of their activities, which is lacking at present, could be beneficial to both user groups in this respect.

Integration of WUG and FUG Activities: Challenges, Opportunities, and Benefits

Discussions in the preceding sections reflect that the water and forest resources at the local level are managed separately, although these two resources have significant impact on the village livelihood. The main reasons behind this are the differences in the institutionalization process of these two resources management methods, as well as the sectoral focus of government plans and programs. However, lately it is realized that the integration of these two activities could help increase the benefit to the rural household in reducing poverty. Users found the idea innovative and useful for future management of these resources. The following paragraphs identify some challenges and opportunities for the integration of these two activities.

Challenges

The difference in the nature and structure of resources management and usufruct rights between WUAs and FUGs are a fundamental cause of the variation in functioning of these two institutions as well as their membership patterns and benefit sharing. The participation in FUGs is broad based, as a large number of

people who live surrounding the community forest boundary can be members of the institution. In WUGs, membership is limited to those who have land in the command area of irrigation. Therefore, socioeconomic diversity and differences in individual access and control over resources and degree of cooperation and conflicts between and among communities is an important aspect to be considered in the integrated activities at local level. Likewise, ensuring participation of the most vulnerable and disadvantaged groups as well as the fair distribution of benefits to them have remained as challenging as ever for the integration of these activities.

Other important areas for integration at the local level are dependent on provisions at the policy, legal, and institutional levels. Ambiguities at the policy level are manifested in the legislative provisions also. This is fundamental to the identification of rights, roles, and delineation of authority among various stakeholders involved in the management of natural resources. At the same time, the role of local elected institutions in INRM is also not explicit, which is impeding the coordination of natural resources activities at the local level.

Opportunities

During the group discussions, participants mentioned that maximizing the resource use that is available at the local level could help increase the income level of the people in the village. Since income from agriculture is not enough to support the family, the income from natural resources could greatly contribute to the income of poor households. For instance natural resources such as limestone, sand, and riverbed materials (gravel and stones), etc. that have not been utilized fully could benefit both groups. These resources can be extracted and used sustainably if WUGs and FUGs can be integrated or linked to draw an appropriate plan to do so.

Likewise, the use of NTFPs could be an important and regular source of income, if properly implemented. Users from both groups expressed their belief that the existing potential has not been fully tapped due to a lack of joint effort and integration, which could help overcome these problems. Further, the resource generation from additional sources could also help implement other community activities that would directly benefit the community's needy.

Users believe the integration would help better water management at the farm level through increased water availability and improved on-farm water management practices. This would help resolve some of the intra- and interinstitutional conflicts from rising competition for the use of resources (forest products and water). Increased cooperation between the two sets of users could facilitate increased interaction to solve these problems. Besides, enhanced cooperation between the two users would lead to better management of the available resources, thereby increasing benefit to the larger population by tackling problems of erosion, landslides, forest encroachment, and scarcity of drinking water.

Benefits

Participants of group discussions identified different benefits through the integration of the two institutions. Participants of group meetings mentioned that integration or linkage between FUGs and WUGs would increase cooperation, raise awareness among users, help in conflict resolution, and contribute to the

increased resource mobilization for the benefit of the community. Many participants indicated that integration of FUGs and WUGs would also improve their working relations with government agencies and can also help in coordinating government agencies.

Though users could not exactly tell about the nature of integration, they suggested that FUGs and WUGs should operate independently like it is now, but some activities can be coordinated by forming a higher level coordination committee represented by users from both groups. During the group discussion, participants also cited various conditions that need to be considered while looking for opportunities to integrate FUGs and WUGs. Participants highly emphasized the need to have the committee free of party politics.

Similarly, other important aspects as mentioned by users were inter-institutional learning and transparency in fund management. Users said that learning from each other's experiences in FUGs and WUGs could greatly help in bringing equity to the benefit sharing mechanism in both institutions. Users also expressed the need to prioritize women's and poor users' concerns while integrating the FUGs and WUGs.

Conclusion

FUG and WUG management units comprise groups of communities from different hamlets (wards), villages, VDCs, or districts, who are the most concerned with and dependent on respective resources from a group and who conserve, use and manage the resources for collective benefits. Also, their functions are institutionalized. The activities of both these institutions have considerable impact on the livelihood, community, and socio-institutional aspect of the people in the catchments. At the two catchments, the livelihood of people is greatly supported by forest and water institutions through increased agricultural activities and supply of firewood, fodder, and litter to the users.

Inequities in the distribution of benefit in WUGs and FUGs and need to be addressed. Forest and water resources have effected land use changes in the catchment with cumulative positive effects. Failure to reduce gender inequality as indicated by women's representation and participation at the decision-making level are the weaker aspects of these institutions.

The case study of the two catchments presented here demonstrates that certain aspects of FUGs and WUGs can be linked at the catchment level. Consideration of the challenges and opportunities in the management of these institutions could be the starting point of any linking opportunities between the two. Overcoming policy-level and management challenges are important integrating these two institutions. The opportunities available from sustainable harvesting and commercial utilization of NTFPs are vital for improved and sustainable livelihood of the people. Reduction and elimination of intra- and interinstitutional conflicts would contribute to enhanced management of these two resources for increased benefit to users. One important aspect of the integration of FUGs and WUGs could be the interinstitutional learning. Therefore, action research in some of these areas needs to be developed and conducted to explore the possibility of integration of these two institutions.

7

Water and Poverty: A Case of Watershed Development in Andhra Pradesh, India

Ratna Reddy, Malla Reddy, and John Soussan

Introduction

This case study of an inland and drought-prone district of Andhra Pradesh typifies the potential and the challenges of poverty-focused watershed development in a semiarid, low-resource, and high-risk environment. These are the conditions under which much of the future agricultural growth and poverty reduction in India will have to take place. In the state of Andhra Pradesh the government watershed-related policies and programs are enthusiastically implemented. The state is in the forefront as far as the watershed development program is concerned. The state has so far initiated about 7,000 watersheds covering about 3 million ha. This accounts for roughly a third of the land that needs treatment and a fifth of the total rain-fed area in the state.

Watersheds covered under different schemes are being implemented as per the guidelines of the 1994–1995 watershed development committee. About 85% of the watersheds are implemented through the government system and NGOs execute the rest. Studies show that the participatory approach used by NGOs results in higher economic and ecological impacts, a more equal spread of benefits, and better sustainability. This case study, based on some successful NGO-implemented watersheds, highlights that watershed development is a necessary condition, but not sufficient, for poverty reduction in arid and semiarid regions. It is observed that the impact of watershed development is conspicuous where watershed development has led to improved water availability. The study identified some complementary programs needed to make the watershed development an effective pro-poor program.

This case study highlights that poverty-focused policy interventions are crucial for maximizing the overall accomplishment and poverty reduction impact of watershed development. The paper recommends the following:

- Proper implementation of the watershed development is a prerequisite for better benefit flows toward poverty reduction. Care should be taken that scaling up the program should not be at the cost of intensive and participatory approach, which is critical for sustainable watershed management.
- Policy interventions that are complementary to watershed development are necessary to benefit the land-poor and landless poor men and women. These include dairying, promoting horticultural crops, establishing infrastructure

and processing facilities for their development (physical capital), etc., with a focus on development of human capital.

- Building up the capacity of the government agencies, NGOs, and Panchayati Raj[1] institutions involved in watershed development and management would effectively facilitate scaling up and speedy implementation of the program.
- Develope a package of poverty reduction-focused policies and programs such as supporting self-help groups, thrift societies, etc.
- Minimize inequities through more egalitarian institutional arrangements and legislation.

Background

The future of agriculture development and food security is critically dependent on the development of rain-fed agriculture. This is not only because these regions account for more than half of the total cropped area, but also because the productivity levels of the irrigated and green revolution belts are now saturated. As a result, returns to investment in agriculture are found to be substantially higher in the rain-fed regions vis-à-vis irrigated regions (Fan and Hazell 2000). Incidentally, the majority of the poor live in these regions. Therefore, development of these regions helps in solving the twin problems of poverty and agricultural production. Besides, it would help in reducing the regional inequalities as well.

While providing productive irrigation facilities to these regions is an effective solution, it would be a time-consuming (long term) and costly proposition given their geographical disadvantages. On the other hand, watershed development has proved to be the most suited technology for improving the conditions of these regions, at least in the short and medium runs. Watershed development helps in improving agriculture productivity of rain-fed areas through *in situ* moisture conservation, vegetative cover, increased availability of water, etc. It can also lead to sustainable irrigated agriculture in moderate rainfall (above 750 mm) conditions.[2]

This case study is an attempt to understand the potential of watershed development in addressing the issues of poverty reduction. The important issues in this regard include

- assessing the linkages between watershed development and rural livelihoods and poverty;
- type and nature of benefit flows accruing to various sections of the community: and
- challenges in making the watershed program pro-poor and sustaining it in the long run.

The study stems from the authors' long-standing experience in the region[3] and some intensive field visits and discussions with various sections of society, as well as other stakeholders in the program such as NGOs, administrators, policymakers, etc. The case study is located in one of the most drought-prone districts of

[1] A form of grassroots local government.

[2] However, this is not to suggest that watershed development is a substitute for irrigation development.

[3] In fact, one of the authors, Mr. Y. V. Malla Reddy, has been involved in the development activities of the region for the past 30 years.

Andhra Pradesh, i.e., the Anantapur district of the Rayalaseema region. The main focus here is on the watersheds that are implemented by the Rural Development Trust (RDT), a local NGO.[4] This case study is organized in five parts. A brief description of the case study region is presented in the following section. The linkages between watershed development, water, and poverty are explored on page 105. While impacts of the watershed development and other supportive programs on the poor are examined on page 110, the last section makes some concluding remarks and recommendations.

Description of the Case Study Area

Choice of Study Area

The government of Andhra Pradesh implements the central government watershed-related policies and programs enthusiastically on a wide scale. The state administration has identified watershed development as a key to promoting sustainable livelihoods for the poor. Andhra Pradesh is the forerunner and exemplifies what can be achieved in poverty reduction state initiatives in better watershed and water management. Its approach is unique as programs are implemented "top-down" with a "bottom-up" approach. The state has so far initiated about 7,000 watersheds covering about 3 million ha. This accounts for roughly a third of the land that needs treatment and a fifth of the total rain-fed area in the state. Therefore, Andhra Pradesh is a natural choice for understanding the links between poverty and watershed/water management initiatives.

The specific case study area, the district of Anantapur situated in the Rayalaseema region of the State, was chosen for two reasons. First of all, as a semiarid, low-resource, and high-risk environment with a high poverty incidence, it typifies the conditions under which much of the future agricultural growth and poverty reduction in India will have to take place. Such areas with rain-fed agriculture cover about 60% of the gross cropped area in India. Second, Anantapur represents some of the best-implemented watersheds in the state and hence provide the opportunity to assess their true potential for poverty reduction.

Physical and Socioeconomic Setting

While India is considered to be rich in annual rainfall and total water resources, water is spatially and temporally unevenly distributed. Andhra Pradesh is one of the states with less-than-average rainfall while within the state; Anantapur is the district with the least rainfall. The area is one of an undulating topography, poor soils, and a generally low resource base.

Over the years population pressure has added to the difficulties of this region characterized by high fragility and low carrying capacity. Moreover, of late, rainfall has become more erratic with its distribution, becoming unfavorable for crop calendars. Though average rainfall over the last 100 years appears to be stable or increasing, rainfall in the crucial months like July has declined (Hill 2002). Its geographical disadvantage provides little scope for surface irrigation facilities. As a result, Anantapur has the lowest proportion of area under irrigation (17%) in

[4] The study focused on the following villages: Guddella, Kadiridevarapalle, Mallapuram, and Marrimakulapalle.

the state. Anantapur district accounts for 4.79% of the state's population and 6.97% of the geographical area. It has only 10% of its area under forests as against 22% at the state level. Anantapur district has a higher percentage of small (26.3%) and semimedium-sized (25.9%) farms, compared with other Rayalaseema districts.

About 19% of its population belongs to scheduled castes (SCs) and scheduled tribes (STs), which is lower than the state average (22%). Its sex ratio (972/1,000) is the same as that of the state average. However, the sex ratio has declined during the last decade. The incidence of gender discrimination is expected to be relatively more acute here because of its low level of development. Similarly, the district has a literacy rate (56.7%) below the state average (61%) as per 2001 census. The figures are much lower in the case of female literacy (43.9% as against the state average of 51.2%). Health of the population reflects its poverty. A UNDP pilot study in the neighboring Kurnool district found half of a village's 473 people suffering from body ache, general weakness, anemia, and cough. Most illnesses among the SC population stemmed from malnutrition and chronic anemia. Diseases associated with poverty (e.g., tuberculosis) are on the rise. On most indicators, the people of Anantapur are worse off than the average of Andhra Pradesh.

As far as basic services are concerned, 97.29% of Anantapur villages have access to water. However, access is not in terms of potable, reliable, and safe drinking water supply with easy access. In fact, most habitations are reported to have poor quality water. About 64% of the villages in the district have access to post and telegraph facilities. Transport-worthy roads or all-weather roads connect 70.15% of the villages in the district. All the villages have access to electricity.

According to the 1991 census, 48% of the state's population are classified as "nonworkers" while 54% of Anantapur's population are "nonworkers." Anantapur has 17% of its population as agricultural laborers, compared with over 20% for the state as a whole. Incidence of poverty is the highest among the ST population (56.7%) followed by SCs (50.2%), backward castes (BCs) (45.5%) and other castes (OCs) (33.3%). The situation of SCs/STs and BCs are much worse in the district than the general situation in the state. In fact, 35.6% of the villages in Anantapur fall in the high deprivation category (income of less than Rs120.03 per capita per month). In the 1991 government survey on indebtedness, it was revealed that 45% of rural families are in debt, as against the state average of 18%. Drought is a major reason for this indebtedness.

Water Resources: Status and Linkages

In the study area, water resources, surface as well as ground, are limited. Rainfall is between 255 and 650 mm per year and falls mainly during the monsoon season (July–September). Rainfall data confirm what local people say, that rainfall patterns have become more unpredictable. The result is crop failure with only the 2000–2001 season giving a reasonable crop in the last 5 years. Even then, late rains damaged the groundnut crop in certain areas. Some localities have ephemeral streams or rivers. Villagers have, from time immemorial, had common access to tanks and open wells, some of which are still in use. There is a clear link between surface and groundwater resources. Rainwater is traditionally harvested by diverting surface water flows into tanks, open wells, and into the groundwater through specific infiltration areas. Most people in Anantapur district have access to drinking water from hand tube wells.

Untimely rainfall is the biggest water-related vulnerability. Crops require water, however limited, at certain stages of their growth. Uncertainty over rainfall characterizes agriculture and life in these areas. One farmer stated it clearly: "Agriculture is now like gambling." The main source of irrigation is groundwater through open and bore wells. Though surface irrigation systems such as tanks used to be the main source of irrigation, most of these systems have degenerated over the years in the absence of policy support. Unfortunately, this has rendered the local institutions that were managing these systems as things of the past, though there are traces of these institutions in some villages. In the process, water resources have transformed from a community resource to a private resource. Due to its capital-intensive and lumpy nature, groundwater extraction has become the prerogative of large farmers. The advent of deep bore wells and submersible deep bore pumps has further aggravated the problem. Expansion of bore wells in the absence of any initiatives to strengthen the groundwater, replenishing mechanisms has led to depletion of groundwater table and drying up of open wells. This has adversely affected the resource of poor farmers. Even some common access (drinking) hand tube wells have gone dry as a result of private groundwater use for irrigation. The conversion of a common good into private property means that the genuine rights of the majority of the people to common pool resource are being denied.

In certain areas groundwater has high levels of fluoride, which is detrimental to the health of particularly the young and the old and those otherwise not completely healthy. As a result there is a high incidence of dental and, in some places, skeletal fluorosis. Poor diet and the consumption of foods contaminated with fluorine add to the problem of drinking water with a fluoride content exceeding the 1.5 parts per million limit. Water quality, particularly of open sources and at the end of the dry season, is often poor. Poor water quality leads to gastrointestinal and other diseases, adversely affecting both people and livestock.

People are aware of the links between ground- and surface water bodies. But due to the magnitude of the investment and collective efforts required, communities shy away from reviving the surface water bodies. They expect the state to take up such activities. They seem to be comfortable with the private exploitation of groundwater though they are aware of the externalities arising out of overexploitation of groundwater. Resource degradation and the widening

inequalities are a common sight. This has not reached a conflict point due to the low awareness of the people regarding resource endowments and entitlements. But the impact of dwindling water tables (well failure)—coupled with adverse climatic conditions, adverse input-output prices, and poor quality of inputs (especially seeds)—has brought the agriculture sector to a flashpoint in these regions. There are reports of farmer suicides and widespread migration even among the large farmers.

Watershed Development, Water, Livelihoods, and Poverty

The preceding section clearly brings out the fragility of the resource base and the prevailing socioeconomic conditions in the study region. This is a general phenomenon even in our study villages prior to the interventions of RDT through watershed development programs. Under such adverse conditions, the introduction of watershed development is expected to improve the living conditions of the local communities in varied ways. These improvements can range from dramatic to moderate changes. Before going into the details of impacts in the next section, here we attempt to establish the linkages between watershed development, water and poverty, and the institutional imperatives underlying the implementation of the program.

Watershed development is a land-based technology consisting of various components aiming at land, water, and tree conservation. Basically, every piece of land is a part of a microwatershed, which is a subset of a macrowatershed. When a micro- or macrowatershed is treated, land quality will improve due to checking of soil erosion caused by wind and water. Activities like contour bunding, pebble bunding, trenching, nala bunding, gulli plugging, plantations, etc. are expected to check soil erosion, enhance in situ moisture, improve the vegetative cover, etc. As a result of improved quality of soil and availability of moisture, productivity of land would increase. Besides, these measures also improve groundwater recharge due to the reduced runoff. At the macrolevel when watersheds, micro as well as macro, are treated, the availability of water resources will improve. Rainwater harvested per unit of land would rise. This could be either groundwater recharge or increased capacity of reservoirs due to low siltation. Besides, watershed development can also create small-scale local reservoirs with the help of check dams, which have multiple uses including groundwater recharge (Box 1).

