

Water and Poverty – A Collection of Case Studies

Experiences from the Field

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The Water and Poverty Initiative is a partnership of organizations with shared interests and commitment to poverty reduction through better water management. The partnership was formed in March 2002 with 13 collaborating partners to support the 3rd World Water Forum's "Water and Poverty" theme. The members of the WPI are: African Development Bank, Asian Development Bank, Gender and Water Alliance, Global Water Partnership, Government of the Netherlands, Inter-American Development Bank, International Water Management Institute, Japan Bank for International Cooperation, Japan International Cooperation Agency, World Conservation Union, United Nations Children's Fund, WaterAid, and the Water Supply and Sanitation Collaborative Council. ADB is the coordinator of the initiative.

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CASE STUDY

DSK: A Model for Securing Access to Water for the Urban Poor

Summary

This case study documents the process by which Dushtha Shasthya Kendra (DSK), a non-governmental organisation, helped residents of some of Dhaka's squatter settlements to gain access to public water and sanitation services.¹ The programme started in May 1996. By April 1998, thirty-two water points and five latrines had been installed, and DSK was planning to construct another thirty water points. In addition, other NGOs who had seen the programme's success and wanted to replicate the approach were planning to construct thirty-six water points throughout the city.

The programme's success is 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

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.

and sanitation provision at regulated prices. Persuading the Dhaka Water Supply and Sewerage Authority (DWASA) to instal water points in squatter neighbourhoods 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 neighbourhoods 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 neighbourhood.

- 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 programme's success. Helping to develop it has been a considerable challenge, because of previously low levels of social cohesion in the target settlements.

The mediation model has proved very effective for the medium-term. However, DSK recognises that what is ultimately needed is a policy change on DWASA's part. If the utility agency were to recognise 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 the positive side, in 2001 DWASA reduced the security deposit that NGOs have to pay for a water connection in these neighbourhoods.

DSK paid great attention to motivating poor communities, and building their capacity, so that they could manage and maintain the new facilities themselves.

Introduction

This case study documents the process by which Dushtha Shasthya Kendra (DSK), a non-governmental organisation based in Dhaka, developed and implemented a water supply programme in some of Dhaka's poor squatter settlements. DSK started working in these communities in the late 1980s. Their water and sanitation initiative is part of an integrated programme 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
- Provide technical assistance to communities and the water utility agency to establish and maintain water connections and 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), were living in slum and squatter settlements. These neighbourhoods, most of which have been in existence for several years², are characterised by high levels of deprivation. Basic services, including water and sanitation, are absent or grossly inadequate. Ninety-seven per cent 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, 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 of the settlements where DSK works have existed for between 11 and 30 years. Dwellings are made of impermanent materials such as bamboo, wooden boards or sheets of plastic on rough frames. Roads, open latrines and drainage are also makeshift. Some of the settlements are in low-lying locations outside the flood barriers, and here the houses have to be built on bamboo stilts.

The inhabitants of these neighbourhoods work as day labourers, garment factory workers, street vendors, maids, transport workers and in a variety of menial jobs in the public and private sectors. The average monthly income is between 2,000 and 3,000 Takas (US\$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.

DWASA

Dhaka Water Supply and Sewerage Authority is the statutory body responsible for water supply, water-borne sewerage and sub-surface drainage in Dhaka city. During the course of the programme, 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, both because it is

² According to the GOB'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, Narayan, Francis B. and Rana, Pradumna B. 1997 Addressing the Urban Poverty Agenda in Bangladesh. Critical Issues and the 1995 Survey Findings p.198 Dhaka University Press Limited.

⁴ System loss was estimated as 56% in the Dhaka Metropolitan Development Plan 1995-2015, Volume 1 p. 30.

deprived of the revenue from these potential consumers, and because it suffers heavy system loss⁴ through the widespread use of illegal water points.

Dhaka City Council DCC

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 of 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 programme in 1996, funding DSK to provide 10 community-managed water points. For the programme'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 Programme

This programme aims to assist low-income households in both rural and marginalised urban areas to gain access to water and sanitation services, by promoting innovative solutions tailored to local needs and conditions. The programme prioritises 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 Co-operation

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

When DSK started working in the area, access to safe water was very limited.

DSK's early experience

DSK has been working among the slum and squatter neighbourhoods of Dhaka since 1988. At first DSK worked with people in two neighbourhoods 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 of the neighbourhoods, people were using a pool of wastewater from a chemical factory. Not surprisingly, during

the first meetings between the communities and DSK, residents prioritised 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 70,000 Takas (US\$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 instalments 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 and paying the instalments to DSK. Four years later, DSK had recovered its initial investment of Tk. 20,000 (US\$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 Programme, the Swiss Agency for Development and Co-operation and WaterAid to develop a replicable model for sustainable water supply for the urban poor. The pilot project began in twelve communities in 1996.

This first experience was not altogether successful, as a *mastaan*, or local powerholder, soon took over the water point.

The current programme

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
- Freedom from domination by *mastaans*

Communities that were used to free water and sanitation services were avoided. Using these criteria, twelve 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 Tk. 7,500 (US\$134) to Tk. 1,000 (US\$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 neighbouring agencies and communities who resent the presence of the squatter settlements. Yet it was precisely because of these adverse conditions that DSK realised 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, health and hygiene activities, whereas in others, the whole user community was referred to as the Water Hydrant Association.

DSK and the communities agreed 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 organisation of women’s savings and credit groups as well as the formation of Management Committees for water points and latrines
- Train the 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 two 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

- Operating water points
- Minor repairs and ongoing maintenance
- Collecting user fees
- Appointing caretakers and paying their salaries
- Regular payment of DWASA bills
- Repayment of 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 meetings between project staff and management committees each month 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 a suitable site for the water points was difficult in most of the neighbourhoods. The settlements are very crowded, and it was hard to find space for the 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 water points were sited on land owned by DCC, DCC allowed their construction to go ahead.

DSK procured construction materials locally. Efforts were made to employ masons from the communities themselves, but there were not enough skilled workers available. However, DSK was able to employ unskilled labourers 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 to 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 up 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 the management of the 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 is 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
- The availability of water at each water point

In some areas, user households who regularly use the water points pay a fixed monthly rate, depending on the number of household members; for instance, a 4-member household might pay Tk. 50.00 per month, with Tk. 10.00 for each additional member. Alternatively, users pay a small fee for each use: about Tk.0.50 for a bucket of water, Tk. 1-2.00 for bathing and Tk. 1.00 for toilet use, where toilet facilities are provided. One-off payments raise more income than fixed monthly charges.

Caretakers

The caretakers collect fees from users and hand this 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 between Tk. 500-1,000 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 caretaker job

Donor costs

The total capital cost of constructing forty water points and two latrines amounted to Tk. 1,507,725 (US\$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 Tk. 726 (US\$13).

Lessons learned

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

The project has demonstrated that even those on a very low income 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.

The caretakers collect fees from users and hand this over to the cashier when the water point closes at night.

Mediation is an effective mid-term 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 one of the keys to the project's success.

Secure and sustainable provision will only come through policy change

As a result of DSK's mediation, and the realisation 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 good will 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 non-land owners. The relevant ordinance is quite flexible, allowing the utility to enter into any contract it deems necessary to fulfil 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 hard 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. Mobilising these 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 to establish their right to water and sanitation services. Also, DSK has decided that only through devolving responsibilities to the communities can the programme achieve sustainability.

The co-operation 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 very important both for developing the project strategy and for timely implementation.

2

CASE STUDY

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

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 DRA, and it is hard 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 (WS) interventions to programmes focused on demand is easily understood. In general, supply-driven interventions have not succeeded in providing poor communities with sustainable water supplies. Communities who 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 programmes 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 WS 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, labour or materials. In the long term, the community must take responsibility for sustaining the new WS systems.

Box 1

WaterAid Partners in Niassa

Government:

- Provincial Department of Water and Sanitation (DAS-Niassa), who have 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)
- District Directorate of Public Works and Housing in Maúa and Nipepe (DDOPH - Maúa and Nipepe), who are responsible for water supply and sanitation at district level

NGOs:

- ESTAMOS, who are implementing water supply and sanitation projects in the districts of Lichinga and Mandimba
- Ulongo – dance, theatre and cultural association

Private Sector:

- Supporting ~10 private sector construction companies

CBOs

- Local Community Education Programme teams in Maúa and Nipepe, made up of activists from the districts, financed directly by WaterAid

This paper explores whether a DRA-inspired water supply policy necessarily creates conditions for more sustainable WS 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 a range of governmental, private sector and non-governmental organisations, supporting their efforts to implement the Government of Mozambique's (GOM) National Water Policy and Implementation Manuals, which are both based on 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 country². It is characterised by poor infrastructure, a weak agricultural economy, and political and 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 to other parts of this low-income country.³

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 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, *Action Plan for the Reduction of Absolute Poverty 2001-2005 (PARPA)*, published in April 2001.

2 DRA in Mozambique

The paper focuses on three areas. First, it provides a brief overview of DRA, followed by a short account of Mozambique’s switch from supply driven interventions to DRA-inspired policies. Secondly, the paper examines partner experiences of applying the new policy in five districts in Niassa over the past three years.⁴ Which elements of DRA seem to enhance sustainability prospects in Niassa, and which need to be modified in order 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 DRA could be better supported in future, based on lessons from Niassa Province.

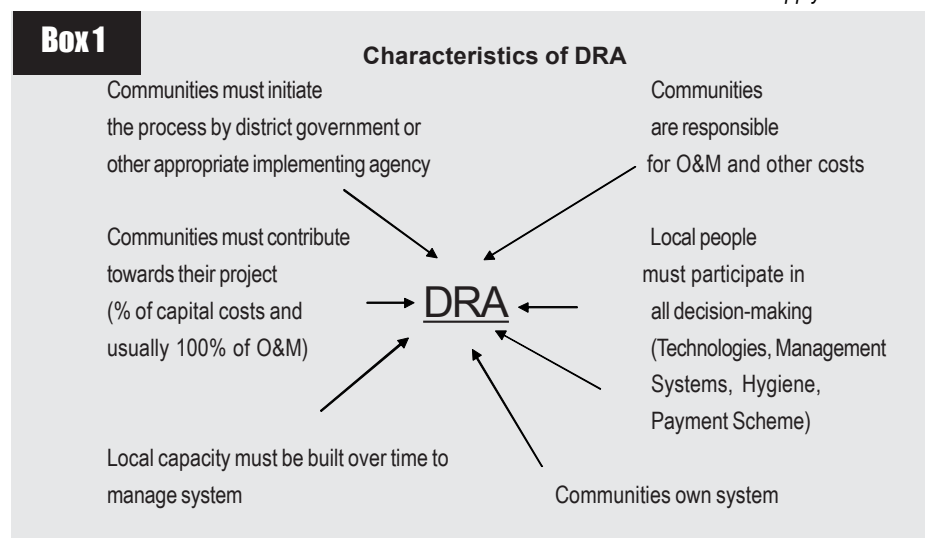
Sustainability is the touchstone by which DRA must be judged. Are projects based on DRA more sustainable than those using other models? WaterAid’s experience in Niassa suggests that DRA does indeed offer advantages compared with supply driven approaches, but that it also has weaknesses in this regard. These insights are relevant wherever WS actors are attempting to enhance sustainability through DRA.

Both the Mozambican National Water Policy and Implementation Manual are premised on 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 DRA, they tend to respond more quickly than men to technical problems at water points, and they have better capacity in relation to improved WS than is generally acknowledged within the sector. DRA sets out to acknowledge and integrate this capacity into WS services
- Water resources should be managed in a holistic manner.

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

The failure of the supply-driven model



⁴ The districts are Maúa, Nipepe, Mandimba, Lichinga and Sanga

Box 2**The Case of Chimbonila**

Chimbonila is the district capital of Lichinga, lies within 25 kilometres 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 resources and income than others living in more isolated parts of the Province.

In 1998, WaterAid financed 8 water points with Afridev handpumps. In 2000, 4 of these water points were rehabilitated. In February 2002, the Projecto de Desenvolvimento Agrário de Niassa (PDAN) installed a further Afridev on a borehole near the Administrative Centre of the town.

At the time of writing, only the new borehole and 1 other water point are operational. The others have failed because the O&M teams have been unable to secure enough funds to repair the water points. Some water points have been vandalised and one has been stolen altogether. Most members of the community have given up on the project.

The main reasons for project failure are:

- Users of the water points can not collect sufficient funds for spares
- Most community members do not consider the project “theirs”, as the water points were imposed on the community

in practice, did not work. Communities were simply told to form a committee with two men and two women, who would manage the WS 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 GOM 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 has found that over 80% of communities have never repaired their handpumps.⁶ Many water points are only functioning because GOM or donors have rehabilitated them.

Changing Direction: From Supply to Demand

The publication of GOM’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 failure of the supply-driven model

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

- GOM and donors tended to identify project sites without consulting the communities concerned.
- The sole technology on offer was “Afridev” handpumps. A target community’s capacity, whether financial, technical, organisational 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 the water points continued collecting water from closer, unprotected sources.
- The model of community management was inappropriate and,

⁵ DAS- Niassa “Banco de Dados”, 2002.

⁶ Data collected as part of WaterAid’s support programme, April 2001

3 Lessons from Niassa Province

The new policy, and the official manual, argue that communities are more likely to sustain water systems if they:

- Initiate the project themselves. This shows that the community is interested in addressing their water problems.
- Make decisions on technologies, management systems, and hygiene programmes.
- Contribute cash up-front: communities must contribute between 2-10% of the total cost of the water service, to demonstrate their commitment and to highlight their financial and organisational 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, as well as repair, costs.

The manual calls for the decentralisation 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 donors further removed from the field.

The challenge facing the Mozambican water sector is to transform the way programmes are implemented, based on the new Policy and Implementation Manual. To support this process, WaterAid and its partners (see Box 1) have been testing the Implementation Manuals 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 of the key issues that have arisen. It offers our insights into whether or not DRA, as applied in Mozambique, is leading to more sustainable water services for poor communities.

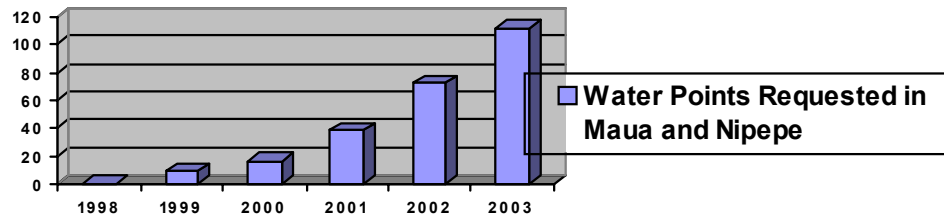
Generating demand: the roles of trust and guaranteed finance

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 programme 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 programmes have grown considerably since 2000 when the policy was first introduced by WaterAid partners. Demand for improved water sources

⁷ Rural coverage data is 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).

has increased dramatically at district level, as the graph on Mauá and Nipepe below suggests. This 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 percentages of people unserved by improved services are likely to be reduced far more quickly than by the supply-driven approach.



A number of critical factors explain this trend:

- Funds for the work supported by WaterAid have been guaranteed to the districts over relatively long periods. This has raised the confidence of district government. As a result, local officials are proactively helping to create demand.
- Community confidence in the process has grown. More communities are approaching the government, because they see that officials are responding to their demands.
- Multiple communication channels for demand creation, and the expression of community demand, have been used and the following have been very valuable:
 - Radio, using simple messages on how to apply, coupled with stories told by local people on their project experience
 - Drama: a drama has been developed that explains the principles of DRA in a simple yet compelling way. The drama looks at issues relating to applications, community contributions, choice, and roles and responsibilities
 - Workshops have been organised with traditional leaders, who are influential and have proved to be invaluable allies for the programme
 - Exchange visits: communities interested in participating in the programme are brought to villages that have already taken part, to facilitate the sharing of information.

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. However, several factors are threatening this:

- DRA will not succeed without a strong state that can respond to community demands and manage the process at district level. However, many donors are implementing policies that strip the state, including local government, of its responsibilities, instead of helping to build capacity
- Government and donors still tend to control the programme 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 donor agency staff.

There is a pressing need to co-ordinate funding, linked to strategic WS planning. Provincial and district government are still deterred to some extent from implementing 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 co-ordination, rather than any shortage of funds. In fact, Niassa is scheduled to receive considerable funding for WS 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 WS plan, based on DRA, that the different donors can then join together in financing. If this were done, the available funding would encourage demand generation, in keeping with government policy.

- In WaterAid's view, government and international donors are using an inflated estimate of the cost of constructing a water point. For instance, handpumps are generally financed at US\$4,000, whereas WaterAid and its partners have calculated the true cost at less than US\$2,000. The result is that the number of communities being provided with an improved WS 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 DRA. This was recognised in the draft Implementation Manuals issued in 1999 and 2000. Both drafts offered 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 windlass and dedicated 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 handpump, and when maintained regularly can provide a valuable service to communities for over ten 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

⁸ In 2003, Niassa is scheduled to receive about US\$100,255 from GOM for improved water supplies. In addition, WaterAid and Ireland Aid are allocating a combined US\$1,225,000, and other donors (for instance Oxfam Belgium and FDC) are likely to provide smaller amounts. The African Development Bank is also considering initiating a large programme in Niassa in 2003.

⁹ In 2002, WaterAid and the Provincial Government organised 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 cost for a water point were estimated at US\$1,167 for a protected well and US\$1,923 for an Afridev handpump. Private contractors bid at these rates. They were able to make respectable profits and invest in new equipment.

spares are hard to come by.¹⁰ Protected wells are now the favoured 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 handpumps have asked for them to be replaced by protected wells. Understandably, they prefer a sustainable supply of water from a

protected well than a handpump which, although it may initially supply higher quality water, is unreliable and too expensive to sustain over time.

One argument focuses on water quality. GOM 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 handpump. In fact, evidence shows that water quality in protected wells with a dedicated rope, bucket and windlass is actually quite good.¹¹ Government WS departments in Zimbabwe, Zambia, Malawi and South Africa 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 is working with partners to contain a cholera outbreak in two districts where Afridev handpumps have broken down, forcing residents to collect water from contaminated sources.¹²

Secondly, some government and donor 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 both of cutting-edge development thinking in general and DRA in particular. Communities are

BOX 5

Sustainability: comparing protected

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

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

¹⁰ The National Department of Rural Water (DAR) recently estimated that US\$28 million has been lost because of the 35% of water points that are broken (Principio de Procura" – Department of Rural Water, Maputo, 2002)

This is probably only the tip of the iceberg, as water point failures are generally under-reported

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*, Reference Number 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*.

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 handpumps reported cases of cholera.

Box 7**Acceptable technologies in the final Manual**

- Handpumps (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)

better placed than government and donor officials to decide 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 GOM allows other technologies to compete with the Afridev pump. Poor communities are not helped by unsustainable technologies. WaterAid calls for the Implementation Manual to be revised to offer a range of technology choices, to reflect experience in the field.

Are capital cost contributions a good measure of sustainability?

In Mozambique, communities are expected to contribute between 2-10% of the costs of their WS systems. According to DRA thinking, community capital cost contributions are indicators of communities' financial and organisational capacity to sustain their water points, revealing:

- 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.
- Organisational capacity: communities are showing, by their actions, that they have the organisational capacity to arrange their contribution, and this is thought to be a proxy indicator of organisational capacity to resolve any future technical and social problems.
- 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 form. 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. labour, 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 programmes. 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 that community will be able to collect the necessary funds to repair a broken handpump 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 WS 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 handpumps, 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 labour, sand and so forth is that it helps to build community capacity, both to select appropriate technologies and maintain them. Communities learn what is actually required to sustain a given technology, where they can get these parts and materials and how much they cost.

Box 8

Conflict in Lichinga

“Communities” almost never contribute labour. Individuals within communities contribute labour on behalf of the community. Unfortunately, this often leads to conflict as people who excavated a well as a 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 labour.

In a small village outside Lichinga, a conflict emerged because the families who supplied the labour 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 vandalism of the water point as families who “paid” with their labour 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 labour and others did not.

Rehabilitation: a threat to sustainability?

According to GOM policy, communities are completely responsible for operating, maintaining and replacing their WS systems. In practice, however, both government and donors, 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 handpumps had been destroyed during the war. However, these rehabilitations were completed some time ago. There are other valid reasons

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.

¹⁴ In the last few years, WaterAid has rehabilitated 8 handpumps and 7 Afridev pumps in the province. 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.

for rehabilitation in Niassa, notably incorrect installation, either by private contractors or GOM's own rural water supply agency, poor quality handpumps 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 GOM'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 donors will repair it free of charge

In WaterAid's view, asking communities to pay the total cost of operation and maintenance 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. GOM 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 WS operation and maintenance. 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 GOM's DRA-inspired WS supply policy in Niassa is that it is not being fully implemented, even by government actors. For instance, the government's rural WS agency is still using a supply-driven approach, while many donors 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 non-implementation of the new policy. WaterAid's own programme 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. Very little information has yet come out about the pilot project, in Inhambane Province. In any case, lessons from Inhambane may not be applicable in provinces such as Niassa. This is for a variety of 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

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

¹⁶ All the communities had chosen Afridev handpumps

5 Conclusions

support of GOM. Problems emerged when they tried to implement projects in districts where other donors, 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 neighbouring communities had just received handpumps for free. Similar problems can be expected in future, for example arising from the African Development Bank's planned initiative in Niassa. The ADB's manual allows communities to consider protected wells as a technical option, in contrast to GOM policy, and its process for selecting projects is also different.¹⁷

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 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, 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 to increase demand and coverage rates.
- 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 on an annual basis and asking communities to contribute at least that to the project. Contributions could be cash, for systems like motorised schemes, that require on-going payments, or specified spares for systems that require on-going but somewhat irregular interventions by O&M teams.
- Expecting poor communities to pay all O&M and rehabilitation costs is socially unjust and unrealistic. WS actors need to clarify what type of repairs lie outside the responsibility of communities, and respond to such problems in a timely and effective manner.
- As with any government policy, GOM's water supply policy needs to be applied consistently, in order to avoid confusion, unfairness, loss of credibility and ineffectiveness. This will mean international donors stepping into line and helping to support official policy.

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".

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 handpumps 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 WS actors applying, or attempting to apply, DRA principles can use them to enhance their own policy and practice.

Acknowledgements

The author is most indebted to WaterAid Niassa staff, DAS – Niassa, DPOPH – Niassa, ESTAMOS and DDOPH – Maúa and Nipepe for their courage, support and insights in the development of the WaterAid – Niassa Support Programme. Thanks are also extended to Lindsey Breslin, John Kelleher, Virginia Roaf, Feliciano dos Santos, Erik Harvey, Belinda Calaguas, Eusébio Simbe de Andrade, João Mazive, Vicky Blagbrough, Steve Sugden, Simon Trace and Heike Gloeckner for their support in the development of this paper. Any errors are those of the author.

3

CASE STUDY

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 characterised 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 marginalised. 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 alleviation in particular.

