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WORKING PAPER 73

Volume 2

The Transformation of Irrigation Boards into Water User Associations in South Africa: Case Studies of the Umlaas, Komati, Lomati and Hereford Irrigation Boards

Nicolas Faysse and Jabulani Gumbo

IWMI International Water Management Institute

FUTURE HARVEST
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Cemagref

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Acronyms

ARDC	Agricultural Rural Development Cooperative
BP	Business Plan
CF	Commercial Farmer
CLP	Compulsory Licensing Process
CMA	Catchment Management Agency
DoA	Department of Agriculture
DEAT	Department of Environment Affairs and Tourism
DoLA	Department of Land Affairs
DWAF	Department of Water Affairs and Forestry
HO	Head Office
RO	Regional Office
EF	Emerging Farmer
HDI	Historically Disadvantaged Individual
HIB	Hereford Irrigation Board
IB	Irrigation Board
IDP	Integrated Development Program
IWRM	Integrated Water Resource Management.
KOBWA	Komati Basin Water Authority
KRIB	Komati River Irrigation Board
LIB	Lomati Irrigation Board
LCF	Large-scale Commercial farmer
MAFU	National Mpumalanga African Farmers Union
NIEP	Nkomazi Irrigation Expansion Program
MC	Management Committee
MCM	Million Cubic Meters
MPB	Mpumalanga Parks Board
NWA	National Water Act
NWRS	National Water Resource Strategy
PTO	Permission to Occupy
RDP	Reconstruction and Development Programme
RSA	Republic of South Africa (under the previous dispensation)
SCF	Small-scale Commercial Farmer
TFA	Tafelkop Farmers' Association
TLC	Transitional Local Council
TSB	Transvaal Sugar Limited
UIB	Umlaas Irrigation Board
WAMS	Water Administration and Measurement System
WfW	Working for Water Program
WMA	Water Management Area
WUA	Water User Association
ZAR	South African Rand

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This working paper is mainly based on interviews, and the active collaboration of many persons was a key factor in enabling these case studies. Discussions before, during and after the field work were held with staff of the provincial DWAF (Department of Water Affairs and Forestry) offices. E. Deacon and W. Comrie (Nelspruit), K. Pretorius (Groblersdal), J. Perkins (Durban), and P. de Wet, the then chairman of the Lomati Irrigation Board, enthusiastically supported the study. The chairpersons of the Irrigation Boards (IBs), R. Gordon (Komati), G. Schoonbee (Hereford), and L. Forsyth (Umlaas) also provided significant assistance. We would particularly like to thank G. Mkhastswa and W. Dutoit of the Lomati IB, T. Sibiwa and E. Makushe of the Komati IB, J. Sefoloshe and J.M. Bernardé of the Hereford IB, and Dr. R. Auerbach, M. Mchunu and A. Burns of the Umlaas IB. Finally we wish to thank Barbara van Koppen and Douglas Merrey for their comments on the paper, and both IWMI and Cemagref for supporting this research. Nicolas Faysse is grateful to both IWMI and Cemagref for co-supporting his Post-Doctoral Fellowship.

Summary

In South Africa, the 1998 *National Water* Act launched an in-depth reform of water resource management. At the local level, all the Irrigation Boards (IBs), which used to be managed by large-scale farmers, are to be transformed into Water User Associations (WUAs). These WUAs are expected to incorporate all users in the defined area of jurisdiction, whether they have a formal water entitlement or not. It is believed that this transformation will enable better participation of historically disadvantaged individuals (HDIs) in the management of water resources. It will also provide a basis for improving local integrated management of water resources.

The International Water Management Institute (IWMI), in cooperation with the Department of Water Affairs and Forestry (DWAF), undertook a research program on this transformation. The main objective of the research was to understand the constraints and opportunities of the transformation, with regard to the goal of meeting HDIs' water-related needs. A secondary objective was to assess the role of these new WUAs in local integrated water resource management. This paper presents three case studies of IBs that have not yet been transformed into WUAs. The case studies constitute the background information for the research report entitled *An assessment of small-scale users' inclusion in large-scale Water User Associations in South Africa* (Faysse, forthcoming 2004).

The first case study deals with the Umlaas IB in KwaZulu-Natal. This Board manages water use in the upper part of the Mlazi River catchment. Around 4,000 ha are irrigated, mainly to produce maize and sugar cane. Times of water scarcity are rare. Slopes in the upper parts of the catchment are steep and the IB along with the upstream rural communities and commercial forestry companies, have undertaken several initiatives to address erosion problems in the area, with the cooperation of these companies..

The second case study relates to the Komati and Lomati IBs in Mpumalanga. The irrigated area of around 21,000 ha is mainly dedicated to sugarcane farming. It hosts the largest area of small-scale irrigation farming in South Africa, but periods of water scarcity are frequent. While the IBs have not transformed into WUAs yet, they have already incorporated the emerging farmers in their area of jurisdiction, as well as in the management of water.

The third case study assesses the Hereford IB in Mpumalanga. The Board manages an earthen canal, mainly for citrus and wheat farming, on a total area of 3,400 ha. Small-scale farmers have settled on an abandoned commercial farm, and the current upgrading of the emerging farmers' scheme and the setting-up of water meters open the way for the meaningful integration of the emerging farmers in the forthcoming WUA.

Introduction

In South Africa, the 1998 *National Water Act* (Act 36 of 1998) launched an in-depth reform of water resource management. At the local level, all the Irrigation Boards (IBs) are to be transformed into WUAs which are expected to invite all users to be incorporated in the defined area of jurisdiction, whether they have a formal water entitlement or not. This transformation from IBs into WUAs was designed to enable better participation by 'historically disadvantaged individuals' (HDIs) in the management of water resources (the term 'HDI' refers to all those who were deprived of certain rights during the apartheid regime, i.e., black, colored, Asian and disabled people, as well as women[1]). The transformation is also expected to provide a basis for undertaking some initiatives with regard to the local integrated management of the water resources.