Basically watershed development is expected to improve the conditions of farmers and the poor through greater availability of water. While overall impact of watershed development on water resources at the macrolevel is clear, it is not so in the local context. At the local level, improvement in water availability depends on local rainfall pattern, soil type, slope, gradient, etc. These aspects may vary from village to village and hence, the availability of water due to watershed development. In the case study region, which is characterized with low rainfall, water gains from watershed development range from improved in situ moisture content to moderate improvements in groundwater availability (Box 1).

Given the socioeconomic context of the study region, the key program beneficiaries would be the landed households who are in the majority. Large farmers are generally better off, but in Andhra Pradesh, in general, and the case study area in particular, their indebtedness is high. The main reasons are drought-induced

Box 1. Check Dams: Beneficial or Not?

The impact of check dams is a debated aspect of watershed activities. Check dams are small, capital-intensive structures, retaining the stream flows of a small catchment area. They help store water for 3–6 months, resulting in groundwater recharge, availability of water for livestock and plantations during the water stress periods. They may even support fish farming. The most important ecological impact is groundwater recharge and revival of open wells.

Of late, check dams have become controversial, for both ecological and economic reasons, as they may obstruct downstream flows. Evidence from the case study area and elsewhere does not support the criticism.

In Kadiridevarapalle, a 100-year-old open well that has dried up during the 1980s was revived in the 1990s when two check dams were made nearby. In the 1950s, the owner of the well, Mr. B. Venganna (80 years old), got the well widened and deepened and added another well. These 40-ft deep wells used to irrigate 2.67 ha of land, growing paddy, millet, and bajra. In 1983–1984, when the water table went down due to severe drought, he installed four in-well bores. Three of them failed shortly thereafter and supply from the remaining one was barely sufficient to irrigate half his land.

After the construction of check dams in 1992 and 1995, both open wells were revived with plenty of water. Another bore well was also installed. Despite the drought conditions of the last 5 years, the wells can supply water round the clock. These wells support 5.33 ha of growing paddy, papaya, sunflower, vegetables, millet, etc. The main constraint is power supply, which is available for only 7–9 hours a day.

crop failure and unsuccessful bore well drilling. Indebtedness is one of the main reasons behind the relatively high number of suicides in the area. Marginal and small farm households are the other interest group. Though Andhra Pradesh is the only state in the country where land inequality has shown a downward trend over time, land continues to be concentrated in the hands of a few while small and marginal farmers dominate in numbers. Relatively speaking, the study region has a low incidence of landlessness. Inequalities are more prevalent in the case of access to water than to land.

SCs and STs are also key interest groups when it comes to poverty reduction. Traditionally, they have been at the margin of society, owning few resources, such as land and also having less social and other forms of capital. Similarly, women make up the majority of the poor and suffer the most from poverty. Census data show that women are predominantly engaged in agricultural labor. In general, women are involved in activities that are less remunerative or unpaid because it is work within the household for subsistence. Only about 2% of women in the case study area own land.

Different interest groups in the case study area have diverse ways of making a living. Their livelihood patterns are largely determined by their access to six forms of "capital," namely

- human capital—health, education, skills, etc.;
- physical capital—infrastructure, land, buildings, etc.;
- natural capital—water, fodder, fuelwood, etc.;
- financial capital—cash flows, savings, etc.;
- social capital—institutional strengths, cooperative behavior, etc. and, finally,
- political capital—active political participation, policy influence.

While livelihoods vary considerably, two general trends are clear. First, most households invest in the future of their children by sending them to school.

Second, most households strive to diversify their income-earning sources to spread the risk.

In times of extreme hardship, such as during the drought that occurred in 4 of the 5 most recent years, the poor start by skipping a meal a day or shift to low nutritional value foods. This has aggravated their health problems and led to greater medical expenditure. Often huge, and unexpected health expenditure pushes households into the debt trap. Furthermore, some poor households have taken one or more of their children, usually daughters, out of school. This reduces expenditure and adds a partial income-earning member.

Marginal and small farmers diversify by working part time as laborers or by getting into nonagricultural income-earning activities. Laborers cope with setbacks by temporarily migrating out of the area to places of work, in the worst cases selling themselves as bonded laborers. Even large farmers cope by reducing social expenditure such as for education, religious festivals, and marriages. Of late, even medium and large farmers are migrating due to well failure consequent to severe drought. For households that have always maintained themselves from their land honorably, impoverishment is a social and psychological trauma.

Context of Watershed Implementation

Collective action institutions are a prerequisite for watershed implementation and management. This aspect is well recognized in the new watershed guidelines formulated in 1994–1995 by the Government of India. The guidelines prioritize participatory approaches to watershed management, and the Ministry of Rural Development has implemented them from 1995–1996 onwards.[5] Watershed work in districts is managed by especially appointed project directors who work as a part of drought-prone areas programs, district development programs, or district rural development agencies. Watershed development teams (WDTs) constituted by project implementing agencies (PIAs) implement the work. Multidisciplinary teams (MDTs) from the project director's office supervise field operations. Members of MDTs, WDTs, and PIAs are drawn from relevant line departments and NGOs. Villages with watershed development programs have a watershed association (WA) and watershed committee (WC). Representatives from *panchayati raj* institutions (local village level elected institutions, or PRIs) are represented in the WC, and where NGOs are involved, they usually insist on representation from existing informal groups as well. Where watershed development is done by government agencies, WCs are usually rather inactive, while in cases where NGOs have done awareness raising and group formation, WCs are more active. Andhra Pradesh is at the forefront of implementing these guidelines with adequate flexibility for local level adaptations. In Anantapur, this has resulted in a move from check dams to the revival of traditional water bodies such as ponds and tanks, horticulture plantations, and dairy development.

To ensure that watershed development has the intended positive impact on the rural poor, the government is experimenting with a "watershed plus" approach.

[5] The 1994–1995 guidelines were updated in August 2001, though the basic principles of the former remain the same.

Among others, this is done through the Andhra Pradesh Rural Livelihoods Programme (APRLP). The APRLP has watershed development at its core, but at the same time it has additional activities not directly related to water, such as dairy farming, savings and credit programs, and horticultural activities that allow the poorer sections of the community to benefit from the security provided by better water management. To ensure maximum and lasting impact, the APRLP has the following seven components

- Capacity building for primary and secondary stakeholders
- Innovation to enhance the impact of watershed works
- Lesson learning and policy influence
- Convergence of top-down and bottom-up activities
- Gender and equity
- Watershed and watershed plus Sustainable Rural Livelihoods initiatives
- Participatory technology development (Government of Andhra Pradesh, 1999).

Implementation is done through NGOs, such as RDT and line agencies in six districts.

The 73rd Constitutional Amendment Act (CAA) greatly strengthened the position and role of PRIs in planning and managing rural development. Andhra Pradesh passed a conformity legislation to acknowledge the acceptance of the principles laid down in the CAA and conducted elections for PRIs. However, Andhra Pradesh has been slow with devolving powers and functions to PRIs. Generally, the line departments and district rural development agencies manage the rural development activities. PRIs with little training and orientation, no experience in managing watershed programs, and with allegations of widespread corruption are seen by many government officials as unfit for playing a major watershed role at this stage. In Andhra Pradesh, *panchayats* are therefore not normally involved in implementing watershed programs.

Local Initiatives

Community-based rainwater harvesting has traditionally been practiced. Under the leadership of kings, temple committees, or local lords, tanks were built and maintained. Furthermore, common pool resources, including rivers, streams, forests, and grazing areas were maintained and any income from these was used to pay for their maintenance in particular and village development in general. For various reasons, the maintenance of these common property resources has suffered. Landowners have also traditionally tried to retain rainwater on their land by building water harvesting structures, such as ponds, bunds, open wells, cross dams, and infiltration areas. This increased the moisture content of the soil and increased crop production. These measures are extended through the soil conservation program of the Central and state governments from time to time. During the 1980s, land conservation activities culminated into an integrated watershed development program.

RDT is one of the largest and leading NGOs in the state, with more than 30 years of standing in Anantapur district. It has worked with the poorer sections of

society in awareness building as well as group formation. RDT has been involved in environmental development and drought mitigation activities for the past 11 years. These previous activities created a good basis for forming watershed committees and for additional activities. RDT has its own model of participatory watershed development, which is close to the "watershed plus" approach. Its main focus has been soil and moisture conservation, rainwater harvesting, vegetation development, horticultural development, and dryland agriculture. RDT works closely with the government at the district and state levels. At present, RDT is working in 50 microwatersheds with the objective of integrated watershed development. In addition to these 50 watersheds, the government funds another 22 under new guidelines. Salient features of the RDT model include

- emphasis on selecting potential villages (for collective action);
- RDT watersheds covering the entire village rather than being restricted to 500 ha to ensure widespread benefits and participation;
- two members from each household (at least from 90% of the total households) should become members of the watershed association by paying a membership fee of Rs11 each;
- mandatory cooperation from the *gram panchayat* president and other members;
- firmness on user contribution to ensure a demand-driven approach; in some instances the user contribution is as high as 30%;
- a somewhat different organizational structure of watershed management in comparison with the guidelines—there is no watershed secretary, who is usually a paid employee;
- a watershed committee that is supported by a watershed advisory committee consisting of village elders (influential people);
- RDT having broad-based technical and nontechnical specialists on a (more or less) permanent basis.

RDT emphasizes a gender perspective. A separate female staff (watershed women organizer) is employed for every 10–12 watershed villages. The organizer lives in the village and interacts regularly with women to talk about their role and responsibility.

RDT has a two-pronged approach to watershed development and poverty reduction:

- land-based watershed development targeting the whole village population and the natural resource base, private as well as common; and
- poor-based socioeconomic development targeting only the poorest in the village, i.e., the dalits and tribals (Table 1).

The approach is designed in such a way that the poorest communities also improve their "six forms of capital" and enhance their proximity to access the benefits of watershed development and poverty reduction, thereby strengthening the equity and sustainability aspects.

Even within the watershed development programs, poor farmers and the dalits and tribals are positively discriminated in cost sharing or people's contribution. For instance, in soil and moisture conservation programs, the dalit and tribal

Table 1. Rural Development Trust's Approach to Watershed Development and Poverty Reduction

Watershed Development Target Group: Entire Population and Natural System	**Poverty Reduction** Target Group: Dalits and Tribals (poorest)
• Soil and moisture conservation • Restoration of traditional water bodies and construction of small in situ rainwater harvesting structures • Development of vegetation and biomass • Water-saving technologies • Rain-fed agriculture practices and technologies • Rain-fed horticulture • Dairy and livestock development • Biogas plants • Development of human capital, institutions, and infrastructure	• Organizing the poorest communities • Universal education with special focus on girls • Women's development • Special programs to develop marginal lands owned by the poor • Credit support for off-farm/nonfarm income-generation activities for women • Health programs, integrating promotional, preventive, and curative aspects of health • Housing • Drinking water and sanitation • Awareness building, institutional, and leadership development of the poor

farmers as well as small and marginal farmers share only 5–10% of the cost, while other farmers share 15–30% of the cost. Similarly, incentives are higher for dalit and tribal farmers in the case of horticulture, as their investment capacity is very low. Such discrimination enables the poor to make best use of the watershed program, which creates some equity.

Impacts

The impacts of watershed development can be termed as short-run and long-run and/or direct and indirect impacts. Being a land-based program, watershed development mainly helps the landed households. Soil conservation activities are beneficial to landed households in the medium to long run. However, the landless and landed poor have benefited from increased employment and wages in the short run. All watershed works are done on a legal unit rate basis by local laborers. As there are no middlemen, the labor earnings resulted in daily wages 2–5 times the normal rate. Because of the volume of work, labor households, as well as small and marginal farms households with extra labor capacity, have benefited considerably from the interventions.

For the poor, the watershed development provided some benefits in the long run while the short-term benefit of earnings from labor have been substantial during the implementation stage. In a recent study of RDT, it was established that many laborers, who have worked continuously for 5–7 years in the watershed program, have improved their living conditions. They have also repaid their old debts, bought assets like land, gold, livestock, etc. Moreover, no fresh borrowings were reported despite the continuous drought. It was heartening to note that the women were the happiest of the laborers, as they had earned and acquired assets like gold for themselves or for their daughters, and bought household articles and kitchen equipment, indicating an improved social status for the family and the women.

Another impact of watershed development on the poor is the decline in migration. For instance, in Kadiridevarapalle, about 5 families used to be on permanent migration and about 20 families on seasonal migration before the advent of watershed development. But after the watershed development, none of the families migrated even seasonally due to an increased underirrigation of the area and diversified cropping patterns consequent to assured groundwater availability. However, the impact of higher wages is normally in the short run, i.e., during the period of watershed works.

Landed households benefit in the medium and long run, as the yield rates tend to improve by 20% (Reddy et al. 2001). Cropping pattern changes are noticed even in the rain-fed agriculture, though on a smaller scale. In irrigated areas, the cropping pattern has shifted from paddy and ragi to sunflower, horticultural crops like papaya, as well as floriculture and vegetable crops (Box 2). But given the uncertainty in rainfall and its distribution, these benefits are not stable. Unless these instabilities are addressed, the benefits from watershed development remain uncertain even to the landed. On the other hand, farmers with access to groundwater are reaping stable benefits from watershed activities as those have improved and stabilized groundwater yields. However, access to groundwater is limited to large and medium farmers in most cases (Table 2). Often, marginal farmers do not have access to

Table 2. Distribution of Well Owners by Farm Size in Kadiridevarapalle

Farm Size (acres)	**No. of Households that Have Open Wells**	**No. of Households that Have Bore Wells**
00 – 03	0	0
3.01 – 5.00	1	4
5.01 – 10.00	2	3
Above 10.00	22	28

Box 2. Shift to Horticulture

In 1996–1997, a year after the Rural Development Trust (RDT) started a watershed program in Mallapuram village, Mr. Timmappa started horticulture cultivation under RDT's advice. He planted mango saplings on 5 acres of his land on which he earlier cultivated groundnuts. RDT paid the cost of the saplings, fertilizers, and for digging the pits. While the 200 saplings grew, Mr. Timmappa grew groundnuts as an intercrop. To supply the necessary water to the mango trees, he dug a hand bore, spending Rs10,000. The guaranteed water supply has enhanced the survival and growth rate of his plants.

During the summer of 2001, the first mangoes were harvested. Mr. Timmappa did not sell all the mangoes in the market, but distributed some among his relatives and retained some for his own consumption. What he did sell gave him a net income of Rs5,000. Marketing is no problem as contractors come and buy the mangoes directly from farmers.

Mr. Timmappa is reasonably happy with the returns from the mango crop. As a result of his success, about 80 ha of land in the village is now under mango cultivation as compared with 6 ha at the beginning of the watershed establishment. With water supply guaranteed, and with some initial external support, there is huge potential for horticulture in the area. Now that horticulture is being taken up in a big way in the district, there is a need for strengthening facilities such as transportation, marketing, storage, and processing. The lack of such facilities is already being felt in the case of papaya.

Box 3. Getting Watershed Benefits to the Poor

A major way to target long-term watershed benefits to the landless and other poor households is to strengthen the common pool resources (CPRs), making them accessible to the poor. An example is the arrangement concerning palm trees in the CPRs of Guddella village. Palm leaves are used in basket- and mat-making activities, while toddy (local liquor) is extracted from mature palm trees. Two economically and socially poor communities depend on these activities for their livelihoods.

Guddella village has 1,000 palm trees under the 30 ha of temple lands (CPR). Before the watershed committee was started, everyone had access to these palm trees. Even neighboring villagers would cut their branches for various purposes. The households from within the village often faced shortage of leaves and were forced to travel far to procure palm leaves.

The watershed committee and the village development committee (VDC) have now taken charge of these trees. Two guards were employed by the VDC at Rs600 per month to protect the trees year-round. Yearly, the households depending on the palm trees pay some money to the VDC to obtain use rights. The amount is decided on a consensus, rather than on an actual cost basis. This arrangement has ensured that the village poor have better access to the resource and has led to a more productive use of their time.

There are similar instances of giving exclusive fishing rights to tanks and behind check dams to the local fishing community. Furthermore, in some villages, SCs are given exclusive use rights to roadside plantations.

groundwater. Therefore, while in the short run agriculture labor (landed as well as landless) benefit from the activities, farmers, especially with access to water, benefit in the medium and long runs.

Watershed development has many positive and potentially long-term impacts. For instance, water retention works on agricultural lands result in better yields due to residual moisture. Removal of pebbles and rocks from fields increases the suitability of the soil to grow crops. Cleaning and deepening of tanks and open wells increase common access for washing, bathing, feeding of livestock, and in some cases, irrigation of nearby fields. Check dams have benefits such as storage of water for fisheries and/or irrigation, and infiltration of water into the ground, and therefore recharging of open wells and boreholes (Box 1). It is observed that on average, each check dam supports three wells in Kadiridevarapalle.

Making the Watershed Benefits Pro-Poor

The government's stress on poverty reduction calls for an all-out effort to ensure a more equitable distribution of watershed development benefits. At present, major benefits of watershed development go to the richer households as 70% of the expenditure goes to interventions that benefit them. At the same time, only 7.5% of the input is used to support livelihoods of poor and landless families (Government of India 2001). The watershed plus approach of the APRLP is a step in this direction, but more innovation and experimentation is needed. Here we discuss some of the pro-poor initiatives that RDT in particular is undertaking.

Most infrastructure built and/or repaired under watershed development interventions is done on private land. These benefits mainly accrue to the landed. There is a clear bias against the landless and landed poor as far as receiving sustained benefits are concerned. One way of addressing their needs is strengthening the common pool resources. However, there is concern over the maintenance of common property resources as there are no effective institutional arrangements in many places to maintain them. At the heart of this is lack of participation, which, though at the core of the program, remains largely unrealized. Further, the people have not been effectively motivated or organized and involved in preparing action plans.

PIAs and WDTs generally see their role as implementers, as indeed the name "project implementing agency" suggests. The transfer of management and technical capacities to communities and watershed committees is neglected. However, the effectiveness of community involvement in common pool resources management is clearly demonstrated in RDT villages (Box 3).

Unlike the general approach, RDT begins its intervention in villages with a poverty reduction stream of activities. Watershed activities are added after a few years. Thus, the poor are strengthened socially and economically to a degree, before the watershed program begins. The idea is that dalits and tribals need a longer-term, poverty-focused intervention due to their socioeconomic backwardness. Such an approach seems to be more effective (Box 4).