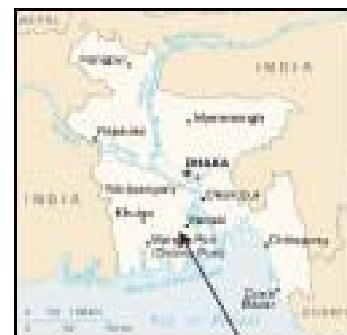
In the last decades the coastal zone has seen economic growth along with some reduction of the extent and severity of poverty. The preconditions for this were created by the water-management, security and transport-enhancing infrastructure developed by the government. The commercial sector and NGOs have 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 alleviation impact, coastal developing 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: Facilitate co-ordination among the various actors, complement the structural with non-structural measures and ensure more equitable benefit distribution. The ICZM policy must be accompanied by a phased, evolution-type implementation strategy and time-bound action plan.

1 Description of Case Study Area

1.1 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.



Polder 55/1

The case study area, polder¹ 55/1 belongs to the very active delta in the south-central area of the coast. Geographically and socially the island and sub-district of Galachipa, part of Pathuakhali district, is representative for a large part of the coastal zone. Until the mid 60s 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.

1.2 Historic setting

In November 1970 a cyclone hit the area which cost the lives of up to 500,000 people (see Box 1: Empoldering: People's Perceptions). 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

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 got married when the storm surge hit our village. My wife, I and other family members 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 nor 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 km per hour. The affected area was reduced to rubbles within a few hours time 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 created

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.

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.

The construction of polder also induced other changes, the most positive ones mentioned by the people are:

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

Negative impacts of empoldering that people mention are:

- 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.

Box 2

Empoldering and poverty alleviation

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

Local people say that the safety net programs of the government (i.e., food for works, 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 sub-district 3750 families received a home and homestead plot under these programs, as well as some supports for income generating activities.

Finally the impact of non-governmental organizations (NGOs) on poverty alleviation is often mentioned. Starting with the Grameen Bank, which launched its program in early 80s, presently there are over a dozen of NGOs working in the region. They work on various social and economic issues, but micro credit is an integral component of their programs. National level NGOs such as Grameen Bank, BRAC and ASA have large micro credit programs and these three NGOs cover roughly 45-50,000 poorer households in Galachipa sub-district. 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.

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 alleviation impact (see Box 2: Empoldering and Poverty Alleviation).

However, in the 80s 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.

Around the case study area, as in other parts of the coastal zone, very lucrative shrimp cultivation has taken off.

Further-more changes in agricultural and fisheries technology meant the infrastructure no longer provided for the needs of the population.

In the early 90s the 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. 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 away 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 elites and local farmers have no option but to 'lease out' their land to the shrimp business, often with negative impacts on them and their lands.

1.3 Water resources

Because the coastal zone is a delta, the 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 ground water. The rivers provide an easy means of transport as well as a variety of 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 society. In many places over-drainage and encroachment has reduced the size of these *beels* and common access, beneficial particularly to the poor, limited.

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

1.4 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 salt water 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 operation and/or maintenance 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 purposes, 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* rice crops depend on the uncertain rainfall during the pre and post monsoon season. In Polder 55/1 SRP built infrastructure to provide supplementary irrigation but the infrastructure has not been maintained and is no longer used.

1.5 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 on the increase. 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 operation and maintenance of polder infrastructure has led to drainage congestion. In polder 55/1 blocking of drainage channels for fish cultivation has aggravated this trend. As a result *Aus* and *Aman* yields and production has 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

1.1 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 and until such time as the area is officially recognised and brought under the official administration. This recognition can take a number of years and until that time local power brokers rule.

Bangladesh has a number of political parties and these are well represented in the coastal area. Though technically political parties are formal institutions, at local level 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 contested. Traditionally local elites occupy most UP seats. From 1997 the UP has 3 seats reserved for women and a few are elected directly to general seats as well. UP Chairman and members protect factional and/or private interests (see Box 3).

Box 3

The Elite Dominating GoB 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 an extent that it actually undermines the basic governance structure.

In Galachipa sub-district there is much newly accreted land, producing rice and *Rabi* crops. However, over the last 5-6 years these lands are being 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 sub-district administration for their help. The Upazila Nirbahi (Executive) Officer (UNO) agreed with their demands and with the support of the police demolished some of the shrimp ponds giving the landowners back control over their land. The rich shrimp farmers objected complaining 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 continues unabated, with much of the profit siphoned off by a few outsiders.

This incident is not an exception. During March 1998 to May 2002 (i.e., over a period of 4 years) 5 UNOs served in this sub-district. Of them only one served in this station for slightly over two years while the others served between 3 to 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 for pumps to the DAE and the Sub-district 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, the DAE objected to this (mis) use. The fishery lobby, supported by UP Chairmen (many directly or indirectly involved in shrimp cultivation), did not support DAE's viewpoint in the Sub-district Council. With support from the department of fishery, they pursued 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 the pumps are all used by shrimp cultivators.

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 both national NGOs, such as ASA, BRAC and the Grameen Bank, and smaller local NGOs and internationally funded activities such as DAINIDA's water supply and sanitation program. The consensus is that NGO activities have helped to 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 GoB 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 both poor co-ordination between different agencies and the problems of staffing posts in what are regarded as remote and low prestige areas.

The overall approach focuses on the integration of development and disaster management policies and activities

1.2 National Policies

As of early 2002 the government is in the process of developing an Integrated Coastal Zone Management (ICZM) policy and strategy. The Water Resources Planning Organisation (WARPO) is the lead agency in this process which is due to be completed by 2005. The approach being adopted in this process of policy development reflects radical new thinking about the role of policy in development and the types of approaches that are needed if 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 emphasised 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 donors, started to develop a distinctive approach to the management of the coastal zone. Basing the analysis on earlier work in Bangladesh, and specific assessments in Asia and further afield, it aimed at a really 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 characterised by many factors that limit development potential as well as by diverse threats from natural disasters. These have tended to be considered separately but it is now realised that whilst natural disasters curb sustainable development, a strong development-based programme will both lessen the impact of disasters and hasten the post-disaster 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 to 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; many issues require the integration of a number 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 GoB 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 analysed. This paper built on the analysis of the donor mission discussed above (Soussan *et al* 1999) to identify the issue of inter-departmental co-ordination as a major challenge in coastal areas: *“development problems to not occur departmentally; they appear in a complex web of interrelationships needing concerted efforts by more than one agency”* (GoB 1999, page 1).

The paper recognises 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”* (GoB 1999, page 11). A range of environmental hazards (both shocks such as cyclones and trends such as erosion, mangrove destruction and saline intrusion) are identified as the focal point of the development challenge of the area, but the paper also recognised anthropogenic vulnerabilities such as poor access to markets, institutional weaknesses and poor service provision as characterising 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.” (GoB 1999, page 10).

The paper goes on to list the range of issues that an ICZM programme should address, with these issues including a range of 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 to rather base ICZM on **harmonization** of the policies, programmes 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. This calls for an integrated approach to water resources management as well as active involvement of direct stakeholders in all stages of the process. The National Water 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 but also the possible environmental impacts. However, it does not mention the conflict between agriculture and shrimp cultivation although the policy does mention the need to combine crop and fish culture and prevent water logging. 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, and this may lead to conflicts over water logged 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 water of less than 40 meters depth. However, presently most marine fishing is done in this area.

The stability of people's livelihoods depends largely on their vulnerabilities and the resources that they depend on.

2.4 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 but also its negative impact and many face the dilemma of what to do. Some have moved into shrimp cultivation while others are still continuing with farming and some others have moved into other 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, the 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 off and diversified their livelihoods into non-farming activities. Households

send their sons to the city or abroad. Tenant farming too has diminished because of the unfavourable tenancy arrangements. In spite of the official tenant laws, landlords without incurring any costs still claim 2/3 of the output as land rent instead of 1/3.

In the past wage laborers in Polder 55/1, as in the whole coastal zone, would have worked as agricultural laborer, 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 not longer the mainstay of the local economy, and many wage laborers have diversified their livelihoods by getting into non-farming professions as well as into 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 non-agricultural 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 70s the common resource fish stock inside the polder has decreased considerably and the fishers now go fishing in the adjacent rivers. From the early 90s 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 patterns of livelihoods in coastal areas are changing, with both 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, and 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.

2.5 Disaster coping strategies

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

The main man-made vulnerability is misuse of power by local lords and government officials.

To cope with the possible damage of storms people protect their homestead by planting trees around their homestead. 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 1970 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 multi purpose 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 spectre 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 the 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 by ‘minding their own business’.

These coping strategies are a key feature of life in coastal areas and provide a basis on which actions to reduce coastal vulnerabilities can be based. Key government programmes such as empolderment and cyclone shelters can be very effective, as can programmes 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?

3 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 *chars* 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 the crops are harvested clashes occur between the henchmen of the 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 heaven 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 in and outflow of saline water.

Traditionally communication in the coastal belt has been by boat. For short distances pedal power was used while larger boats were powered by wind. From the 80s onward there has been a rapid mechanization of all but the smallest of these country boats. As a result transportation speed has gone up 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 accreted 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 the land is already claimed by others as mentioned above.

Where the forestation is successful the trees seldom grow to full maturity. At some stage people from nearby areas will 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 of roads and cyclone shelters, sinking of tube wells, establishing schools, markets etc. Depending on availability of resources the

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 its policy of allocating new land to genuinely landless households. Already over 4,000 households have received both the land itself as well as the necessary ownership documents. Claims by another 12,000 households are being processed.

4 IMPACTS

4.1. 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;
- created the secure conditions for other infra-structural investments such as roads, schools, market places, 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;
- reduced grazing area for livestock.

In principle most of the impacts of empoldering are long term and by enabling other interventions such as micro-credit, empoldering has a clear poverty alleviation impact. As people in the case study area remarked: “now we eat three

Box 4

Poverty alleviation through Micro-credit

Again and again people with few assets mention how important micro-credit is to get them out of poverty. Take Rokan Mia: “I, was born landless and started my working life as a cow-boy. 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 myself.

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 organised 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 4000 (US\$?) to be paid back in 52 instalments of Taka 100 over the period of one year. With this money I bought a rickshaw for Taka 2600 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 time I managed to repay the loan. Now I own the rickshaw and on average I earn Taka 100-150 per day, of which I spend around Taka 10 for maintenance of my rickshaw and another Taka 10-15 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.”

meals a day and very few people go hungry”. However, if the infrastructure is not operated and maintained properly these benefits may reduce or disappear all together. For instance in many polders inappropriate operation, lack of maintenance of gates and embankment breaches has 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 bio-diversity. Human interventions, such as empoldering, have resulted in a reduction of natural habitats such as *beels* (low lying areas permanently under water) and forest and a reduction in the bio-diversity. 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.

4.2. Sustainable operation

Sustainable operation of the infrastructure is necessary if the benefits of empoldering are to last. In the mid 90s SRP therefore made an effort to broaden local participation in operation and maintenance of the water management infrastructure. In line with the then “Guidelines for People’s Participation (GPP) in projects a four tier system of water user organisations was introduced in Polder 55/1. It was made up of Water Users Groups, linked through Water User Committees which were federated in Water Users Associations. All of these organisations were represented in the Polder Committee, which also included officials from relevant government department.

These groups initiated under 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

Box 1

Pauperization: side effect of a project

A few years ago the Forest Department launched a project called Coastal Green Belt Project. Under the project trees were planted on the slopes of the embankment. The objectives of the project were to increase vegetation coverage and create a protection wall with trees against cyclone and storm surges. To ensure survival of the trees, all grazing of cattle on the embankment was banned. Cattle found near the embankment were picked up and taken into custody. Enforcement of the ban, which was very effective, was done through deployment of paid employees under supervision of the forest department personnel.

The households living along the embankment, who had always used the embankment as grazing ground or shelter for their cattle during the rainy season, found it difficult to cope with this new rule. Many violated the decree on the belief that they would not be penalized. Realities turned to be different. The forest department people frequently picked up the cattle. Owners had to pay Taka 20-30 as bribe to get their cattle back or see the cattle being confiscated. This became unbearable for small and marginal households, and many decided to sell their cattle. Consequently, most of the poorer households lost their livestock assets, and for many the loss of their livestock also restricted their entry into land and labor market as a tenant or laborer with draft power, through which many were making a living.

Presently the embankment looks green but households living along the green belt consider this achievement as being at the cost of their wellbeing. Among households who were forced to withdraw from land due to shortage of cattle, many could not resume livestock rearing. They were forced to adopt their livelihood activities and in the process many lost their land as well as their physical capital (i.e., cattle).

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.

Those outside the inner circle of control feel powerless to change the situation and are utterly frustrated.

4.3 Sustainable maintenance

Alongside sustainable operation SRP also attempted to increase the sustainability of maintenance through introducing Embankment Maintenance Groups (EMGs) 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 SRP major work on the embankment remained the responsibility of the BWDB. River erosion is the main threat and BWDB must do the necessary rehabilitation and/or embankment retirement. However, 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 operation and maintenance, result in the infrastructure gradually deteriorating and the initial positive impacts disappearing.

5 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 GoB rightly sees the coastal zone as one with tremendous development potential with many untapped resources with 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. It is also recognized that structural interventions must be combined with relevant and supporting non-structural interventions and with effective governance arrangements. In relation to natural disasters this implies community capacity building so that they can cope with the immediate natural shocks and

The general public is quite aware of the need to maintain a healthy environment.

recover from losses with dignity. In the case of water management infrastructure such as embankments and regulators, this understanding calls for broad-based operation and maintenance. This broad view of development too is a major advantage when it comes to utilizing coastal resources for poverty alleviation.

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 upon 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, including specifically the enhancement of local government structures and the development of more effective inter-agency collaboration. This view is particularly relevant for wider poverty-focused strategies.

In some place the coastal resource base has been overexploited and permanently damaged. This applies in particular to the Sundarbans and to 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 permanent damaged. The potential productivity and contribution to poverty alleviation 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 elites, discussed above, and the barriers to effective institutional harmonisation (both between government agencies and amongst 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 under development 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 both 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 terms of 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 be one of harmonization of 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 alleviation. Water is critical to coastal livelihoods in so many ways, whilst 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 have created employment opportunities and security that has allowed many poor to move out of poverty. Better water management will only achieve its full poverty alleviation impact if it is complemented by other activities that make use of the opportunities created, including schemes such as micro-credit 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 in equitable and sustainable ways. 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 realised, but essential to it is the continuation of the political support from the centre that has characterised recent years.

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4

CASE STUDY

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

Summary

Combining improved water supply with micro-enterprise development has much potential to alleviate poverty in semi-arid 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 micro-enterprise development program for female entrepreneurs.

Joint research by the International Water and Sanitation Centre (IRC), SEWA, and 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 favour 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 micro-enterprise development in the reformulation of 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 alleviation programmes;
- de-linking 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;
- gender programmes to start addressing women's immediate gender needs and link these with the improvement of gender equality between, but also among the sexes i.e., 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.

1 Introduction

Every day, innumerable women still spend substantial amounts of time carrying home domestic water for the family. Water collection reduces the time left for welfare-increasing work and is a drain on household labour 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 was valued at paid labour, 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 labour or small businesses. SEWA organizes women labourers for full employment and self-reliance so they have a regular income, food security, and access to health and childcare for themselves and their families. As self-reliant, autonomous actors, these women make their own decisions and control their economic activities independently.

¹ The district of Banaskantha 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 has been retained here.

SEWA initiated activities in Banaskantha¹ to, amongst 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, only improving the water supply is not enough to alleviate 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 towards not only improving and reviving the existing water supply, piped water supply as well as traditional water sources, but also towards helping poor women to get organized, build their capacity and start and run micro-enterprises. SEWA also aimed to empower the women by giving them self-reliance 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 times of adversity. This case study illuminates this potential. In order to serve as a model for others, this case study will attempt to:

- Showcase the impact of effective water management on poverty alleviation 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 semi-arid regions.
- 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 the SEWA’s efforts. Therefore, preconditions for scaling up need to be identified and to be introduced in the design of similar projects and programmes.

2 Research objectives and methodology

This case study is based on the findings of a study conducted by the IRC Water and Sanitation Centre (IRC, Delft), the Self-Employed Women’s Association (SEWA, Ahmedabad), and the Foundation of Public Interest (FPI, Ahmedabad). That study had economic and gender objectives². Overall, it aimed to look at how domestic water projects may be adjusted to maximise benefits from productive uses of water and time, thus maximising the poverty alleviation impact. Specifically, it sought to assess 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

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).

used participatory rural appraisal (PRA) methods to collect data on time use, gender, and enterprise economics.

Participants were women from 11 SEWA-supported micro-enterprise groups in 9 villages and from 5 control villages (with comparable socio-economic conditions, according to the 1991 census) where SEWA was not active.³ The 5 different types of enterprises covered are crafts, dairying, salt farming, gum collection, and tree and fruit plantations. Women from these enterprises took part in the design of the tools, the analysis of the data and the discussion of the findings and conclusions. Field staff from SEWA and FPI implemented the present study, funded by the Swedish International Development Cooperation Agency (Sida).

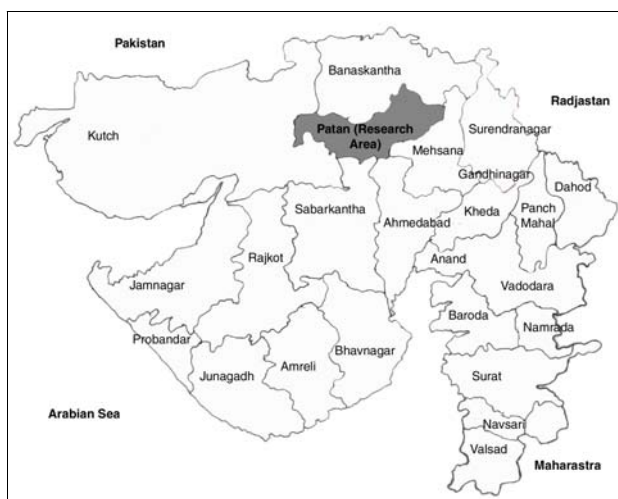
3 The setting and problems in the context

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

I was married when I was still a child and I have 2 sons and 2 daughters. I work in the saltpans from November till April and earn Rs. 40/- (US\$ 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 litres) 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.



³ In 10 other villages, interviews were held with women enterprise leaders.

Eight years ago, I became 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 go to demand for more water tankers, for example. I take part in many of SEWA's activities and I give health and cleanliness training to our girls.

Kokuben Ramabhai Ahir (woman, 40 years), member of Salt Enterprise in Madhutra

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 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. Over-extraction and poor maintenance makes the water in a number of wells become saline and unsafe for drinking.

3.2 Natural and man-made disasters⁴

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 this⁵. On the 26th of January 2000, the state of Gujarat and a large part of India experienced the most violent earthquake of the last 50 years. The epicentre of this quake was located 20 kilometres northeast of Bhuj. Kutch and the neighbouring districts of Surendranagar, Rajkot and the research area Patan were badly affected by this earthquake.

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

Table 1 : Impacts of the earthquake and drought on livelihoods

	Activities	Embroidery	Salt	Dairy	Gum	Plantation	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 year⁶	Not affected	Na	Na	24%	24%	14%	3%
	Affected	Na	Na	72%	71%	86%	85%

N.B. figures do not add up to 100%, as missing values are not shown

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 last five years Banaskantha witnessed the followed disasters: flooding (1997); Malaria epidemic (1997); Cyclone (1998 and 1999); Drought (2000 and 2001); and earthquake (2001)

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.

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 also been damaged. Crafts women lost their working and storage place.

Also the water supply has been badly affected by both 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. Though the piped water supply was restored in some of the villages, water tankers remained the sole sources of drinking water in a large number of villages.

Additional data reveal that 60% and 78% of the respondents consider that their water supply and livelihood respectively is in a worse condition compared to prior to the earthquake⁷.

		Wells	Ponds	Standpost	Bore well
% 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 ⁸	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%

Table 2: Impacts of the earthquake and drought on the domestic water supply

4 Findings

4.1 Time Activity Profiles

Time activity profiles of women from both enterprise and control villages were used to derive insights into women's use of time. They distinguished domestic, 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 to 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 sub-standard quality and often breaks down for longer periods of time.

⁷ 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.

⁸ The high percentage of missing values is explained by the difficult circumstances in which the data had to be collected that were prevalent during the period shortly after the earthquake.

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 (1) expenditure-saving activities - including working on own agricultural land, and (2) income generating activities - either by hiring themselves out as daily wage labourers, or by doing micro-enterprise 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 micro-enterprise activities provide family income at crucial times - in summers (and droughts), when other income sources are absent.

When the piped water supply breaks down women need to spend substantially more time on fetching water.

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	Other	4.3*	5.1*	5.2	5
	Water collection	2.8	3.5	2.8	2.5
Total productive activities	Income generating	7.5*	5.4*	3.4*	0.1*
	Expenditure saving	1.1	1.9	3.6*	7.2*
	Water for productive activities	0.4	0	0.3	0
Total personal activities		7.5	8.2	8.6	9.8

Data indicated with * indicate that 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 jewellery, I lost all my land to a moneylender, and I was not earning more than about Rs. 100 per month. About 10 years ago, SEWA started working in our village and helped us to 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 Rs. 450/- a month (US\$ equivalent?) 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 the village meetings.

After the earthquake, things became very bad. We have water for only 2 or 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, 39 years), leader of fruit plantation in Zandala village.

4.2 Economic impacts

Two calculations were made: (1) the costs of reduced water collection time and (2) the potential benefit of reduced water collection time.

4.2.1 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) were calculated to be an average of Rs. 50 (US\$ equivalent?) per woman per month, during the three summer months. Extrapolating the loss to all SEWA micro-enterprise members in the two blocks, the inadequate operation and maintenance of the water service constitutes a total loss of Rs. 6 million annually for 40,000 SEWA members in Patan.

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

4.2.2 Benefits of reduced collection time

If water supply is improved, so that women spend only one 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: (1) the maximum additional income a woman can earn assuming time saved is devoted to *economic activities*; and (2) the maximum time that is freed for *personal and reproductive activities*. Calculations showed that additional annual income could be between Rs.750 and Rs. 5520 per woman (depending on the economic options available). Alternatively, each woman might gain between 45 and 152 eight-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 towards poverty alleviation in semi-arid areas that addresses water supply as well as micro-enterprise development.

Secondly, 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 Rs. 150 /- per month per household. These improvements include the revival of traditional water sources⁹ as well as piped water supply.

⁹ These include Roof Rainwater Harvesting, construction of plastic lined ponds, de-silting of wells, and so on.

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.

4.3 Gender impacts

4.3.1 Changes in gender relations

In all villages, gender relations have changed in favour 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 to discuss 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 small number of 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.

4.3.2 Control over time and income

A certain degree of control over time and income is essential for the women to use timesavings for income generating purposes. 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.

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 analysed using a similar method as for time use. Three categories of income were analysed: enterprise income, income from other sources (such as agricultural labour 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 kilometres to fetch water from 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. The water from that pond often would make us sick as well.