The International Water Management Institute (IWMI), in cooperation with the Department of Water Affairs and Forestry (DWAF) has undertaken a research program on this transformation. The main objective of the research is to understand the constraints and opportunities of the transformation, with regard to the goal of meeting HDIs' water-related needs. A secondary aim of this research is to understand the potential for WUA involvement in the integrated management of water resources.

Seven case studies provide the backbone of the research. A team of researchers performed these studies between July 2002 and July 2003.

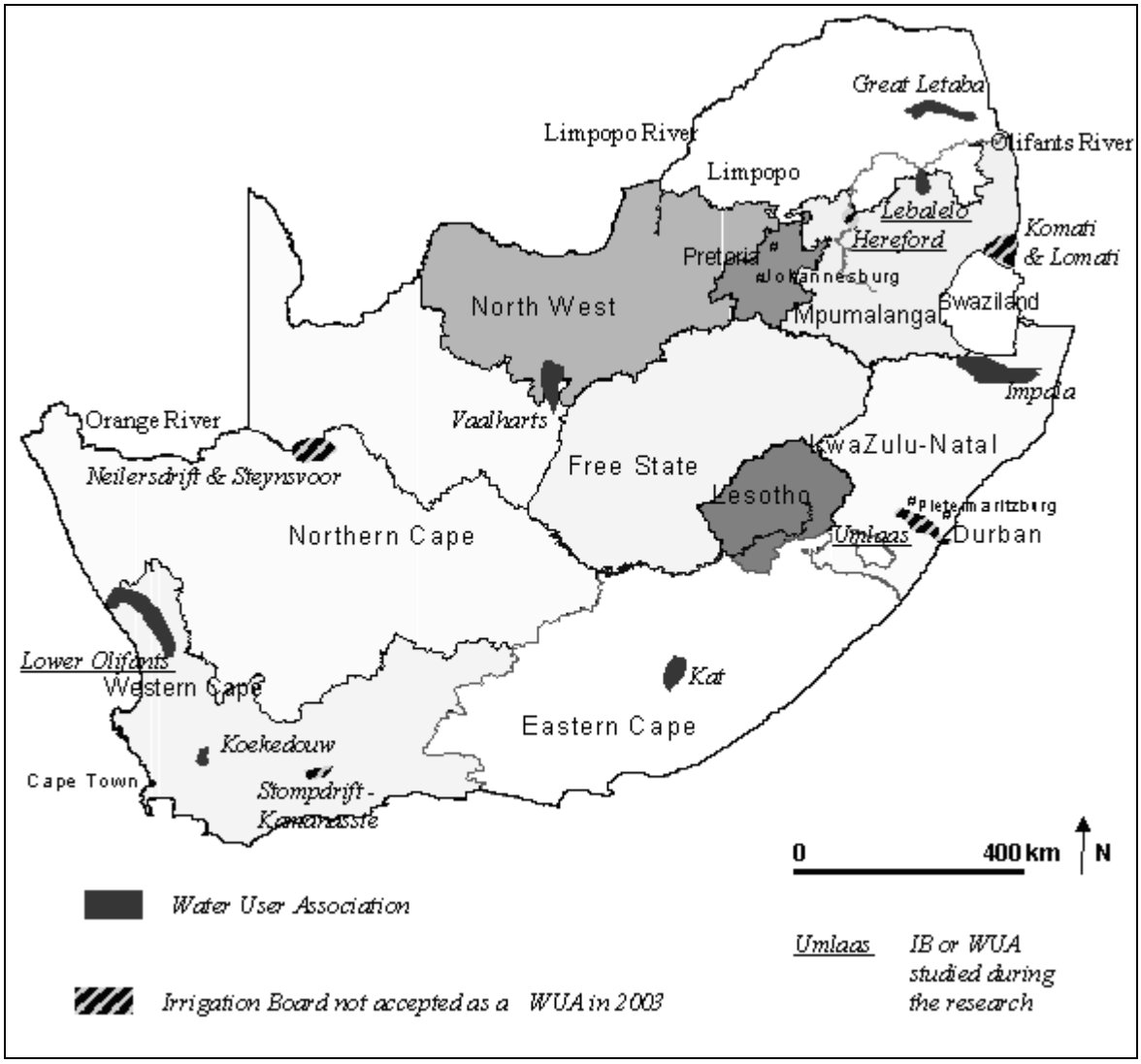
The Volume 1 working paper presents three examples of existing WUAs: the Lower Olifants, Great Letaba, and Vaalharts WUAs (Seshoka et al. 2004). The present paper, Volume 2 of the case studies, presents three cases of IBs that are yet to be transformed into WUAs. The description of the research and the introduction to the South African context are given in the research report, and are not repeated here.

Jabulani Gumbo wrote the case study on the Umlaas IB in KwaZulu-Natal, while Nicolas Faysse wrote the case studies of the Komati and Lomati IBs in the Inkomazi area, and of the Hereford IB in Mpumalanga. Figure 1 shows the location of these case studies and of the other IBs or WUAs with a significant population of HDIs (see Faysse 2004). Each case study report has been reviewed at least by the chairman of the WUA or the IB.

The study was co-funded by IWMI and Cemagref.

[1]A formal definition is: "HDI means a South African citizen, who (i) due to the apartheid policy that had been in place, had no franchise in national elections prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act 110 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act No. 200 of 1993) (the Interim Constitution); and/or (ii) is a female; and/or (iii) has a disability, provided that a person who obtained South African citizenship on or after the coming to effect of the Interim Constitution, is not to be an HDI" (Preferential procurement regulations, as approved in April 2001 pertaining to the Preferential Policy Framework Act no. 5 of 2000).

Figure 1. IBs or WUAs with a large presence of HDIs.