Another important activity, which has potential for improving rural livelihoods, is dairy activity (Box 5). Dairy activity is closely linked with the improvement of common pool resources (CPRs) like water and grazing lands. Renovating water bodies, horticulture, and dairy activities are eagerly pursued by the district administration in the study region. While dairy development has a lot of potential, it needs to be tuned to local constraints. At present, the program is not favorable to poor households. Dairy could be an effective pro-poor program under the watershed development if the policy support is tuned to the needs of the poor.

One more activity under the watershed program, which has greater potential for poverty reduction, is the formation of self-help groups. Forming and strengthening institutions at the village level is an innovative feature of the watershed development guidelines. Small groups (10–15 members) are organized to generate money through savings. During watershed development, wage rates go up 3–5 times and employment opportunities also increase. During that time, it is relatively easy for even the poor to start savings. The savings are circulated among group members who use it for investment or consumption, paying a predecided interest rate (usually 24% per annum). Once these self-help groups are established, a revolving funding of Rs50,000 per watershed is available to support them through matching grants. The watershed in Mallapuram, under RDT implementation, demonstrates the potential of such programs in poverty reduction (Box 6).

Box 4. Impact on Dalits and Tribals in Watershed Villages

- Literacy levels have gone up from 5 to 70%; in the case of girls, from 0 to 60%.
- Households depending entirely on wage labor have now become part-time cultivators.
- Their land values have gone up by 100–300% due to land improvement activities.
- Self-confidence and leadership among men and women (social and political capital) has improved substantially.
- Nonfarm employment of educated youth has increased manifold.
- Health and nutrition status has improved.
- Participation in village development activities has increased along with the villagers, bargaining capacity for better wages, better facilities, and services.

Box 5. Dairy Development and the Poor

Dairy development along with a horticulture development program is expected to enhance the benefit flows from watershed development to the poor. These activities are dependent on water and other common pool resources like grazing lands. While these two programs are being launched in a big way, their impact on poor communities is rather ambiguous, as the prevailing policy environment is not conducive for such benefit flows toward the poor.

Dairy development is actively pursued in some villages. Nationalized banks provide loans of up to 90% of the cost. The total loan amount ranges between Rs20,000 and Rs28,000. Some of the conditions for getting the loan include

- a deposit of Rs2,000 per animal as guarantee;
- ownership of land, irrigated irrigated is preferred; and
- a guarantor; the borrower is expected to repay the loan monthly with 50% of the earnings from milk.

These conditions exclude the poor from participating in the program. The suitability of the feed-intensive murra buffaloes to the local environment is questionable and local varieties may be more profitable. Provision of loans to local varieties will not only be low cost but also accessible to the poor. Even the landless households can maintain local varieties, as their fodder requirement is much lower. Efforts are being made by the Rural Development Trust (RDT) to convince banks to finance local varieties and improve breeds through cross-insemination.

There is a need to inculcate the idea of dairy as an economic activity. This could be done by strengthening infrastructures like collecting centers, cooling stations, and markets, coupled with some demonstration of the viability and profitability of dairy. The latter needs some efforts of selecting the right breeds that suit the local conditions. In fact, RDT has initiated the Gopal Mitra program under which a local person is trained to perform artificial insemination (AI) of local cows and buffaloes with improved breeds and help the households with dairy-related problems.

RDT's AI program is at almost free though it takes about 2–3 years for improved animals to start giving income to the farmers. The AI program is more pro-poor as it is not capital-intensive. Besides, local cattle upgraded through AI survive under low fodder, hot climatic conditions, and water stress conditions, apart from being highly disease resistant.

Institutional Integration

It is clear from our discussion that institutional innovation and sustenance is the key for successful watershed development especially in targeting the poor. Participatory watershed development emphasizes evolution of institutions and strengthening existing ones. While institutional arrangements such as watershed associations, user groups, self-help groups, etc., have evolved to reap the benefits of the program, their sustenance in the long run is questionable. This is because institutional arrangements are imposed from the outside rather than socially embedded. Socially embedded or informal institutions are more sustainable than formal institutional arrangements because they evolve out of a genuine requirement. Evolution of such institutions is a time-consuming and costly (transaction costs) affair and hence their impact is rather limited. On the other hand, the impact of formal institutions could be widespread and effective at the macrolevel. Though it is too much to expect—the evolution or replication of socially embedded institutions in every village—formal institutions should draw lessons from such institutions to sustain them in the long run. Often, the success of socially embedded institutions is critically linked with their financial sustainability and socioeconomic equity in the distribution of costs and benefits. There is a need for integrating market principles with institutional approaches. Marrimakulapalle is an example of such institutional sustainability and provides some useful insights for institutional strengthening and sustenance (Box 7).

Summary and Conclusions

It is clear from our preceding analysis that watershed development is necessary for strengthening the ecological resource base and improving the carrying capacity of fragile environments. But watershed development in itself is not sufficient to

Box 6. Self-Help Groups and the Poor

Under the watershed program in Mallapuram there are eight self-help groups. These groups are organized around occupations and there are two tailoring groups (women), two groups of cane workers (women), two groups of masons (men), one group of carpenters (men), and one group of cobblers (men). Membership ranges between five and ten. Most groups are very active and have generated substantial savings. They not only lend for their own vocational activities, but also lend toward new activities such as petty business, etc. One of the women groups has about Rs150,000 in savings, and they have lent out money for the purchase of two auto-rickshaws. The main reason for the success of these groups is that they concentrate on individual-based lending rather than community-based activities. While collective activities can be very profitable, most of the time they are dogged by the classic collective action dilemmas. The real strength of self-help groups lies in identifying activities that match local resources, skills, and needs, and are economically profitable.

achieve the broader objective of poverty reduction or eradication. Being a land-based technology, it is more beneficial in the midterm and long term to the households with access to land and water. In the short term, it is highly beneficial to laborers. A well-implemented watershed development program enhances sustainable agricultural employment opportunities in the long term and thus provides indirect benefit to labor and might reduce seasonal migration as well. Nevertheless, watershed development should be viewed and pursued as a major sectoral policy in these regions, as agriculture development still holds the key to the overall development of the region. Still more than 70% of the population depends on agriculture or agriculture-related activities. More importantly, our analysis has also brought out that watershed development can be translated into a pro-poor strategy with complementary or supportive policies. Here we discuss some weaknesses of watershed development in its present form and indicate the complementary policies to make it pro-poor.

In general, the watershed development program in Andhra Pradesh is considered successful when compared with other states, especially in spread and magnitude. The main reasons for this relative success include

- a wide public debate on droughts and political determination to do something about it;
- relatively good governance and efficient administration translating political intentions into action;
- a state-level political process that creates an environment for innovation and reform;
- active support from funding agencies, because of the flexible and effective government approach;
- NGOs interested in watershed development and working together with the government; and
- the realization that there is no immediate alternative to watershed development in rain-fed areas.

Given this policy environment, it becomes easier to understand and rectify the weaknesses of the program. The weaknesses are identified in the context of the comparative situation between the best-implemented watersheds (our case study

Box 7. Socially Embedded Institutions and the Poor

While the formal watershed committee was established only in 1998, Marrimakulapalle had 20 years of experience in maintaining traditional institutions. About 20 years back, the village elders, with the help of the Rural Development Trust (RDT), initiated three institutions, the Anjaneya Swamy Committee (ASC), Peerla Swamy Committee (PSC), and Vidya Committee (VC). The committees have proportional representation from all the caste groups in the village. The ASC has 11 members and looks after the law and order issues in the village. The PSC also has 11 members and works as a community bank. The PSC generates money from various common resources such as income from temple lands, sale of dung in the streets, fines from punishments by ASC, etc. The PSC has constructed quarters for schoolteachers to rent out. Money thus generated is distributed among community heads, proportionately to their population. This is given as loans to the needy within the community at a 24% per annum interest rate. The PSC has accumulated savings of Rs300,000.

The VC has 30 members representing all the caste groups and collects voluntary funds from members. Donated money is used for extension of the school building, employing assistant teachers, etc. Since the construction of quarters, most teachers stay in the village. The needs of the landless are taken care of in a unique fashion. The village council has acquired 10 ha of land with the help of RDT, on which a bore well is drilled for irrigation. This land is auctioned to groups of landless households on a yearly, rotational basis. Usually, a group of 4–5 households take the land for cultivation. In this manner, equity issues are resolved to some extent as far as land is concerned. However, inequity in water distribution is yet to be resolved. Some economic and equity principles of these informal institutions could be useful for strengthening formal institutions.

watersheds) and the general picture in the region or the state. Detailed studies (Reddy et al. 2001) on the Andhra Pradesh watershed development program have identified the following operational weaknesses:

- strict adherence to a maximum watershed size of 500 ha, irrespective of the reality on the ground;
- number of watersheds that one PIA can cover is too rigidly defined as between 10 and 12, where some PIAs can do with much more, while for others, even 10 is too much; and
- there is a need for new watershed committees to have training and exposure visits to successful watersheds to learn from their past experiences.

At a design and policy level, five main weaknesses have been identified:

- the need for a more equitable distribution of benefits;
- the need to improve implementation;
- the need to exercise caution while scaling up and speeding up watershed development;
- the need to ensure mutually supportive, poverty reduction-oriented policies; and
- the need to delink land and water rights.

Improved implementation, particularly of participatory aspects, is needed if interventions and their impacts are to be sustainable. Around 85% of watersheds are implemented through government line agencies. These are normally not well geared toward a participatory and bottom-up approach. Participatory watershed development is found effective (especially when done by NGOs), but the work is slow. This process has become the main bottleneck for scaling up the program. Scaling up gets further complicated when poverty reduction and other

issues are integrated into the watershed development approach. At the same time, ad hoc scaling up in a targeted fashion is neither effective nor sustainable. Hence, attempts should be made to achieve effective scaling up through appropriate policy design, tuned to the demands of the community and to enhance the capacity of implementing agencies.

A two-pronged approach is needed for scaling up. First, the capacity of smaller NGOs should be strengthened so that NGOs can implement a large proportion of the watersheds. To facilitate the process of selecting good PIAs (NGOs) and strengthening the smaller NGOs, district resource development agencies should identify a nodal PIA (NGO) in each district, which will identify the right PIAs. These nodal PIAs along with state-level and district-level officials and other stakeholders will form as a network at the state level. This would facilitate exchange of views on policy matters. Second, involving the panchayati raj institutions in the whole process needs to be looked into afresh (Bandhyopadhyay, Yugandhar and Mukherjee 2002). They could play an important role as PIAs, as well as play a catalytic role to the NGO PIAs. This institution needs to be properly reassessed before discarding it.

Equity in the distribution of economic gains among community members is as important as the equity in coverage. While the former is concerned with equity in access, the latter pertains to equity in outcomes. Equity issues pertain to the neutrality of technology in terms of location (different geographic locations of the watershed) and well-being (economic status) of participants. Inequity in the former case is purely technical while the latter is structural and institutional. No technology has a built-in bias toward a particular class/caste. The bias is always due to the existing institutional structure (agrarian structure, water markets, credit markets, social structure, etc.). In both cases, inequalities could be minimized through institutional arrangements. In other words, technical inequalities can be corrected by compensating the participants from disadvantaged locations. Also, the distributional bias in distortions in land, labor, water, and credit markets needs correcting. Failure to recognize problems of inequity is fatal in understanding the process of watershed management. Equity aspects are also important from the collective action point of view. In this context, access to water by the poor can only be guaranteed if the present link between water and landownership is removed. This may seem impossible, but experience with the *Pani Panchayat* (Maharastra) and in South Africa show that it is possible (Reddy 2002).

Furthermore, there is a need to ensure that various government policies, such as in agriculture, power, credit, etc., become mutually reinforcing and are aimed at poverty reduction. Without an integrated package of supportive policies, watershed development will yield suboptimal results and its poverty reduction impact will be minimal.

To have a more poverty-focused approach, watershed development should be complemented and supported by policies and programs that directly benefit the poorer sections of rural society. Our case study identifies some potential areas like strengthening the common property resources and promotion of horticultural and dairy activities. These activities need to be supported by institutional arrangements for collective action such as self-help groups and thrift societies.

Such interventions, in the form of "watershed plus," are being promoted under the APRLP. To make these activities economically viable and sustainable, policy support is needed in infrastructure such as markets, transport, processing units, etc.

Recommendations

The following recommendations can be drawn from the case study.

- Continue and expand the process of experimenting with watershed development at the grassroots level and ensure that lessons learned (weaknesses) are taken on board in policy design,
- Develop and test interventions that particularly benefit poor men and women, through watershed development and complementary development activities,
- Build the capacity of government agencies, NGOs, and panchayati raj institutions involved in watershed development and management,
- Develop a package of poverty reduction-focused policies, including a watershed policy that is mutually complementary and reinforcing,
- Minimize inequities through more egalitarian institutional arrangements and legislation.

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8

Microirrigation for Income Generation in Asia

Michael Roberts
International Development Enterprises

Achieving the Millennium Development Goals—particularly, the goal of halving the number of people surviving on less than a dollar a day—will require a major reorientation of worldwide development efforts away from pursuing general "economic development" and toward "poverty reduction" as a distinct and more urgent goal. In contrast to current trends, the allocation of development resources must become biased toward rural areas, agriculture, and smallholder agriculture in particular. Microirrigation stands out as a simple, practical, and widely applicable tool for enhancing the agricultural potential of smallholders and creating opportunities for more active and effective participation of smallholders in markets. This case study summarizes and draws lessons from the 20-year experience of International Development Enterprises (IDE) with microirrigation for smallholder income generation in Asia. Microirrigation technologies (treadle pumps and low-cost drip irrigation in particular) have had a widespread impact on rural poverty, helping some 2 million smallholder families increase their net income by an average of $100 per year for an initial investment of about $30. The distribution of microirrigation technologies through the private sector at affordable, sustainable, and unsubsidized prices has proven to be an effective and efficient means of achieving widespread impact with minimal donor resources. The income-generating potential of microirrigation is directly related to the degree to which smallholders are integrated with input and output markets. By developing smallholders' comparative advantage in the production of high-value crops and facilitating market environments that respond to their specific needs, smallholders are empowered to become effective market participants and to take advantage of market opportunities. Microirrigation holds great potential as a means to effectively target development resources at the rural poor in an environmentally sound and gender-sensitive manner. IDE is among the organizations spearheading the smallholder irrigation market initiative (SIMI), which seeks to facilitate the large-scale expansion of micro-irrigation and market integration for the rural poor, potentially reaching up to 30 million smallholder households in the next 15 years.

Introduction

Out of the 1.2 billion poor people living on less than $1 a day, 75%, or 900 million, live and work in rural areas. Fully two thirds of these rural poor live in Asia, with a heavy concentration (43%) in South Asia alone. The majority of the rural poor are subsistence farmers with limited access to productive assets, credit sources, and markets. As a result, their agricultural productivity and income are

low, and they are highly vulnerable to climatic extremes, price variations, environmental degradation, natural calamities, family illnesses, and other economic shocks. The rural poor are often located in less-favorable regions with poor soils, poor infrastructure, and limited water resources.

This is the environment where IDE has worked for the last 20 years with the sole focus of poverty reduction through the application of market principles to benefit the poor. IDE is a nonprofit organization incorporated in Canada, India, Switzerland, United Kingdom, and United States. Together, the IDE family of organizations supports field programs in seven countries: Bangladesh, Cambodia, People's Republic of China, India, Nepal, Viet Nam, and Zambia.

This case study describes IDE's experience with microirrigation for smallholders in Asia and its potential for generating income for the rural poor. For the purpose of this discussion, microirrigation is defined as self-contained irrigation systems for use on small plots of land (typically less than 0.5 ha) by small groups of people (typically a single household) without the need for collective infrastructure. Smallholders are defined as households that engage in subsistence agriculture on small plots of land. They may own or rent their land or make use of common property and thus may include those who are normally classified as "tenant farmers" or even "landless."

Microirrigation Technology

IDE has taken a lead role in the development and dissemination of two micro-irrigation technologies that have proven successful in helping individual smallholder households to access and control water for irrigating small plots of land.

Treadle Pumps

The treadle pump is a foot-powered pump that can be used to lift water from shallow groundwater or surface water sources. The pump can be operated comfortably for long periods, delivering sufficient water for irrigation of rice and vegetable crops. The basic treadle pump costs less than $30 in Bangladesh (including the cost of the tube well), making it accessible to even very poor smallholders. In total, approximately 2 million treadle pumps have been purchased and installed by smallholders in Asia as a result of IDE's programs.

Table 1. Treadle Pump Dissemination in Asia Attributable to IDE Interventions

Country	Year Started	Total Treadle Pumps[a]
Bangladesh	1986	1,500,000
Nepal	1987	40,000
India	1990	440,000
Cambodia	1994	20,000
Total		2,000,000

[a] Approximate totals as of mid-2002.

A major key to the success of the treadle pump technology has been its dissemination through market channels. IDE stimulated demand for the pumps through creative information and marketing campaigns aimed directly at the rural poor. Simultaneously, IDE worked with the local private sector to establish a network of pump manufacturers, distributors, and installers. The private sector supply chain has now grown to include more than 100 manufacturers, 1,100 dealers, and 3,000 installers.

Drip irrigation

Drip irrigation delivers water from a storage vessel directly to plants through a system of plastic tubes with minimal water loss. Crops irrigated by drip show water savings of up to 50% and yield increases of 30–50%. Drip irrigation is often associated with the capital-intensive, commercial farms of more wealthy farmers. Systems used on large farms, however, are unaffordable for smallholders and are not available in sizes suitable for small plots.

Beginning in 1995, IDE developed various of low-cost drip irrigation kits that are appropriate for small landholdings and affordable for smallholders. The smallest kit consists of a 20-l bucket with enough tubing to irrigate a 25-square meter (m^2) plot and costs about $5. The next size consists of a 200-liter (l) drum with tubing to irrigate 125 m^2 and costs about $25. Larger kits can irrigate areas up to 1,000 m^2. The systems are expandable so that farmers can start small and scale up as their financial capacity and technical skills increase. The kits are typically used to maximize water efficiency in arid regions for the production of horticulture crops including vegetables and fruits.

To date, some 20,000 low-cost drip irrigation systems have been distributed through market channels in Bangladesh, India, Nepal, and Viet Nam.