Now it takes me just one 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 Rs. 300 to Rs. 400 (US\$ 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, 35 years), member of gum collection enterprise in Parsund village.

5 Conclusions and Policy Recommendations

5.1 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 also yields *economic* returns. Conditions are:

- the water supply provides the time savings and quantity and reliability of water required for economic use;
- the water project is linked with a micro-enterprise programme that provides the right enabling conditions, such as organisation and training of women, market research, marketing, quality control, and micro-credit facilities;

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

5.2 Poverty Alleviation

From the findings, it became clear that:

- 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 hiring themselves out as daily wage labourers, and by doing micro-enterprise work;
- work in the micro- enterprises provides family income at times when this is *especially essential* i.e., 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;
- a micro-enterprises support programme that goes beyond training, but covers the whole range of requirements and assists the micro-enterprises to pool 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-wise, there is 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 alleviation programmes.
- As the total amount of water in semi-arid areas is limited, poverty alleviation policies should furthermore try to de-link *water and poverty* by providing income-generating opportunities that depend less, or not at all on water, and are based on market demand.

5.3 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 favourably with the current type of government relief work, which is inflexible and physically demanding and has lower returns.

Policy-wise it is recommended 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*.

5.4 Gender Relations

Overall, and in all study villages, gender relations have changed in favour of women during the last ten years. On a number of essential indicators, such as possession of assets, participation in decision taking, 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 *anti-poverty* 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 generation, projects i.e., 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 a number of 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 programmes should start addressing women's immediate gender needs and link these with the improvement of gender equality between, but also *among* the sexes i.e., for women of different *ages and positions* in the family.

6 Scaling up

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

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

Secondly, many NGOs do have the capacity to mobilise 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*, provided this can be done based on and adjusted to real market demands and with an efficient plan for managing and marketing their output.

Policy-wise it is recommended that:

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

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5

CASE STUDY

Agricultural Water and Poverty Linkages: Case Studies on Large and Small Systems¹

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Summary

This paper uses case studies to examine the linkages between agricultural water and rural poverty, and demonstrates how deprivation of agricultural water to rural households leads to other socio-economic deprivations. There are five key interrelated dimensions of the agricultural water/poverty alleviation relationship. These are production, income/consumption, employment, vulnerability/food security, and overall welfare. In general, irrigation access allows

¹ The paper is based on a number of recent research outputs produced at IWMI on the subject. Direct and indirect contributions of other IWMI staff to the paper is acknowledged here.

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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 socio-economic 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 (1) agricultural water/irrigation access reduces chronic poverty incidence; (2) irrigation's impact on poverty is highest where landholdings are equitably distributed; (3) effective rural poverty alleviation requires that agricultural water/irrigation development be targeted to poor communities/areas/localities; and (4) unequal land distribution is associated with inequitable distribution of agricultural water benefits. The paper then examines a study of water and poverty in six Asian countries. While ongoing, key preliminary findings indicate that (1) land and water resources are important determinants of rural poverty; (2) there is significant inequity in the distribution of water across irrigation system reaches; and (3) the incidence of poverty at tail reaches is higher than elsewhere in irrigation systems, an outcome worsened when land distribution is unequal.

The paper finally 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 institutional/ technology bundling in Pakistan, community initiative in Indonesia, cropping shifts in India, and both the Dual Canal and Bethma systems in Sri Lanka.

I. 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 deprivation of agricultural water to rural households leads to other socio-economic 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 and 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.

II. Background

Poverty is complex and 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 (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). Though 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, 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 (World Commission on Dams, 2000; WSSCC, 2000; Zoysa, Lipton *et al.*, 2001).

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 between 80-90 percent of annual utilized supplies and provides the 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 five decades to improve social outcomes. Huge investments 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 uplift in rural communities and poverty alleviation. These 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 incomes 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 the 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); small holders; 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 small holders and small holders benefiting more than the landless. However, the landless can still directly benefit from increased irrigation services. For example, those working in the agricultural sector

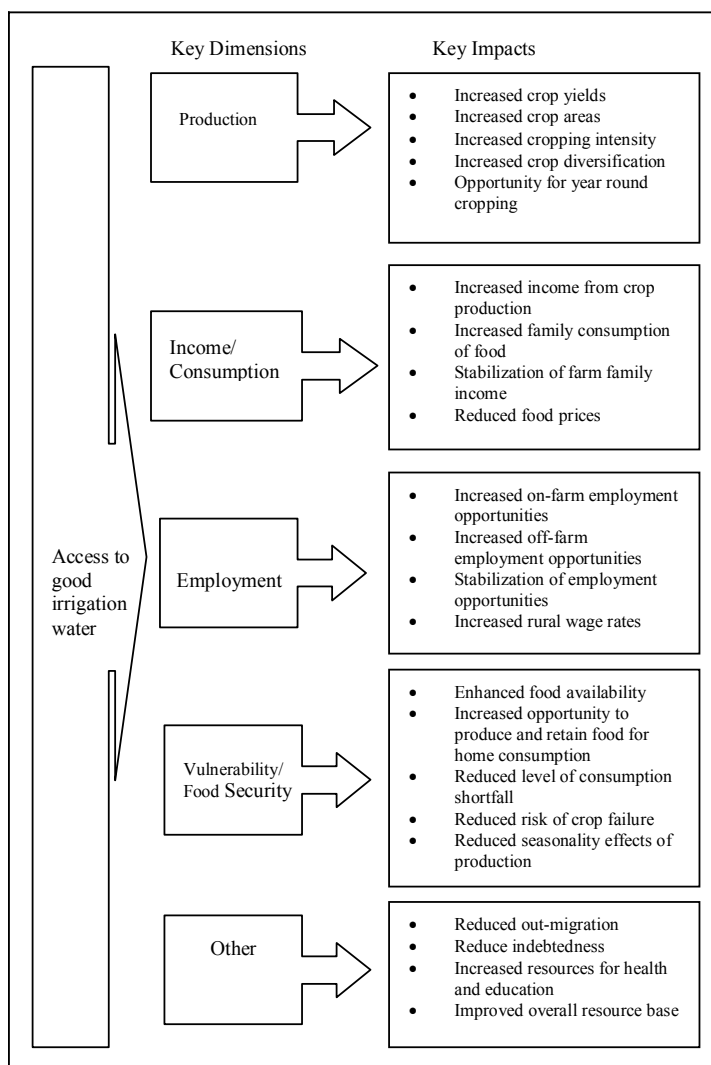


Figure 1. Agricultural Water and Poverty Alleviation: Key Dimensions

can experience an expansion in employment opportunities and agricultural wages, enhancements to livestock and poultry raising, and improved opportunities in other non-crop, 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. Small holders 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 understand the impact of irrigation on the rural poor in a comprehensive way. While the case studies presented below account for both direct and indirect impacts of irrigation on poverty, the focus is on more localized impacts. The broader economy level poverty impacts of irrigation through multiplier effects are not explored here.

III. 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 to determine strategies, which can be employed within existing irrigation systems for poverty reduction.

An Analysis of Selected Irrigation Systems in Sri Lanka and Pakistan

This first case study is based on a recently completed analysis of agricultural water and poverty in Sri Lanka and Pakistan (Hussain, Marikar and Thrikawala, 2002; Hussain, Jehangior and Ashfaq, 2002). 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 alleviation. The study was undertaken over the 2001-2002 period 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

The core objective of these programs was to reduce water loss and improve access to water for crop production.

located in the dry zone within a scheme that is part of Sri Lanka's larger land re-settlement 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 multi-pronged strategy. Irrigation development was coupled with an expansion of other physical and social infrastructure. Many of the settlement schemes are now prosperous agricultural areas and form 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 alleviating poverty.

Within the WLB study site, about 12,000 hectares of land provide direct and indirect support to the approximately 17,000 families settled in the system (including families encroaching lands in the area). A large number of these families have been relocated from other districts. Each settler was given a parcel of 1-2 ha for paddy and other field crop cultivation in addition to land allotments for homesteads. The WLB has been developed in phases, gradually moving from upstream to downstream development. Recently, infrastructure in up- and middle-streams 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 both new and old settlers. Land distribution is fairly equal, and there is a mix of both public and private land ownership. Paddy is the major crop, followed by other field crops including banana, chilies, and onions. Overall cropping intensity is around 200 percent. Surface supplies are the only source of water for crop production. Average annual rainfall in the area is around 1500 mm.

The study site in Pakistan is located in the upper portion of the Upper Indus Basin (UUIB). Irrigation systems were initially developed in Pakistan's Upper Indus during the Colonial period. After independence, a number of 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 percent 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 user associations. In the study sites within the UUIB, the On-Farm Water Management Program was implemented during the mid-1990s.

The settlements in the Pakistan study area are very old. As in other parts of the country, most land is privately owned, and there is significant inequity in the distribution of land ownership. Wheat, rice, cotton and sugarcane are major crops grown in the area. Overall cropping intensity, which ranges between 120-

150 percent, is fairly low as compared to other Asian countries. Conjunctive 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 hectares 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 (1) well developed/improved infrastructure, (2) less developed/unimproved infrastructure and (3) with no infrastructure and without irrigation. The study used primary data collected through household level surveys conducted three times during the 2000-2001 year. The sample included 858 households in WLB and 720 households in UUIB 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 both monetary (incomes and expenditures) as well as non-monetary indicators (under 5 mortality, dependency ratio, body mass index, housing quality, access to services, agricultural performance). Further dynamics of income poverty were measured using the concepts of chronic or permanent poverty (defined as a state in which household income/consumption is constantly below poverty line within a given time period) and transient or temporary poverty (defined as a state in which the household's average income/consumption is above the poverty line but occasionally falls below the poverty line within a given time period).

The selected study areas were divided into sub-areas or strata based on a number of criteria including: availability of irrigation infrastructure, infrastructure condition (improved or unimproved); cropping patterns; and the nature of water supplies (perennial or non-perennial). 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 (1) comparing various strata representing the state of infrastructure development – quantifying the differences in the value of relevant variables by developing a socio-economic profile for each strata; (2) developing and quantifying key indicators of poverty – covering both monetary and non-monetary dimensions of poverty; (3) using econometric analysis to estimate the household income/consumption smoothing effects of irrigation infrastructure development; and (4) 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,

Overall, the highest chronic poverty is found among non-farm households and in areas with no access to irrigation infrastructure.

compared to those without. Household average monthly expenditure in areas with irrigation infrastructure access is 24 percent higher than in areas with no access to irrigation infrastructure. This is largely because areas where households have access to irrigation exhibit (a) higher cropping intensities, double cropping; (b) higher crop productivity and overall production; and (c) higher employment opportunities and wage rates. For example, the agricultural wage rate in areas where households have access to irrigation is over Rs. 200 per day compared to Rs. 173 per day in areas with no irrigation.

The study also indicates that (1) 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; (2) access to irrigation infrastructure enables households to smooth their consumption, with higher incomes received over extended period of time (resulting from higher productivity, crop diversification and double cropping); and (3) 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 to 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 non-monetary indicators, are the 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) compared to 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 non-farm 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 UUIB, 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 percent) and improved crop incomes (with increases ranging from 12-22 percent). 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 percent less in areas with improved irrigation infrastructure than in those without) because of several factors including (a) inequity in distribution of resources, particularly land, with those having larger landholdings benefiting more compared to small land holders and the landless; and (b) poor governance in the water sector (poor infrastructure condition, including improved infrastructure, due to inadequate maintenance, and un-reliable water supplies due to lack of proper planning and water theft), which tends to negate any anti-poverty impacts of improvements in infrastructure. The study indicates that the incidence of chronic poverty is higher among non-farm households (64.2

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

	Sevenagala, Irrigated	Sevenagala Rainfed	Kirribanara	Sooriyawewa	Extension and rainfed Area	Ridiyagama	Irrigated all	Rainfed All	Farm	Non farm	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
- Non-poor (%)	29	12	15	13	16	25	20	15	18	23	19
Household Annual Expenditure (Rs)	64360	59024	67243	64907	49398	94283	71473	52898	69856	57341	67901
Household Annual Income (Rs)	112062	111281	71202	81523	66080	132945	97467	82517	99814	66377	94592
Value of Household Assets (Rs)	18232	13694	17240	19517	8532	32394	21418	10436	20165	14795	19339
Value of Household Agricultural Assets (Rs)	17415	1752	21731	18837	10484	27749	21002	7309	19811	10575	18369
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: Sevenagala area is located at the upstream of the system (in irrigated part of Sevenagala, irrigation infrastructure is well developed/improved/lined); Kirribanwewa is located in middle stream where infrastructure is recently improved/lined; Sooriyawewa is located further downstream where infrastructure is recently improved/lined; Extension area is located further down to Sooriyawewa where irrigation infrastructure is being provided now; and Ridiyagama is located adjacent to Sooriyawewa and Extension area, where there is irrigation infrastructure but un-improved.

Note 2: 1US\$ = around 90 Sri Lankan Rupees in 2001

Table 2. Reasons for differences in anti-poverty impacts of irrigation in Sri Lanka and Pakistan

<i>Selected Systems in Sri Lanka</i>	<i>Selected Systems in Pakistan</i>
<ul style="list-style-type: none"> • Inequity in land distribution is very low • Landlessness is limited • All irrigation infrastructure was improved without regard to landholding size • Irrigation infrastructure was improved uniformly • Irrigation infrastructure improvement has resulted in increased crop productivity and incomes, and the poor have benefited the most • Infrastructure improvement was targeted to the poor 	<ul style="list-style-type: none"> • Inequity in land distribution is very high • Landlessness is high and increasing • Most irrigation infrastructure was improved in areas with large landholdings • In most cases, irrigation infrastructure was not improved uniformly • While irrigation infrastructure improvement has increased crop productivity and incomes, much of the benefit has gone to non-poor (large landholders) • Irrigation infrastructure improvement was not targeted to the poor

percent) than among farm households (6.5 percent). The majority of these non-farm households, constituting over 39 percent of all households, are landless.

Why are the anti-poverty 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, which were not targeted at the poor.

The case study concludes that (1) access to agricultural water/irrigation can significantly reduce the incidence of chronic poverty; (2) the impact of irrigation on poverty is highest where landholdings are fairly equitably distributed (3) for effective poverty alleviation, agricultural water/irrigation development must be targeted to the poor communities/areas/localities; and (4) in situations where land distribution is highly skewed (Pakistan), the benefits of agricultural water will continue to be inequitably distributed unless fundamental measures such as land re-distribution are taken.

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, China, India, Indonesia, Pakistan and Vietnam. 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: (1) canal reaches receiving less irrigation water have lower productivity and a higher incidence of poverty; (2) under existing conditions, small, marginal and poor farmers receive less benefits from irrigation than large and non-poor farmers; (3) the greater the degree of O&M cost recovery the better the performance of irrigation management; (4) participatory irrigation management (PIM) and/or irrigation management transfer (IMT) leads to improved irrigation system performance which in turn reduces poverty; (5) 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; and (6) 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:

1. In the selected irrigation systems, the incidence of rural poverty is highest in Pakistan and Bangladesh and the lowest in China. Estimates also suggest that the incidence of rural poverty is decreasing over time in all study countries except Pakistan.
2. In rural settings, land and water resources are important determinants of poverty. Past development of land and agricultural water resources in all 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 non-food 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.

3. Inequity in the distribution of land and water resources is highest in selected systems in South Asia (SSSA), with distribution in Pakistan most inequitable. Inequity in land distribution is only marginal in China and Vietnam. In SSSA, much of the rural poverty is (1) among landless households where household members are unskilled, without opportunities in non-agricultural sectors, and depend on agriculture for wage labor; and (2) among small landholders because of both water and non-water related constraints (e.g. information, technology, inputs). In SSSA, 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 non-agricultural / 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].
4. Crop and water productivity levels in China, Vietnam and Indonesia, where landholdings are generally smaller, are fairly high with cropping intensities ranging from 200-300 percent. 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 SSSA, particularly in Pakistan and India, 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 non-water sectors.
5. The study finds significant inequity in the distribution of water across head, middle and tail reaches of the systems studied. Inequity in water distribution exists even in systems in China and Vietnam where there is less inequity in land distribution. Inequity in water distribution translates into productivity differences, with lower productivity at tail reaches/downstream. For example, in 10 distributaries studied in Pakistan, wheat productivity varied from 1680 –3459 kg/ha at the head to 1236 –2965kg/ha at the tail. The study further found that, as a result of less access to water and lower productivity, the incidence of poverty at tail ends is higher than at head and middle reaches

The problem of tail reach poverty exists mostly in situations where there are neither alternative water sources (e.g. groundwater) nor alternative sources of employment (non-agricultural enterprises, market towns). 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”. The incidence of poverty increases with reduced irrigation water access (tailends) or when there is no access at all (rainfed 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 percent of the population, water availability and access may be a necessary, if not sufficient, condition for poverty alleviation. Agricultural water deprivation leads to unacceptable socio-economic conditions including a lack

of the basic food and non-food supplies needed to fulfill human physical needs as well as ill-health, lack of education and skills and a lack of reasonable living conditions, all of which can push the already poor and vulnerable into deeper distress. Conversely, a considerable part of rural poverty can be alleviated through improved access to water with well-planned and targeted interventions

Institutional reforms and related interventions in the water resources sector are presently underway, at the broader level, in all the study countries, though the progress is slower in SSSA than elsewhere. The 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 overlapping

Institutional reforms and related interventions in the water resources sector are presently underway, at the broader level, in all the study countries, though the progress is slower in SSSA than elsewhere. The 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 overlapping authority or gaps in authority; lack of funding for enforcement; and lack of clarity in 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, participatory irrigation management (PIM) or irrigation management transfer (IMT) through the formation of water user associations is still in the experimental stage. The results achieved so far are mixed. Early results from the study suggest that IMT and/or PIM has the potential to create conducive environment for improving performance of irrigation, including equity in distribution of water and improved access to water by the poor. For example in SSSA, 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 (for example, the recovery rate increased to 88 to 95 percent in systems where IMT was implemented in Pakistan and Indonesia). Along with improvement 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 (1) distribution of land is fairly equitable; (2) irrigated agricultural systems are relatively small and manageable; and (3) communities within the systems are fairly homogenous (e.g. not divided historically into lower or upper castes). In areas where these conditions do not hold, it will take a relatively long time before the reform initiatives have a chance of 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 the preliminary findings of the study, two sets of interventions are identified to increase the benefits of irrigation water to the poor: (1) broad interventions for improved management of agricultural water to improve

The need for participatory agricultural water management has been recognized for transparent and effective water management.

agricultural water/irrigation system performance that would have both direct and indirect positive impacts on poverty; and (2) targeted interventions that would have direct positive impacts on poverty. The interventions relate to the following aspects: (a) institutional, policy, legal and regulatory; (b) management, allocation, participation; (c) infrastructure and technology; (d) economic and financial; and (e) research, knowledge, information and capacity development. The initial menu of identified interventions is presented in Box 1.

Box 1

Preliminary Menu of Interventions to Increase Benefits of Irrigation Water to the Poor in Surface Irrigation Systems

Broad Interventions

1. Improve institutional environment and governance in agricultural water sector;
2. Involve communities in management of agricultural water resources;
3. Encourage public-private partnership in managing agricultural /irrigation water resources;
4. Establish effective regulatory measures and mechanisms for transparency and accountability between service providers and water users;
5. Establish clear water rights and water entitlements in the systems, by introduction of effective and enforceable legal framework, with flexible provision for seasonal water use in the system;
6. Promote full O&M cost recovery to improve and maintain system performance (from which 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;
7. Introduce systems of advance payments of water fee by users to improve on collection rate;
8. Promote conjunctive management of surface and groundwater, to help reallocate water to areas where groundwater is of poor quality;
9. Develop/improve/line canal infrastructure in areas where ground water is not suitable for crop production.
10. Introduce season-wise planning for equitable distribution and efficient use of available water resources;
11. Improve markets for inputs and outputs;
12. Improve economic value of water through diversification of both crop and non-crop farm outputs;
13. Promote cropping pattern changes from high water consuming crops to low water consuming but high value crops (e.g. paddy to high value crops);
14. Clearly recognize and incorporate rural poverty concerns, and the need and importance of pro-poor interventions in national and sub-national level policies and plans.

Targeted Interventions

15. Promote pro-poor institutional arrangements: These include: (a) involving the poor/smallholders in water management decisions i.e. establishing and strengthening water user associations (WUAs) with due representation of the smallholders and the poor, (b) establishing and strengthening separate WUAs of tail enders in situations where there are significant head-tail inequities in distribution of water;
16. Establish guaranteed minimum water rights for smallholders in drought and scarcity conditions to ensure household food security;
17. Establish pro-poor water allocation/distribution rules: allocating more canal water per unit of area for small holders as compared to large farmers especially where there is significant inequity in distribution of land;
18. Give priority in water allocations to areas and command reaches where incidence of poverty is higher;
19. Promote canal water reallocations to canal command areas/reaches where groundwater is of poorer quality, mostly tail ends where incidence of poverty is relatively higher;

20. Develop pro-poor (discriminatory) pricing systems: differential pricing for larger areas beyond specified ceiling per farm households;
21. Create employment opportunities for the poor including landless— by involving them in O&M, water fee collection and other supervisory measures;
22. Increase productivity and value of water in ways that favor the poor i.e promoting crop diversification towards high value crops on small-holder farms by providing necessary incentives, information and support measures;
23. Target technological support, such as providing high quality seeds, fertilizers, credit, agricultural equipments for land leveling for the poor communities in canal commands;
24. Provide monetary and technical support for installation of pumps/water lifting devices for communities in command areas/canal reaches which are relatively poorer but have good quality groundwater;
25. Prioritize command areas/reaches with relatively greater incidence of poverty for infrastructure rehabilitation and upgrading, and for new infrastructure for storage and distribution of water;
26. Improve markets for the inputs purchased and outputs produced by the poor;
27. Build capacity of smallholder and the poor through information and training programs.;
28. Develop data bases on poverty, location, incidence, and depth of poverty, and undertake monitoring of the poverty on regular basis;
29. Encourage research on agricultural water and poverty.

IV. 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, 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 land holders in accessing presently unusable water supplies, in turn leading to increased production and income. Emerging evidence suggests that access to agricultural water through these technologies has tremendous potential to improve the livelihoods of millions of the poorest. Thus identification and promotion of these technologies offers significant opportunities in the fight against poverty.

Poor small holders, and also landless households around the globe are main beneficiaries of micro-irrigation technologies. These technologies are particularly suited to small and poor and even landless households as they self-select the poor and have a strong land and water-augmentation effect. Box 2 presents an overview of potential anti-poverty impacts of micro-irrigation technologies around the globe.

Treadle Pumps in South Asia’s “Poverty Square”³

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, tubewells and

³ This is based on 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, International Water Management Institute, Colombo, Sri Lanka.

other sources up to a maximum height of 7 meters. It performs best at a pumping head of 3.0-3.5 m, delivering 1.0-1.2 l/s.