The Umlaas Irrigation Board

The Umlaas Irrigation Board (UIB) is located in the Mlazi River catchment in the Midlands section of the province of KwaZulu-Natal, within the former Republic of South Africa and the former KwaZulu homelands (figure 1). The irrigation district is approximately 20 kilometers from Pietermaritzburg on the R56 road to Richmond (figure 2). Irrigated agriculture and forestry are the mainstay of the local economy.

The UIB was established under the previous Water Act,[2] mainly to develop and manage storage dams for irrigation water. The UIB was required to transform into a WUA by the new National Water Act [3] in order to open the management of a given water system (canal, part of a river, dam) to all stakeholders, especially HDIs. In 2003, the UIB was still in the process of being transformed into a WUA.

The qualitative research approach followed was based on semi-structured interviews. The analysis is based on certain predefined questions, as mentioned in the research methodology.

The case study report is divided into five sections. The first two sections describe the methodology and the Mlazi River catchment area. The third section describes the operation of the UIB and the transformation issues. The fourth section assesses the needs and problems of HDIs, and analyzes the existing and possible actions that could be taken by the UIB to empower the HDIs. The last section deals with the involvement of the UIB in integrated water resource management in the catchment, and describes the links between the UIB and other water management organizations.

Methodology

The following questions were used as guidance for the study:

What will change for HDIs after the UIB becomes a WUA?

This is the main research question of the case study. This research question is broken down into several secondary questions:
What is the overlap between the UIB's responsibilities and HDIs' needs? This question tries to determine the extent to which the needs of HDIs in the Mlazi River catchment could be satisfied by the WUA. To do this, the most important needs and problems of HDIs were identified and ranked.
What is the current and future involvement of HDIs in the management of the UIB/WUA?
What is planned for the transformation from UIB into WUA? How was the public participation process designed? What were the issues discussed during this process? Has the inclusion of HDIs into the WUA been an opportunity for women to improve their status?

To what extent does the UIB practice integrated water resource management?

What are the scientific assessments of water issues in the basin? What are the stakeholders' perceptions of the water issues? What is the institutional framework to deal with the different

[2]Water Act (Act 54 of 1956).
[3]National Water Act (Act 36 of 1998).

water issues? How is the management of the water quantity and quality, and of environmental and health issues, linked to water? What is the role of the UIB in integrated water resource management (IWRM) of the catchment, and what could be the role of the WUA?

The above questions and others were answered mainly through semi-directed interviews with 34 different stakeholders (table 1). The reference codes given in this table will hereafter be placed in brackets and used at the end of a relevant sentence to signify that a specific stakeholder is the source of information.

Table 1. Stakeholders interviewed in the Umlaas Irrigation Board.

Stakeholder		Reference	Number
DWAF Regional Office Durban		DD	1
		IFM	1
Historically Disadvantaged Individual	Emerging farmers	EF1	1
		EF2, EF3, EF4,	4
		EF6	1
	Community gardens	CG1, CG2, CG3	31
	Cattle herdsman	CH	1
	Tribal authority	TA	1
	Water committee	WC	1
	Land claim	LC	1
Umgeni water	Drinking water supply	DWS	1
	Scientific service	SS	1
Umlaas Irrigation board	Large-scale farmers	LSF	1
	Chairman	CM	1
	Secretary	SE	1
	Environmental officer	EO	1
	Water bailiff	WB	1
	Small-scale farmers	SCF1, SCF2, SCF3	3
Commercial forestry	Mondi manager	MM	1
	Mondi worker	MW1, MW2	1
	NCT chairman	NC	1
	NCT worker	NW	1
Richmond municipality	Mayor	MA	1
	Environmental health officer	EHO	1
	Mobile clinic sister	MCS	1
	Ward councilor 4	WCf	1
Bachs Fens Ecological farm	BF Ecological farmer	BEF	1
Total			34

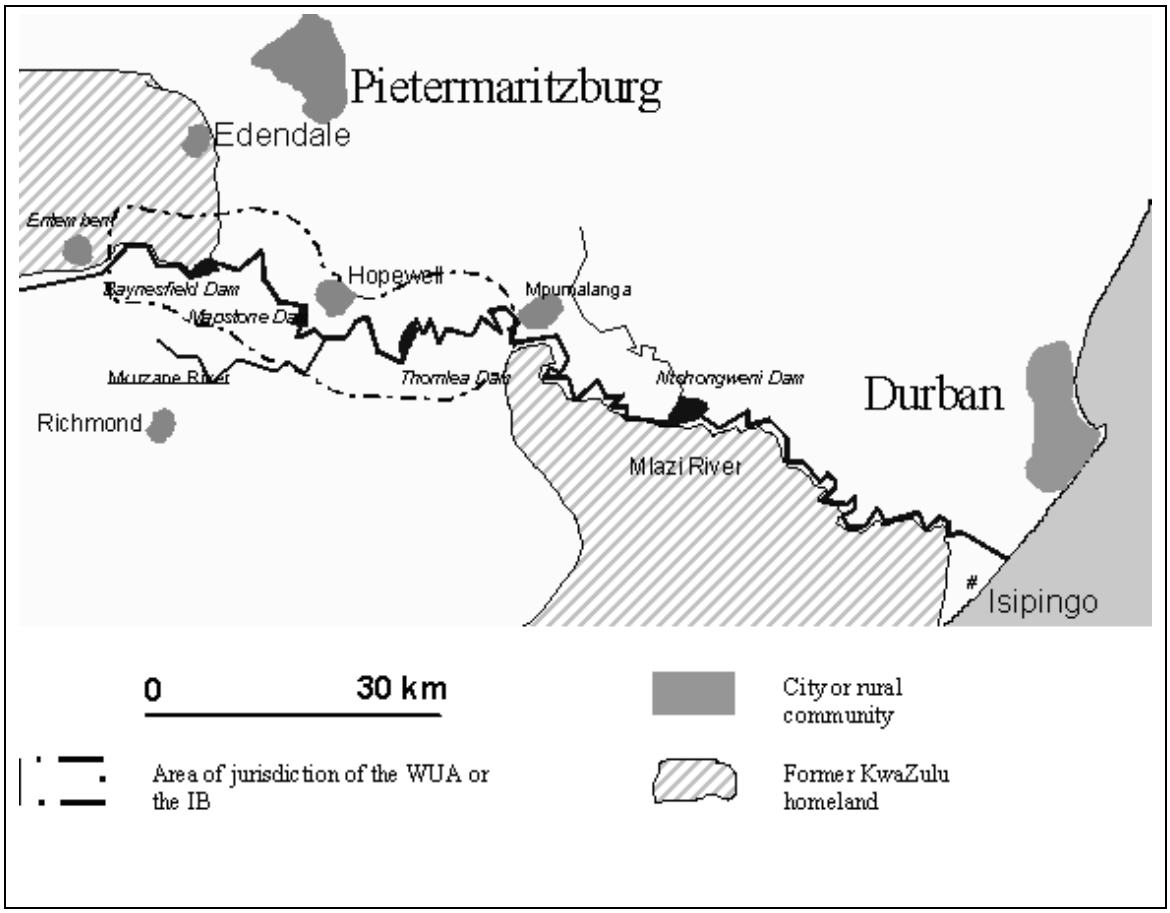
The people interviewed were commercial and emerging farmers,[4] the municipality, the Department of Water Affairs and Forestry (DWAF), the UIB and rural communities. The participants were selected at random, without prior knowledge of their activities, with the exception of the UIB chairman.