Relating Microrrigation to Key Action Areas of the Water and Poverty Initiative

Economic and social benefits derived from microirrigation at the household level relate directly to key action areas identified in the thematic framework for the Water and Poverty Initiative.[1]

Pro-Poor Economic Growth and Livelihood Improvement

Treadle pumps and drip irrigation systems provide an affordable entry into irrigated agriculture, giving smallholders an opportunity to increase their production and generate income by selling their surplus. Farmers investing in treadle pumps or drip irrigation systems have seen income increases averaging over $100 per year. Approximately 2 million microirrigation systems have been installed in South and Southeast Asia, raising the productivity of more than .25 million ha of farmland and injecting more than $200 million per year into rural economies.

[1] The social and economic benefits of IDE microirrigation systems have been documented in regional and country-level impact evaluations by independent investigators. One such report is Shah, Tushaar, et al. 2000. Pedaling Out of Poverty: Social Impact of a Manual Irrigation Technology in South Asia. Available: *www.cgiar.org/iwmi/pubs/Pub045/Report45.pdf.*

Economic benefits resulting from microirrigation technologies are biased toward the poor because technologies themselves are self-targeting. Treadle pumps and low-cost drip have high labor requirements relative to more expensive irrigation options such as engine pumps and state-of-the-art drip irrigation equipment. For this reason, microirrigation systems are primarily attractive to the rural poor, who have small landholdings and relatively abundant family labor, but are of little interest to more wealthy farmers with larger landholdings.

As a spin-off benefit, microirrigation technologies stimulate the rural economy as financially empowered smallholders begin purchasing goods and services from rural markets. Local small and medium enterprises are also engaged in producing, distributing, and installing the microirrigation equipment, creating employment in the rural nonfarm sector.

Improved Access to Water

Microirrigation provides an affordable alternative for many smallholders who would not otherwise be able to access irrigation water. Large-scale irrigation systems are typically developed in more favorable agricultural areas populated by well-endowed farmers. Community-level irrigation schemes also require considerable capital and social investment, putting them out of reach for many. In all cases, the poorest farmers are prone to marginalization and receive proportionately less benefit from collectively operated irrigation systems, if they receive any benefit at all. Microirrigation fills an important technology gap for the rural poor by providing a low-cost entry into irrigated agriculture that requires very low capital investment and little or no social organization.

The use of market channels has been a key factor in achieving widespread distribution of microirrigation technologies. Subsidized or free distribution of technologies through NGO or government programs is unlikely to have had the same far-reaching and sustainable effects. The private marketplace is arguably the most efficient and effective mechanism for widespread distribution of a technology to maximize both access and impact.

The accessibility of microirrigation has been further enhanced by its income-generating characteristics. The cost of a microirrigation system can usually be repaid in a single growing season. This rapid return on investment makes it economically feasible to purchase a pump, even with money borrowed at very high interest rates (e.g., from a local moneylender). Financial barriers to micro-irrigation are reduced even further when microirrigation technologies are linked with microcredit schemes that charge reasonable interest rates.

Capacity Building and Empowerment

Access to affordable irrigation options through the private sector empowers the poor to participate in markets and progressively increase their level of self-reliance. As consumers (as opposed to charity recipients), smallholder households have the ability to choose technologies that are appropriate for their situation, and collectively, they can have an influence on the technology itself through feedback to the technology suppliers.

Increasing the food security and cash income of the rural poor also reduces their vulnerability and susceptibility to exploitation. Increased economic status is associated with improved education, greater exercise of human rights, and increased expectations for democratic participation in decision making at all levels.

Microirrigation also contributes to gender equity by reducing women's workloads, improving family nutrition, providing a source of independent income for women, creating opportunities for women to learn new skills, and reducing the necessity for family members to migrate from the home for seasonal wage labor.

Disaster Mitigation

Treadle pumps and drip irrigation systems have been used in rehabilitation projects to help restore rural food production following natural disasters. Irrigated vegetables can begin providing a source of food and income within 2 months.

Lessons Learned

The Critical Role of Water in Poverty Reduction

Scarce water resources and a lack of control over water resources are pervasive constraints facing a large majority of smallholders. Water, being essential for agriculture and human health, is a critical factor in livelihood strategies of the rural poor. For this reason, water is an effective and strategic entry point for addressing rural poverty.

Without access to and control over water, smallholders do not have a basis for commercial agricultural production. The risk of losing their crops due to erratic rainfall or insufficient irrigation water deters smallholders from investing in high-value production. IDE's 20-year experience with smallholders in Asia demonstrates that water control at critically important stages of crop production is usually the most important factor in enabling smallholders to become commercial producers of high-value crops.

The Need to Focus on Rural Poverty and Smallholders in Particular

The slow progress of international efforts to reduce poverty stems from rural poverty not being confronted head-on. The president of the International Fund for Agricultural Development (IFAD) has stated

> ...the failure [to meet Millennium Development Goals] stems in large part from a misconception that the main poverty problem has moved from the countryside to the burgeoning mega-cities of the developing world [however], 75% of the world's poor live in rural areas, most of which make their living in farming or farm labor. As this figure will drop only to 60% by 2020, a focus on rural poverty and agricultural development is crucial to the reduction of poverty overall.[2]

Resources that have found their way into agricultural development have too often focused on production technologies suited for more well-endowed farmers

[2] Fawzy H. Al-Sultan in Rural Poverty Report 2001: The Challenge of Ending Rural Poverty 2001. Rome: IFAD.

(e.g., large-scale irrigation and seed-based technologies), which, at best, have a secondary effect on poverty among smallholders. Dealing with the challenge of poverty requires dealing with the smallholder—directly and unequivocally. IDE has found that significant gains in rural livelihoods can be achieved with relatively modest resources by facilitating market forces to directly support the agricultural production requirements of smallholders.

Smallholders' Comparative Advantage in Agricultural Production

Smallholders have an important advantage over larger commercial farmers as their family members can usually satisfy farm labor requirements without the use of hired labor and with little or no supervision cost.[3] This provides the basis for a comparative advantage for smallholders in labor-intensive farming systems where factors of production must be closely managed.

Given an adequate supply of water, smallholders can exploit their labor advantage in the production of horticultural crops such as fruits, vegetables, nuts, spices, mushrooms, flowers, and other specialty crops. With these crops—using concentrated, labor-intensive production systems—it is possible for smallholders to achieve higher yields per unit area and better quality produce than farmers that cultivate larger areas with capital-intensive farming systems do. Larger farmers, on the other hand, are better suited to the production of staple crops, which require less intensive management and are more adaptable to mechanization. The smallholders' aptitude for horticultural crops and the large farmers' aptitude for staple crop result in a comparative advantage for smallholders in the production of horticultural crops.[4]

This comparative advantage of smallholders can be further enhanced by providing products and services that are suited to their unique characteristics and that will enhance their ability to grow and sell crops efficiently. Under intensive production systems, the smallholder has the capacity to create annual net returns of $0.70 per m^2, and—under favorable market conditions—may go significantly beyond this value.[5]

Meeting the Specialized Needs of the Poor

To meet the specific needs of the poor, technologies must be engineered from a poor person's point of view. In many cases, it is not sufficient to merely scale down a solution that is appropriate for a large commercial farm. In the case of

[3] Costly supervision is required to monitor the work of nonfamily agricultural labor (Stiglitz 1974). The costs of monitoring labor for nonmechanized, labor-intensive agricultural production are particularly high (Eswaran and Kotwal 1985).

[4] To have a comparative advantage in horticultural crops, smallholders do not necessarily have to produce them more efficiently, in absolute terms, than larger farmers. It merely requires that smallholders be less disadvantaged in producing horticultural crops than they are in staple crops. The economic law of comparative advantage asserts that the total production of all goods increases and all market participants benefit when each participant specializes in the product for which he/she has a comparative advantage.

[5] Mushroom production techniques promoted by IDE in Cambodia have enabled some farmers to earn net incomes as high as $400 per year on only 50 m^2 of land (an annual return of $8 per m^2).

drip irrigation, commonly available systems have sophisticated and expensive water filtering and emitter systems designed to prevent clogging and thereby reduce maintenance. IDE's low-cost systems have very basic filters and emitters, which significantly reduce the cost of the system, but require that the emitters be monitored and periodically unclogged—a procedure that can be easily accomplished by a smallholder with relatively abundant family labor on a small plot of land, but which would be impractical on a large farm with hired labor.

It is also important to recognize that priorities of the poor are often different from more wealthy consumers. In Bangladesh, IDE experimented with different price-quality variations of the treadle pump. When given a choice between a pump that would last 7 years and a less expensive pump that would last 2 years, the poorest smallholders preferred the lower cost, less durable pump. The poor value affordability more highly than durability. This makes economic sense, given that cash is always in short supply for the poor and the food and income generated by the lower-priced pump will provide for their needs today while enabling them to upgrade their pump at a later date.

Integrating Smallholders into Markets

From a smallholder's point of view, the market environment can be envisaged as a three-part system consisting of the input market, the small farm, and the output market.

- The *input market* includes the enterprises and organizations that provide the goods, services, information, and credit required for agricultural production.
- The *small farm* is the household production unit that consumes inputs to cultivate crops for self-consumption and for sale to output markets.
- The *output market* includes the enterprises and organizations that provide the goods, services, information, and credit required moving the small farm production from field to consumers at economically rewarding prices.

Microirrigation technology has no power to generate income for smallholders unless there are market opportunities to exploit. Market opportunities provide the driving force that draws goods and services through the market system with value being added at each stage: from input supply chains, through on-farm production, to postharvest processing and delivery to consumers. Thus, smallholders should see technology such as microirrigation as a factor that enables market participation, not as a driving force in itself.[6]

If smallholders are to benefit from the movement of commodities through market systems, it is important that they be integrated into those systems, as consumers of goods and services and as producers of saleable crops. In areas where IDE works, we have found that the most successful smallholders—those who have been able to lift themselves out of abject poverty—are those who participate more fully in markets by purchasing more inputs, making effective use of technical

[6] Similarly, other agricultural production factors such as credit, information, capacity building, policy, and infrastructure should be seen as enablers of market participation, not as driving forces in themselves.

knowledge and market information, and developing stable linkages to output markets.

Unfortunately, smallholder-friendly market environments rarely arise spontaneously. Rather, a situation of market failure usually exists, whereby the market does not provide the goods and services needed by the smallholder. The rural poor tend to be ill served or bypassed as a market segment for many reasons: they are located in sparsely populated remote areas, they have low purchasing power, they make purchases and sell produce in small volumes, and the quality quantity of their production are inconsistent.

To create smallholder-friendly market conditions, some form of external intervention, facilitation, and investment is required to align market forces and provide the activation energy that will eventually lead to self-sustaining and expanding market systems. IDE has demonstrated, for instance, that it is possible to facilitate networks of small and medium enterprises to profitably manufacture and distribute microirrigation technologies in rural areas. Treating the rural poor as customers, facilitating an efficient supply chain, and actively promoting products that meet a real need have accomplished this. In this way, IDE has helped create markets for affordable microirrigation equipment where no market existed before. The experience of IDE and other organizations has shown that other agricultural inputs (such as high-quality seeds and micro-credit) and output services (such as agro-processing and market linkages) can be made affordable for smallholders and still be profitable for suppliers. With the right products—appropriately sized, priced, and marketed—the private sector can deliver appropriate inputs and output services to smallholders in a sustainable "win-win" relationship.

The Way Forward

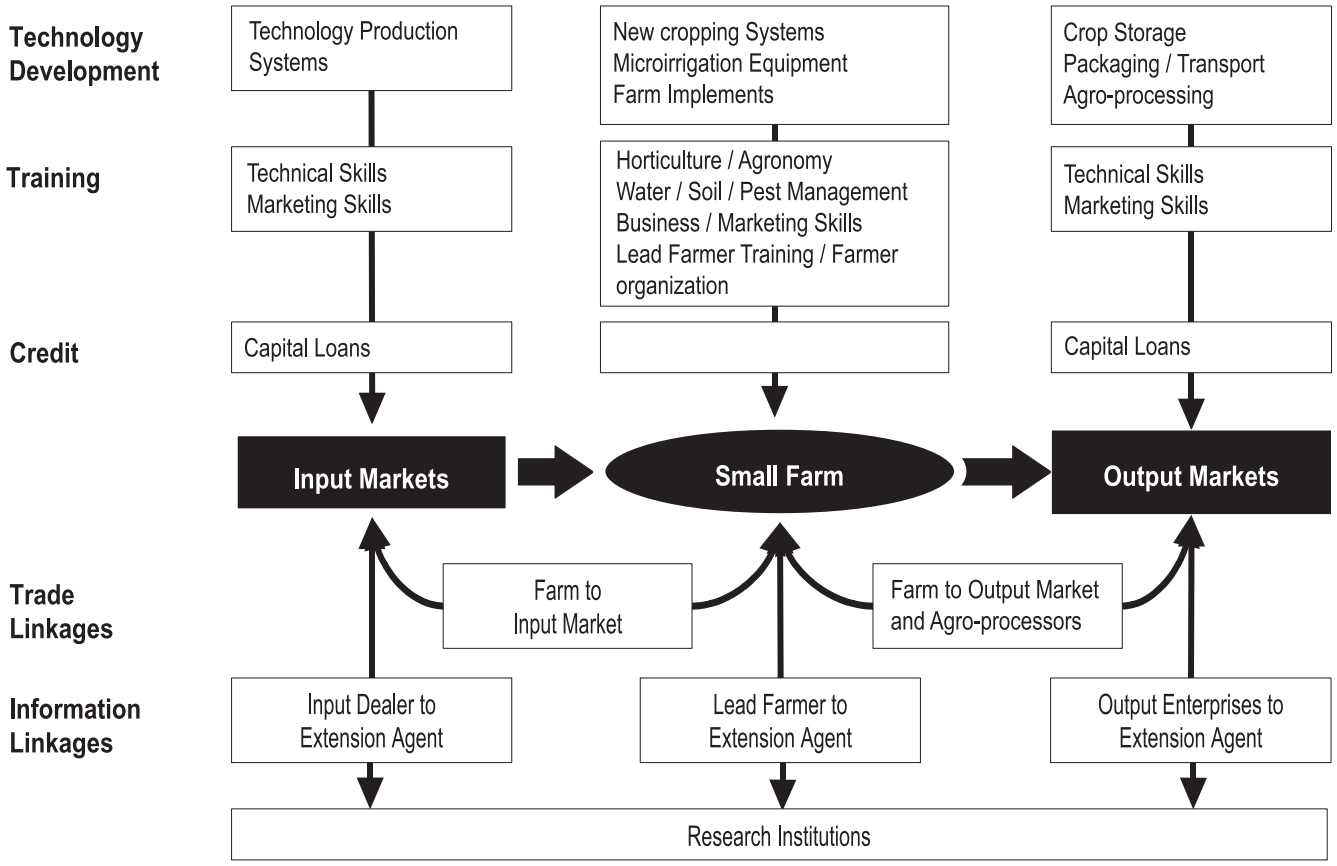
The worldwide scope for affordable microirrigation is very large, with widespread applicability to the creation of production systems that are extremely efficient—in water usage and in targeting economic benefits toward the rural poor. Two preliminary studies prepared by IDE and Winrock International have indicated that as many as 30 million rural households can potentially benefit over the next 15 years from microirrigation as a means to smallholder market integration.[7]

As an initial step toward this very ambitious goal, IDE (in collaboration with Winrock and other partners) has spearheaded the SIMI. The SIMI aims to coordinate efforts of the international development community to tap the productive potential of microirrigation and market integration for rural poverty reduction. Affordable microirrigation technologies are taken as a starting point for increasing smallholder production. Increased production then becomes the basis for profitable interactions with the market, which in turn lead to increased incomes and improved livelihood for smallholders. The SIMI follows a series of six logical steps.

[7] Smallholder Irrigation Initiative: Study on the Dissemination Potential of Affordable Drip and Other Irrigation Systems and the Concrete Strategies for their Promotion, funded by SDC and Japan Irrigation and Drainage Institute (March 2001), and Smallholder Irrigation Market Initiative (SIMI): A Plan to Achieve Large-Scale Poverty Reduction through Water Control and Market Participation, funded by the Dutch Ministry of Foreign Affairs (April 2002).

- *Market-shed definition.* A "market shed" is defined as the geographical area and associated population that has real or potential trade relationships with a particular market center. A single market shed may comprise anywhere from several thousand to several hundred thousand smallholder families that share a degree of uniformity in hydrology, agro-ecology, market access, and socio-cultural characteristics. Market sheds are selected in areas where smallholders have at least minimal access to water and markets since infrastructure projects for water resource development and transportation are not included in the SIMI model. Rather, the SIMI seeks to help smallholders and small enterprises take advantage of existing water and market opportunities, whether they exist naturally or through the intervention of other projects.
- *Water strategy*. Analyze the water situation within the marketshed to identify an overall approach that will allow smallholders to access and control water for irrigation. Emphasis is placed on low-cost, household-level, micro-irrigation systems for accessing, storing, and controlling irrigation water. Such systems are consistent with the ideal of maximizing water-use efficiency and minimizing social transaction costs for users. Environmental assessment is of primary importance at this stage to minimize adverse effects of the proposed water strategy and ensure sustainability in the long term. Other key considerations at this stage include water policy, customary water-use arrangements, power relations (including gender issues), and potential water-use conflicts.
- *Opportunity analysis*. Based on an analysis of high-value crop markets—and with extensive participation of farmers, research institutions, NGOs, and government agencies—identify a set of cash crops that smallholders can produce with comparative advantage and for which there are promising markets.
- *Constraints analysis*. For each of the crops identified above, identify constraints in the input-production-output chain. The basic tool used to identify constraints is sub-sector analysis, which seeks to identify the significant players in the market system, the relationships between those players, and the rules that govern those relationships. Emphasis is placed on four areas of potential constraint: technology, capital/credit, capacity building, and market information.
- *Intervention design*. Intervention strategies are designed to address the priority constraints identified above. Figure 1 indicates the types of interventions that may be required in a given market shed. Typically, production factors (such as technology, capital/credit, capacity building, and market information) are neither available to smallholders in a form that is useful to them nor at affordable prices. Market interventions seek to activate the private sector to address the particular needs of smallholders by delivering appropriate and affordable products and services. Networks of small agribusinesses provide the critical linkages between smallholders and the wider economy. External intervention in the form of public investment and grant funding is used to "get the ball rolling," allowing market forces to take over and become self-sustaining. After 5–6 years of market interventions, it is expected that smallholders will be sufficiently integrated with market systems, that they will achieve net incomes amounting to $500–1,000 per year from cash crop

Figure 1. Potential Areas for Intervention to Facilitate Smallholder Market Integration



production. At this point, external intervention is phased out, leaving the market to operate under its own power, and leaving farmers well informed, motivated, and organized to continue developing and taking advantage of market opportunities on their own.