Recent research by IWMI suggests that treadle pump technology has had a tremendous impact in improving the livelihoods of the poor in eastern India, the Nepal Terai and Bangladesh (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 land holdings, 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 with costs ranging from US\$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 2400 households in parts of Bangladesh, Nepal Teri and Eastern India, a study by Shah *et al.* suggests that (1) for poor small holders 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; (2) treadle pump technology enables farmers to grow high-yielding and high value crops (such as china rice, a high-yielding variety, and high value crops such as vegetables); and (3) the technology increases crop yields, (for example in Uttar Pradesh and north Bihar, treadle pump users had average potato yields of 16-17 t/ha, a level 60-70 percent 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 US\$ 100 per year in annual net income with gross incomes of US\$300-400 per acre quite common. Net incomes with use of the technology did, however, vary across households and regions. International Development Enterprise (IDE), an 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

Box 2

Small Irrigation Technologies and Poverty Alleviation

The Case: The Global Initiative for Smallholder Irrigation is the world's most ambitious poverty alleviation 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 effect*. 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 alleviation objective would be achieved through production of high valued 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 hectares under cultivation each year over the 15 years. These technologies have so far been successfully tested in several countries in Eastern Asia (China), South Asia (Bangladesh, India, Nepal), Latin America (Brazil, Nicaragua, Mexico) and Africa (Kenya, Zambia).

We present here a summary of issues and lessons learnt from case studies undertaken on smallholder irrigation in Nepal and India (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)	<ol style="list-style-type: none"> 1. Here private sector is the key player for the promotion and marketing of irrigation technologies and provision of 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. 2. Poor landless households use horticultural kits for income generation. 3. The package consist of bucket kits, seed, fertilizer, pest control and other information.
Opportunities to Serve the Poor	<ol style="list-style-type: none"> 4. Wealth creation becomes possible by growing high value crops like papaya mixed with other vegetables, bittergourd on the fence, and pumpkins on the roof!
Cross Cutting Issues	<ul style="list-style-type: none"> • Poorest households with land as little as 40-100 square meters and water as meagre as 2 to 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 and generate new income for the landless.
Pro-Poor Policy Implications	<ol style="list-style-type: none"> a) Access to low-cost drip irrigation technology. b) Access to credit. c) Access to inputs. d) Access to markets. e) Access to additional water. f) Active involvement of private sector to mass-market these pro-poor technologies. <ul style="list-style-type: none"> • 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	<ol style="list-style-type: none"> 1. Small irrigation technologies have strong potential to self-select the poor. <p>The technologies offer a 'win win' gift for poorest and landless households around the globe.</p>

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.* Winrock International and International Development Enterprises.

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 alleviation interventions, by increasing the net annual income of South Asia's poorest rural households by a billion dollars' (Shah *et al.* 2000).

V. Examples of Pro-poor interventions

The case studies presented above demonstrated linkages between agricultural water and poverty at the system and household levels and 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 sub-basin

“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 the creation of new institutional frameworks (organizing farmers into Farmer Organizations) and the supply of technological packages (providing inputs such as new seed varieties, fertilizers, farm equipment, information on timings and quantities of input use and introduced measures such as laser land leveling). The Farmer Organizations (FO) were provided the following inputs/services: (1) farm implements and equipment for use by members as well as for renting out to non-members, with revenues used to build and strengthen FO Fund; (2) fertilizers and improved seed varieties to all members at half cost under the condition that the inputs be used in the recommended quantity and time; (3) laser land-leveling for all members; and (4) 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 to 20 percent. IWMI’s study in the Chaj area suggests that wheat yields have significantly increased (more than doubling from 2 tons/ ha to over 4 tons/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 and 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 2050 residents, has a total area of 929 ha and average land holdings of 0.3 to 0.6 ha. The village is fully agricultural dependent, with no industry or other non-farm activities. Given its location within the irrigation system and with no suitable quality ground water available, the village was once faced with the

classical tail-end problem of water shortages. However, the village took the initiative to collect funds from the community members to build infrastructure to divert and use drainage water that was 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 is cultivated with high value crops, such as onions and chilies, with the remaining third in paddy. Crop yield is very high, 7-8 tons/ha for onions, 1 ton/ha for chilies and 6-7 tons/ha for paddy with production taking place at reasonably profitable rates. Traders now come to the area to buy produce that is then transported to Semarang and even Jakarta. Demand for labor has now significantly increased, especially in sowing and harvesting seasons, with wage rates ranging from Rp. 20,000 per day for female labor to Rp. 40,000 per day for male labor. The availability of water and the increased economic productivity of water through crop diversification have brought enormous prosperity in 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 the distribution of water translates into differences in productivity levels and inequity in farm incomes, with those having better access to water (i.e. 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” has been introduced in

the tail-ends of the existing irrigation systems and in a newly developed area further downstream which forms part of Sri Lanka's resettlement program.

Under the dual canal system, mini water storage tanks with a command area of about 80 hectares have been designed based on the topography of the area. Some of the 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 hectare of land while upland crop farmers are given 0.8 to 0.9 hectares (returns from upland crops are higher than that from paddy). In addition, each farmer is allotted 0.1 hectare 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 the areas poor.

Community Sharing of Land and Water: The Bethma System in Sri Lanka⁴

Dry zone villages in Sri Lanka have traditionally been located near man-made tanks. Water was distributed from the tank outwards towards paddy fields divided into three echelons. Each household in the village maintained holdings in each of the three echelons. During water-rich periods, water was distributed to all fields within the system, while in drier periods the echelons further 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 amongst 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 terms of water access are temporarily reallocated 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.

⁴Extracted 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.

Enhancing Anti-poverty 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 anti-poverty impacts of irrigation. While the 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;
- 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)

The anti-poverty impacts of irrigation can be enhanced by creating conducive conditions that could achieve *functional* inclusion of the poor. These conditions include (1) equitable access to land (2) integrated water resource management (3) access to and adequacy of good quality surface and groundwater (4) modern production technology (5) shift to high value market-oriented production (6) opportunities for the sale of farm outputs at commensurate prices but at low transaction costs, and (7) opportunities for non-farm employments.

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 example, 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 land ownership. 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 land holdings are equitable, as is the case in irrigated land re-settlements in Sri Lanka, but irrigation resources are poorly managed, or access to complimentary 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-valued 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 poor out of poverty through the irrigation locomotive. Even if all these aforesaid conditions are met, but 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 the potential benefits. Existence of employment

opportunities outside the farming sector, especially in areas with high land to man ratios, would further help to diversify incomes, minimize risk, and reduce poverty. In short, it is the 'package' that matters for effective poverty alleviation, and not the mere supply of irrigation water.

Concluding Remarks

There are strong linkages between irrigation and poverty. These linkages are both direct and indirect. Direct linkages operate via localized and household level effects, and indirect linkages operate via aggregate or national level impacts. Irrigation benefits the poor through higher production, higher yields, lower risk of crop failure, and higher and year round farm and non-farm 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 poor into land, labor and commodity markets, and it empowers the poor by putting them at a level playing field with other market entities, including non-poor. Increased production makes food available and affordable for the poor. Poor and landless are main beneficiaries of low food prices as they are net buyers of food.

The 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 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 poor and 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, poor and landless benefit, in both absolute and relative terms, from irrigation investments. Recent advances in irrigation technologies, such as micro-irrigation systems, have strong anti-poverty potential.

Ongoing studies in Asian countries document strong evidence that irrigation helps to alleviate both permanent and temporary poverty. Further, it helps to alleviate 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. The interventions should focus on reaching out to the poor through improved economic, policy, institutional, and governance measures. Generating a knowledge base through multi-country 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

CASE STUDY

Integrated Management of Water, Forest and Land Resources in Nepal: Opportunities for Improved Livelihood¹

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November, 2002

¹ Paper prepared for presentation at World Water Forum3, Kyoto, Japan in March 2003

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Summary

Successful activities by both Forest User Groups (FUGs) and Water User Groups (WUGs) have made important contributions to the livelihoods of people in Nepal. This study explores the possibility of integration or establishing linkage between these two that could have a 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 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 and that needs to be addressed to cash on the opportunities for the integration of these two institutions

1. Introduction

Integrated Natural Resources Management (INRM) at catchment level has been evolving together with concepts of Integrated Water Resources Management (IWRM). Despite increased thrust (expression? – better: emphasis) in international meetings and policy forums on the need of basin level planning and application of IWRM, very little literature is available that provides knowledge base in understanding the integration process at the catchment level in developing countries. In addition, the actual cases of the IWRM framework at local level is inadequate in South Asia including Nepal, although the consensus at the national policy making bodies for the need of an IWRM framework exists.

In this context, this study tries to document the existing interaction process that links Forest User Groups (FUGs) and Water User Groups (WUGs) at catchment level and explores the possibility of integrating their activities. It is believed that the integration of activities of Forest User groups (FUGs) and Water User Groups (WUGs) at the catchment level could lead to a better management of resources for the increased and wider benefit to the community. The integration/linkage is also expected to resolve various existing intra and inter-institutional 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.

2. Research Approach

The research was conducted in two irrigation systems- Begnas Irrigation System and Bhanu Shera Irrigation System in Kaski and Tanahu Districts respectively - at the catchments of the two districts⁶ (Kaski and Tanahu) of the Gandaki River Basin in Western Nepal (Figure 1). The research sites were selected in consultation with District Irrigation Offices (DIO) and District Forest Offices

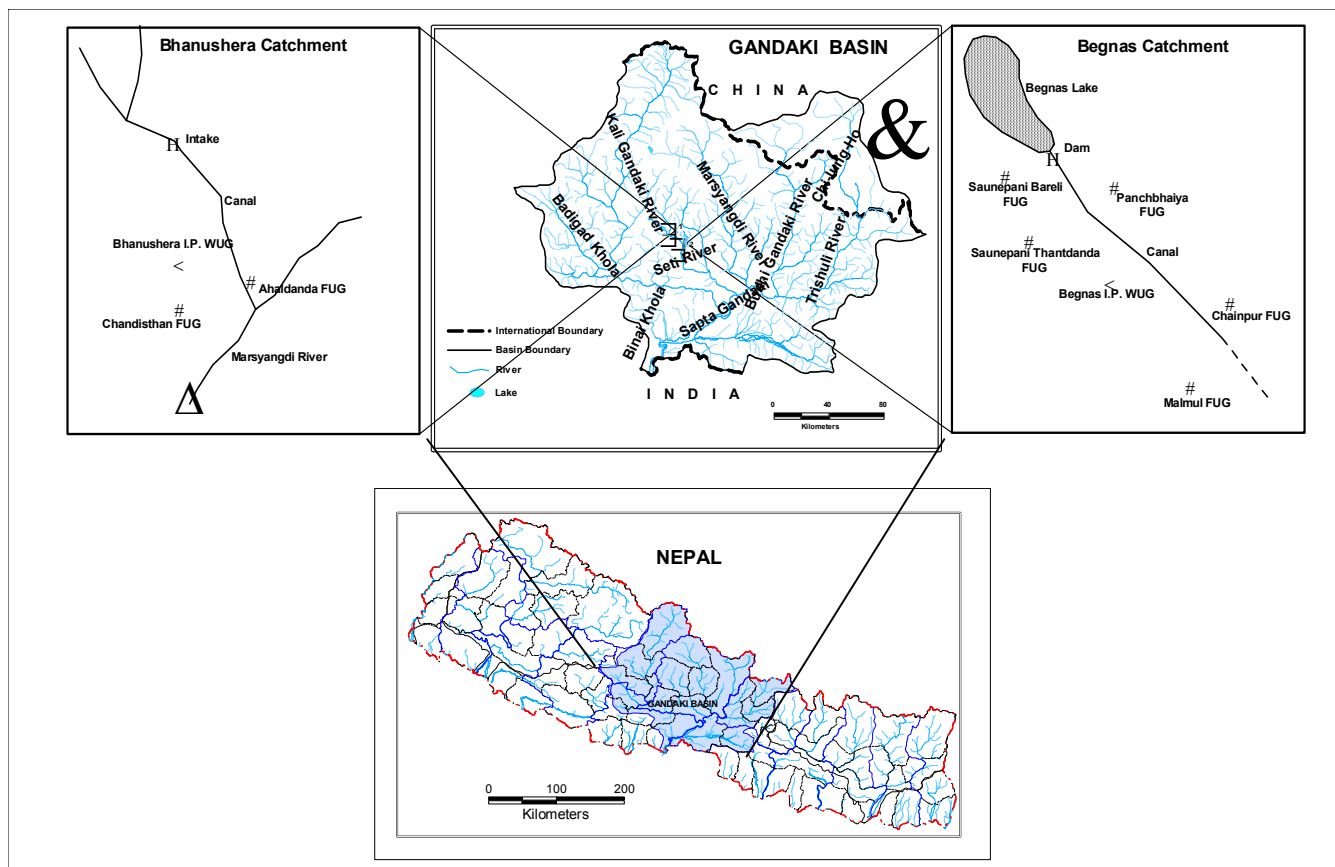
¹ District is a politico-administrative unit and the focal unit for the implementation of development programmes. The county is divided into 5 Development Regions, 14 Zones, 75 Districts and 3915 Village Development Committees.

(DFO) in the respective districts. The purpose of taking irrigation systems as the selection unit was due to the impracticability of studying a large number of FUGs and WUGs present in the catchment and because of the exploratory nature of the study as well as the availability of resources.

The quantitative data focused on generating information at household level.

Location Area of Study Sites

During the field visit, both quantitative and qualitative data were collected at the catchment and household level. The quantitative data focused on generating information at 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 Bhanu Shera Irrigation Project was collected through group discussions and secondary sources. Qualitative data mainly focused on collecting information from concerned community stakeholders during group discussions. Direct observation of local conditions of resources that entailed visiting forest and irrigation canals also formed part of the qualitative assessment. Some PRA methods like resource mapping, oral histories on resource use pattern and land use changes were also utilized.



Location Area of Study Sites

3. 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 the year 1984 and was completed in 1988 by the Department of Irrigation (DOI) with loan assistance from the Asian Development Bank. Three tier WUGs were formed to manage this irrigation system and management transfer to the user groups is underway. The canal system of this irrigation scheme did not include the 157 ha of land at the tail end, which has continued to be the most contentious issue in the catchment.

Bhanu Shera 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, the Department of Irrigation assisted in renovating and extending the canal system at the request of users, after which the users formally registered as Water User Groups. The community now manages the entire system and there are no management controversies among users.

The Forest Users Group

A total of 7 FUGs, five in Begnas and two in Bhanu Sera, were studied. These FUGs were close to the irrigation systems. The profile of the FUGs (Table 1) indicates that some of the FUGs were as old as 12 years while some were recently formed.

Catchment	Name of FUG	District	Location	Date of Formation	Area (ha)	Total Member Hhs	Forest dependent population (%)	Main Forest Species
Begnas	SaunePani Bareli	Kaski	Lekhnath Municipality -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 Municipality -11	1997	235.3	378	75	Sal, Chilaune, Katush
	SaunePani Thantdanda	Kaski	Lekhnath Municipality -8	2001	NA	NA	20	Sal, Chilaune
	Malmul	Kaski	Lekhnath Municipality -13	1996	115	170	25	Sal, Chilaune
Bhanu 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

Note: *Castanopsis indica* (katus), *Schima walichii* (chilaune), *Artocarpus intergra* Shorea robusta (sal).

Table1 List of FUGs studied in two Catchments

Existing land use pattern

Both the studied catchments are undergoing rapid land use changes enforced by new market pressures in the region. The total area is much larger (1130 ha) in Begnas catchment than that of Bhanu Shera Catchment (75ha). The construction of irrigation systems and delineation of community forest area has also brought change in land use pattern in the catchment.

Land Use Type	Area (ha)		Land use in percent	
	Begnas Catchment	Bhanu Shera Catchment	Begnas Catchment	Bhanu Shera Catchment
Irrigated Land	580	20	51.33	28.57
Rainfed land	154	20	13.63	28.57
Forest/Scrubs	315	20	27.87	28.57
Grazing Land	81	15	7.17	14.29
Gross Command Area	1130	75	100.00	100.00

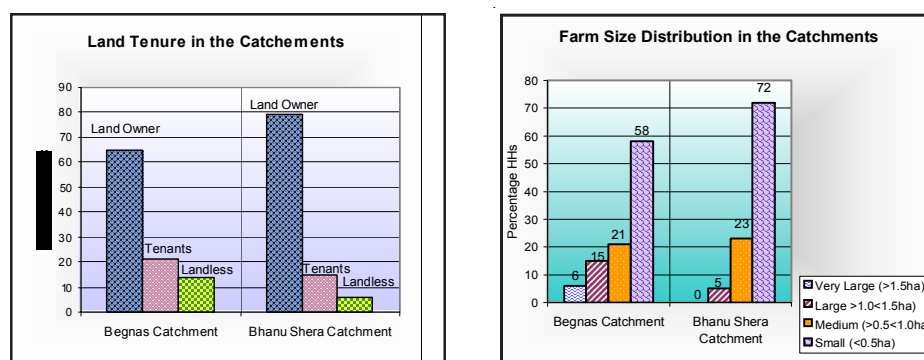
Source: District Irrigation Office (DIO), Kaski and Tanahu Districts

Table 2 Land use pattern in the study sites

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

Land Tenure and Farm Size

In the catchments, land tenure and farm size distribution determines the well being of a farmer. A farmer with no land or a small plot of land is often the poorest. Though large landholding is not always equivalent to being rich, it certainly indicates that the farmer is socially and economically better positioned in the community than others. The following figures depict the land tenure and farm size distribution in the two catchments.



Source: Field Survey 2002

Figure 2 Land tenure and farm size distribution

Agricultural production shows significant difference before and after the establishment of irrigation systems.

Among the total 550 households in the Begnas catchment, a large proportion (65%) owns the land and the majority (58%) are small farmers having less than 0.5ha of land. The percentage of large (1.0-1.5 ha) and medium landholders (0.5-1.0 ha) is also significant with 21 and 15 percent respectively. Likewise, a significant number of households are tenants (21%) or landless (14%). Nevertheless, the percentage of very large owners is relatively small (6%). From the data collected from 53 households in the Bhanu Shera catchment, it can be derived that there is a comparatively large number of land-owners in this catchment (79%) and that the majority (72%) of these land-owners have small plots of land indicating more equitable access to land. The percentage of large farmers having more than 1.0ha of land is negligible in this catchment.

The presence of a large number of small landholders in both catchments explains that the majority of households have low food sufficiency level. The small landholders in the catchments either share crops or rent the 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 of people are more influential in the decision making in the community. Nevertheless, other caste groups do not feel sidelined when major decisions are to be made in the community affairs.

In contrast, the community in the Bhanu Shera catchment is more heterogeneous and Newar and Magar (38% and 32% respectively) are the majority in comparison to the two upper caste groups. Thus, the dominance of one group is not prevalent indicating a more egalitarian decision-making process in the community.

4. Impacts of FUGs and WUGs

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

Livelihood Impact

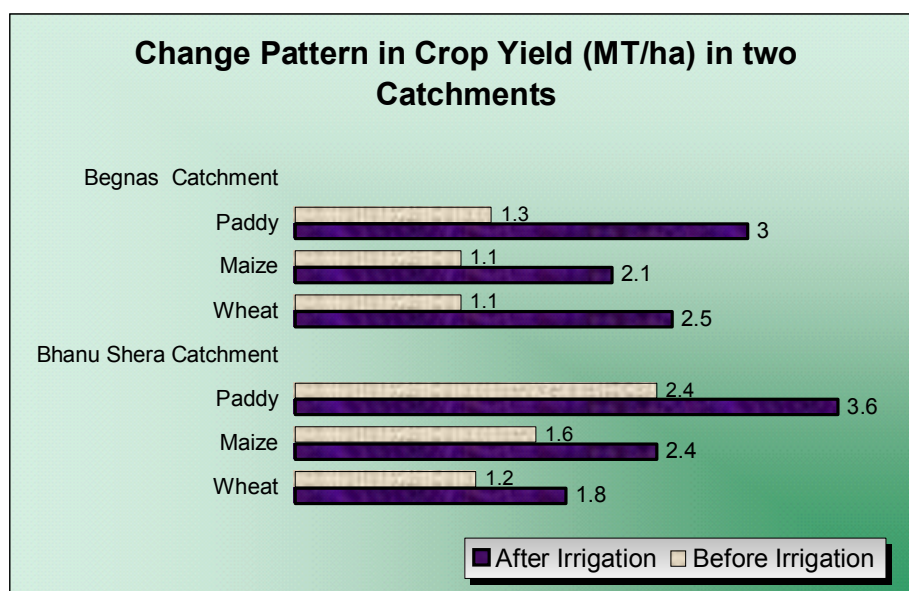
At both catchments, agriculture has predominance as main economic activity. In the Begnas catchment, 86 percent of households had agriculture as the main income source. Besides agriculture, 23.3 and 16.6 percent of households have small-scale business and services as auxiliary income source respectively. In the Bhanu Shera catchment, 90 percent of the respondents (results obtained from group discussions) had agriculture as the main source of income and 25 percent of them had other auxiliary sources of income like small-scale business and private/government services.

Agricultural production shows significant difference before and after the establishment of irrigation systems. Before the construction of the irrigation canal in the Begnas area, paddy production was only 1.3MT/ha but soon after the construction of the irrigation canal the production increased to 3.0MT/ha. Correspondingly, the production of maize and wheat also increased. The results are similar for the Bhanu Shera catchment where renovation of the traditional

irrigation system helped to increase the production of paddy and other crops significantly.

Members of WUGs in both catchments said that increased irrigation water availability has resulted in good agricultural productivity. The 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 Begnas Catchment has increased to 200% from 129% after the completion of the irrigation scheme (DIO, Kaski District) and farming systems have been improved through active promotion from Non-Governmental Organization (NGOs) and International Non-Governmental Organizations (INGOs). This is evidenced from the increase in the use of chemical fertilizers, as reported by the respondent households in Begnas Catchment. From the 30 surveyed households, it was found that on an average a household uses chemical fertilizer in the ratio of 0.4kg per doko (equivalent to 25kg) of animal manure. Few farmers have initiated large-scale coffee production and fruit farming.

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



Source: Field survey 2002

Figure 4 Change in cropping pattern and crop yield before and after irrigation

The requirement of fodder, firewood, litter and timber determines the household's dependence on forest resources. In Begnas Catchment, 38% of the FUG member households said that they are highly dependent on forest products. They make frequent visits to forests to collect firewood and fodder. Respondents also said that they could take as much quantity of firewood for household consumption as they need but that they cannot sell firewood in the market while 42%

The community welfare program was targeted at assisting poor users who could not go to health posts during illnesses and funds were even spent on death rituals.