Context

Brief description of the basin

The Mlazi River[5] has its headwaters located just above the Entembeni area, at 1,500 meters above sea level (figure 2). A number of tributaries converge to form the upper section of the Mlazi River. The river flows along an area characterized by intense commercial agriculture and forestry into the Baynesfield Dam (figure 2). It then winds down into Mapstone Dam and nearby Hopewell. The river afterwards flows through Ngomankulu port entering the Tala valley

Figure 2. The Mlazi River catchment.



[4]'Commercial farmer' means a large-scale farmer, almost always white, while 'emerging farmer' means a small-scale, historically disadvantaged farmer.
[5]See (Auerbach 1999) for a description of the area and its history.

and draining into the Thornlea Dam, winding its way through Killarney valley towards Mpumalanga Township. It then makes its way towards the Shongweni Dam thereafter flowing towards the Indian Ocean, entering the sea through a concrete canal, south of Durban (Water Research Commission 2002).

The area of study is the first 80 to 90 kilometers of the river from its source to just before Mpumalanga Township (figure 2). The upper catchment of the Mlazi River has three major dams: Thornlea (2.7 MCM), Baynesfield (1.8 MCM) and Mapstone (3.5 MCM) i.e., a total capacity of 8 MCM . The stored water is used for irrigation purposes.

The economy of the area is based on commercial forestry in the upstream part of the basin and irrigated agriculture, which consists mainly of sugarcane cropping, maize, sunflower, millet/sorghum, vegetables, pigs, chicken, dairy, and beef farming (Umlaas Irrigation Board 1997). Overall, at least 4,535.8 ha are cultivated, of which around 4,454.8 ha are scheduled for irrigation. The commercial timber enterprise uses approximately 6,500 ha for growing timber in the higher rainfall areas (CM, MW, NW).

The people in the rural area of Entembeni practice subsistence farming and community gardening, that is, they grow vegetables and maize for household consumption and sell any surplus. The people of Hopewell live in an urban set-up and they work either as farm laborers or in the nearby towns.

The Mlazi river catchment is one of the ten tertiary catchments of the proposed Mvoti to Umzimkulu water management area, which stretches along the east coast of South Africa, predominantly within the province of KwaZulu-Natal, and borders on Lesotho to the west. It is situated in a humid part of the country, and the mean annual precipitation is 960 millimeters (DWAF 2002). The mean annual runoff for the Mlazi river catchment is 184.1 MCM.

Table 2 presents the water uses of the whole Mlazi catchment. In this table, bulk water requirements represent water delivered to non-urban sectors (such as the Hammarsdale industrial sector). Urban consumption represents the water use from the Ntshongweni Dam by the Durban city (actually, this use has stopped due to heavy pollution). The estimated ecological reserve represents the water required to maintain a proper functioning of aquatic life in the ecosystem.

Table 2. Estimated water use in the Mlazi river catchment area for the year 1995 (MCM).

Forestry	Dryland sugar cane	Alien vegetation	Bulk	Irrigation	Rural	Urban	Ecological reserve	Total
2.3	5.6	1.9	3.0	17.5	1.8	286.2	23.0	341.3