- *Implementation and evaluation.* Details of this step are very much dependent on the results of the program formulation in preceding steps. It is clear, however, that market intervention of the kind proposed here requires concerted efforts of multiple players that are able to deal with technology development, the injection of capital and credit, training and capacity building, and market information development. A key strategy will be to create "platforms" upon which participating organizations—including government, NGOs, research, and private-sector organizations—can work together in a deliberate, determined, and targeted fashion toward the goal of sustainable market participation by the rural poor. The platform organizations act as facilitators, supporting the real "actors" in the market system, i.e., the smallholders and small enterprises in the input and output chains.

The SIMI is, by necessity, demand-driven. Market systems simply will not function sustainably unless they respond to real demands. Grassroots participation of smallholders and small enterprises in each of the six steps is necessary to ensure that resulting market systems conform to actual needs and field realities.

A flexible approach is therefore required so that the implementation of the SIMI and resulting market systems can be tailored to conditions in each market shed.

To facilitate the learning process, IDE has proposed that the SIMI be piloted in the context of several regions that are generally comparable in terms of hydrology, agro-ecology, market access, and sociocultural characteristics.[8] Pilot projects in these regions will be accompanied by intensive action research to document and draw lessons from the ongoing field experience. Once a solid knowledge base for market-shed development in a specific region is in place, it can serve as the basis for rapid expansion of market-shed development efforts within the same region. In each new market shed, the learning approach will continue, though research and documentation activities will be less intensive than in regional pilot projects.

Conclusion

Achieving the Millennium Development Goals—particularly the goal of halving the number of people surviving on less than a dollar a day—will require a major reorientation of worldwide development efforts from pursuing general "economic development" and toward "poverty reduction" as a distinct and more urgent goal. In contrast to current trends, the allocation of development resources must become biased *toward* rural areas, agriculture, and smallholder agriculture in particular.

Microirrigation stands out as a simple, practical, and widely applicable tool for liberating market forces to benefit the rural poor. The experience of IDE during the past 2 decades has demonstrated how this can be achieved on a relatively small scale (2 million smallholders). The concepts embodied in the SIMI approach provide a way forward, employing a demand-driven, action-oriented approach to reduce poverty on a very large scale through the integration of smallholders into expanding markets, with microirrigation as an entry point.

[8] Regions have been initially identified in Asia, including the Gangetic plain (Bangladesh, West Bengal in India, and the Terai of Nepal); the Deccan plateau (central India); Eastern India (Orissa), the hill regions of Asia (Lao People's Democratic Republic [Lao PDR], Myanmar, Nepal, North India, Thailand, and Viet Nam); south-central People's Republic of China (Guizhou, Sichuan, and Yunnan); and the Greater Mekong Subregion (Cambodia, Lao PDR, Thailand, and Viet Nam).

9

The Soozhal Initiative: A Model for Achieving Total Sanitation in Low-Income Rural Areas

By S. Ramesh Sakthivel and Roger Fitzgerald (WaterAid, India)

Summary

One of the objectives agreed at the World Summit on Sustainable Development in Johannesburg in August 2002 was to halve the proportion of people without safe water and sanitation by 2015. Many such people live in rural areas; in India, rural sanitation coverage is just 14%.

This case study documents the Soozhal network's rural sanitation initiative in the Cuddalore district of Tamil Nadu, India. Soozhal, a group of seven NGOs, launched its project to complement one of the Government of India's total sanitation campaigns (TSCs), which involved nongovernment stakeholders.

At the outset of Soozhal's program, which began in October 2000, less than 6% of households in Cuddalore district had a latrine. Soozhal's objective of 25% of target households building latrines in the first 2 years of the initiative has been achieved. From a target population of 47,825 households without latrines, 8,274 had built latrines and a further 3,892 were on track to complete latrines by October 2002.

Soozhal's success has influenced the Government to adopt their methodology within the non-Soozhal areas of the district TSC, which has also boosted the rate of latrine construction there.

Some challenges facing India's TSCs include

- how to create demand for sanitation and bring about behavioral change in large numbers of households and individuals;
- how to bridge the gap between the small government subsidies available and the actual cost of building latrines—a problem for low-income households; and
- how to make the best use of available resources.

Soozhal has addressed these challenges through a threefold strategy:

- unlocking latent demand for sanitation by training local women to use specially adapted communications tools;
- supporting the newly created demand with tailored financial arrangements that respond to the financial realities of low-income households: this optimizes the efficiency of government subsidies; and

- working directly with community-based organizations, to help raise demand for sanitation and to mobilize communities to improve their own sanitation.

Soozhal's experience in Cuddalore district is that it is important to pay attention to the supply and demand aspects of sanitation for low-income households. Unlocking demand needs to be backed up by realistic and timely delivery mechanisms. The program provides a model of how to optimize the use of limited resources—from domestic governments and external development partners—to benefit large numbers of low-income households. It demonstrates how a sanitation program can succeed with low levels of subsidy, by stimulating demand and mobilizing communities.

Introduction

This case study sets out the experience of a rural sanitation program in part of the Cuddalore district of Tamil Nadu, India. The program involved government and nongovernment stakeholders, and formed part of a TSC launched in the district in April 2000 by the Ministry of Rural Development and local authorities. TSCs are being piloted in 69 rural districts throughout India. Their objectives include encouraging households below the poverty line to build latrines, build school toilets, and set up communal sanitation facilities for women.

One of the objectives agreed at the World Summit on Sustainable Development in Johannesburg was to halve the proportion of people without safe water and sanitation by 2015. Many such people live in rural areas: in India's rural areas, sanitation coverage is just 14%. The lack of facilities for the hygienic disposal of human waste leads to a high incidence of diseases linked to water and sanitation, particularly diarrheal diseases.

At the outset of the program, sanitation coverage in Cuddalore district was less than 6%, which is below the national rural average. Soozhal's objective was to achieve 25% coverage in the 81 selected panchayats (groups of villages) within 2 years. This target has been reached. Of a population of 47,825 households, 8,274 had built latrines by September 2002 and a further 3,892 were on track to complete theirs by October 2002.

The impact of the Soozhal initiative can be seen by comparing the rates of latrine construction in the panchayats covered and not covered by Soozhal within the district. By October 2001, 5,455 toilets had been constructed in the entire district. Of these, 4,004 were constructed in the 81 Soozhal panchayats in 12 months as opposed to 1,451 toilets being constructed in the remaining 682 panchayats in 18 months.

As a result of Soozhal's success, the Government adopted Soozhal's methodology and started promoting the use of self-help groups from the second year onward within the non-Soozhal areas. By September 2002, a total of 21,619 latrines had been constructed within the district; 8,274 by Soozhal and 13,435 by the Government.

Cuddalore district has a high proportion of dalits and low-income households: almost 50% of households have an annual income of less than Rs6,000 ($120). Literacy levels and incomes are lower than the national average, both of which are factors in the low sanitation coverage. The area is dependent on seasonal rain-fed agriculture, with the season lasting from October to March. The major

crops are paddy, sugarcane, and cashew nuts. Agriculture provides the area's only employment opportunity, although in recent years government-sponsored credit programs have provided opportunities for income generation through small-scale dairy enterprises, trading, and commercial services. There is also off-season migration between April and September, when many men travel to other parts of Tamil Nadu and the neighboring state of Kerala to work on construction sites.

The Cuddalore TSC Stakeholders

Ministry for Rural Development

India's Ministry for Rural Development launched its Central Rural Sanitation Program in 1986. The program was refocused in 1999, with an emphasis on a campaign approach involving the use of mass communication techniques such as wall paintings, village motivation camps, and exhibitions. TSCs are based on two principles: first, that the best way to achieve the goal of total sanitation is to respond to demand; and second, that people's participation and hygiene education are prerequisites for unlocking this demand.

Cuddalore District Rural Development Authority

The Cuddalore District Rural Development Authority, a local government department, is responsible for rural development programs in the area. Within this, a separate section oversees the TSC. A committee, consisting of department heads and external funders such as UNICEF and WaterAid, advises the district authorities on TSC matters. Staff turnover among local government officials has been a problem for Soozhal, along with bureaucratic delays, (e.g., on the release of subsidies, etc.). While district-level officials are well disposed to Soozhal's initiative, Soozhal is still working at building a positive relationship with lower-level officials.

WaterAid

Before the TSC began, WaterAid had been actively working with its local partner organization, BLESS, and the district administration taking part in discussions, training local government officials, and helping develop district plans for expanding sanitation coverage. Following this collaboration, the district administration invited WaterAid to help develop a replicable model for the TSC program. As WaterAid's financial resources are limited, it was decided that the most effective role it could take was that of facilitator, preparing the ground for other actors to implement the project.

The Soozhal Network

WaterAid's partner organization in Cuddalore, BLESS, decided that, mainly due to the size of the target area, a network of local NGOs would be more effective than a single agency working alone. BLESS identified other NGOs that had both a good rapport with communities and a commitment to the TSC approach. The process of building the network lasted 18 months, and culminated in its official formation in August 2000. The network comprises seven local NGOs, including BLESS itself.

The TSC approach focuses on mass communication techniques, rather than working through community groups, and none of the Cuddalore TSC funds were earmarked for community capacity building. WaterAid provided Soozhal funding for this as a strategy for helping create demand for sanitation.

Project Development and Implementation

The Cuddalore district TSC covered 682 village panchayats, or groups of villages, with a total population of about 1,427,000. From these, the Soozhal network chose 81 panchayats covering a total of 288 villages and an estimated 208,000 people for its own direct intervention. A baseline survey found that there were 47,825 households without latrines. Soozhal's strategy involved the following.

Community capacity building

Women's self-help groups (SHGs) were established in the area several years ago as part of a state-run women's development program. SHGs, which tend to have 15–20 members, meet each week to run savings and credit schemes for household consumption and income generation. The existence of so many well-functioning SHGs was a great strength on which Soozhal was able to build. Soozhal has worked with over 650 SHGs, with a total of 8,465 members, and facilitated the creation of another 85 SHGs as part of the water and sanitation initiative. Each new SHG cost Soozhal approximately Rs750 ($15) to promote, making this a very cost-effective strategy.

SHGs, which now have a total membership of 13,643 women, are networked at village, panchayat, and "cluster" levels, with a cluster consisting of five panchayats. Their effectiveness is demonstrated by the fact that some have been contracted to undertake school sanitation and water works.

Unlocking demand

A total of 2,465 SHG leaders, three from each group, have been trained as hygiene communicators, each taking part in three 2-day courses. They were chosen using the criteria of commitment, communications skills, and leadership qualities. As well as hygiene communication, they share the responsibilities of running their group, such as convening meetings, accounting, and keeping records.

The first objective was to encourage these women to adopt good hygiene and sanitation practices within their own households. The second was that they should educate and motivate other group members to change their hygiene practices and begin to demand latrines.

The hygiene communicators explained the scope of proposed programs, the criteria for subsidies, technical options, achievable benefits, financial implications, and commitments expected from users to other group members. They were provided with technical handbooks and trained to use a range of participatory educational tools such as flash cards and calendars with SHG members and local schoolchildren. These tools had been used in previous WaterAid projects, and were adapted for the project during workshops in which both group members and Soozhal project staff participated.

Over an 18-month period, 15,000 families were reached through Soozhal participatory processes and peer education, complemented by the TSC mass communications campaign. Numerous factors contributed to the success of this element of the program, notably the fact that the women's SHGs meet regularly, the commitment of the hygiene communicators, and good interaction among group members. Involving women's SHGs members as hygiene educators has proved to be more efficient and more cost-effective than deploying project staff in this role. The total cost of training the hygiene communicators was Rs1,080,000 ($21,600), which works out as Rs438 ($8.76) per head.

Through the work of hygiene communicators, communities have been made aware of the link between a lack of hygiene and diseases, and the benefits of using a latrine. The hygiene practices of group members have changed as a result, and demand for latrines is building up among families of group members, schoolchildren, and communities in general. Creating demand in this way is crucial. If sanitation programs are to be effective, it is not enough simply to provide latrines. People must also appreciate their necessity and value them.

Offering choices

Parallel with the work of hygiene communicators, the network set about trying to raise demand for sanitation by demonstrating different types of low-cost latrines and related structures. Models of alternative designs were displayed both in villages themselves and in NGO centers where most hygiene communicator training took place. The models created interest, and enabled villagers to decide which design would be most suitable for their household.

One of the key messages at this stage was that households could build a useable basic latrine immediately, then go on to improve it later when more funds became available. Superstructures made of thatch and other impermanent materials cannot withstand the area's strong winds and rains for long, so it was expected that most households would go on to build something more permanent later.

The supply of building materials was devolved to the village level, and wherever possible, masons from the local area were used. Soozhal introduced simple, low-cost building methods and many households made their own cement bricks for the latrines.

Establishing effective financial arrangements

In order for it to work, the demand-responsive approach must be backed by appropriate financial arrangements—namely financial mechanisms that reduce dependency on government subsidies and facilitate the effective use of available government funds. Two key financial instruments meet the financing requirements of the Cuddalore program.

Bridging loan funds to cover working capital requirements

These help overcome the problem that government subsidies are paid in arrears, and often delayed. Bridging loan funds also avoid cash flow problems for implementing NGOs and microcredit groups. NGOs use this money to provide latrine construction kits, which households then pay for once they receive their

government subsidies. WaterAid has provided bridging loan funds of Rs200,000 ($4,000) for each cluster of panchayats.

Sanitation fund

The overall sanitation fund consists of each group's revolving loan fund amalgamated at cluster level. As revolving loan funds are shared through the network, resources can be efficiently directed to wherever they are needed.

The sanitation fund complements government subsidies. As part of the TSC, the Government provides Rs500 ($10) to each household to help them build a latrine. The construction of a single pit pour-flush latrine with space for bathing costs between Rs650 and Rs850 ($13–17), depending on whether or not the pit has to be lined. This does not include labor, which is provided by the household. If a superstructure made of permanent materials is included, the cost rises to Rs1,800–2,000 ($36–40).

There is a sizeable gap between the amount of subsidy offered and the actual cost of building a latrine, and most low-income households cannot bridge this gap themselves. At the outset of the initiative, there was a serious risk that the demand that Soozhal had helped generate would stagnate, and available resources go to waste.

Soozhal staff discussed how to resolve the issue with the women's SHGs. One suggestion was to use existing group funds as credit for latrines. However, these funds were being fully utilized for their original purposes. Instead, the groups decided to set up separate savings schemes for sanitation, to run alongside the existing schemes. Each group member makes a deposit of Rs100 ($2). The maximum amount that a household can then borrow for sanitation is Rs1,000 ($21), to be repaid in monthly installments over a 10-month period. Typically, interest rates are less than 20% per annum. This covers any bank charges or interest payments on the revolving loan fund, as well as the groups' administrative expenses. Households wanting to borrow have to demonstrate commitment to building a latrine, for instance by subscribing to the sanitation fund, digging a pit, and collecting building materials. Some groups stipulate that borrowers need to have constructed a latrine designed to standard before they can take out a sanitation loan. One of the advantages of this form of financing is that it is relatively easy for groups to check whether a household is ready for a sanitation loan, and that the loan is properly used. On the borrowers' side, an advantage is that they do not need to make time-consuming visits to government offices to claim subsidies or prove that they are building a latrine.

Default rates are very low: individual NGOs in the network report that between 80 and 100% of loans are repaid in full by the due date, and the maximum delay in repayment so far has been 3 months. This excellent credit history is because households are proactive in applying for loans, groups assess people's capacity to repay before disbursing the loans, and there is strong peer pressure to repay.

The groups have raised more than Rs1,100,000 ($22,000) internally. This supplements seed funding of Rs25,000 ($500) per group, which was necessary because of the project's relatively short time frame, and the high demand. To

begin with, the groups borrowed Rs500,000 ($10,000) from banks. However, Simavi, a Netherlands-based funding agency, subsequently lent Rs2,200,000 ($44,000) interest-free. Soozhal's initial bank loan has now been repaid, and it is hoped that, thanks to Simavi's loan, commercial borrowing for the Sanitation fund can be avoided in the future. It is notable that banks that in the past would only fund microfinance for traditional income generation activities are now interested in lending for sanitation, because of the low default rates and high turnover. For instance, the government National Bank for Agricultural and Rural Development is offering credit at annual interest rates as low as 4%.

Box 1 contains information on the Palaar cluster, one of the 16 group clusters, to illustrate the project's achievements to date.

Box 1. The Palaar Cluster

No. of Panchayats Covered	5
Total Households	2,362
No. of Members	1,074
Sanitation Fund Mobilized from Members	Rs72,300 ($1,500)
Number of Latrines Built	571

The Palaar cluster plans that all group members will have built latrines by March 2003, with total sanitation coverage in the cluster area by March 2004. They intend to apply for a bank loan to help them achieve this. The cluster has made a donation of Rs4,000 ($83) toward building school latrines, as well as making loans of Rs36,000 ($750) for this purpose.

Lessons Learned

The Soozhal initiative has thrown up learning points for agencies wishing to assist low-income rural households to build latrines and improve their hygiene practices.

- Building the capacity of community members to raise awareness is an effective way of unlocking latent demand for sanitation.
- Working directly with community-based organizations complements and enhances a mass-communication campaign approach, such as that adopted by TSCs.
- Once demand is created, low-income households are often willing to contribute to building latrines. However, they still need public finance to complement their own efforts and help them realize their aspirations. Well-designed financial mechanisms, in this case, microfinance, can do this.
- Subsidies need to be well targeted and well timed if they are to result in large numbers of latrines being built.
- Pooling the available finance between low-income communities enables them to optimize resources.
- Delegating responsibilities and decentralizing roles, especially on handling finance, is essential: the Soozhal initiative has shown that community groups can take on these responsibilities.

- Transaction costs for obtaining and monitoring loans from group savings and credit schemes are low compared with those of government subsidies: this benefits both borrowers and lenders.

Soozhal's imaginative and flexible approach has contributed to the rapid pace of sanitation coverage and changes in people's hygiene practices in the target area. It has shown that low-income rural communities, if mobilized and well organized, can be empowered to take these changes into their own hands.