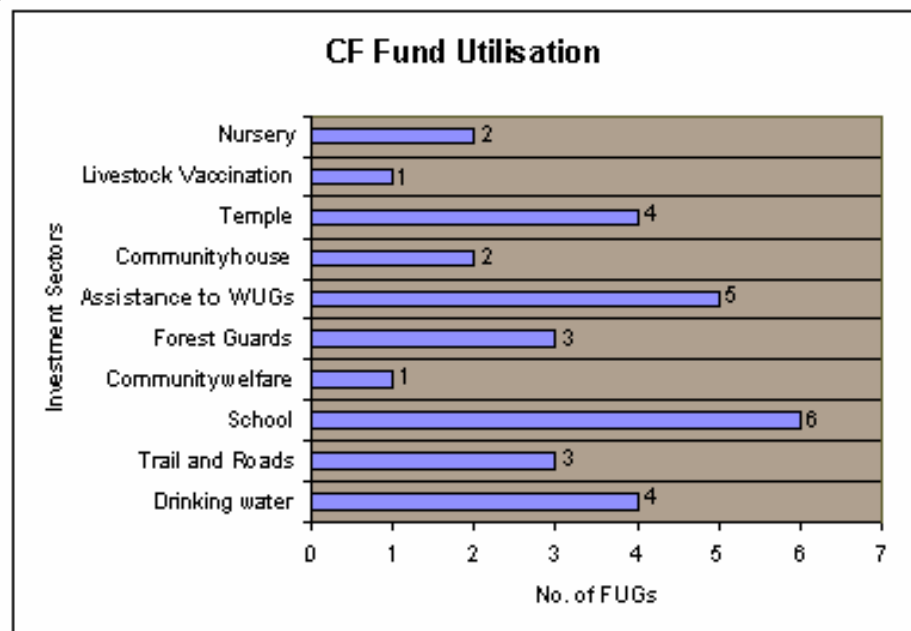
households were partially dependent (meaning of sentence?) They mostly collect fodder for livestock and occasionally (once a year) apply to the FUG committee to take timber. The rest of the member households (20%) expressed that they are not dependent on forest products at all. They use LPG (what does it stand for?) or biogas for cooking, do not keep livestock and have modern houses made of bricks and cement. They have become members of FUGs because of potential benefits that may arise in the future. The lesser dependence on forest products is also due to tree plantation, as 60 percent of the respondents (30) reported to have more than 10 trees on their own land. The presence of a large number of trees can be attributed to large land-holding size. This further shows that farmers with large land holdings tend to be less dependent on forest resources compared to 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 used for fodder and timber.

At the study sites, all the households, including those that had switched over to using LPG for cooking, were still bringing firewood from the forest for cooking livestock feeds. Income generation for poor families from Non-Timber Forest Products (NTFP) in forests has also not been achieved at the study sites. Consultation with FUG members revealed that there is high potential for income generation from NTFPs in forests of both the catchments. Different kinds of herbs and sal leaves (*Shorea robusta*) 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 the NTFPs they extract. This has led to under-utilization of the NTFPs and hence, a potential income source for improving the livelihood of the poor is being lost.

Community Impact

Of the total 7 FUGs studied in the two catchments, 6 FUGs had invested some amount of their funds for upgrading and building infrastructures of local schools. Another major investment of the Community Forest (CF) fund (5 FUGs in total) was found to go into assisting WUGs. FUGs either contributed cash or supplied timber from forests for the maintenance of irrigation canals in the village. Drinking water and temple construction were other main sectors in which 4 FUGs had already made some investments. CF fund was utilized either in maintaining the already existing drinking water scheme or launching a new one. Most of the drinking water sources that originated inside the community forest were protected by FUGs. Similarly, the community also prioritized trail and road construction and the appointment of forest guards for which considerable CF fund was utilized by 3 FUGs. One of the FUGs was well ahead of others in investing in community welfare and livestock vaccination programs in the village. The community welfare program was targeted at assisting poor users who could not go to health posts during illnesses and funds were even spent on death rituals.

The biggest portion of the collective funds of WUGs was utilized for regular operation and maintenance of the irrigation system. Irrigation systems need all year round maintenance and hence it leaves very little opportunity for WUGs to invest in various developmental programs in their village. The discussion above indicates that FUGs' role in income generation through investment in various community activities has been beneficial for the poor households in the community. Further, their contribution to the maintenance of irrigation systems has direct bearing on the livelihoods of the people dependent on agriculture. The investment in other social and economic activities has promoted cohesion between various groups and social development in the community. This is important in terms of future co-ordination and integration of WUG and FUG activities that would have a direct impact on the livelihood of the people.



Source: Field survey 2002

Figure 5 Distribution of Community Forest Fund utilization

Environmental Impact

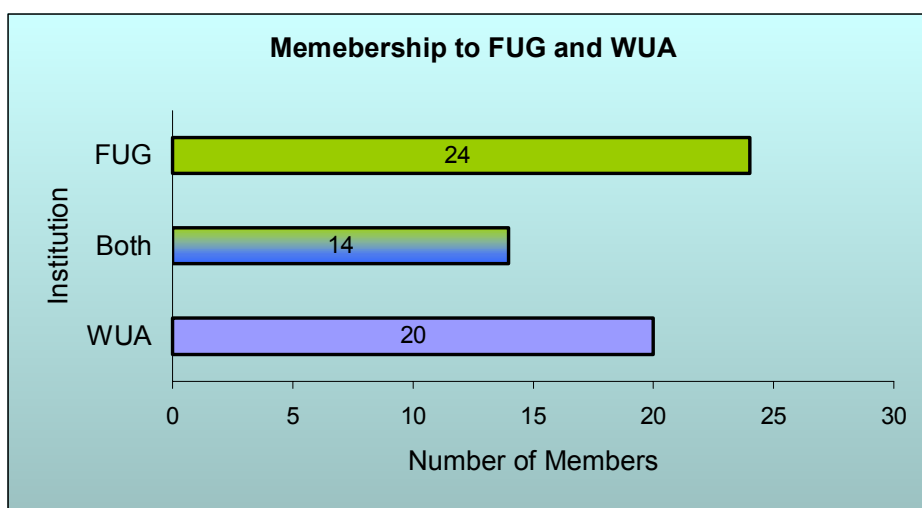
Environmental impact was measured in terms of changes in resource quantity and quality before and after the emergence of FUGs and WUGs. Oral histories on changes in resource use pattern and conditions obtained from elderly persons at the study sites formed the basis for assessing the ecological impacts. With agricultural intensification at study sites, small irrigation systems management by communities is increasing. Correspondingly, informal WUGs are also increasing. In Begnas and Bhanu Shera Catchments, users affiliated to WUGs and FUGs said that water availability and forest conditions have improved over the years. The respective user groups have started regular operation and management of the canal system in their villages, as well as the regulation of forest products. Over-harvesting of grass and fodder, irregular and illegal felling of trees has been reduced in both the catchments. The users said that after handing over of the forest to them, the forest has become more dense and firewood, fodder and leaf litter availability in the forests has increased. In Malmul

FUG of the Begnas catchment, due to increased demand for grass, a separate grass committee within the FUG has been formed to regulate the distribution of grass among users. Many of the users have now started planting fodder and timber trees in their farmland and hence pressure on the community forests has been reduced.

Socio- Institutional Impact

Membership in WUG and FUG

At the study sites, the community consisted of members that were affiliated to a one or both the institutions. Since, there were many forest user groups in a catchment, households had membership in at least one of the FUGs whereas only those households having land in the command area had membership in a WUG. Considering this, members of FUGs and WUGs were overlapping. The following figure for Begnas Catchment represents how WUG and FUG members overlap in a given catchment.



Source: Field survey 2002

Figure 6 Distribution of Membership in Begnas Catchment

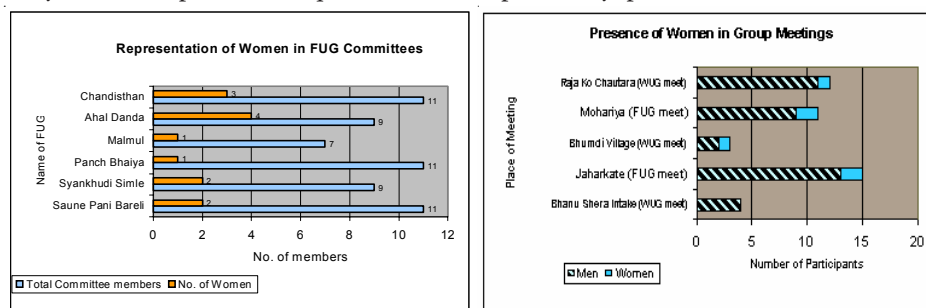
Of the total 30 respondents in Begnas Catchment, nearly 50 percent are common members of both FUGs and WUG. Unlike WUG membership that requires land holding in the command area as the principal criteria for membership, FUG membership is flexible as it allows various categories of households to become members: Forest dependent households that live close to the forest as well as partially or non-dependent households that live far from the forest. Many FUG member households take membership even though they are not dependent on forests for firewood and fodder. Many of them seek FUG membership due to considerations of future requirements of timber for construction purposes. As FUG membership only requires an entrance or membership fee, a large number of households become members. The 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 to the management of forests is higher than that for those who are actively involved in forest management. The participation in group meetings in FUGs was higher (87.5%) compared to the WUGs (60%), indicating users'

interest in FUGs due to the wide range of activities they are undertaking for the benefit of the community.

Gender participation

Equality in roles of men and women in FUGs and WUGs was primarily determined by their representation in the committee and their role in decision-making processes. The inclusion of women in one-third of the total committee positions has been a rule in recent years. The majority of FUGs and WUGs at the study sites (Figure 7) has, however, not followed this rule. Only in two of the FUGs in Bhanu Shera Catchment, women hold one-third of the positions in the committee. Moreover, the positions filled by women were mostly those of ordinary members having less responsibility. Important positions like of chairperson, secretary, treasurer, etc. were filled by men.

Women's representation in WUG committees is no better than in FUGs. Only in one sub-committee of Begnas WUG (Begnas-1), the committee consists one-third of women. One of the WUG committees, Begnas-3, does not even have a single woman. In spite of the existing rules to have one-third of women in the committee, both in FUGs and WUGs, women are under-represented. Women's participation in meetings was also reported to be negligible. From the member households, mostly men attend committee and general assembly meetings. Only in one of the surveyed households, the respondent said that his wife attends 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 put to them.



Source: Field survey 2002

Figure 7 Distribution of Women in FUG and WUG Committees

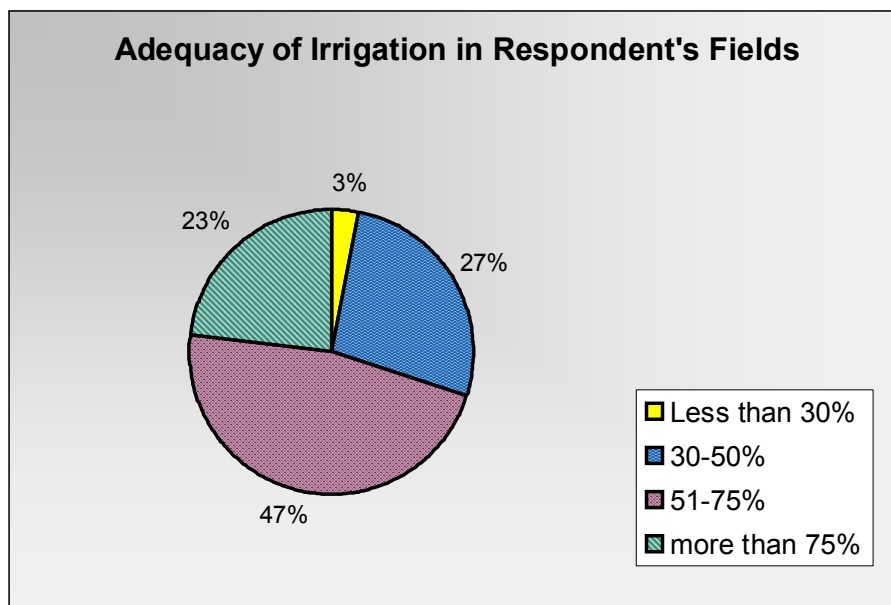
Equity in benefit sharing

The successful institutionalization of FUGs and WUGs depends on how effectively equity issues, mainly usufruct rights and benefit-sharing among users, are addressed by them. At study sites, usufruct rights and benefit sharing mechanisms in FUGs and WUGs were complex. As land tenure right is the prerequisite for getting benefit from irrigation water, equity between members with small and big land holdings and users at the head and tail end is the chief concern. For example, in Begnas Catchment, very few households (3%) reported that less than 30 percent of their land receive irrigation (Figure 10). However, the majority reported that they received inadequate irrigation (51-75%) in

their field and nearly 25% of the households reported having received irrigation for more the 75% of their land. Interestingly, fifty percent of the total (30) respondents said 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.

The fact that there are fewer (more?) numbers of satisfied users at the head end while dissatisfied users are mostly found at the tail end is reflective of the unequal access to the resource use. (Contradiction?) This situation was partly due to a lack of adequate consultation by DOI with the users while designing the project. To address the issue of inequality, it is important to increase the participation of the users in resource management. Initiation of on-farm water management practices in consultation with the farmers could help in addressing this issue.

In FUGs, usufruct rights and benefit sharing among different members varied according to their differing dependence level on forest products. Some users were highly dependent on forest products and hence were actively involved in overall management. There were other sets of users who were partially dependent on the forest. Few users were not dependent on forest at all. Benefit sharing by these different sets of users depends on the kind of contribution they make into 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 on the forest resources, as they are not able to spend cash on getting forest resources. Therefore, they also contribute more to the management of the forest.



Source: Field survey 2002

Figure 10 Adequacy of irrigation in farmers field

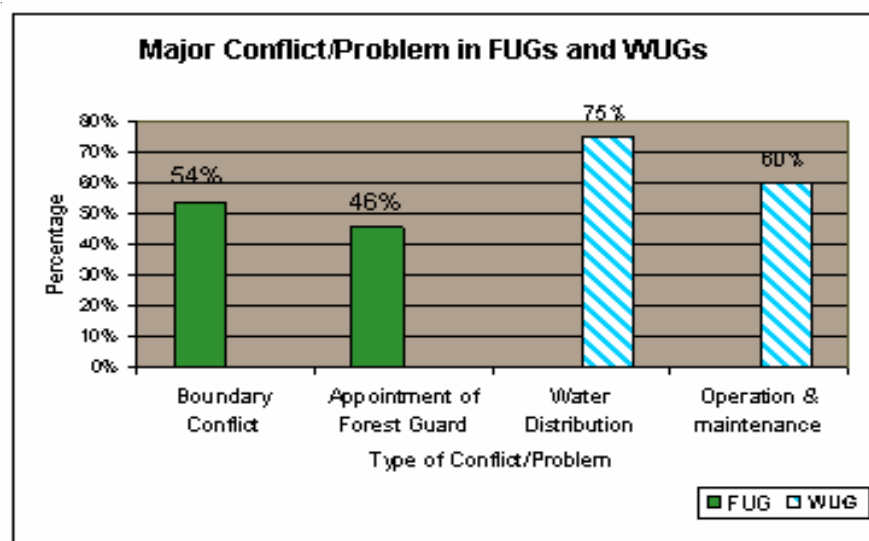
In some FUGs in the catchment, the equity issue appeared to be an inherent mechanism of a social change process. Some users who earlier were dependent

on forest are, in the course of a social change process, no longer dependent on it. Many of these members come from richer households who held important positions in the FUG committee. After they opted out from the committee, poor users who highly depend on the forest got an opportunity to be represented in the FUG committee.

Boundary conflicts arose mainly due to the encroachment of forestlands by adjacent private landholders.

Intra-institutional conflicts

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



Source: Field survey 2002
Figure 11 Conflicts in FUG and WUG

Boundary conflicts arose mainly due to the encroachment of forestlands by adjacent private landholders. In one of the FUGs, members told that forestland was encroached by landless immigrants from different parts of the country and illegal felling of trees by non-users. 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 the middle of forest land, etc. In another case a new FUG was formed after it separated from a previous FUG. The reason for their separation was that the users managing the forests came from two different hamlets (wards) of the same VDC reflecting the effect of political boundary in the management of the forest.

The majority (75%) of WUG members cited water distribution among users to be the main problem. Conflict over equal/fair distribution of water between head and tail ender communities was existent in two of the three WUGs studied. The respondents also said that community cohesion for operation and maintenance of the irrigation canal was another major problem existent in WUGs. Members were reluctant to contribute cash or labor for the maintenance of

irrigation canals in the case of the large irrigation system in the Begnas catchment. This sort of problem was not existent in the small irrigation system in Bhanu Shera. The majority of users held the opinion that the District Irrigation Office that had invested in the canal construction should maintain the canal system, indicating their reluctance or inability to contribute to the operation and maintenance of the system.

Inter-institutional Conflicts

In 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 Chandisthan FUG (Bhanu Shera catchment), Karnalitaar WUG has its source and its alignment also passes through this community forest. Users of Chandisthan FUG think that the careless lying around of hume (unknown word) pipes of the Karnalitaar irrigation canal is the main cause of landslides in their forest. Co-ordination of their activities, which is lacking at present, could be beneficial to both users groups.

5. Integration of WUG and FUG activities: Challenges, Opportunities and Benefits

The 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 reason behind this is due to the differences in the institutionalization process of the management of these two resources and also due to the sectoral focus of government plans and programs. However, lately it has been realized that the integration of these two activities could help increase benefits for the rural households to reduce poverty. The users found the idea innovative and useful for the future management of these resources. The discussions in the following paragraphs will try to identify some of the challenges and opportunities for the integration of these two activities.

Challenges

The difference in nature and structure of resources management and usufruct rights between WUAs and FUGs is a fundamental cause for the difference in functioning of these two institutions, their memberships patterns and benefit-sharing. The participation in FUGs is broadly based as a large number of people who live in proximity of the community forest boundary can become members of the institution. In WUGs, the membership is limited to those who have land in the command area of irrigation. Therefore, socio-economic 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 for the integrated activities at local level. Likewise, ensuring participation of the most vulnerable and disadvantaged groups and a fair distribution of benefits to them has remained as challenging as ever for the integration of these activities.

Another important area for integration at local level depends on provisions at the policy, legal and institutional level. Ambiguities at the policy level are also manifested in the legislative provisions. 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 local level.

Opportunities

During the group discussions, participants mentioned that a maximization of resource utilization that is available at the local level could help in increasing 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 example, natural resources like limestone, sand, and river bed materials (gravel and stones), etc. that have not been utilized fully could be utilized for the benefit of both groups. These resources can be extracted and utilized in a sustainable manner if WUGs and FUGs can be integrated or linked to draw an appropriate plan for their use.

Likewise, the utilization of Non-Timber Forest Products could be an important and regular source of income, if properly utilized. The users from both groups expressed the opinion that the existing potential has not been fully utilized due to a lack of joint effort. Integration could help in overcoming these problems. Further, the resource generation from additional sources could also help in implementing other community activities that would directly benefit the needy in the community.

Users believe that the integration would help better water management at the farm level through increased water availability and through improved on-farm water management practices. This would help resolve some of the intra and inter-institutional conflicts in view of rising competition in the use of resources (forest products and water). Increased co-operation between two sets of users could facilitate increased interaction to solve these problems. Besides, enhanced co-operation 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 drinking water scarcity.

Benefits

Participants of the group discussions identified different benefits through the integration of the two institutions. The participants of group meetings mentioned that integration or linkage between FUG and WUG would increase cooperation, raise awareness among users, would help in conflict resolution and would contribute to the increased resource mobilization for the benefit of the community. A large number of participants said that the integration of FUGs and WUGs would also improve their working relation with government agencies and can also help improve co-ordination between government agencies.

Though users could not exactly tell about the nature of integration, they suggested that FUG and WUG should operate independently like it is now, but some of their activities could be coordinated by forming a higher level

coordination committee represented by the 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. The participants highly emphasized the need to have the committee free of party politics.

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

1. Conclusion

Both forest and water management units consist of a group of communities from different hamlets (wards), villages, VDCs (what does it stand for? Village development council?) or districts, who are mostly concerned with and dependent on the respective resources. They form a group and conserve, utilise and manage the resource for collective benefits and their functions are institutionalised. The activities of both of 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 benefits do exist in both WUG and FUG and that needs to be addressed. There have been cumulative effects of both forest and water resources that have effected land use changes in the catchment with positive effect. Failure to reduce gender inequality as indicated by women's low representation and participation at decision making level is one of the weaker aspects of these institutions.

The case study of two catchments presented above indicates that certain aspects of FUGs and WUGs can be linked at catchment level. Considering the challenges and opportunities in the management of these institutions could be the starting point for any opportunities to link the two. Overcoming policy level and management challenges are important for the integration of these two institutions. The opportunities available from sustainable harvesting and commercial utilization of NTFPs are vital for improved and sustainable livelihood of the people. Both reduction and elimination of intra and inter-institutional conflicts would contribute to an enhanced management of these two resources for an increased benefit to the users. One important aspect of integration of FUGs and WUGs could be inter-institutional 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.

Quote (Combination of two sentences):

Forest and Water User Groups have made important contributions to the livelihoods of people in Nepal and integrating these two institutions could have an important impact on reducing poverty at local level.

7

CASE STUDY

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

Ratna Reddy, Malla Reddy and John Soussan

Abstract

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 semi-arid, low resource and high-risk environment. These are the conditions under which much of the future agricultural growth and poverty alleviation in India will have to take place. In Andhra Pradesh the government watershed related policies and programmes are enthusiastically implemented. The state of Andhra Pradesh is in the forefront as far as the watershed development programme is concerned. The state has so far initiated about 7000 watersheds covering about 3 million hectares. This accounts for

The future of agriculture development and food security is critically dependent on the development of rain fed agriculture.

roughly a third of the land that needs treatment and a fifth of the total rain-fed area in the state.

All the watersheds, covered under different schemes, are being implemented as per the guidelines of the 1994-95 watershed Development committee. About 85 percent of the watersheds are implemented through the government system and NGOs execute the rest. Studies show that the participatory approach used by the NGOs result in higher economic and ecological impacts, a more equal spread of benefits and better sustainability. This case study, based on some of the successful NGO implemented watersheds, highlights that watershed development is a necessary condition but not sufficient for poverty alleviation in arid and semi-arid 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 of the complementary programmes that need to go along in order to make the watershed development an effective pro poor programme.

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

1. Proper implementation of the watershed development is a prerequisite for better benefit flows towards poverty reduction. Care should be taken that scaling up of the programme should not be at the cost of intensive and participatory approach, which is critical for sustainable watershed management.
2. Policy interventions that are complementary to watershed development are necessary to benefit the land poor and land less poor, men and women. These include dairying, promotion of horticultural crops, establishing of infrastructure and processing facilities for their development (physical capital), etc with a focus on development of human capital.
3. Build up the capacity of the government agencies, NGOs and Panchayati Raj institutions involved in watershed development and management in order to facilitate scaling up and speedy implementation of the programme in an effective manner.
4. Develop a package of poverty alleviation focused policies and programmes such as supporting self-help groups, thrift societies, etc.
5. Minimise 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 due to the fact that these regions account for more than half of the total cropped area but also due to the reason that the productivity levels of the irrigated and green revolution belts has saturated. As a result, returns to investment in agriculture are found to be substantially higher in the rain-fed regions when compared to 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 run) 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) conditions¹.