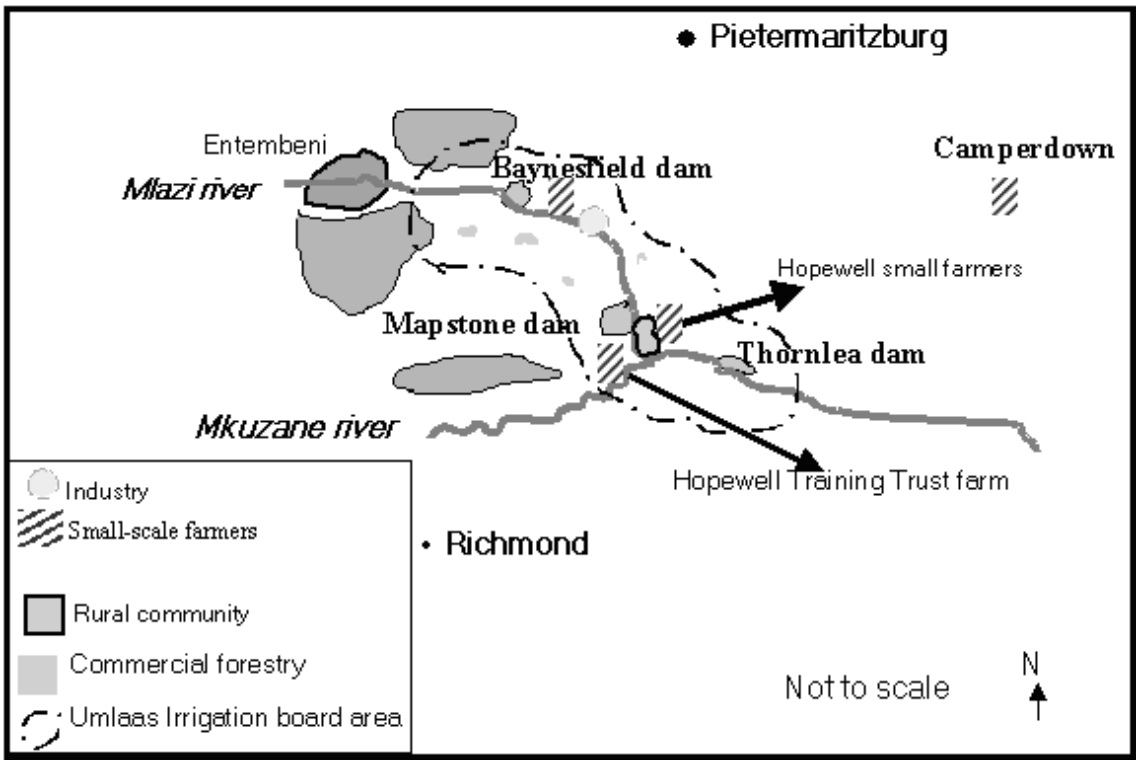
Source: DWAF KwaZulu-Natal Regional Office (2002).

Water Users

The current users of water from the Mlazi River in the study area are 74 commercial farmers, the Entembeni and Hopewell communities, some emerging farmers, a forestry area, the environment, and an industrial factory (figure 3).

Commercial Farmers. The commercial farmers use water for irrigation purposes, livestock watering or for their own domestic use directly from the Mlazi River or any of the storage dams.

Figure 3. Schematic figure of the Mlazi river basin and water users.



Since water fees were cheap at the time of the UIB's establishment (as low as ZAR 0.77/ha/year) (CM), some farmers registered more land than they were using.[6] In contrast, some farmers may have expanded to crop more than their registered land (CM). Some farmers also over-declared their area under irrigation when they completed the DWAF license registration process (CM). Therefore, there is currently no accurate record of the land under irrigation. The irrigation techniques used range from flood, through overhead sprinklers to micro jets.

There are also three HDI commercial farmers, who own private land and have formal water rights but farm on smaller areas than the other commercial farmers.

Commercial Forestry. Forestry plantations dominate the upper catchment of the Mlazi River, with both softwoods and hardwoods.[7] Among the softwoods found are pines, namely *Pinus patula, P. elliottii, P. taeda* and *P. radiate*. The hardwood tree species are *Eucalyptus grandis* (saligna gum) and *Acacia mearnsii* (black wattle). These plantations are located in the high rainfall areas (CM). Most of the natural grasslands have been replaced by commercial forestry. According to researcher, Dr Adrian Armstrong, of the KwaZulu-Natal Nature Conservancy Service "at least 92 percent of the Natal mist belt (Richmond, Byrne, Ixopo, Eston and Baynesfield) has been transformed by afforestation. Commercial tree farming covering some 41 percent of the area has had a marked impact on biodiversity" (The Natal Witness 1998).

Commercial forestation is a major activity besides the farming operations, with approximately 10 licenses issued by the DWAF in the Mlazi catchment (CM; DD). There used to be a specific DWAF committee in charge of the issuing of licenses but the DWAF decided

[6]In 2003, ZAR 1.00 = approximately US$0.12.
[7]NCT pamphlet (n.d.) entitled *Linking Natal's independent timber growers and their dates.*

that no more licenses would be issued (CM). The foresters are neither members of the irrigation board nor of the proposed WUA. Two forestry companies are currently operating in the Mlazi river catchment, namely Mondi Forests and NCT Timbers.

Mondi Forests leases approximately 4,192 ha from Baynesfield Estates and grows pine and gum trees, but the lease with Baynesfield Estates is expiring and the forestry lands are gradually being taken over by NCT Timbers. NCT Timbers owns approximately 650 ha of timber plantation, of which 350 ha are planted with wattle and 300 ha with gum (NW). Wattle trees are considered an invasive alien if grown along riverbanks but not under forestry conditions. Mondi Forest also owns approximately 2,344 ha of land (Maybole Estate) near the Entembeni community (MW). Moreover, Mondi Forest has other forestry plantations towards Richmond at Greenhill, which serves as its head office for timber operations (CM).

Both companies carry out self-audits as part of their conservation and environmental plans. The timber companies are accredited with the Forest Stewardship Council, an international non-governmental organization assessing the environmental and social management of commercial forestry all over the world.

The forestry companies are members of a national association called Forestry of South Africa, which has agreed with the DWAF to pay a general fee of ZAR 10/ha/year, wherever the plantation is located in South Africa, as water resource management charges (CM).

Small-scale Farmers. There are very few small-scale farmers in the study area. There are about four emerging farmers in the Hopewell area, three members of a farming club on the Hopewell Training Trust farm, and three members farming on rented land at Camperdown (figure 3). None of them have formal water rights.

Small-scale Farmers at Hopewell. Most of the small-scale farmers own less than one hectare of land and the one with the most land (3 ha) was interviewed. This farmer operates on a piece of land that was made available to him by the Induna[8] (EF1). He grows cabbages in winter, potatoes in spring/autumn, and maize in summer. Traders come from the nearby towns to purchase the farm produce.