10

Mountain-River-Lake Integrated Water Resources Development Program, Jiangxi, People's Republic of China

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Introduction and Background

During the 1960s and 1970s, Jiangxi Province, in eastern People's Republic of China (PRC), suffered from severe environmental degradation. By 1980, water and soil erosion was serious, as were frequent droughts and floods, accelerating deterioration of soil quality and desertification, loss of biological resources, widespread pollution, and an increasing incidence of schistosomiasis (120,000 persons infected in the lake area every year), and substantial poverty (14% of the population below the poverty line in 1985).

In the early 1980s, the Jiangxi provincial government, with the help of the Central Government, initiated an integrated eco-restoration and poverty reduction program. This program was based on the understanding that "the Mountain is the source—the River is the flow—the Lake is the reservoir" (MRL)—i.e., that the three comprise an integrated biological system. Water and soil erosion in the mountains was explicitly linked to poverty, so poverty reduction was a focus of the program, which is an example of an integrated water resources management (IWRM) approach. The program has won worldwide acclaim for its achievements. This case study paper highlights the key elements of the program, the main achievements, and the lessons learned.

Jiangxi Province is situated on the south bank of the mid-low reaches of the Yangze River in eastern PRC. The total area is 166,900 km^2 of which 36% is mountainous land, 42% hilly land, while plain land and water bodies make up the remaining 22%. Of the land area, about half is arable land and half forest. Jiangxi Province has a population of 41.4 million and includes 11 cities and 99 counties.

The main water body in the province is Poyang Lake, which receives its water from the watersheds of Fu River, Gan River, Rao River, Xin River, and Xiu River.

Source: www.chinaonline.com/refer/maps/secure/col_jiangxi.gif.

These watersheds cover about 162,225 km^2, occupying 97.2% of the total land area of Jiangxi Province.

In the early 1980s, authorities of Jiangxi Province identified the following main regional development problems.

- ***Serious water problems and soil erosion***

  Forest coverage was only 31.5% in the early 1980s against 60% historically. Rivers and lakes were silted up and the water bodies shrunk due to serious water and soil erosion.

- ***Frequent droughts and flooding disasters***

  Some parts of the province experienced almost yearly flooding and other parts regular droughts.

- ***Acceleration of soil deterioration***

  Organic substance declined and desertification started.

- ***Decline of biological resources***

  The previously widely available and diverse forest and natural water resources declined noticeably.

- ***Serious pollution***

  The province experienced serious industrial pollution as well as wastes from urban areas.

- ***Increase of endemic diseases***

  Every year around 120,000 persons are infected by snail fever in the lake area.

- ***Increasing poverty***

  In 1985 about 6.2 million people lived below the poverty line.

In 1983, the Jiangxi provincial government decided to conduct three integrated scientific surveys in the Poyang Lake region and the watersheds of the five rivers. The purpose was to identify the problems in the area and their interrelationships on the basis of which it would formulate relevant development strategies for the region. The following scientific surveys were conducted.

1983–1987	Integrated Scientific Survey in the Poyang Lake Region Survey Area: 40,000 km^2 in 25 counties
1984–1986	Agricultural Nature Resources Survey in South Jiangxi Mountain Areas Survey Area: 39,083 km^2 in 18 counties
1985-1987	Integrated Scientific Survey of Nature Resources in the Watershed of Gan River Survey Area: 117,000 km^2 in 64 counties

Through the surveys, historical trends, and the present situation, issues in the region were identified, including natural resources and their use. The analysis showed that the main issues in the Jiangxi Province were that watersheds are not independent, but interrelated and interdependent. This understanding is reflected in the MRL concept underpinning the program that "Harnessing the lake must harness the rivers, harnessing the rivers must harness the mountains." The mountains, rivers, and the lake are all part of a complex and complete biological system.

Another concept that underpins the MRL Program is that balancing the needs of the economy and the environment of the region requires coordination, planning, systematical development, and integrated management.

Setting Up the Mountain-River-Lake Program

In 1985, the Jiangxi provincial government, with the support of Central Government and international agencies, established the MRL Development Committee to lead the integrated development of the region. The MRL Development Office was established as the executive body with branches at the prefecture and county level. Project planning was based on catchments rather than administrative boundaries.

In 1991, after completion of the necessary surveys, the provincial People's Congress approved the "Profile of Comprehensive Plan of MRL." The Congress emphasized that the program was a long-term development project in the province that required all related parties to be involved in the implementation. The provincial governor took the leadership of the MRL Development Committee. However, since the approval of the program, the Congress has not monitored its implementation. Nevertheless, the legislation support and political commitment behind the MRL Program are considered essential for its success.

The MRL Program development can be divided into three stages.

- From the early 1980s to the end of the 1990s, **scientific survey and issues** were identified. At this stage the comprehensive plan for development was formulated through interdisciplinary and multidisciplinary scientific surveys. The research identified the principal issues in the area.
- From the beginning of the 1990s to mid-1990s, **pilot case studies** were undertaken to explore development models in different geographical areas, and disseminate the success stories to a wider area through governmental encouragement and incentives.
- From 1996 to the present, new participatory mechanisms and "bottom-up" methods are being introduced for the catchment development, with the help of a General Technical Cooperation (GTZ)-funded project.

Institutional development is the key factor in the MRL. Through various development stages, transitional functions of the institutional development can be seen. In 1981, the Poyang Lake Scientific Investigation Leading Group and its office were set up to conduct technical coordination for interdisciplinary and multidisciplinary survey and researches. The office, headed by a chief engineer, involved many institutes and organizations from central, provincial, and local levels.

In 1985, the Gan River and Poyang Lake Development Leading Group (the predecessor of the MRL Development Committee) and its office were set up, together with the academic committee. During the investigation, it was found that dealing only with Poyang Lake was not enough and that the area to be taken into account should extend to the middle and south of the province.

The Leading Group was responsible for organizing and coordinating development and management activities in the area. The committee members came from related government agencies, and included some prefecture leaders. At prefecture levels, subordinate bodies were set up. These agencies were guided by scientific and technological commissions at provincial and prefecture governments.

In 1991, the MRL Development Committee was formally set up, incorporating the original Leading Group, the Office and the Academic Committee. In 1995, the MRL Regional Development Center was set up as a subordinate organization of the MRL Development Committee to provide technical support. In 1999, the MRL Promotion Association was set up to promote public participation and disseminate the achievements to the public.

Initially, the provincial governor chaired the MRL Development Committee. Recently, after restructuring government organizations, the vice-governor took over. As a result, the coordination function of the committee became somewhat weak.

In 1997, the Office introduced a major change in the process by introducing participatory methods that consider local farmers as the focal point of rural development. They are assisted and encouraged to participate in the whole process of problem analysis, project planning, decision making, implementation, monitoring and evaluation, and follow-up management. This leads to the development of holistic land use planning as well as self-managed farmers' organizations in rural areas.

As a result of shifting to a participatory approach, the role of the Office changed from being the key actor to acting as a facilitator. In the new approach, the farmers make participatory land use plans themselves and the Office provides the necessary technical advice. The Office also provides access to technology, financial sources, and information. The Office has thus become an agency, which bridges the gap between farmers and various sources of technology and inputs. The MRL Promotion Association is responsible for promoting project development by providing technical services, building the experts, databases, etc.

Approach to Mountain-River-Lake Development

The following are the development goals of the MRL Program:

- to achieve integrated development of the MRL region through comprehensive planning and implementation;
- to gradually establish an economic complementary mechanism for resources renewal to protect and sustainably use natural resources, to develop the economy and human resources, and to improve the people's living condition in the MRL region;
- to establish a service network of high technology and training for the whole MRL region;
- to manage and control water and soil erosion, and environmental pollution in a holistic way; and
- to establish MRL ecological economic zones offering models to similar areas at home and abroad.

The MRL Program is based on the following seven basic strategies.

- To manage the lake, the river must be harnessed; to harness the river, the mountain must be managed; to manage the mountain, poverty must be reduced.
- Watershed development must be done systematically and water and land management must be done comprehensively, taking ecology and economy into account.
- Planning must be based on comprehensive scientific surveys on the resources, the environment, and society of the MRL region.
- Sustainable development of the MRL region requires research on macro-strategies.
- There must be an overall planning framework for the MRL regional development.
- Experiments and demonstrations are needed for development and management in selected typical zones of the MRL region.

- A technical training network is needed to promote human resource development.

One of the key elements of the MRL approach is the dissemination of successful experiments. Case studies were written about the following nine successful experiments.

- Integrated development of red soil hilly land
- Development of small watersheds in mountain areas
- Eco-forestry development in mountain areas
- Agro-forestry and comprehensive eco-economic development in paddy fields
- Fodder grass development in southern agriculture region
- Comprehensive development of large water surfaces in lake areas
- Eco-agriculture to control snail fever and reduce poverty in the Poyang Lake area
- Comprehensive development and management of sandy wasteland
- Planning and construction of an ecological city

The case studies and their demonstration and dissemination were the key success factor in the program. During the scientific investigation in 1988, it was realized that the pilot experiment is necessary to address the development and environmental issues, and that became the main work of the Office. The focus of the pilot experiments was on the environment, such as water and soil degradation in the catchment. Most pilot experiments involved multidisciplinary methods and combined development and harnessing of natural resources with participation of the local people.

Since 1983, 27 demonstration sites and 127 extension stations have been established with the help of the Ministry of Foreign Economic and Trading Cooperation (MOFETC), the Ministry of Science and Technology (MOST), and the State Planning Commission, etc. A total of 27 pilot experiments were developed, of which one third were successful. Experiments that failed did so mainly because the technology did not fit the local circumstances or because there was insufficient demand in the open market for the products.

However, successful experiments alone are not enough. The crucial question is how to scale up these success stories to cover the whole area of the MRL Program. Widespread training was considered to be the answer. Between 1990 and 1997, the MRL Program therefore developed a training center in Nanchang as well as three training centers in the southern, middle, and northern parts of the province. These centers provide training services to technologists and farmers. Initially this training was free of cost, but now participants have to pay part of the cost. Since then more than 1,400 training workshops have been conducted, 120,000 persons trained, and about 180 new technologies and methods introduced.

At the same time, MOST made arrangements with banks to develop a more than yuan (CNY)200 million ($25 million) loan project, with the interest subsidized. Counties or local companies that wanted to use technologies or models developed by the MRL Program could apply for a loan from the banks. These loans were issued against verifiable indicators.

After the loan projects were finished, they were assessed by the MRL Program in technology and financial operation. If a loan project were successful in these areas, the MRL Program would pay interest to the organization (7–8%). Loan projects that failed to successfully use new technology or that had a poor financial operation would not receive the subsidized interest.

In general, the banks were satisfied with the projects. Causes of failures were related to lack of capacity of the organizations concerned and other institutional issues. However, this technology dissemination process was rather top-down and implemented and promoted by government agencies. This process was another form of subsidy. Another key element of the MRL Program is that it provides access to small loans. Normally, the farmers in the poorer areas find it very difficult to get loans from banks. The banks consider giving loans to these poor farmers too risky, while the small amounts of the loan means the cost to handle them is very high. Helping poor farmers get access to capital for development through credit is crucial, so that they can grow out of poverty.

The MRL Program introduced the Grameen Bank model, which was successfully developed in Bangladesh. The Rural Bank is funded by the United Nations Development Programme (UNDP) and the bank applies the following selection criteria for households that apply for a loan.

- The total household property value is less than CNY20,000 ($2,500).
- The annual per capital income is less than CNY1,500 ($188).
- The farmers have working ability.
- Preference is given to women in granting loans (they are considered to be relatively stable and do not usually waste money on cigarettes and alcohol).

The implementation of the small-scale credit scheme is through the poverty reduction office at the county level. This office forms groups consisting of five households. Each group member is responsible to help, monitor, and take care of the other members. This arrangement allows an increase in the level of credit and reduces the risk for the bank. The basic groups are brought together in a central group, which convenes every 2 weeks for loaning, repaying, and training. The loans, which range from CNY500 to CNY2,000 ($63–250), do not require a collateral. Loans are payable within 1 year at an annual interest rate of 6%.

After getting the loan, from the third week, the farmers start repaying in 25 installments. The group also sets up a special fund to which 5% of each loan is deposited by collecting 0.2% of the loan at the time of the 2-weekly installment. The fund is owned by the group members, who can avail of loans at no interest. After the loans are repaid in full, the fund is returned to the farmers.

As of November 2001, 12 central groups with 83 subgroups and 439 farmers of which 430 were female, had been funded. The total amount of loans was CNY1.06 million ($133,000) and the repayment rate was 95%.

This model addressed the issues of the lack of access of the poor farmers to capital, the low repayment rate of loans, and low efficiency of capital use. It is very helpful in increasing the capacity for the poor to grow out of poverty, but it should be realized that the actual interest on the loans is about 9%, which means the poor farmers get access to capital at a relatively high interest rate.

With the help of international organizations, a geo-information system for the MRL region has been established since 1991. This system is used for resource surveys, monitoring floods, regional planning, sectoral planning, small-scale watershed development, and so forth.

Following the principle of "promoting development by opening to the outside," with the aid of the MOFETC, MOST, and the State Planning Commission, the MRL Program has established cooperation and exchange relationships with more than 20 international organizations and foreign countries. The following are a few examples of such cooperation, all of which were undertaken by the MRL Office:

- Development of the MRL Region of Jiangxi Province, 1990–1993; assisted by UNDP, $600,000;
- Sustainable Development of the MRL Region of Jiangxi Province, 1995–1998; assisted by UNDP, $970,000;
- Sino-German Cooperation: Sustainable Development of Mountain Areas of Jiangxi Province (Phases I and II), 1996–2003; assisted by German Government, DM12 million;
- Sino-Bengal Cooperation: Experiment of the GB Micro-finance to the Poor, 1999–2001; assisted by UNDP, $50,000;
- Demonstration Project on the Wetland Eco-Tourism Development in Shahushan in the Poyang Lake, Jiangxi Province, 2001–2002 (Phase 1); assisted by World Wide Fund for Nature, CNY500,000 ($62,500);
- Participatory Rural Development and Poverty Alleviation, 2002–2005; assisted by UNDP, $1 million; and
- Sino-Bengal Cooperation: Experiment of the GB Micro-finance to the Poor, 2002–2005; assisted by UNDP, $65,000.

The Forestry Department of Jiangxi Province carried out the Protection Forestry Construction of the Yangze River in 1998–2002 with the assistance of the German Government, amounting to DM12 million.

The Agriculture Department of Jiangxi Province implemented the following programs with the help of international funding agencies:

- Integrated Development of Agriculture of Ganzhou City of Jiangxi Province, 1996–2000; assisted by the Food and Agriculture Organization; C$24 million (loan);
- Red Soil Development Project (Phase I), 1986–1991; assisted by the World Bank, $37 million;
- Red Soil Development Project (Phase II), 1987–1989; assisted by the World Bank, $40 million; and
- Aquatic Product Development in the Low Wasteland of the Poyang Lake Region of Jiangxi Province, assisted by UNDP, CNY26.4 million ($3,300,000).

Finally, the Planning Commission of Jiangxi Province was the executing agency for the Jihu Agricultural Development Project, 1989–1997; amounting to $63.4 million, with the assistance of the World Bank. The European Union (EU) assisted

the Sciences and Technology of Nanchang City in the implementation of the Integrated Development of Desertilized Land of Jiangxi Province Project, amounting to $5 million, from 1993 to 1998.

The MRL Program has established relationships for cooperation and exchange with many international organizations such as UNDP, FAO, the World Bank, the EU and countries like Australia, Bangladesh, Canada, Germany, India, Israel, Japan, New Zealand, Philippines, Thailand, United Kingdom, United States, and Viet Nam.

Achievements of the Mountain-River-Lake Program

Under the leadership of the provincial government and with the help of the Central Government and international funding agencies, the MRL Program has achieved much success in promoting the integration of environmental protection, economical development, and poverty reduction following the MRL Development Overall Planning Outline of Jiangxi Province.

The main achievements are focused on the three ecological zones in the province:

- Integrated development of red soil hilly land in Jitai basin;
- Sustainable development of small watersheds in the mountain areas; and
- Eco-agriculture to control schistosomiasis and reduce poverty in the Poyang Lake area.

The following are main impacts.

- The forest coverage rate has increased from 31% to 56.8%. The number of forest parks at the state or provincial level has increased to 50.
- The area of Poyang Lake has been enlarged from 3,500 km^2 to 5,100 km^2. The water quality of Poyang Lake has reached the state standard of drinking water grade II.
- About 4 million poor farmers have become better-off by means of technical innovation, extension, and access to microcredit. GNP per capita of Jiangxi Province has increased from CNY597 ($78) in 1985 to CNY4,484 ($560) in 1998.

The MRL Program has received much acclaim from both home and abroad. Among others, in 1992, the MRL Program was selected to participate in the Technical Fair of the World Environment and Development Conference in Brazil. In 1994, the MRL Program was selected as one of the priority projects of the PRC's Agenda 21. In 2000, the MRL Program, as one of excellent projects in regional sustainable development around the world, was selected to attend EXPO 2000 in Hannover.

It is believed that the MRL Program is a successful model, which may be replicated in similar areas in the PRC as well as in other developing countries.

While implementing the MRL Program the following lessons were learned.

- Activities giving long-term benefits must be combined with those that yield immediate benefits.
- Development models must be based on local conditions.
- Technology must be applicable and extended step by step.

- It is useful to strengthen cooperation with outside organization by adopting a way of "development promoted by opening up."
- It is necessary to establish a management system with high effectiveness and efficiency.

In the 21st century, the MRL Program will focus on eco-environment improvement and enhance technology innovation to increase the science and technology content of the program. Based on the small watershed development, the development of MRL eco-economic zones will be the mainstay of the MRL Program. Emphasis will be given to the development of eco-agriculture-based modern agriculture, organic food-based food processing industry, and eco-tourism.

Policy Implications

The success of the MRL Program has the following policy implications.

- Political commitment is essential for undertaking such a wide-ranging program covering such a large area.
- An integrated approach—taking into account social, economic, and environmental issues—must be followed to reverse environmental devastation and help reduce poverty.
- The concept of the MRL should be replicated, as it is sound integrated management of water resources, land, and forest, while applying ecological methods for sustainable development.
- The setup of the MRL Program can be replicated as it provides an effective and open platform for agencies to cooperate and contribute in their own areas of specialization.
- Ensuring public participation and creating public awareness should be an inherent part of all development programs, as it turns out to be a major reason for the success of the MRL Program.