This case study is an attempt to understand the potential of watershed development in addressing the issues of poverty alleviation. The important issues in this regard include: a) assessing the linkages between watershed development and rural livelihoods and poverty, b) type and nature of benefit flows accruing to various sections of the community, and c) challenges in making the watershed programme pro-poor and sustaining it in the long run. The study stems from the authors' longstanding experience in the region² and some intensive field visits and discussions with various sections of society and also other stakeholders in the programme such as NGOs, administrators, policy makers, etc. The case study is located in one of the most drought prone districts of Andhra Pradesh i.e., 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 NGO³. This case study is organised 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 in section three. While the impact of the watershed development and other supportive programmes on poor is examined in section four, the last section makes some concluding remarks and recommendations.

II Description of the Case Study Area

Choice of study area

The Government of Andhra Pradesh (GoAP) implements the central government watershed related policies and programmes enthusiastically on a wide scale. The state administration has identified watershed development as a key to promote sustainable livelihoods for the poor. AP is the forerunner and exemplifies what can be achieved in poverty alleviation through better watershed and water management through state initiatives. Its approach is unique in the sense that programmes are implemented 'top-down' with a 'bottom-up' approach. The state has so far initiated about 7000 watersheds covering about 3 million hectares. 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, AP is a natural choice for understanding the links between poverty and watershed / water management initiatives.

¹ However, this is not to suggest that watershed development is a substitute for irrigation development.

² In fact, one of the authors Mr. Y. V. Malla Reddy has been involved in the development activities of the region for past 30 years.

³ The focused villages for the study include Kadiridevarapalle, Mallapuram, Marrimakulapalle and Guddella.

Anantapur has the lowest proportion of area under irrigation (17 per cent) in the State.

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

Physical and Socio-economic setting

While India is considered to be rich in terms of annual rainfall and total water resources, water is spatially and temporally unevenly distributed. AP 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 woes of this region characterised by high fragility and low carrying capacity. Moreover, of late rainfall has become more erratic with its distribution becoming unfavourable for crop calendars. Though average rainfall over the last hundred 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 per cent) in the State. Anantapur district accounts for 4.79 per cent of the state's population and 6.97 per cent of the geographical area. It has only 10 per cent of its area under forests as against 22 per cent at the state level. Anantapur district has higher percentage of small (26.3 per cent) and semi-medium (25.9 per cent) size farmers when compared to other Rayalaseema districts.

About 19 per cent of its population belong to Scheduled Castes and Tribes (SC/ST) (Who are they?), which is lower than the State's average (22 per cent). Its sex ratio (972/1000) 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 per cent) below the state average (61 per cent) as per 2001 census. The figures are much lower in the case of female literacy (43.9 per cent as against the state average of 51.2 per cent). Health of the population reflects its poverty. A UNDP pilot study in the neighbouring Kurnool district found half of a village's 473 people suffering from body ache, general weakness, anaemia and cough. Most of the illnesses

amongst the SC population stemmed from malnutrition and chronic anaemia. Diseases associated with poverty, e.g. tuberculosis, are on the rise. On most indicators the people of Anantapur are worse of than the average of AP.

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

According to the 1991 census, 48 per cent of the state's population is classified as 'non-workers' while 54 per cent of Anantapur's population is 'non-workers'. Anantapur has 17 per cent of its population as agricultural labourers when compared with over 20 per cent for the state as a whole. Incidence of poverty is the highest among the ST population (56.7 per cent) followed by SC (50.2 per cent), BC (45.5 per cent) and OC (33.3 per cent) (What do abbreviations stand for? Name of caste?). The situation of SC / ST and BC are much worse in the district than the general situation in the state. In fact, 35.6 per cent of the villages in Anantapur fall in the high deprivation category (income of less than Rs. 120.03 (equivalent in US \$?) per capita per month). In the 1991 GoAP survey on indebtedness, it was revealed that 45 per cent of the rural families are in debt as against the State average of 18 per cent. 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 255-650 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 five 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 ground water resources. Rainwater is traditionally harvested by diverting surface water flows into tanks, open wells and into the ground water 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 characterises agriculture and life in these areas. One farmer stated it clearly: "Agriculture is now like gambling". The main source of irrigation is ground water through open and bore wells. Though surface irrigation systems such as tanks used to be the main source of irrigation earlier, 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 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 ground water extraction has become privy (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 ground water replenishing mechanisms has led to depletion of ground water 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 ground water 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 ground water 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 ppm 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 ground water though they are aware of the externalities arising out of over-exploitation of ground water. Degradation of the resource 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.

III Watershed Development, Water, Livelihoods and Poverty

The preceding section clearly brings out the fragility of the resource base and the prevailing socio-economic conditions in the study region. This is a general phenomenon even in our study villages prior to the interventions of RDT through watershed development programmes. 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 in to the details of impact 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 programme.

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 micro watershed, which is a sub-set of a macro watershed. When a micro or macro watershed is treated land quality will improve due to

Box 1**Check Dams: beneficial or not?**

The impact of check dams is a debated part of watershed activities. Check dams are small, capital intensive structures, retaining the stream flows of a small catchment area. They help water storage for 3-6 months resulting in ground water 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 ground water recharge and revival of open wells.

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

In Kadiridevarapalle, a hundred year old open well that has dried up during the 80s was revived in the 90s when two check dams were made nearby. In the 50s the owner of the well, Mr. B. Venganna (80 years old) got the well widened and deepened and added another well. These 40 feet deep wells used to irrigate 2.67 hectares of land, growing paddy, millet and bajra. In 1983-84, 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 92 and 95, both open wells were revived with plenty of water. One more bore well also was installed. Despite the drought conditions of the last 5 years, the wells can supply water round the clock. These wells support 5.33 hectares growing paddy, papaya, sunflower, vegetables, millet, etc. The main constraint is power supply, which is available for 7-9 hours in a day.

checking of soil erosion caused by wind and water. Activities like contour bunding, pebble bunding, trenching, nala bunding, gully 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 ground water recharge due to the reduced run off. At the macro level when all the 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 in terms of ground water 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 ground water recharge (see Box 1).

Basically watershed development is expected to improve the conditions of the farmers and the poor through greater availability of water. While overall impact of watershed development on water resources at the macro level 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 characterised with low rainfall, water gains from watershed development range from improved *in situ* moisture content to moderate improvements in ground water availability (see Box 1).

Given the socio-economic context of the study region the key beneficiaries from the programme would be the landed households who are in the majority. Large farmers are generally better off, but in AP in general and the case study area in particular, their indebtedness is high. The main reasons are drought induced 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 another interest groups. Though AP is the only State in the country in which the 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 low incidence of landlessness. Inequalities are more prevalent in the case of access to water than to land.

Scheduled Castes and Scheduled Tribes are also key interest groups when it comes to poverty alleviation. 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 labour. In general women are involved in activities that are less remunerative or unpaid because it is work within the household for subsistence. Only about two percent 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, fuel wood, etc.), financial capital (cash flows, savings, etc.), social capital (institutional strengths, cooperative behaviour, etc.) and finally political capital (active political participation, policy influence). While livelihoods vary considerably, two general trends are clear. First of all most households invest in the future of their children by sending them to school. Secondly, 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 leading 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 labourers or by getting into non-agricultural income earning activities. Labourers cope with setbacks by temporarily migrating out of the area to places of work, in the worst cases selling themselves as bonded labourers. Even large farmers adjust 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 honourably, the process of pauperisation is a social and psychological trauma.

⁴The 1994-95 guidelines are updated in August 2001, though the basic principles of the former remain the same.

Generally, rural development activities are managed by the line departments and the District Rural Development Agencies (DRDAs).

Context of Watershed Implementation

Collective action institutions are a prerequisite for watershed implementation and management. This aspect is well recognised in the new watershed guidelines formulated in 1994-95 by the government of India. These guidelines prioritise participatory approaches to watershed management, and the Ministry of Rural Development has implemented these guidelines from 1995-96 onwards⁴. Watershed work in the districts is managed by specially appointed Project Directors who work as a part of the DPAPs, DDPs and DRDAs. Watershed Development Teams (WDTs) constituted by the project implementing agencies (PIAs) implement the work. Multi-Disciplinary Teams (MDTs) from project director's office supervise the field operations through. Members of MDTs, WDTs and PIAs are drawn from the relevant line departments and NGOs. Villages with watershed development programmes have a watershed association (WA) and watershed committee (WC). Representatives from the *Panchayati Raj* bodies are represented in the WC and where NGOs are involved they usually insist on representation from the existing informal groups as well. Where watershed development is done by GoAP agencies the WCs are usually rather inactive, while in the cases where NGOs have done awareness raising and group formation the WCs are more active. AP is in the forefront of implementing these guidelines with adequate flexibility for local level adaptations. In Anantapur this has resulted in a move away 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 GoAP is experimenting with a "watershed plus" approach. Among others this is done through the Andhra Pradesh Rural Livelihoods Programme (APRLP). 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 programmes 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: i) capacity building for primary and secondary stakeholders, ii) innovation to enhance the impact of watershed works, iii) lesson learning and policy influence, iv) convergence of top-down and bottom up activities, v) gender and equity, vi) watershed and watershed plus SRL initiatives, and vii) participatory technology development (GoAP, 1999). Implementation is done through NGOs, such as the Rural Development Trust (RDT) and line agencies in 6 districts.

The 73rd Constitutional Amendment Act (CAA) greatly strengthened the position and role of the *Panchayati Raj* Institutions (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 the PRIs. However, AP has been slow with devolving powers and functions to PRIs. Generally, rural development activities are managed by the line departments and the District Rural Development Agencies (DRDAs). PRIs with little training and orientation, no experience of managing watershed programmes and with allegations of widespread corruption are seen by many

Under the leadership of kings, temple committees or local lords, tanks were built and maintained.

government officials as unfit for playing a major watershed role at this stage. In AP Panchayats are therefore not normally involved in implementing watershed programmes.

Local initiatives

Community based rain water harvesting has traditionally been practised. Under the leadership of kings, temple committees or local lords, tanks were built and maintained. Furthermore common pool resources, including rivers, streams, forest 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. Land owners 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 programme of the Central and State Governments from time to time. During the 80s land conservation activities have culminated into an integrated watershed development programme.

Rural Development Trust (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 the formation of Watershed Committees and for the 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 dry land agriculture. RDT works closely with the government at district and state levels. At present, RDT is working in 50 micro watersheds with the objective of integrated watershed development. In addition to these 50 watersheds, the government funds 22 under new guidelines. Salient features of RDT model include:

1. Emphasis is laid on selecting potential villages (for collective action).
2. RDT watersheds cover the entire village rather than being restricted to 500 hectares. This ensures widespread benefits and participation.
3. Two members from each household (at least from 90 per cent of the total households) should become members of the watershed association by paying a membership fee of Rs. 11 each.
4. Cooperation from the *Gram Panchayat* president and other members is mandatory.
5. Firmness on user contribution in order to ensure demand driven approach. In some instances the user contribution is as high as 30 per cent.
6. The organisational structure of watershed management is somewhat different from that of the guidelines. There is no watershed secretary, who is usually a paid employee.

7. The watershed committee is supported by a watershed advisory committee consisting of village elders (influential people).
8. RDT has broad based barefoot (expression?) technical and non-technical specialists on a (more or less) permanent basis.

RDT emphasises a gender perspective. A separate women staff (watershed women organiser) is employed for every 10-12 watershed villages. The organiser 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 alleviation. It follows: i) land based watershed development targeting the whole village population and the natural resource base, private as well as common and ii) poor-based socio-economic development targeting only the poorest in the village i.e. the dalits and tribals (See 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 alleviation, thereby strengthening the equity and sustainability aspects.

Watershed Development	Poverty Alleviation
Target Group: Entire population & Natural system	Target Group: Dalits and Tribals (poorest)
<ol style="list-style-type: none"> 1. Soil and Moisture conservation 2. Restoration of traditional water bodies and construction of small <i>in situ</i> rainwater harvesting structures. 3. Development of vegetation and biomass. 4. Water saving technologies. 5. Rain fed agriculture practices and technologies. 6. Rain fed horticulture 7. Dairy and livestock development 8. Bio-gas plants 9. Development of human capital, institutions and infrastructure 	<ol style="list-style-type: none"> 1. Organising the poorest communities. 2. Universal education with special focus on girls. 3. Women's development. 4. Special programmes to develop marginal lands owned by the poor. 5. Credit support for off-farm / non-farm income generation activities for women. 6. Health programmes, integrating promotional, preventive and curative aspects of health. 7. Housing. 8. Drinking water and sanitation. 9. Awareness building, institutional and leadership development of the poor.

Table 1: RDTs Approach to Watershed Development and Poverty Alleviation

IV Impacts

Even within the watershed development programmes poor farmers and the dalits and tribals are positively discriminated in terms of cost sharing / peoples contribution. For instance, in soil and moisture conservation programmes the dalit and tribal farmers as well as small and marginal farmers share only 5 to 10 per cent of the cost while the other farmers share between 15 to 30 per cent 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 programme, which creates some equity.

The impacts of watershed development can be termed as short run and long run or / and direct and indirect impacts. Being a land based programme watershed development mainly helped the landed households. All the soil conservation activities are beneficial to landed households in the medium to long run. However, 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 labourers. As there are no middlemen the labour earnings result in daily wages 2-5 times the normal rate. Because of the volume

of work labour households, as well as small and marginal farms households with extra labour 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 labour have been substantial during the implementation stage. In a recent study of RDT it was established that many of the labourers, who have worked continuously for 5-7 years in the watershed programme 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 among the labourers, as they had earned and made assets like gold for themselves or for their daughters, bought household articles and kitchen equipment symbolising improved social status of the family and 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

Box 2**Shift to Horticulture**

In 96-97, a year after the RDT started a watershed programme in Mallapuram village, Mr Timmappa started horticulture cultivation on RDT's advice. He planted mango saplings on five acres of his land on which he earlier cultivate groundnuts. RDT paid the cost of digging pits, fertilizers and saplings. While the 200 saplings grew Mr Timmappa grew groundnuts as an intercrop. To supply the necessary water to the mango trees, Mr Timmappa has dug a hand bore, spending Rs. 10000. The guaranteed water supply has enhanced the plant survival and growth rate.

During the summer 2001 the first mangos were harvested. Mr Timmappa did not sell all the mangos in the market, but distributed some of the fruits among relatives and retaining some for his own consumption. What he did sell gave him a net income of Rs. 5000/-. Marketing is no problem as contractors come and buy the mangos 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 to 6 hectares at the beginning of the watershed establishment. With water supply guaranteed, and with some initial external support there is huge potential for the horticulture in the area. Now that horticulture is being taken up in 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.

Farm Size (acres)	No. of Households having open wells	No. of Households having bore wells
00 – 03	00	00
3.01 – 5.00	01	04
5.01 – 10.00	02	03
Above 10.00	22	28

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

the families migrated even on a seasonal basis due to an increased area under irrigation and diversified cropping pattern consequent to assured ground water availability. However, the impact of higher wages is normally 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 per cent (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, 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 the watershed activities for watershed activities have improved and stabilised the groundwater yields. However, access to groundwater is limited to large and medium farmers in most of the cases (Table 2). Often marginal farmers do not have access to groundwater. Therefore, while in the short run agriculture labour (landed as well as land less) 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. Removing of pebbles and rocks from the 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 a number of benefits such as storage of water for fisheries and/or irrigation, infiltration of water into the ground and therefore recharging of open wells and boreholes (see Box 1). It is observed that on average each check dam supports three wells in Kadiridevarapalle.

Making the Watershed Benefits Pro-poor

The GoAP's stress on poverty eradication calls for an all-out effort to ensure a more equitable distribution of watershed development benefits. At present the major benefits of watershed development go to the richer households as 70 per cent of the expenditure goes to interventions that benefit them. At the same time only 7.5 per cent of the input is used to support the livelihoods of poor and landless families (GoI, 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 the pro-poor initiatives of RDT in particular.

Most of the infrastructure built and/or repaired under the watershed development interventions is done on private land. These benefits mainly accrue to landed. There is a clear bias against the land less and landed poor as far as receiving sustained benefits are concerned. One way of addressing their needs is strengthening the common pool resources. There is however concern over the maintenance of common property resources as in many places there is no effective institutional arrangements to maintain them. At the heart of this is lack of

Most of the infrastructure built and/or repaired under the watershed development interventions is done on private land.

Box 3**Getting Watershed Benefits to the Poor**

A major way to target long term watershed benefits to land less 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 1000 palm trees under the 30 ha of temple lands (CPR). Before the watershed committee was started, everyone had access to these palm trees. Even neighbouring 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 are employed by the VDC at Rs 600 per month to protect the trees year round. Yearly the households depending on the palm trees pay some money to the VDC to get use rights. The amount is decided on a consensus basis, rather than on an actual cost basis. This arrangement has ensured that the village poor have better access to the resource and led to a more productive use of their time.

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

participation, which, though at the core of the programme, remains largely unrealised. Further, the people have not been effectively motivated or organised and involved in preparing action plans. The 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 CPR management is clearly demonstrated in the RDT villages (see Box 3).

Unlike the general approach RDT begins its intervention in villages with a poverty alleviation 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 programme begins. The idea is that Dalits and tribals need longer-term intervention with poverty focus due to their socio-economic backwardness. Such an approach seems to be more effective (Box 4).

Box 4**Box 4: Impact on Dalits and Tribals in Watershed Villages**

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

Box 5**Dairy Development and the Poor.**

Dairy development along with a horticulture development programme is expected to enhance the benefit flows from watershed development to the poor. Both of these activities are dependent on water and other common pool resources like grazing lands. While these two programmes 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 towards the poor.

Dairy development is actively pursued in some of the villages. Nationalised banks provide loans of up to 90 percent of the cost. The total loan amount ranges between Rs. 20,000 to Rs. 28,000. (US\$ equivalent?) Some of the conditions for getting the loan include: a) a deposit of Rs. 2000 per animal as guarantee, b) ownership of land, irrigated is preferred and c) a guarantor. The borrower is expected to repay the loan with 50 percent of the earnings from milk on a monthly basis.

These conditions exclude the poor from participating in the programme. The suitability of the feed intensive murra buffaloes to 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 poor. Even the landless households can maintain local varieties, as their fodder requirement is much lower. Efforts are being made by the RDT to convince the banks to finance local varieties and improve the local breeds through cross insemination.

There is a need to inculcate the idea of dairy as an economic activity. This could be done through strengthening the infrastructure like collecting centres, 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* programme 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 the dairy related problems.

RDTs AI programme is at almost no cost though it takes about 2-3 years for improved animals to start giving income to the farmers. The AI programme 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 high disease resistant.

Another important activity, which has potential for improving rural livelihoods, is dairy activity (Box 5). Dairy activity is closely linked with the improvement of 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 the local constraints. At present the programme is not favourable to the poor households. Dairy could be an effective pro-poor programme under the watershed development if the policy support is tuned to the needs of the poor.

One more activity under the watershed programme, which has greater potential for poverty alleviation, 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 (10-15 members) groups 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 amongst the group members who use it for investment or consumption, paying a pre decided interest rate (usually 24 per cent per year). Once these self-help groups are established a revolving funding of RS 50,000 per watershed is available to support them through matching grants. The watershed in Mallapuram, under RDT implementation, demonstrates the potential of such programmes in poverty alleviation (Box 6).

Box 6**Self Help Groups and the Poor.**

Under the watershed programme in Mallapuram there are 8 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 5-10. Most of the groups are very active and have generated substantial savings. They not only lend for their own vocational activities, but also lend towards new activities such as petty business, etc. One of the women groups has about Rs. 150,000 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 concentrated on individual based lending rather than community based activities. While collective activities can be very profitable, most of the times 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.

Institutional Integration

It is clear from our discussion that institutional innovation and sustenance is the key for the success of the watershed development as well as making it a pro-poor activity. Participatory watershed development emphasises evolution of institutions and strengthening the existing ones. While a number of institutional arrangements such as watershed association, user groups, self-help groups, etc are evolved in order to utilise the benefits of the programme, their sustenance in the long run is questionable. For, these institutional arrangements are imposed from the outside rather than being 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

Box 7**Socially Embedded Institutions and the Poor**

While the formal watershed committee was established only during 1998, Marrimakulapalle had 20 years of experience in maintaining traditional institutions. About 20 years back the village elders, with the help of RDT, initiated three institutions, the *Anjaneya Swamy Committee (ASC)*, *Peerla Swamy Committee (PSC)* and *Vidya Committee (VC)*. All the committees have proportional representation from all the caste groups in the village. The ASC has eleven members and looks after the law and order issues in the village. The PSC also has eleven 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 and rents them out to teachers. 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 cent per annum interest rate. The PSC has accumulated savings to the tune of Rs. 300,000. The VC has 30 members representing all the caste groups and collects funds from the members on a voluntary basis. Donated money is used for extension of the school building, employing assistant teachers, etc. Since the construction of quarters most of the teachers stay in the village. The needs of the landless are taken care off in a unique fashion. The village council has acquired 10 hectares 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 yearly, rotational basis. Usually a group of 4-5 households take the land for cultivation purposes. In this manner, the equity issues are resolved to some extent as far as land is concerned. However, inequity in water distribution is yet to be resolved. Some of the economic and equity principles of these informal institutions could be useful for strengthening the formal institutions.

Watershed development in itself is not sufficient to achieve the broader objective of poverty alleviation or eradication.

is rather limited. On the other hand, the impact of formal institutions could be widespread and effective at the macro level. 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 in order to sustain in the long run. Often, the success of socially embedded institutions is critically linked with their financial sustainability and socio-economic equity in the distribution of costs and benefits. There is a need for integrating market principles with the institutional approaches. Marrimakulapalle is an example of such institutional sustainability and provides some useful insights for institutional strengthening and sustenance (Box 7).

V 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 the fragile environments. But watershed development in itself is not sufficient to achieve the broader objective of poverty alleviation or eradication. Being a land based technology it is more beneficial in the mid and long terms to the households with access to land and water. In the short term, it is highly beneficial to labourers. A well-implemented watershed development programme enhances sustainable agricultural employment opportunities in the long term and thus provides indirect benefit to the labour 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 per cent 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 of the weaknesses of watershed development in its present form and indicate the complementary policies to make it pro-poor.

In general, watershed development programme in AP is considered successful when compared to other states, especially in terms of spread and magnitude. The main reasons for this relative success include: i) a wide public debate on droughts and political determination to do something about it; ii) relatively good governance and efficient administration translating political intentions into action; iii) a state-level political process that creates an environment for innovation and reform; iv) active support of donors, because of the flexible and effective government approach; v) NGOs interested in watershed development and working together with the government; and vi) the realisation 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 programme. The weaknesses of the programme are identified in the context of the comparative situation between the best-implemented watersheds (our case study watersheds) and the general picture in the region or the state. Detailed studies (see Reddy, et.al; 2001) on the AP watershed development programme have identified the following operational weaknesses: a) strict adherence to a maximum watershed size of 500 ha, irrespective of the

reality on the ground; b) number of watersheds that one PIA can cover is too rigidly defined as between 10-12, where some PIAs can do much more, while for others even 10 is too much; and c) there is a need for training and exposure visits by new watershed committees to successful watersheds so that they get a good idea what they are getting into. At a design and policy level five main weaknesses have been identified, namely 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 alleviation oriented policies and the need to de-link land and water rights.