Good quality irrigation water comes from a wetland near the homestead, providing the farmer with sufficient water, so he is not required to pump water from the Mlazi River. His diesel motor anyway cannot pump water from a great distance and height.

The farmer receives extension advice from the Department of Agriculture (EF1) and other assistance from Agrotech, a seed company. The farm soil has been tested to determine the appropriate type of fertilizer to use and the correct quantities. The farmer was not aware of the following: (a) the new National Water Act and possible subsidies for emerging farmers and (b) that the UIB was transforming.

The main constraint faced by these farmers was the lack of land for expansion. The Land Bank may grant loans to buy more land, provided the farmer has title deeds for the current land. Since the interviewed farmer did not own the land, he had requested a letter from the Hopewell ward councilor to indicate that he was entitled to occupy the land. However, since the land belonged to the chief, he needed a Permission to Occupy (PTO)[9] certificate. The Land Bank accepts the PTO as a form of security for loans to HDIs. The farmer is interested in a section of a neighboring farm that is for sale.

[8]The Induna is the representative of the traditional chief at the village level.
[9]Title deeds granted to black people by the local chiefs in the previous dispensation in the homelands.

Hopewell Training Trust Farm. Originally, there were 12 members of a cooperative based at the Hopewell Training Trust Farm. In 2003, only four members remained (three females and one male) since the other members decided to leave for various reasons.

The members of the cooperative are not owners of the farm but have been given permission to carry out farming operations there after undergoing training at Zakhe Agricultural College and on the farm itself. The cooperative has been registered as a social club with the Department of Agriculture office in Pietermaritzburg (EF2).

The farmers grow a variety of vegetables (beetroot, cabbage, chilies, coriander, and spinach) on 2.5–3 ha of the land. Due to limited finances, they cannot farm on a larger piece of the land. The market for their produce is either at Hopewell or Pietermaritzburg. The members do not own a truck and they use public transport to bring their produce to the market (EF5). They have obtained loans from the Land Bank to buy agricultural inputs, seeds, and fertilizer.

The irrigation water comes from the Mlazi River and is pumped to a 10,000-liter holding tank. The farmers do not have an electric pump so a neighboring farmer pumps the water to the holding tank for a fee. The cooperative farm does not have water rights and uses part of the neighboring 10-hectare water rights. The irrigation techniques used are sprinkler and shower.

The agricultural extension officers come to the farm to advice the farmers (EF5) who have been trained to rear chickens, but the chicken project has not started yet due to the lack of financial resources to buy the chickens and the inputs (EF2).

Upcoming Farmers. Baynesfield Estates. About 24 families, former farm workers of Baynesfield Estates, instituted a land claim against their employer. The land claim was settled when some farm workers opted to receive cash, and the Department of Land Affairs bought a small part of the Baynesfield Estates to resettle some of the farm workers on the farm. These upcoming farmers were not engaged in any farming activity because they needed infrastructure such as houses first to prevent people from stealing their produce (LC).

Camperdown. This farming area lies outside the area of jurisdiction of the UIB, along a tributary of the Mlazi River, but the area will fall under the jurisdiction of the future WUA. A commercial farmer is currently registering the private dam on the property with the DWAF. He reported that the overhead electric cable for the water pump was stolen. An overhead electric cable (cost ZAR 5,000) is cheaper than an underground cable (ZAR 15,000) but is prone to vandalism and theft.

Three emerging farmers rent 10 ha of land from the commercial farmer, and grow rainfed potatoes and maize. To avoid crop failure due to the shortage of water, they should irrigate but this is not possible due to the lack of irrigation equipment.

The farmers have approached the Department of Agriculture (DoA) and the Land Bank for financial assistance to purchase a water pump (EF6). Both the emerging farmers and the landowner are interested in registering their water rights, as well as in being part of a WUA, if it can improve the management within the tributary.

Rural Communities. The Entembeni community, with a population of 2,500 people, is located on one of the tributaries of the Mlazi River. They use the water for household and gardening purposes, as well as livestock watering for approximate 600 head of cattle and a substantial number of goats (TA; MW). The Umgeni Water Board supplies their drinking water (TA; DWS). The community is entitled to 6,000 liters of free basic water per month, paid for by the Msunduzi Municipality [Msunduzi Municipality Integrated Development Plan (IDP) 2002].

There is a community garden operated by 35 members of the Vulizela farm association (CG1; CG2). The irrigation techniques used are sprinklers and showers. Irrigation water comes from a small weir built on the Mlazi River, and a 35-meter pipeline conveys water to the gardens by gravity. The members of the community garden were experiencing a reduced flow of the river (CG) so the association was considering raising the wall of the weir in order to increase its capacity.

The Hopewell community can be divided into three sections, namely the Hopewell residents, the Argos residents, and the Hopewell rural residents. The population of Hopewell has been estimated at between 15,000 and 25,000; the 1996 census gives a figure of 16,036.

The Hopewell residents obtain their drinking water from the Umgeni Water Board and they pay a monthly water fee that ranges from ZAR 40 to ZAR 45 (WCf). The 6,000 liters of free basic water were likely to be available at the end of 2003 (MA). The Umgeni Water Board operates on a cost recovery basis and the water connection fee, which was ZAR 250, is now ZAR 550, essentially for the installation of household water meters. The households that are unable to install the water meter buy water from other people with an Umgeni supply at ZAR 0.50 for 25 liters of drinking water and resort to the river or dam for bathing and washing (WC). The current water charge is ZAR 6.89/m^3. About 510 houses are connected to Umgeni water and approximately 8,000 residents benefit from the Umgeni drinking-water supply (WC). However more than a 1,000 people may be drinking untreated water from the river or the dam due to the high water charges (WCf).

Some 77 percent of the residents earn less than ZAR 1,500 per month and the unemployment rate is officially 42 percent (Richmond Municipality IDP 2002). The people struggle to pay water fees and are always late in paying (WC).