11

Allocating Water for Home-Based Productive Activities in Bushbuckridge, South Africa

John Soussan,[1] Sharon Pollard, Juan Carlos Perez de Mendiguren,[2] and John Butterworth[3]

Introduction and Background

This case study gives an overview of the findings of two surveys[4] into the productive uses of domestic water undertaken by the Association for Water and Rural Development (AWARD) with rural communities in Bushbuckridge district in eastern South Africa. The surveys were undertaken in relation to AWARD's work to improve the access of poor people to water resources in the Sand River Catchment. The second survey was part of the DFID[5]-funded Water, Households, and Rural Livelihoods (WHIRL) project. This paper was prepared as a contribution to the Water and Poverty Initiative that has been launched to raise awareness of the potential role of water in poverty reduction. As we shall see, this is certainly the case in the Bushbuckridge area, with water-dependent activities vital to the livelihoods of many poor people and improvements in access to reliable water services having the potential to make a major contribution to poverty reduction.

Any discussion of water issues in contemporary South Africa must be set within the context of existing dynamic changes to water laws, policies, and institutional responsibilities. Key aspects of the reform process are defining mechanisms to improve existing services and to allocate water to different stakeholders based on assessments of their minimum needs. For the domestic sphere, this reflects a definition of basic needs that assumes domestic water is only about health and hygiene, water for drinking, cooking, sanitation, and washing. Productive uses of domestic water are recognized in the water use category known as Schedule 1, for which no license is required, but the productive activities that take place in the household have yet to be recognized in planning and allocation processes.

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[3] Natural Resources Institute, Chatham, UK.

[4] J.C. Perez de Mendiguren and M. Mabalane. 2001. Economics of Productive Uses for Domestic Water in Rural Areas, AWARD Research Report; and Acornhoek and K. Mokgope and J. Butterworth. 2002. Rural Water Supply and Productive Uses: A Rapid Survey in the Sand River Catchment, WHIRL Project Working Paper 4. Natural Resources Institute, Chatham, UK.

[5] Department for International Development, UK.

As we shall see, these are a key element of the livelihoods of rural people in the Bushbuckridge area and are particularly important for many poor people, including female-headed households that are common in the area.

This leads to a reassessment of the concept of water for basic needs. This has traditionally been seen as being about health and hygiene only, but for the residents of Bushbuckridge, as for people in other parts of South Africa and across the developing world, the definition should be extended to include water needs for livelihoods activities. This is more than a semantic point where many of these activities take place in or around the home, as the systems through which domestic water is provided have tended not to recognize these essential needs and can consequently jeopardize the livelihoods of the poor. This has two key implications.

- Levels of domestic water needs are likely to be far higher than those assumed by conventional approaches to basic needs.
- Different households will have different needs, as the scale and nature of use of domestic water for productive activities vary greatly within any community. This means that norms-based allocation systems (so many liters per person per day) will not be sufficient for many poor people.

This is a very real issue for organizations such as AWARD, which are working at the grassroots level to assist communities in developing and managing their water supply systems. In this, they work within a framework set by government policies and norms. A particular challenge is to create greater awareness of the importance of the productive use of domestic water particularly at the operational levels (Department of Water Affairs and Forestry, or DWAF) and local government. If these do not recognize the key role that domestic water plays in many livelihood activities of poor rural households, then poverty reduction opportunities will be missed.

The Policy and Institutional Context

Contemporary South Africa is in the middle of a dynamic and fundamental reform of its water laws, policies, and institutional processes. These have rightly been recognized as innovative and of international significance, but the current phase is one where the basic structure set by new laws and policies is being worked through institutional mechanisms to implement them. There are many uncertainties and tensions in this process. Livelihoods of many rural people will be seriously affected if the ongoing process of change does not recognize the need to ensure that water is allocated to productive uses of domestic water.

The process of change derives from the provisions of the Water Services Act (1997) and the National Water Act (1998). The Water Services Act substantiates constitutional requirements with respect to rights of access to water supplies, establishes national norms and standards, and defines the institutional framework for the provision of water and sanitation services. The Act delegates authority for water services to local municipalities. This has focused on the district level, with district municipalities charged to develop water service development plans within the framework of district-level integrated development plans that covered a wide range of service provision. A structure below the district level has been developed, with local municipalities, ward committees, and at the village level, water

Box 1. Institutional Arrangements for Water Resources Management and Supply in the Sand River Catchment

An overview of the proposed governance structures for water resources management and supply in the Sand River Catchment is given in Figure 1. Although still in the early stages of implementation, water supply governance is more advanced than water resources management. The diagram illustrates the need for institutional links between the provisions of the National Water Act and the Water Services Act. The development of these links is a critical challenge for the future of water management in South Africa. The Sand River Catchment forms part of the Inkomati water management area, which will be governed by a catchment management agency (CMA), although this is not yet operative. Subcatchments are likely to be represented by catchment management fora, comprising representatives of stakeholder fora or water users associations. These fora will, in effect, make representations to the CMA for sectoral water allocations, including water demands for rural communities. The district municipalities represent the water services authority that functions to "allocate" water to local municipalities, which act as water service providers. The ward councilors will, in effect, make representations to local municipalities regarding water demands for their villages of jurisdiction and water supply constraints. They, therefore, rely heavily on inputs from village water committees. Municipalities articulate these needs through the water services development plans (WSDPs). The Sand River Catchment falls under the Bohlabela district municipality and the Bushbuckridge local municipality. The key points where local people's interests are represented are at the village and ward levels and the development of the capacities of the elected representatives at these two levels is critical for ensuring the needs of the poor are reflected in water investments and allocations.

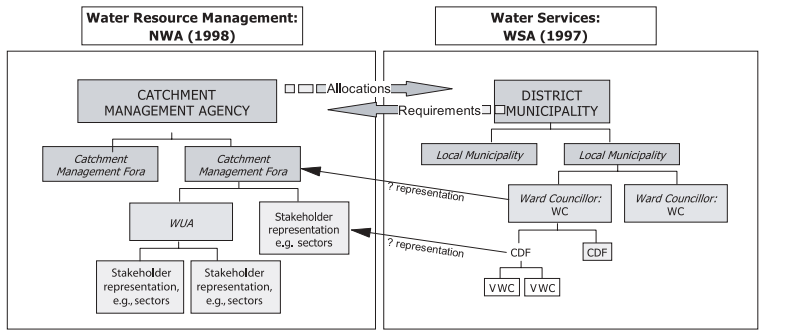
committees (which are part of the community development forum) established. These are linked to elected representatives at each level (Box 1).

The National Water Act established the ways that water resources are to be protected, used, developed, managed, and controlled, based on principles of equity, sustainability, efficiency, and accessibility. The Act created a new set of imperatives to govern water management based on three key elements of the Act.

- Water is established as a public good with no private ownership permitted.
- The Act makes provision for a reserve that defines water to protect ecological functions and to meet minimum basic needs (known as the basic human needs reserve or BHNR). The basic need has subsequently been established as 25 liters per capita per day (lpcd) and water is defined as a basic right (the so-called Reconstruction and Development Programme minimum standard (Pollard et al. 2002).
- The Act recognizes the catchment as the basic unit for water resources management.

Under the National Water Act, South Africa is divided into 19 water management areas that correspond to river catchments. It seeks to sustainably manage water resources for the benefit of all and to reverse past racial and gender discrimination. The Act seeks to set up structures for integrated water resources management based on participatory processes. This will be achieved through the development of catchment management agencies (CMAs) in each of the 19 hydrological areas. CMAs will be responsible for preparing catchment management strategies that allocate available water resources to stakeholders to meet their needs on a sustainable basis. Within each catchment, a multitiered set of stakeholder forums are to be set up through which different needs can be established and water management problems identified and resolved.

Figure 1: Schematic Diagram of the Proposed Institutional Arrangements for Water Resources Management and Supply



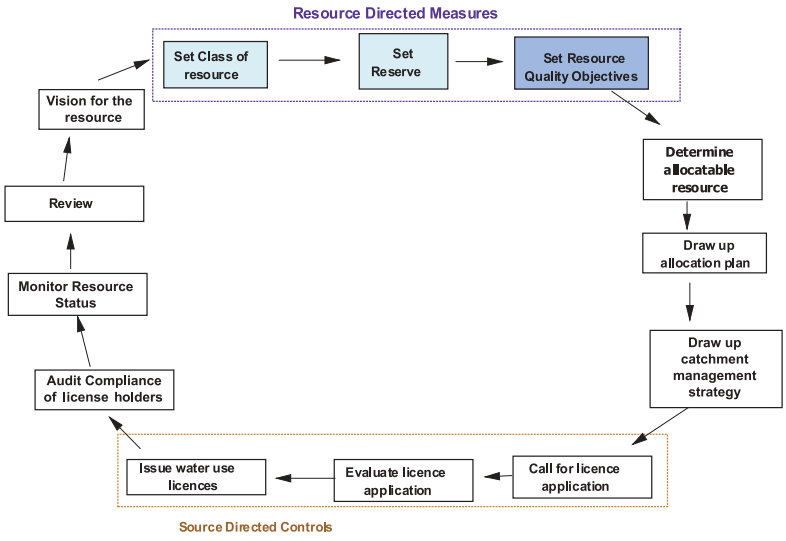
CDF = community development forum representing multiple village-based committees, VWC = village water committee, WC = ward committee comprising CDFs from a number of villages, WUA = water users association. Note: The details of these institutional arrangements may vary in different regions of South Africa. This figure indicates that water supply issues should relate to wider catchment management issues of water allocations and through representation.

The National Water Act also establishes a system for licensing all water users other than domestic and subsistence (Schedule 1) users, for a monitoring and regulatory system (including water quality and waste disposal) and a framework for the financial aspects of water management (including water charges). The Act also recognizes the importance of ensuring that water management within South Africa does not negatively affect its neighbors, including provisions to regulate transboundary water flows. Taken together, these two key pieces of regulation represent a radical and innovative framework that is intended to set water management in South Africa to a new direction. This is represented diagrammatically in Figure 2, which shows the links between different stages in the water management cycle.

The establishment of this legislative and policy framework has not solved water problems overnight, however, as there are formidable challenges in establishing institutional mechanisms through which different provisions could be implemented. There are also areas of uncertainty in the overlap of the two pieces of legislation. In particular, the Water Services Act establishes the management of water services through structures of local government, which do not coincide spatially with the hydrological divisions made for water resources management in the National Water Act. There are also considerable problems of uncertainties over responsibilities and limitations to capacities at all levels (and especially within local government) that will take concerted efforts and a considerable time to resolve.

During this process, a key challenge is to ensure that the needs and interests of poor people are catered to in the water allocation mechanisms that are established as new institutional processes are developed. The BHNR gives a clear basis for this in relation to domestic consumption needs for health and hygiene purposes, and indeed the mechanisms of a per capita norm is

Figure 2. The Water Resource Management Process in South Africa



Source: Department for Water and Forests. 2001.

appropriate for this purpose. What it does not do is ensure that domestic water needed for key productive activities that are essential to the livelihoods of poor people are catered to, and indeed the reserve mechanism is not appropriate for this as the amount of water needed is different from household to household and region to region.

The BHNR consequently needs to be complemented by an allocation mechanism where these productive activities are recognized as a key demand in their contribution to the livelihoods of poor people and the economic development of areas where the poor live. This means that priority should be given to Schedule 1 activities over and above those catered to by the BHNR. These mechanisms need to be built into the emerging institutional structures through which water resources are allocated and water services managed. This issue is explained further in Box 1, which summarizes AWARD's experiences in the Sand River Catchment. This issue is further developed below, but before doing so, the next section provides a summary of the survey findings that will help give a clearer picture of the role of productive uses of domestic water in the livelihoods of poor people in the Bushbuckridge area.

Productive Uses of Domestic Water in Busbuckridge

The two surveys studied water use in a total of 19 villages with a combined population of over 26,700 people. Five villages were included in both surveys. A range of data collection methods was used, including household interviews, key informant interviews, group discussions, and observations. The villages surveyed represented a range of water supply conditions, from very good connections to extremely bad water supply conditions. For analytical purposes, the villages were divided into "best case" villages, where supply conditions were good, and "worst case" villages where there were major problems in accessing water supplies. All aspects of water supply and use in the villages were examined.

All households, of course, use water for their basic consumption needs: for drinking, cooking, bathing, and washing clothes and utensils. The amounts used varied somewhat according to the quality and proximity of the water supply and the size and wealth of households, but in almost all villages the average use for these purposes was close to or below the minimum "basic needs" figure of 25 lpcd. In many cases, people could access the water they needed, but this often meant women spending a long time fetching water from distant sources, queuing for water at communal water points, or buying water from vendors. There were also concerns about water quality in some cases. Interestingly, there was no statistical difference in the quantities of water used for these purposes between villages with good water supplies and villages where supplies were poor. The main benefits of improved water supplies were seen to be the time saved in fetching water rather than the increased amount that could be consumed. These time savings were extremely significant for women in particular, freeing up time for other livelihood activities or for leisure.

The surveys focused on productive uses of domestic water, and in both cases found that this was substantial, with a wide range of water-dependent activities that constituted an important part of the livelihoods of participating families. A similar list of activities was found in both surveys, though the importance of different activities varies from village to village. The main water-dependent productive activities found in the surveys were vegetable gardens, fruit trees, beer brewing, brick making, hairdressing, livestock (cattle and goats) and ice-block making. Many other activities were cited in one or two villages. These included grass mat weaving, smearing and plastering of walls and floors, medication and religious uses, baking, poultry, duck ponds, and car washing.

Where adequate water is available, the most common productive water use is vegetable gardens. These are generally small backyard gardens of a few square meters. Onions, tomatoes, and leafy vegetables are typical crops. Many homestead plots also contain fruit trees, which provide shade and have aesthetic value as well as bear fruits. This featured strongly as an existing activity where it is possible and as an activity that is aspired to if there were more favorable conditions such as an improved water supply. Irrigation of vegetable gardens and fruit trees at the homestead is more widespread compared with irrigation of crops in community gardens. The latter needs more organization at the community level, whereas a homestead plot is easily developed under individual initiative. Growing vegetables within the homestead is also more convenient and secure. Importantly, entry costs to poor people of using domestic water for backyard irrigation are low: there are no committees to join and little equipment is needed.

Cattle are important consumers of domestic water. However, the source of water for cattle is often not from a domestic system, but from outside the village. For instance, where there is a reticulated water supply system such as in Zoeknog or Shere and there are perennial rivers nearby, cattle drink water from rivers. However, where there is only one primary and reliable source of water (e.g., the river in Dumfries) humans and livestock share the source. In times of stress during droughts, competition for water between people and livestock becomes a problem. When rivers and dams that are normally reserved for cattle and other animals dry up, they are often provided for from within the reticulated water supply system. This has resulted in damage to facilities and health hazards. On the

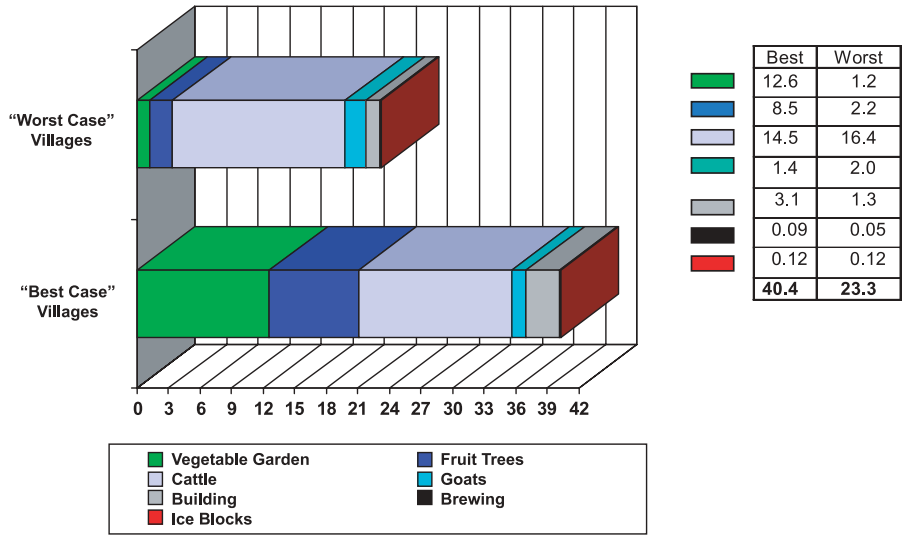
other hand, where there is no reticulated or proper water supply for humans, the latter often share the source of water reserved for cattle, again with serious health implications.

There are differences in the extent to which each of the activities that use water is engaged within each village. Obviously, the most water-consuming activities are engaged at a larger scale in communities where there is better access to an improved and reliable water supply. The best example in this regard is vegetable gardens, whereby villages with bad water supply systems have consumption levels much lower than villages with better water supply systems. Exceptions are watering cattle, where the livestock can be moved to more distant water sources and livestock rearing is not dependent on the domestic water supply because there are alternative sources of water. Therefore, in villages where the water supply system is poor, it is still possible to raise cattle.

There were major differences in the quantity and pattern of water use for livelihood activities between villages dependent upon the quality of their water supply. Figure 3 summarizes the average water consumption for low-level economic activities. For each village, these figures take into account the total number of people involved in each activity and average their consumption across all households, regardless of whether they are involved in the activity or not. Therefore, the figures presented here provide an estimation of the per capita amount of water that is needed to support the current level of productive activities.

The main conclusion from these figures is that all economic activities using domestic water occur over and above the first 25 liters (basic needs)**.** An additional 25–40 lpd will be needed to support these economic activities (given current proportion of households involved in the activities and water consumption). The activities using most water are cattle ranging, vegetable gardens, beer brewing, and watering trees.

Figure 3. Summary Consumption for Main Water-Based Livelihood Activities in "Best Cases" versus "Worst Cases" (liters per capita per day)



	Best	Worst
Vegetable Garden	12.6	1.2
Fruit Trees	8.5	2.2
Cattle	14.5	16.4
Goats	1.4	2.0
Building	3.1	1.3
Brewing	0.09	0.05
Ice Blocks	0.12	0.12
	40.4	**23.3**

Also, comparisons between consumption in the "best case" and "worst case" villages provide an indication of the likely increase in water consumption with improved water supplies. Water consumption for all activities except for livestock and ice block making, is much higher in the best case villages. The most important increases occur in the irrigation of gardens (950%), irrigation of fruit trees (286%), building activities (138%), and beer brewing (80%).