Improved implementation, particularly of the participatory aspects, is needed if the interventions and their impact are to be sustainable. Around 85 per cent of watersheds are implemented through the government line agencies. These are normally not well geared towards 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 of the programme. Scaling up gets further complicated when poverty alleviation and SL (what does abbreviation stand for?) 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 designing, which is tuned to the demands of the community and enhance the capacity of the implementing agencies.

A two-pronged approach is needed for scaling up. Firstly, the capacity of smaller NGOs should be strengthened so that NGOs can implement a large proportion of the watersheds. In order to facilitate the process of selecting good PIAs (NGO) and strengthening the smaller NGOs, DRDA 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. Secondly, involving the *panchayati raj* institutions in the whole process needs to be looked into afresh (see Bandhyopadhyay, Yugandhar and Mukherjee, 2002). They could play an important role as PIAs as well as playing a catalytic role to the NGO PIAs. This institution needs to be given a fair trial before discarding it.

Equity in the distribution of economic gains among the community members is as important as the equity in coverage. While the former is concerned with the equity in access the later 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 the participants. Inequity in the former case is purely technical while the later is structural and institutional. For, no technology has an in-built bias towards 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 the cases, inequalities could be minimised through institutional arrangements. In other words, technical inequalities can be corrected though compensating the participants of the disadvantaged locations. And distributional bias needs correcting of distortions in land, labour, water and credit markets. Failure to recognise the 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* (Maharashtra) and in South Africa, show that it is possible (Reddy, 2002).

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

In order to have more poverty focused approach, watershed development should be complemented and supported by policies and programmes that directly benefit the poorer sections of rural society. Our case study identifies some of the potential areas such as strengthening the common property resources, 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 (correct name?). Such interventions, in the form of “watershed plus” are being promoted under the APRLP. In order to make these activities economically viable and sustainable policy support is needed in the form of infrastructure such as markets, transport, processing units, etc.

Access to water by the poor can only be guaranteed if the present link between water and landownership is removed.

Recommendations

The following recommendations can be drawn from the case study:

1. Continue and expand the process of experimenting with watershed development at grassroots level and ensure that lessons learned (weaknesses) are taken onboard in policy design.
2. Develop and test interventions that particularly benefit poor men and women, both through watershed development as such and complementary development activities.
3. Build up the capacity of the government agencies, NGOs and Panchayati Raj institutions involved in watershed development and management.
4. Develop a package of poverty alleviation focused policies, including the watershed policy that is mutually complementary and reinforcing.
5. Minimise inequities through more egalitarian institutional arrangements and legislation.

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8

CASE STUDY

Micro-Irrigation for Income Generation in Asia

a case study prepared by **International Development Enterprises** for the **Asia-Pacific Regional Consultation Workshop on Water and Poverty**, September 2002

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 alleviation” 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. Micro-irrigation 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 IDE’s 20-year experience with micro-irrigation for smallholder income generation in Asia. Micro-irrigation technologies (treadle pumps and low-cost drip irrigation in particular) have had a widespread impact on rural poverty, helping some two million smallholder families to increase their net income by an average of US\$100 per year for an initial investment of about \$30. The distribution of micro-irrigation technologies through the private sector at affordable, sustainable, and

The majority of the rural poor are subsistence farmers with limited access to productive assets, credit sources, and markets.

unsubsidized prices has proven to be an effective and efficient means of achieving widespread impact with minimal donor resources. The income-generating potential of micro-irrigation 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. Micro-irrigation holds great potential as a means to effectively target development resources toward 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 one dollar per day, 75 percent, or 900 million, live and work in rural areas. Fully two-thirds of these rural poor live in Asia, with a heavy concentration (43 percent) located 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 illness, 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 in which International Development Enterprises has worked for the last 20 years with the sole focus of poverty alleviation through the application of market principles to benefit the poor. IDE is a non-profit organization incorporated in Switzerland, the USA, Canada, India, and the U.K. Together, the IDE family of organizations supports field programs in seven countries: Bangladesh, Cambodia, China, India, Nepal, Vietnam, and Zambia.

This case study describes IDE's experience with micro-irrigation for smallholders in Asia and its potential for generating income for the rural poor. For the purposes of this discussion, micro-irrigation 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."

Micro-Irrigation Technology

IDE has taken a leadership 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 of time, delivering sufficient water for irrigation of rice and vegetable crops. The basic treadle pump costs less than US\$30 in Bangladesh (including the cost of the tubewell), making it accessible to even very poor smallholders. In total, approximately two 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*
Bangladesh	1986	1,500,000
Nepal	1987	40,000
India	1990	440,000
Cambodia	1994	20,000
Total		2,000,000

*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.

The systems are expandable so that farmers can start small and scale-up as their financial capacity and technical skills increase.

Drip irrigation

Drip irrigation delivers water from a storage vessel directly to the plants through a system of plastic tubes with minimal water loss. Crops irrigated by drip show water savings of up to 50 percent and yield increases of 30 to 50 percent. Drip irrigation is often associated with the capital-intensive, commercial farms of more wealthy farmers. The 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 a variety of low-cost drip irrigation kits that are appropriate for small land holdings and affordable for smallholders. The smallest kit consists of a 20-litre bucket with enough tubing to irrigate a 25 m² plot and costs about US\$5. The next size consists of a 200-litre drum with tubing to irrigate 125 m² and costs about US\$25. Larger kits can irrigate areas up to 1000 m². 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 India, Nepal, Vietnam, and Bangladesh.

Relating Micro-Irrigation to the Key Action Areas of the Water and Poverty Initiative

The economic and social benefits derived from micro-irrigation at the household level relate directly to a number of the 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 US\$100 per year. Approximately two million micro-irrigation systems have been installed in South and Southeast Asia raising the productivity of more than a quarter million hectare of farmland and injecting more than \$200 million per year into rural economies.

The economic benefits resulting from the micro-irrigation technologies are biased toward the poor because the 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, the micro-irrigation 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, micro-irrigation 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 the production, distribution, and installation of the micro-irrigation equipment, creating employment in the rural non-farm sector.

Improved access to water

Micro-irrigation 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 more 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. Micro-irrigation 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.

¹ The social and economic benefits of IDE micro-irrigation systems have been documented in numerous regional and country-level impact evaluations by independent investigators. One such report, which is available on the internet, is *Pedaling out of Poverty: Social impact of a manual irrigation technology in South Asia* by Tushaar Shah, et al. (IWMI, 2000) at www.cgiar.org/iwmi/pubs/Pub045/Report45.pdf

The use of market channels has been a key factor in achieving widespread distribution of micro-irrigation 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 micro-irrigation has been further enhanced by its income-generating characteristics. The cost of a micro-irrigation 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 micro-irrigation technologies are linked with micro-credit 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.

Micro-irrigation 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 away 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 two months.

Lessons Learned

The critical role of water in poverty reduction

Scarce water resources and/or a lack of control over water resources are pervasive constraints facing a large majority of smallholders. Water, being essential for both agriculture and human health, is a critical factor in the 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 alleviate poverty stems from the fact that rural poverty has not been confronted head-on. The President of the International Fund for Agriculture and 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 percent 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 percent 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 (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 in that 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 the 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,

² Fawzy H. Al-Sultan in *Rural Poverty Report 2001 – The Challenge of Ending Rural Poverty*, 2001, International Fund for Agriculture and Development (IFAD), Rome.

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

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 are. 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 results in a comparative advantage for smallholders in the production of horticultural crops.⁴

This comparative advantage of smallholders can be further enhanced through the provision of 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 US\$0.70 per square meter, and—under favorable market conditions—may go significantly beyond this value.⁵

To meet the specific needs of the poor, technologies must be engineered from a poor person's point of view.

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 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 the 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 seven years and a less expensive pump that would last two 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.

⁴To 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 the production of horticultural crops than they are in the production of 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.

⁵Mushroom production techniques promoted by IDE in Cambodia have enabled some farmers to earn net incomes as high as US\$400 per year on only 50 m² of land (an annual return of US\$8 per square meter).

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.

Micro-irrigation 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 post-harvest processing and delivery to consumers. Thus, smallholders should see technology such as micro-irrigation 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, both as consumers of goods and services and as producers of saleable crops. In the 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 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 a number of 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 and quantity of their production is inconsistent.

To create smallholder-friendly market conditions, some form of external intervention, facilitation, and investment is required in order 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 micro-irrigation 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 to create markets for affordable micro-irrigation 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-

The priorities of the poor are often different from more wealthy consumers. The poor value affordability more highly than durability.

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.

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 micro-irrigation is very large, with widespread applicability to the creation of production systems that are extremely efficient, both in terms of water usage and 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 micro-irrigation 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 Smallholder Irrigation Market Initiative (SIMI). SIMI aims to coordinate the efforts of the international development community to tap the productive potential of micro-irrigation and market integration for rural poverty alleviation. Affordable micro-irrigation 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 livelihoods for smallholders. The SIMI market intervention strategy follows a series of six logical steps:

1. *Marketshed definition.* A ‘marketshed’ is defined as the geographical area and associated population that has real or potential trade relationships with a particular market center. A single marketshed 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. Marketsheds 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, 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.
2. *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 the 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-

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).

use arrangements, power relations (including gender issues), and potential water-use conflicts.

3. *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.
4. *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.
5. *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 marketshed. 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 five to six 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 to \$1000 per year from cash crop 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.
6. *Implementation and evaluation.* The details of this step are very much dependent on the results of the program formulation in the preceding steps. It is clear, however, that market intervention of the kind proposed here requires the 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, NGO, research, donor, 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 approach 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 the resulting market systems conform to actual needs and field realities. A flexible approach is therefore required so that the

implementation of SIMI and the resulting market systems can be tailored to conditions in each marketshed.

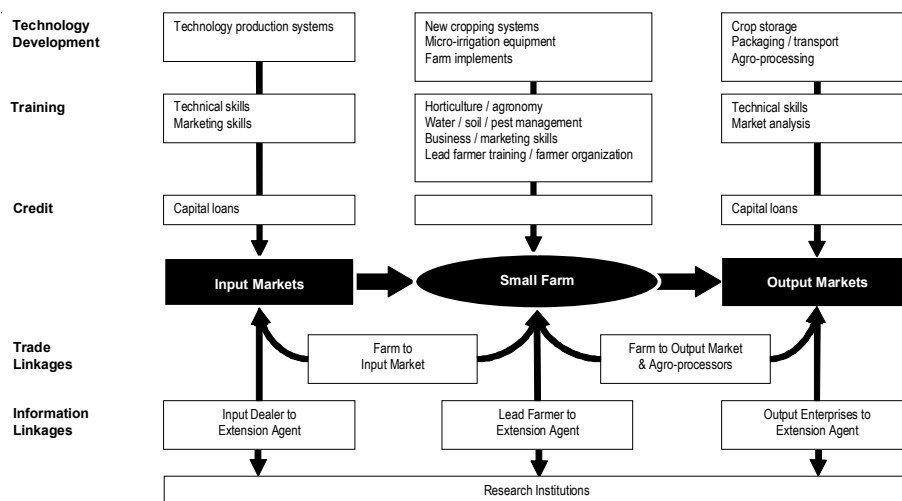
To facilitate the learning process, IDE has proposed that the SIMI market intervention strategy be piloted in the context of several regions that are generally comparable in terms of hydrology, agro-ecology, market access, and socio-cultural characteristics.⁸ Pilot projects in these regions will be accompanied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

Micro-irrigation 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 two decades has demonstrated how this can be achieved on a relatively small scale (two million smallholders). The concepts embodied in the SIMI approach provide a way forward, employing a demand-driven, action-oriented approach to alleviate poverty on a very large scale through the integration of smallholders into expanding markets, with micro-irrigation as an entry point.

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



⁸ A number of 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 (Nepal, north India, Myanmar, Laos, Thailand, and Vietnam); south-central China (Guizhou, Sichuan, and Yunnan); and the Greater Mekong Sub-Region (Vietnam, Cambodia, Laos, and Thailand).

9

CASE STUDY

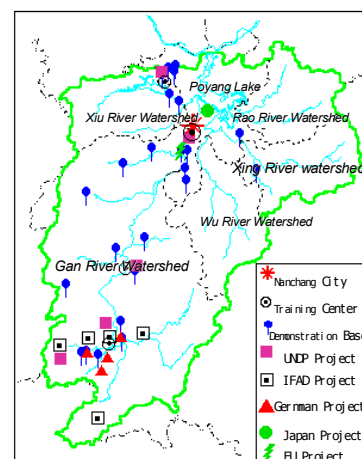
Mountain-River-Lake Integrated Water Resources Development Program, Jiangxi, China

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(First draft of case study paper for Water and Poverty Initiative, Kyoto March 2003)

1 Introduction and Background

During the 1960s and 1970s, Jiangxi province, Eastern China, 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 1980's the provincial government, with the help of the central government, initiated an integrated eco-restoration and poverty alleviation program. This program was based on the understanding that the '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 alleviation was a focus of the program, which is an example of an Integrated Water Resource 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 China. The total area is 166,900 km² 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. The lake receives its water from the watersheds of Gan River, Fu River, Xin River, Rao River and Xiu River. These watersheds cover about 162,225 km², occupying 97.2% of the total land area of Jiangxi Province.

In the early 1980's the Jiangxi province authorities identified the following main regional development problems;

1. *Serious Water and Soil Erosion*

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

2. *Frequent Droughts and Flooding Disasters*

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

3. *Soil Deterioration Accelerating*

Organic substance had declined and desertification started.

4. *Biological Resources Declining*

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

5. *Serious Pollution*

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

6. *Endemic Diseases Increasing*

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

7. *Large Amount of Poor People*

In 1985 about 6.2 million people lived under 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:

1. 1983-1987“Integrated Scientific Survey in the Poyang Lake Region Survey Area”40,000 km² in 25 counties;
2. 1984-1986“Agricultural Nature Resources Survey in South Jiangxi Mountain Areas Survey Area”39,083 km² in 18 counties
3. 1985-1987 “Integrated Scientific Survey of Nature Resources in the Watershed of Gan River” Survey Area” 117,000 km² in 64 counties.

Through the surveys, the historical trends and present situations, and the issues in the region were identified, including natural resources and their utilization. The analysis showed that the main issues in the Jiangxi province were that watersheds are not independent, but inter-related and inter-dependant. This understanding is reflected in main concept underpinning the program: “Mountain is the source - River is the flow - Lake is the reservoir” (MRL) and “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 the balancing the needs of the economy and the environment of the region requires coordination, planning, systematical development and integrated management.

2. The set-up of the Mountain-River-Lake program

In 1985, 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. An MRL Development Office was established as the executive body with branches at prefecture and county level. Planning in the project 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 provincial People’s Congress emphasized that the program was a long-term development project in the province, and required that all related parties will be involved in the implementation. The provincial governor took the leadership of the MRL

Development Committee. However, since the approval of the program the provincial People's Congress has not yet 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 early 80's to the end of 90's, scientific survey and issues identification. At this stage the comprehensive plan for development was formulated through the inter-disciplinary and multidisciplinary scientific surveys. The research identified the principal issues in the area.
- From beginning of 90's to middle of 90's, pilot case studies to explore the development models in different geographical areas, and disseminate the success stories to a wider area through governmental encouragement and incentives.
- Since 1996 to the present, new participatory mechanisms and "bottom-up" methods are being introduced for the catchment development, with the help of a GTZ-funded project.

The institutional development is the key factor in MRL. Through the various development stages, the 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 the inter-disciplinary and multi-disciplinary survey and researches. The Office involved many institutes and organization from central, provincial and local levels and is headed by a chief engineer.

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 only dealing 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 to organize and coordinate development and management activities in the area. The committee members came from the related governmental agencies, and included some related prefecture leaders. At the prefecture levels, subordinate bodies were set up. All these agencies were guided by the scientific and technological commissions at the 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 MRL Development Committee. Its task is 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 took the leadership of the MRL Development Committee. Recently, after the restructuring of the governmental organizations, the vice-governor rather than the governor, has taken the leadership.. As a result the coordination function of the committee was somewhat weakened.

In 1997, the Office introduced a major change in the process by introducing participatory methods. In this new approach local farmers are considered 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 the development of self-managed farmer's organization 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. Furthermore the Office provides access to technology, financial sources, and information. The Office has become an agency that bridges the gap between the farmers and various sources of technology and inputs. The MRL Promotion Association is responsible to promote the development of the projects by providing technical services, building the experts database etc.

3. Approach to Mountain-River-Lake development

The developmental goals of the MRL Program are as follows:

- To achieve integrated development of the MRL region through comprehensive planning and implementation.
- To gradually establish an economic complementary mechanism for the resources renewal in order 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 hi-technology and training, covering the whole MRL region.
- To manage and control water and soil erosion, and environmental pollution in a holistic way.
- To establish MRL eco-economic zones to offer 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 alleviated.
- Watershed development must be done systematically and water and land management must be done in a comprehensive way, taking both ecology and economy into account.
- Planning must be based on comprehensive scientific surveys on the resources, the environment and society of MRL Region.
- Sustainable development of the MRL region requires a 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.

A total of 27 pilot experiments were developed, of which one-third were successful.

One of the key elements of the MRL approach is the dissemination of successful experiments. Case studies were written up about the following 9 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 alleviate 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 of the pilot experiments involved multi-disciplinary 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. The 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 1400 training workshops have been conducted, 120,000 persons trained and about 180 new technologies and methods introduced.

At the same time, the Ministry of Science and Technology made arrangements with the banks to develop a more than 200 million CNY (c. US \$ 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 terms of the technology and financial operation. If a loan project was successful in these areas, the MRL Program would pay the interest to the organization (7-

8 %). Loan projects that failed to successfully utilize 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 governmental agencies. This process was another form of subsidy. There are some cases where trained or skilled farmers voluntarily developed their area through the application of new technologies.

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 the 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. To help poorer farmers get access to capital for development through credits 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 UNDP and the Bank applies the following selection criteria for households that want to take a loan from the Bank:

- The total household property value is less than 20,000 CNY (app. US \$ 2500);
- The annual per capital income is less than 1,500 CNY (app. US \$ 188);
- The farmers have working ability;
- Preference for giving loans is given to women (they are considered to be relatively stable and are usually not wasting money on cigarettes and alcohol).

The implementation of the small-scale credit scheme is through the poverty alleviation 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 two weeks for loaning, repaying and training. The loans do not require collateral and are normally between 500-2000 CNY (app. US \$ 65-188). Loans are given for one year with an interest rate of 6%.

The process of the five group members to get the loan is 2:2:1. After getting the loan, from the third week, the farmers start repaying and the loan will be paid off in 25 installments. The group also sets up a special fund. A total of 5% of each loan is deposited in this fund by collecting 0.2% of the loan at the time of the two-weekly installment. The fund is owned by the group members and without interest if use. After total repayment of all loans, the fund is returned to the farmers.

Until November 2001, 12 central groups with 83 (sub-) groups and 439 farmers of which 430 were female, had been funded. The total amount of loans was 1.06 million CNY (app. US \$ 815,000) and the repayment rate is 95%.

This model addressed the issues of the lack of access of the poor farmers to poverty alleviation capital, and the low repayment rate of the loan and low efficiency of capital use. It is very helpful in increasing the capacity for the poor to grow out of poverty. However, it should be realized that the actual interest

the MRL Program has established cooperation and exchange relationships with more than 20 international organizations and foreign countries.

on the loans is about 9%. Poor farmers consequently get access to capital through a rather complicated procedure and 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 of the flooding, 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, the 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 executed 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” (Phase I, II), 1996-2003 assisted by German Government, 12 million DM;
- “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 assisted by WWF, 500,000 CNY (phase I);
- “Participatory Rural Development and Poverty Alleviation”, 2002-2005, assisted by UNDP, \$1 million;
- “Sino-Bengal Cooperation: Experiment of the GB Micro-finance to the Poor”, 2002-2005 assisted by UNDP, 65,000 US \$.

The Forestry Department of Jiangxi Province executed the “Protection Forestry Construction of the Yangze River” 1998-2002. Assisted by German Government. 12 million DM.

The Agricultural Department of Jiangxi province executed the following programs with international cooperation:

- “Integrated Development of Agriculture of Ganzhou City of Jiangxi Province”, 1996-2000. Assisted by FAO. 24 million US\$ (loan);
- “Red Soil Development Project” (Phase I), 1986-1991. Assisted by World Bank, \$37 million;
- “Red Soil Development Project” (Phase II), 1987-1989 assisted by World Bank, \$40 million;
- “Aquatic Product Development in the Low Wasteland of the Poyang Lake Region of Jiangxi Province”, assisted by UNDP, 26.4 million CNY.

Finally the Planning Commission of Jiangxi Province executed the “Jihu Agricultural Development Project”, 1989-1997 assisted by World Bank, \$63.4 million while the EU assisted the Sciences and Technology of Nanchang City in

4. Achievements of the Mountain- River-Lake program

the execution of the “Integrated Development of Desertified Land of Jiangxi Province” 1993-1998, with \$5 million.

The MRL Program has established relationships for cooperation and exchange with many international organizations such as UNDP, FAO, World Bank, EU and countries like Germany, UK, USA, Canada, Australia, Japan, New Zealand, Israel, India, Thailand, the Philippines, Vietnam, and Bangladesh.

Under the leadership of the provincial government and with the help of the central government and international assistance, the MRL Program has achieved much success promoting the integration of environmental protection, economical development and poverty alleviation 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
- Eco-agriculture to control schistosomiasis and alleviate poverty in the Poyang Lake area.

The main impacts are:

- The forest coverage rate has increased from 31% to 56.8%. The number of Forest Park at the state or provincial level has increased to 50.
- The area of Poyang Lake has been enlarged from 3,500 km² to 5,100 km². The water quality of Poyang Lake has reached the State standard of drinking water grade II.
- Four million poor farmers have become better off by means of technical (technological?) innovation, extension and access to micro-credit. GNP per capital of Jiangxi province has increased from 597 CNY (c. US \$ 78) in 1985 to 4,484 CNY (US \$ 580) 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 China’s Agenda 21. In 2000, 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 China 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 MRL Program. Emphasis will be given to the development of eco-agriculture-based modern agriculture, organic food-based food processing industry and ecotourism..

5. Policy Implications

The success of MRL Programme 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 to alleviate poverty.
- The concept of MRL should be replicated as it is sound, integrated management of water resources, land, and forest while applying ecological methods for sustainable development.
- The set-up of the MRL Program can be replicated as it provides an effective and open platform for all the 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 turned out to be a major reason for the success of the MRL Program.