Some other people have been resettled in Reconstruction & Development Programme (RDP) houses on the Argosy farm. The government bought the farm for residential purposes and the houses are currently under construction. The owners of completed houses have access to a single, temporary standpipe. The water comes from the Umgeni Water Board and is currently free to the residents, courtesy of the contractor, pending the installation of water meters (WCf).

The people from the rural Hopewell area are downstream of Mapstone Dam. They drink water from the Mlazi River (MA) and add Jik, a disinfecting agent containing chlorine, to kill bacteria (WCf; WC).

There used to be a community garden but it is currently lying idle due to in-fighting and theft. A farmer took it over in order to grow cabbages but abandoned it due to increased theft and the need to install a fence (WCf). Water is easily available from the Mapstone Dam, since the community garden is less than 5 meters from it.

The estimated number of cattle in the area is 1,600, with access to grazing a major constraint. Water for livestock watering is available from the dam or the river (WCf).

Other Users. There is an industrial factory located within Baynesfield Estates which processes pork and other pork related products. The factory uses a considerable amount of water in its cleaning operations. The wastewater is sent to remote holding tanks where it is used to irrigate a field of Kikuyu grass. A furrow surrounds the area to prevent the water from flowing into the river (EO).

The environment is also a user of water, and the KwaZulu-Natal Department of Agriculture and Environmental Affairs is the custodian of the environment in this province. There is a

Nature Reserve on Baynesfield Estates, with blue swallows, oribi (a small species of buck) and Hilton daisies in the misty grasslands. Wild trout, wide mouth bass, and yellow fish (indigenous) are found in the streams and dams (EO).

The Mlazi river catchment is characterized by wetlands and some of them have been registered as sites of conservation significance (EO). Some losses of wetland have been recorded in the KwaZulu-Natal province, ranging from 52 percent in the Nkomazi catchment to 66 percent in the Midmar catchment. The province once boasted 8,100 km^2 of wetlands (The Natal Witness 1998). In the Mlazi catchment, the UIB is trying to conserve the wetlands, as these are better than dams at serving as biological filters and trapping silt (EO).

History

The Mlazi water catchment area has three issues of historical importance. These have direct and indirect bearing on the main actors and how they interact with each other. These issues are the establishment of the irrigation board, the construction of the Mapstone Dam, and land claims.

Establishment of the UIB. The Umlaas Irrigation Board was established in 1977 to control the use of water for irrigation. It does not 'distribute' water—it has no canals or pipelines of its own and all the abstractions of water are made from the Mlazi River, or from private dams in the case of two irrigators (CM). During the first 6 years, there were often restrictions of water use among irrigators due to the erratic flows of the Mlazi River. To improve the water availability, the UIB constructed its first dam, the Thornlea, completed in 1984. The Baynesfield Dam was completed in 1986 (DD). At that time, the dams were funded with a one-third grant and a two-thirds loan from the state (CM).

Construction of the Mapstone Dam. When the UIB built the Mapstone Dam in the 1990s, it thought it could widen the rate base by scheduling new irrigation lands. The UIB also wanted to make the new users pay more, on the basis of the difference between the value of dry land and irrigated land. This value was around ZAR 4,000/ha. The DWAF refused to allow the UIB to expand the land under irrigation. Hence, only 288 ha more were scheduled for irrigation and made available to the irrigators. The Mapstone Dam was also financed with a one-third grant and a two-thirds loan from the Land Bank, guaranteed by the state (CM).

The construction of the Mapstone Dam had its controversies. The dam is situated on land that was owned by the Mapstone family, Chief Mkhize and Hopewell landowners (CM, WCf, MA). The UIB sought and obtained permission from these landowners and paid adequate compensation (CM). However, they met with resistance from the Hopewell residents (WCf, MA). The reasons for the resistance varied from the mythical snake that would drown people should the dam be built, to the non-availability of water. The Hopewell community assumed that, although they used to obtain water for domestic purposes from the Mlazi River, they would be denied access to water once the dam was constructed (WCf). However a meeting to reassure the community was held and the construction went ahead (WCf, CM).

Land Claims. In 1976, some families were evicted from Baynesfield Estates and, under the new dispensation, these families launched land restitution claims, which were successful (LCF). The Department of Land Affairs then bought 240 ha on behalf of the claimants from Baynesfield Estates (LC). Twenty-four families decided to take the land, while 81 families were paid

monetary compensation (LCF). However, the land purchased was not on the original list of claims— the original land was close to the river, and thus easy to farm and irrigate, but the new land was in the hills. Again, various reasons were advanced as to why they could not be awarded the original land (LC)—either the land had a higher price tag or was being leased by another person (LC).

Regarding water rights for the 240 ha, the new farmer owners will register themselves and apply for water permits (LCF).

Water Resource Management Issues

Water Quantity. The region has an abundance of water, with a mean annual precipitation of 960 millimeters (DWAF 2002) but there are periods of water shortages, as experienced in the 1990s. The construction of the Mapstone Dam did not result in a large increase of land scheduled for irrigation. However, the water from the dam is an additional insurance against periods of water scarcity (CM).

Water availability is a constraint to development, both for commercial farmers and emerging farmers. Commercial farmers require more legal water rights to increase the land that can be irrigated. Emerging farmers require finance to purchase the pumping infrastructure (electric pumps and conveyance pipes), as well as water licenses.

Most of the time, there is enough water in the river and no necessity to control water pumping. The farmers do not know their exact water consumption—often the bailiff has to tell them what they used (WB). When the dams start emptying, the Management Committee sets up a limitation for the amount of water that can be used, issued in terms of mm/registered ha/week. The worst period of water restriction was when farmers were restricted to 1.5 mm/ha/week (CM).