However, as they are averages for all households, figure 3 does not reflect the real amount of water used by a household involved in a particular activity, the amount required for each activity being much higher than the above average. Figure 4 provides average consumption figures for each activity, when only those households that engage in the activity are considered.

Figure 5 provides an overview of the average level of involvement of households in each activity. Not all households engage in "low-level economic activities." In the "best case" villages, the proportion of households involved in each activity range from 2% of the households for beer brewing to 73% for the irrigation of fruit trees. Moreover, for most activities, the proportion of households involved is also higher in the "best case" villages than in the "worst case" villages. This demonstrates that the ability to participate in these livelihood opportunities is directly related to the location and reliability of the water supply, a conclusion supported by the views of survey respondents.

We can consequently see that the productive use of domestic water is extremely common throughout the Bushbuckridge area, and in all probability would be even more widespread if all communities had reliable access to a convenient water supply. What is the economic significance of these activities? This can be assessed by looking at the income generated from each activity using "gross margins" figures per activity, and per liter of water.

Figure 4. Water Consumption per Business in Households Involved in Business
(liters per capita per day)

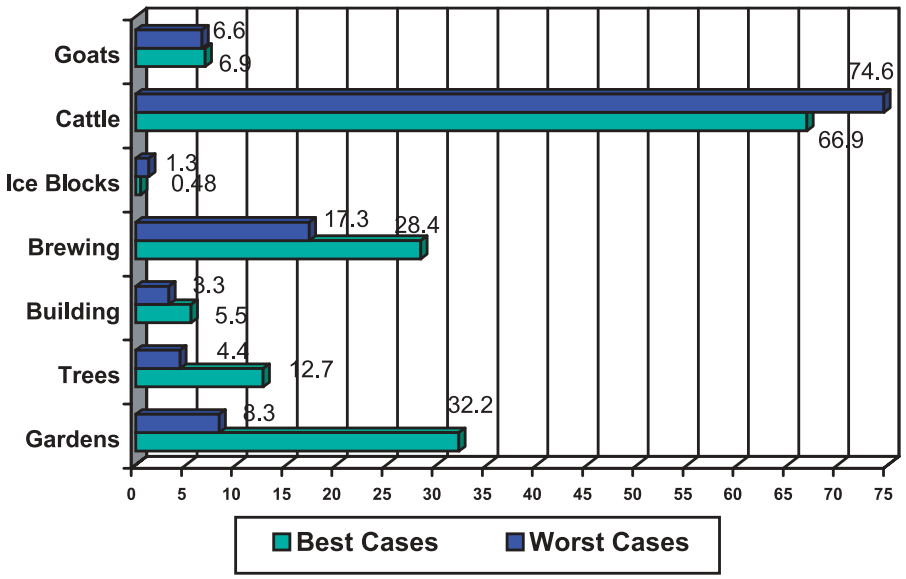


Figure 5. Percentage of Households Involved in Each Activity (%)

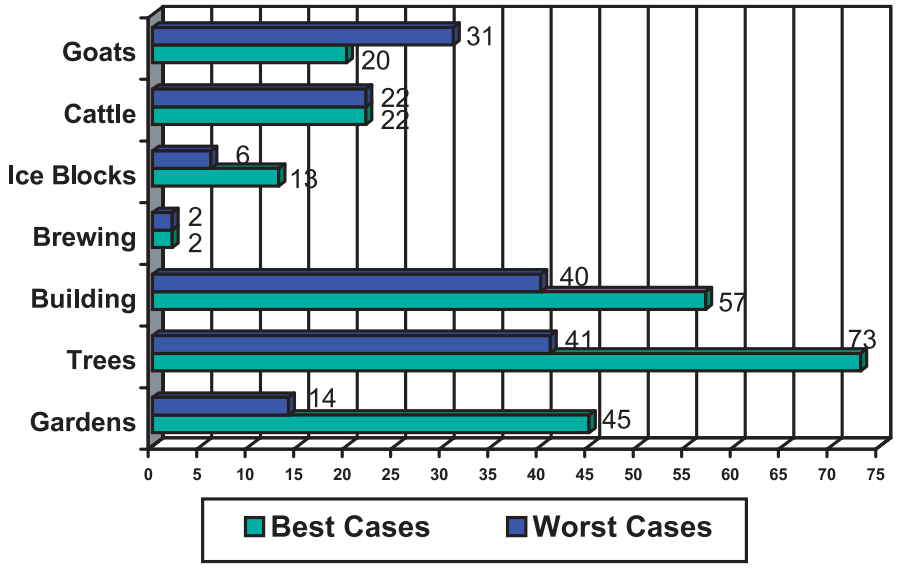
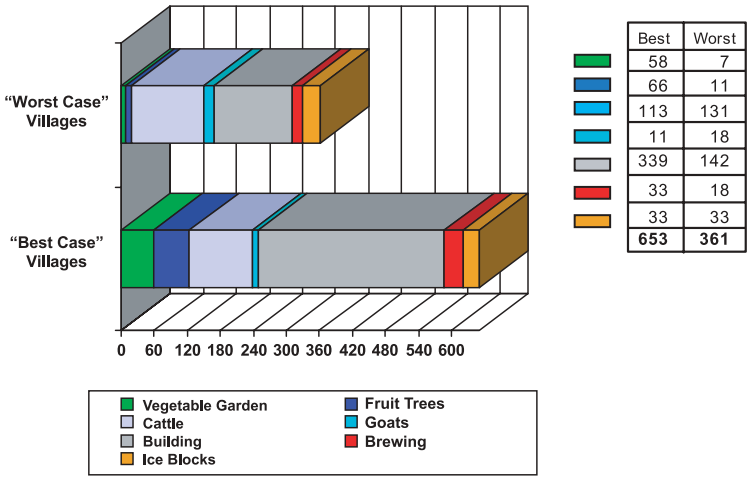


Figure 6 summarizes the returns from all household-based economic activities in both types of villages. This income reflects an average value for all activities when estimated across all households, regardless of whether each household engages in the activity or not (under current proportion of household involvement and water consumption). Total income generated from these economic activities averages rand (R)529–653/person/year ($50.38–62.19). On average, this represents around 10% of the average household income in the Bushbuckridge area but the actual amount earned varies from household to household and community to community. In the "best case" villages, where water supplies are not a constraint to these livelihood activities, the income derived from the productive uses of domestic water are considerably greater than this average figure.

Figure 6. Total Gross Margins from Water-Dependent Livelihood Activities in the Two Types of Villages (rand per capita per year)



	Best	Worst
Vegetable Garden	58	7
Fruit Trees	66	11
Cattle	113	131
Goats	11	18
Building	339	142
Brewing	33	18
Ice Blocks	33	33
	653	**361**

The income levels in Figure 6 show the average benefits of an additional water allocation, but they do not reflect the real income generated by a household involved in a particular activity. Figure 7 provides average "gross margin" figures for each activity, when only those households that engage in the activity are considered. The figures are, of course, higher, showing that for those households engaged in these activities they are a major source of livelihood. This is particularly true for the poorer households involved, many of which are women-headed, as their income is often far below the average figure for the region.

Finally, Figure 8 provides an overview of the "gross margins" for all activities. They show a wide variation across businesses. Ice-block making provides the highest return (R1.7 or $0.16 per liter) followed by beer brewing (R1.05 or $0.1 per liter) and hair salons (R0.84 or $0.08 per liter). Fruit trees (R0.02 or $0.002 per liter) and vegetable gardens (R0.013 or $0.001 per liter) provided the lowest returns.

The highest rates of involvement in the productive use of domestic water are for activities with the lowest returns per liter of water. This is the case for fruit trees and vegetable gardens. In contrast, beer brewing and ice-block making activities providing the highest returns per liter, have the lowest rate of household involvement.

Overall, the data presented here demonstrate the importance of the use of domestic water for productive activities in the livelihoods of poor people and the general economy of the Bushbuckridge area. For poor and vulnerable households in particular, who have limited access to livelihood assets and few alternative income opportunities, the ability to undertake these productive activities in the home can make the difference between getting by and destitution. This is especially true for many women-headed households that have much poorer access to outside job

Figure 7. Annual Gross Margins per Capita for Those Involved in Each Activity
(rand per capita per year)

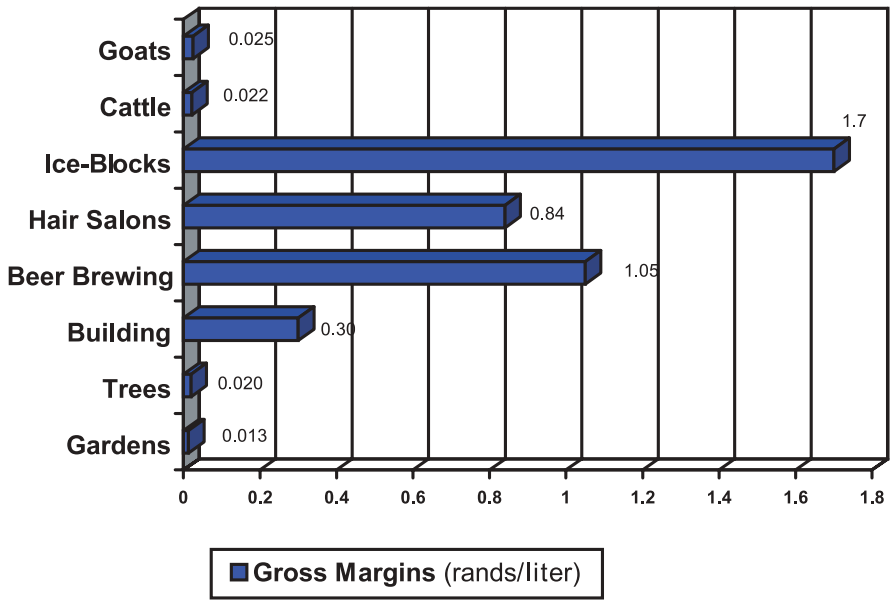
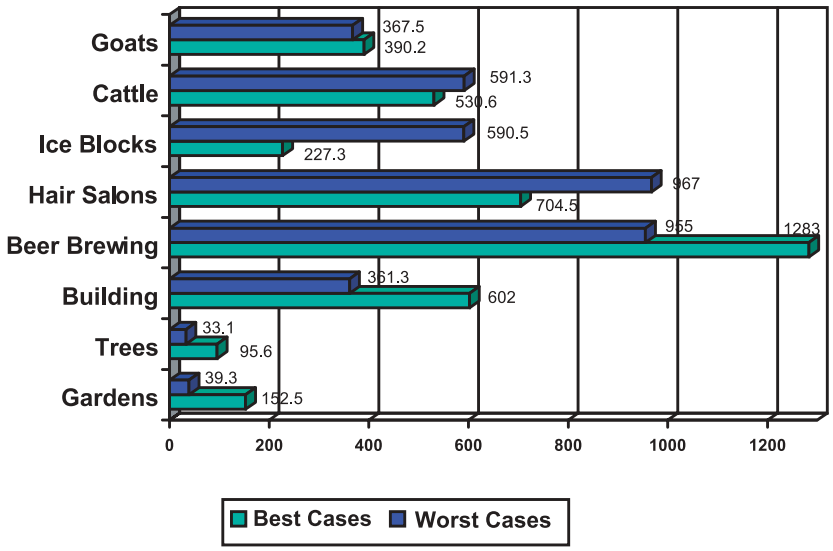


Figure 8. Gross Margins for "Water-Dependent Low-Level Economic Activities"
(rand per liter)



opportunities, can rarely engage in farming, and need to juggle making a living with their domestic opportunities. For these people, growing fruits and vegetables, running a hair dressing salon, or brewing beer can be the key to avoiding, or at least reducing, poverty. Although not measured in surveys, the nutritional benefits of home consumption from backyard gardens were also reported to be of great importance. Indeed, it is possible that these nutritional benefits are as great as or greater than the cash income these gardens generate.

Where poor people have access to enough water above their minimum consumption needs, these water-dependent productive activities become viable. Where they do not, important poverty reduction opportunities can be lost. As such, enhancing the supply of domestic water in this region (data from these surveys suggest a doubling of the average domestic minimum) is not so much about health and hygiene (most people can meet these needs) as about reducing poverty and creating livelihood opportunities.

Policy Implications

This section discusses in detail the main lessons learned from the research and highlights some relevant policy issues. Above all, this case study demonstrates that a full understanding of the relationship between water management and poverty reduction cannot be captured by conventional approaches to water supply systems. The productive use of domestic water is a classic example of a key aspect of water management that falls into an institutional "gap." Domestic supply provision is premised on the assumption that the main issue is health and hygiene within the household. Conversely, discussion of productive uses of water by poor people tends to focus almost exclusively, in rural areas, on agriculture. Yet the key role of water in poverty reduction and livelihoods development for many poor people (and especially those with limited access to agricultural land) lies in opportunities for water-dependent production within the household. This requires

a basic reevaluation of how we view basic needs and domestic water, as well as the types of poverty-focused water programs that are developed. This essential message is clearly demonstrated by the survey results from Bushbuckridge. Similar experiences would be found elsewhere in South Africa and the rest of the developing world. Other specific policy conclusions can be drawn from the case study.

- For the Bushbuckridge area, there is enough evidence to inform the allocation of water for the BHNR using the figure of 25 lpcd as the minimum amount required to meet basic human needs for health and hygiene.
- A major challenge is how to make the concept of a BHNR operational. Research needs to be put into the design and implementation of appropriate allocation mechanisms from the technical, institutional, and economic perspective so as to ensure sustainable access to domestic water for present and future generations.
- As part of this, there is a need to think radically about new, more decentralized, systems for water supply appropriate for the diverse range of uses found in communities. For instance, hundreds of thousands of new houses are being built for poor families in South Africa. None of these have a system for collecting rainwater.
- Water-based activities play an important role in rural livelihood systems in Bushbuckridge. The inability to access domestic water for economic purposes can reduce considerably the livelihood options for poor people in the area. A key challenge is how to ensure adequate and sustainable allocations of water for these livelihoods-based activities. It is argued here that these should be seen as a basic need, but meeting this need cannot be through the extension of the BHNR for 25 lpcd, as the water needs for productive purposes vary greatly from household to household.
- Furthermore, lessons learned from this research are very relevant to the rural water supply and sanitation sector, given the growing concerns about cost recovery and sustainability. The ability of the rural poor to access increasing amounts of water quantities will not just be determined by the availability of water, but mainly by their ability to carry the costs of the water supply. The ability to pay, in turn, can only be enhanced by increasing the economic opportunities of the rural poor, and as we have seen before, accessing water for productive uses, over and above the basic needs (25 lpcd) may be a necessary precondition for this.
- In other words, the rural water sector policy should not only be driven by the supply of "basic needs" but also by economic opportunities that the access to additional water can generate in rural areas. The allocation of water for these livelihood activities should be a key element of the ongoing development of water service plans and catchment management approaches. These are recognized in the definition of Schedule 1, but the key challenge is now the development of mechanisms to prioritize Schedule 1 water uses over and above the BHNR. The Department of Water Affairs and Forestry (DWAF) recognizes the importance of water for small-scale livelihoods activities, but there still remain uncertainties over how these needs will be met, in the allocation of water for these uses, and even more, the awareness of service providers of these critical needs.

Box 2. Water for Livelihoods Development in Zimbabwe

Small-scale horticultural production can provide valuable employment, nutritious food, and regular income for rural Zimbabweans. But many people do not have access to a reliable water source, a means to pump water from underground, or proper access to reliable markets. Through a package of support and assistance, the Mvuramanzi Trust in Zimbabwe is helping rural families produce irrigated vegetables for home consumption, and for sale in Zimbabwe and in European markets, from family water points that previously would only have been used for domestic purposes. Needs include microfinancing to improve access to credit, low-cost and appropriate pumping technologies such as rope pumps, irrigation systems to make the best use of time and water, and training in crop production and managing water supplies. The Trust's aim is to assist 3,500 families each year to install rope pumps and set up irrigation systems at their homes. Some farmers work with a private company called Hortico, which has a special division for communal out-growers, and exports vegetables like sweet corn, baby corn, butternut, fine beans, mange tout, and hot chilies to European markets.

Such opportunities are found elsewhere in rural Zimbabwe, where there are few sources of cash income for rural families and relatively small, but regular sums of cash from the sale of vegetables are particularly important to these families. The money earned is often invested in saving schemes or other ventures, such as dryland cropping or petty businesses. Household or community-managed gardens can contribute significantly to the overall local economy. Community gardens are typically around 1 ha in size, and each member family has several small vegetable beds. Crops are cultivated and watered individually by members, but some decisions, such as which crops to grow or how to manage water, are taken collectively. Crops grown include leafy vegetables, tomatoes, onions, and often an early crop of green maize to catch good prices at the start of the season

Improved well and borehole construction technology, such as collector wells, can provide sufficient water for both domestic consumption and small-scale irrigation in the unfavorable geological conditions of Southern Zimbabwe. Instead of a deep but narrow borehole, a well about 2 meters (m) wide is dug to the base of the weathered rock. Then horizontal boreholes are drilled from the bottom of the well. These extend for up to 30 m and collect water from a large radius around the well. Using such methods, enough water can be abstracted to meet the basic needs of households and also to irrigate a community garden near the well. During the 1992 drought, such wells were able to meet the domestic water needs of surrounding villages and still be used for some vegetable cropping, when conventional sources had dried up, albeit on a reduced extent.

Sources: Lovell 2000 and Waughray et al. 1998.

- Alternative ways of providing water for productive uses need to be explored. In some circumstances, providing this water through current domestic water systems may not be the most effective way (Box 2). Some creative thinking will be needed from engineers and technical experts to provide solutions that are appropriate to the South African context.
- Finally, the provision of water for productive uses needs to be done without compromising the provision of basic needs. Evidence from India indicates that in the context of a dramatic increase in groundwater extraction for small-scale irrigation during the last 10 years, domestic water supplies are becoming increasingly threatened as a consequence of groundwater depletion and increasing demand (Batchelor et al. 2000). Caution is needed before the wholesale exploitation of new resources begins.

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