Acknowledgement:

The authors would like to thank the great helps to Mr. Xingzhao Dai, Mme Qiong Zhou, Mme Meiyong Liu from the Office of MRL Development Committee, for providing the materials during the field investigation, and Mme Hilary Sunman from HR Wallingford for formulating the case study for Toolbox, Global Water Partnership.

10

CASE STUDY

Allocating Water for Home- based Productive Activities in Bushbuckridge, South Africa

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1 Introduction and Background

This case study gives an overview of the findings of two surveys¹ 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-funded (what does abbreviation stand for?) Water, Households and Rural Livelihoods (WHIRL) project. This paper has been 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 the existing dynamic changes to water laws, policies and institutional responsibilities. This is discussed more fully below. 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 recognised in the water use category known as Schedule 1, for which no licence is required, but the productive activities that take place in the household have yet to be recognised in planning and allocation processes. 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 re-assessment 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 recognise these essential needs and can consequently jeopardise the livelihoods of the poor. There are two key implications of this, points developed further throughout this paper:

- 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 litres per person per day) will not be sufficient for many poor people.

⁴ With contributions from Julian Solomon, Derick du Toit, Kopotsko Mokgope and Patrick Moriarty

⁵ J.C. Perez de Mendiguren & M. Mabalane (2001) Economics of productive uses for domestic water in rural areas AWARD Research Report, Acornhoek and K. Mokgope & J. Butterworth (2002) Rural water supply and productive uses: a rapid survey in the Sand River Catchment WHIRL Project Working Paper 4, NRI Chatham UK.

2 The Policy and Institutional Context

This is a very real issue for organisations such as AWARD, who are working at the grassroots level to assist communities to develop and manage 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 at, in particular, the operational levels in DWAF (What does abbreviation stand for?) and local government. If these do not recognise the key role that domestic water plays in many livelihood activities of poor rural households then poverty reduction opportunities will be missed.

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 recognised 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 into institutional mechanisms to implement them. There are many uncertainties and tensions in this process. The livelihoods of many rural people will be seriously affected if the on-going process of change does not recognise the need to ensure that water is allocated to the 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 gives substance to 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 delegated 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 committees (which are part of the community development forum) established. These are linked to elected representatives at each level (see Box 1).

Box 1

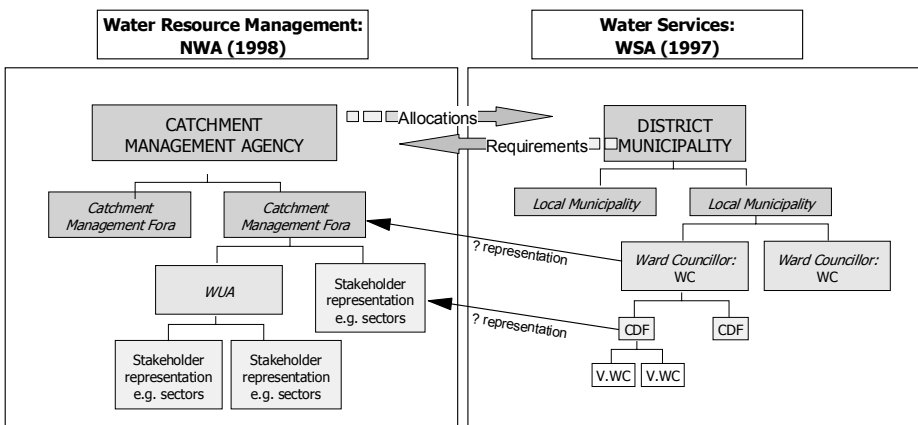
Institutional arrangements for water resources management and supply in the Sand River Catchment

An overview of the proposed governance structures for water resource management and supply in the Sand River Catchment is given in Figure 2. 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 CMA although this is not yet operative. Sub-catchments are likely to be represented by catchment management fora, comprising representatives of stakeholder fora or water user 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 which function to 'allocate' water to the local municipalities, which act as the water service provider. The ward councillors will, in effect, make representations to the local municipalities regarding water demands for their villages of jurisdiction and water supply constraints. They rely heavily therefore, on inputs from the village water committees. Municipalities articulate these needs through the water services development plans (WSDPs). The Sand River Catchment falls under the remit of 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.

Within each catchment a multi-tiered set of stakeholder forums is to be set up

Figure 2: Schematic of the proposed institutional arrangements for water resource management and supply. 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 in terms of water allocations and through representation. Abbreviations: VWC = village water committee; CDF = community development forum representing multiple village-based committees; WC = ward committee comprising CDFs from a number of villages; WUA = Water User Associations.

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:



...od with no private ownership permitted.

...erve that defined water to protect ecological basic needs (known, as the basic human sic need has subsequently been established d water is defined as a basic right (the so-Pollard *et al* 2002).

...nt as the basic unit for water resources

...frica is divided into 19 Water Management ents. It seeks to sustainably manage water verse past racial and gender discrimination. r integrated water resources management will be achieved through the development (CMAs) in each of the 19 hydrological le for preparing catchment management resources to all stakeholders to meet their in each catchment a multi-tiered set of through which different needs can be problems identified and resolved.

...hes a system for licensing all water users (Schedule 1) users, for a monitoring and ality and waste disposal) and a framework agement (including water charges). The

Act also recognises the importance of ensuring that water management within

South Africa does not negatively affect its neighbours, including provisions to regulate trans-boundary 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 in a new direction. This is represented diagrammatically in Figure 1, 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 the institutional mechanisms through which the 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 the 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 for 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 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 for, 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.

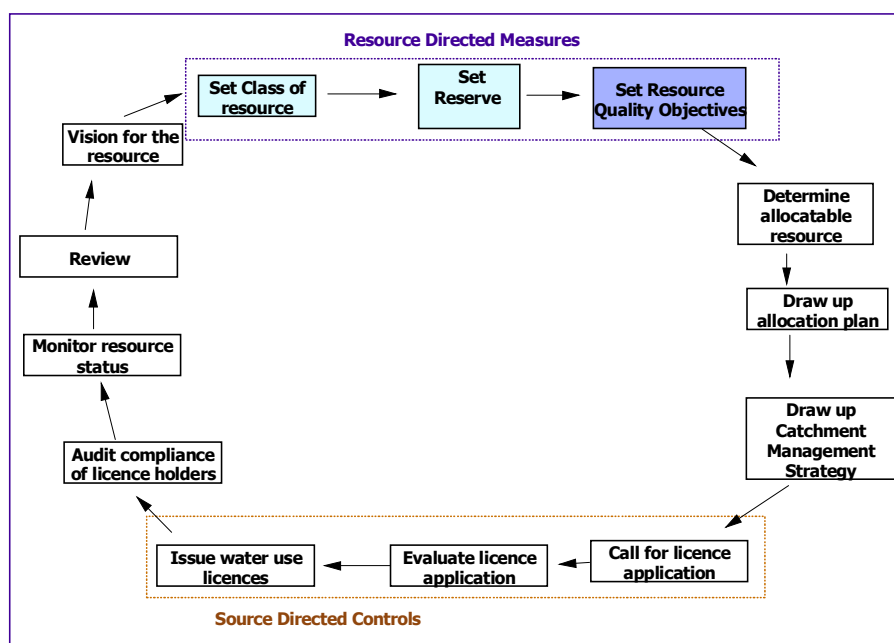


Figure 1. The water resource management process in South Africa

The BHNR consequently needs to be complemented by an allocation mechanism in which these productive activities are recognised as a key demand in terms of their contribution to the livelihoods of poor people and the economic development of the areas in which the poor live. This means that priority should be given to Schedule 1 activities over and above those catered for 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 summarises 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 to give a clearer picture of the role of productive uses of domestic water in the livelihoods of poor people in the Bushbuckridge area.

3. Productive Uses of Domestic Water in Bushbuckridge

The two surveys studied water use in a total of 19 villages that had 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 litres per capita per day. 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 timesavings were extremely significant for women in particular, freeing up time for other livelihood activities or for leisure time.

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 ones varies from village to village. The main water-dependent productive activities found in the surveys were vegetable gardens, fruit trees, beer brewing, brick making, hair dressing, 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 leaf vegetables are typical crops. Many homestead plots also contain a number of fruit trees, which provide shade and have aesthetic value as well as giving fruits. This featured strongly both as an existing activity where it is possible and as an activity that is aspired to if there were more favourable conditions such as an improved water supply. Irrigation of vegetable gardens and fruit trees at the homestead is more widespread compared to irrigation of crops in community gardens. The latter needs more organisation 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, the entry costs to poor people of utilising domestic water for backyard irrigation are low: there are no committees to join and little equipment is needed.

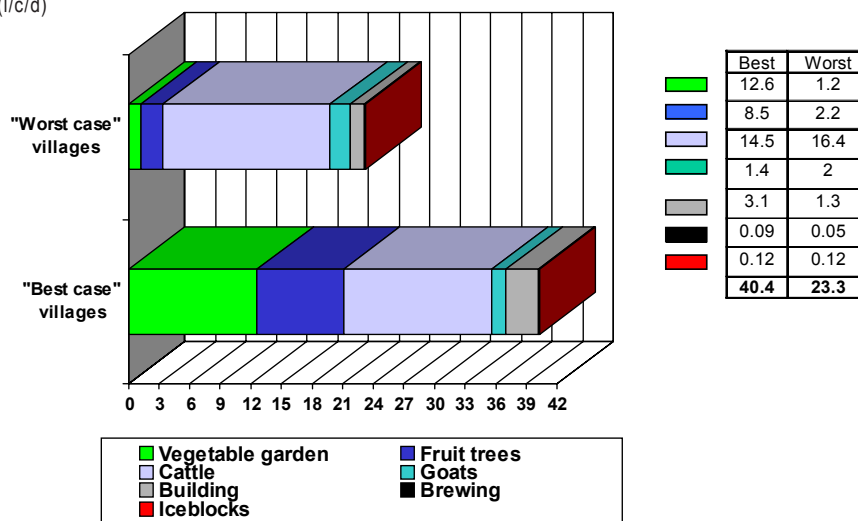
Cattle are important 'consumers' of 'domestic' water. However the source of water for cattle is often not from a 'domestic' system, but outside the village. For instance, where there is a reticulated water supply system such as in Zoeknog or Shere and there are perennial rivers nearby, cattle drink water from the 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 livestock and people is more important. 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, with again serious health implications.

There are differences in terms of the extent to which each of the activities that use water is engaged in within each village. Obviously, the most water-consuming activities are engaged in 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 all the villages with bad water supply system have consumption levels much lower than the villages with better water supply systems. The 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 summarises the average water consumption for all '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 litres (basic needs). An additional

Figure 3: Summary consumption for main water-based livelihood activities in “best cases” versus “worst cases (l/c/d)



25 to 40 l/p/d will be needed to support these economic activities (given current proportion of household involved in the activities and water consumption). The activities using most water are cattle ranging, vegetable gardens, beer brewing and watering trees.

Also, the comparisons between consumption in “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-blocks, is much higher in 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, the figures above do not reflect the real amount of water used by a household involved in a particular activity, being the amount required for each activity much higher than the above average. Figure 4 provide average consumption figures for each activity, when only those households that engage in the activity are considered.

Figure 4: Water consumption per business in households involved in the business (l/c/d)

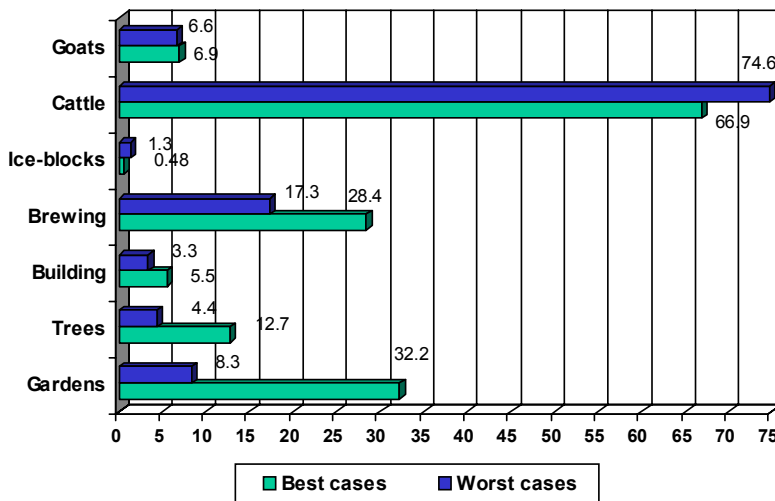


Figure 5: Percentage of households involved in each activity (%)

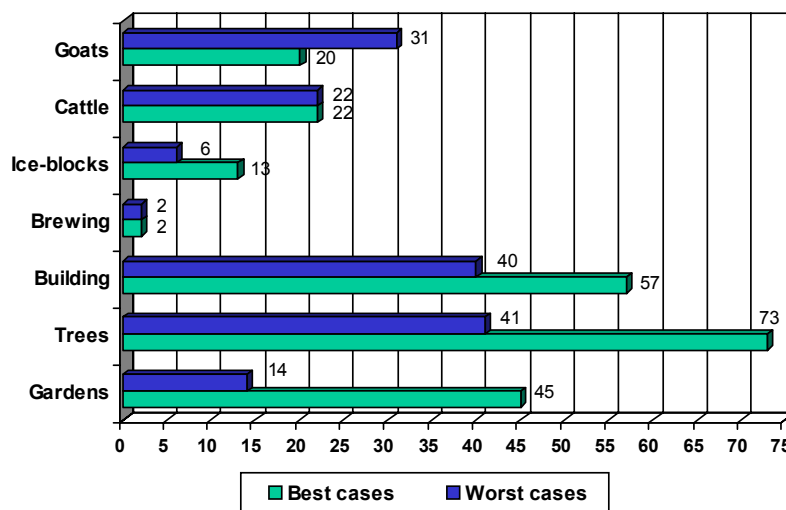


Figure 5 provides an overview of the average level of involvement of households in each of the activities. Not all households engage in “low-level economic activities”. In “best case” villages, the proportion of households involved in each activity range from 2% of the households for beer brewing to 73% for the irrigation of fruit trees. Moreover, for most activities, the proportion of households involved is also higher in “best case” villages than in “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 the respondents in the surveys.

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 litre of water.

Figure 6 summarises 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 R529 to R653 person/year (10.5 Rand = US\$1). On average this represents around 10 percent of 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 upon these livelihood activities, the income derived from the productive uses of domestic water are considerably greater than this average figure.

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 provide average “gross margin” figures for each activity, when only those households that engage in the activity are

Figure 6: Total gross margins from water-dependent livelihood activities in the two types of villages (R/capita/year)

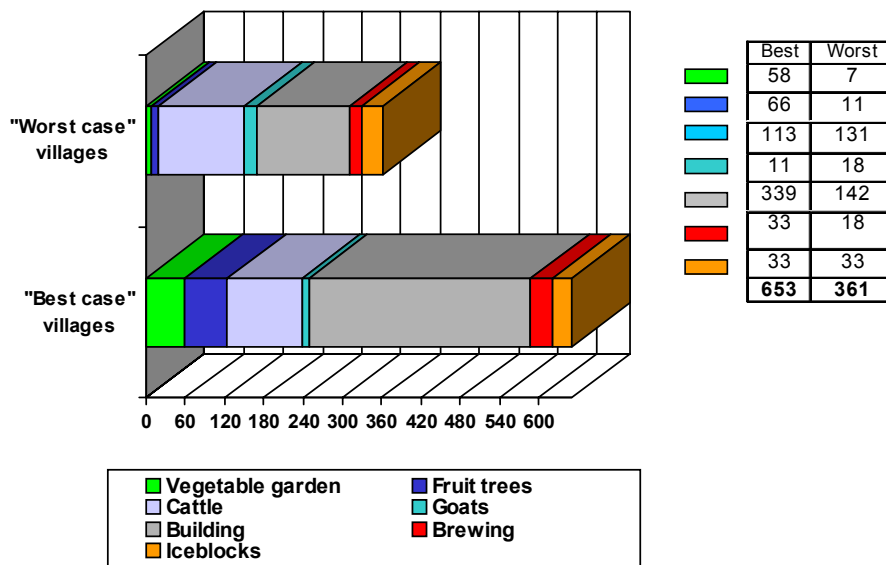
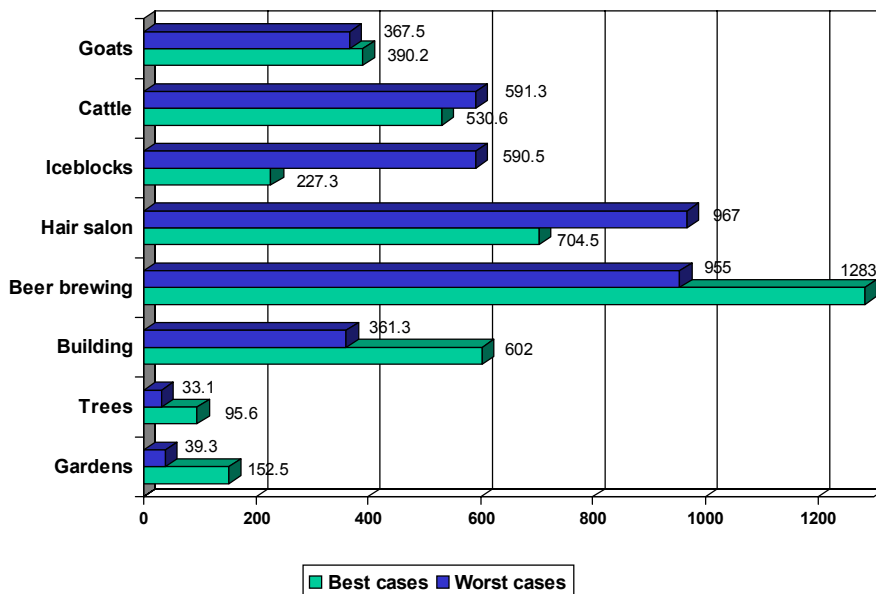


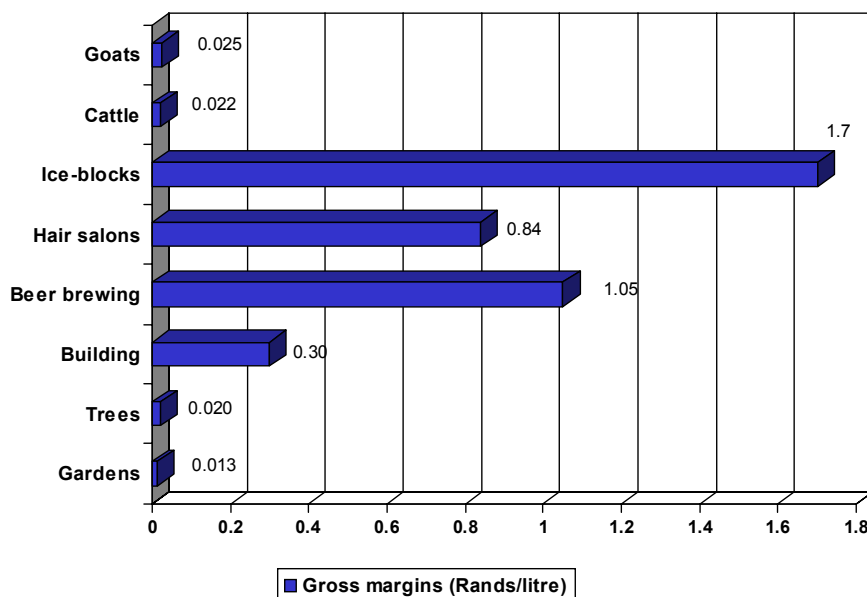
Figure 7: Annual gross margins per capita for those involved in each activity (R/capita/year)



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, many women-headed, involved as their income is often far below the average figure for the region.

Finally, Figure 8 provide an overview of the “gross margins” for all activities. They show a wide variation across businesses. Ice-block making provide the highest return (1.7 R/l) followed by beer brewing (1.05 R/l) and hair salons (0.84 R/l). Fruit trees (0.02 R/l) and vegetable gardens (0.013 R/l) provided the lowest returns

Figure 8: Gross margins for “ water-dependent low-level economic activities” (R/litre)



The highest rates of involvement in the productive use of domestic water are for those activities with the lowest returns per litre 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 litre, have the lowest rate of household involvement.

Overall, the data presented here demonstrates 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 the many women-headed households who have much poorer access to outside job opportunities, can rarely engage in farming and need to juggle making a living with their domestic opportunities. For these people, growing fruit 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 the surveys, the nutritional benefits from home consumption from backyard gardens were reported also 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 then these water-dependent productive activities become viable. Where they do not then important poverty reduction opportunities can be lost. As such, enhancing the supply of domestic water in this region (the data from these surveys suggests 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.

4 Policy Implications

This section discusses in detail the main lessons learnt from the research and highlight 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 re-think of how we view basic needs and domestic water, as well as the types of poverty-focused water programmes 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. A number of other specific policy conclusions can be drawn from the case study. They are:

- For the Bushbuckridge area, there is enough evidence to inform the allocation of water for the BHNR using the figure of 25 l/p/d as the minimum amount required to meet basic human needs for health and hygiene purposes.
- A major challenge is to how to make the concept of a BHNR operational. Research need 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 both for present and future generations.
- As part of this, there is a need to think radically about new, more decentralised, systems for water supply appropriate for the diverse range of uses found in communities. For example, 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 l/p/d, as the water needs for productive purposes vary greatly from household to household.
- Furthermore, the lessons learnt from this research are very relevant for 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 the 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 l/p/d) 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 the 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 on-going development of water service plans and catchment management approaches. These are recognised in the definition of Schedule 1, but the key challenge is now the development of mechanisms to prioritise Schedule 1 water uses over and above the BHNR. The Department of Water Affairs & Forestry (DWAF) has recognised the importance of water for small scale livelihoods activities, but there still remain uncertainties over how these needs will be met, both in terms of the allocation of water for these uses and, even more, the awareness of service providers of these critical needs.
- 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 (see experience with homestead gardens in Zimbabwe, Box 2). Some creative thinking will be needed from engineers and technical experts in order to provide solutions that are appropriated to the South African context.

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, means to pump water from underground, or access to reliable markets. Through a package of support and assistance the Mvuramanzi Trust in Zimbabwe is helping rural families to produce irrigated vegetables for home consumption, and for sale both in Zimbabwe and in European markets, from family water points that previously would only have been used for domestic purposes. Needs include micro-financing 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 trusts aim is to assist 3,500 families each year to install rope pumps and set up irrigation systems at their homes. Some of the farmers work with a private company called Hortico, who have a special division for communal out-growers, and export vegetables like sweetcorn, babycorn, butternut, fine beans, mange tout and hot chillies 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 hectare 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 unfavourable geological conditions of Southern Zimbabwe. Instead of a deep but narrow borehole, a well about 2 metres 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 metres 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 to the well. During the 1992 drought such wells were able to meet the domestic water needs of surrounding villages, when conventional sources had dried up, and still be used for some vegetable cropping albeit on a reduced extent.

Sources: Lovell, 2000 and Waughray et al. 1998

- 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 ten 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 starts.

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