Small-scale commercial farmers complain that the UIB marginalizes them when it comes to water restrictions. They say that the UIB favors the big farmers in the allocation of scarce water (SCF1). A commercial farmer complains that, even though he has water rights, he is unable to irrigate because that would require servitude rights and the UIB has been unable to assist him in getting them (SCF3). Some black small-scale commercial farmers expect the WUA to offer better service and be more representative in terms of race and gender (SCF).

There is for the moment no requirement to leave a specific amount of water flowing downstream, although the farmers between Mophela and Salem, downstream of the Thornlea Dam, seem to have insufficient water available to them (BEF; CM). It takes about a week for the water to flow to these farmers from the Thornlea Dam (CM).

Water Quality

There are few problems of water quality on the upper Mlazi River. The water quality shown by the biomonitoring studies is good (EO). The in-stream habitat is natural and is aided by the removal of alien, invasive vegetation from the banks (EO), which is undertaken by the Working for Water Program (WfW). The UIB has facilitated the introduction of the program, which is actually funded by the DWAF. The Hopewell and Entembeni communities take an active part in the weed clearing exercises, since it provides a much-needed source of employment. In the coming budget year (May 2003) the WfW program has a budget of ZAR 1.5 million, targeting the upper reaches of the Mlazi River (EO).

Agricultural operations such as the use of pesticides and fertilizers are likely to impact on the water quality in the Baynesfield Dam, which is of importance since people from the Hopewell community drink untreated water from the Dam.

No industry exists upstream of the Baynesfield Dam but there is an industrial bacon factory downstream of the dam. There are continuous chemical and biomonitoring studies below the bacon factory to detect any pollution that may occur.

At the Mapstone Dam, water quality is likely to be impacted by farming operations such as the return flow of water with fertilizers and pesticides, and urban runoffs from the Hopewell area (EO).

There was once an accidental discharge of piggery waste into the river and this resulted in the proliferation of blue-green algae. This endangered the lives of stock that drank directly from the river and some other pigs located downstream died, probably due to the consumption of the polluted water (BEF).

The UIB has appointed an Environmental Officer to monitor water quality in the Mlazi river catchment, among other tasks. The Environmental Officer publishes a newspaper called *The Upper Mlazi Newsletter*, which contains news about initiatives in the catchment and is distributed to members of the IB and interested stakeholders (EO).

The biomonitoring is part of the local River Health Program.. The first River Health Program was funded by the DWAF in Mpumalanga and such programs have now spread to the whole of South Africa. Currently, the local program is championed by the Umgeni Water Board and each participant has its own funding: the DWAF, the Department of Environmental Affairs, KwaZulu-Natal Wild Life, and the UIB (EO). The Umgeni Water Board also hosts the website (www.umgeni.co.za). The participants meet every quarter to exchange notes and information. Water samples are regularly collected for biomonitoring. The method is based on the analysis of invertebrates in the water and is much cheaper and quicker than a classic chemical analysis. The fecal coliform counts are generally about 200 to 400 cfu/100 ml and the water is suitable for recreational purposes.

In the past, the biomonitoring experts used to have a very good relationship with the DWAF—whenever they found any trace of pollution, the DWAF would take action to prosecute the responsible party. However, probably due to the problem of understaffing, the DWAF's current response to pollution incidents is slow (EO).

Environment. The growth of weeds (water hyacinth) has a significant impact on river health and reduces the benefits that people may obtain from a healthy river ecosystem. In the Thornlea Dam, the water hyacinth has been brought under control biologically and mechanically. The biological control measures include the use of the plant's natural enemies (Water Research Commission 2002).

Sand mining companies used to extract sand from the riverbed for construction purposes and most of them have stopped the practice, but some companies continue the practice of sand extraction downstream of the Mapstone and Thornlea Dams.

Erosion. The upper reaches of the Mlazi River area are naturally prone to erosion because of steep slopes upstream and the occurrence of flash floods, and soil erosion contributes to the siltation of dams downstream. Opinions differ as to whether the erosion problem is an old one or not (CM). On the one hand, some people think that the river water has always been brown

(besides, ‘Mlazi’ means ‘a brown-whey color’ in Zulu); on the other hand, other people argue that erosion is a recent phenomenon caused by human activity.

For the Entembeni community, the erosion problems are fourfold. First, there is overgrazing; second, the community still uses burning as a land clearing method; third, the cattle paths create gullies (*dongas*); finally, the roads leading to the village are poorly constructed, which leads to erosion. In the past, there was no control of the cattle, so they grazed on the fragile riverbanks and destroyed the young trees. With regard to the overgrazing issue, the forestry company, Mondi, made available some open spaces within the plantation as cattle grazing areas (MW) and a herdsman has been hired to rotate the livestock through them. The UIB facilitated the dialogue between the community and Mondi Forests.

Commercial forestry logging activities have an impact on soil erosion and degradation because the contractors have an incentive to cut as many trees as possible in a given period of time (EO). The Environment Officers of the forestry companies do not always thoroughly monitor the activities of the contractors during logging operations, and so some contractors cut down all the trees on large, steeply sloping areas of land, leaving them barren. A recent research conducted by students from the Netherlands is said to have diagnosed the design of logging roads as another major contributor to soil erosion (EO).

Health. In one situation, the water bailiff had warned a small-scale commercial farmer not to use the river water because of poor quality due to high levels of blue green algae, flowing downstream (EO). But nobody had warned the water users based in Hopewell (SCF3).

The Hopewell area is prone to incidence of bilharzia, scabies, dysentery, acute and moderate forms of diarrhea, and problems of personal hygiene (MCS). Common diarrhea and dysentery are waterborne diseases associated with the drinking of unsafe water (Ndolo et al. 2002). Scabies occurs in situations where there is a great shortage of water and people opt not to take a thorough bath every day or for some days (Ndolo et al. 2002).

Bilharzia (*schistosomiasis*) is also a water-based disease whereby people are infected through coming into contact with contaminated water, for example, by wading, bathing, or washing. The spread and transmission of schistosomes eggs occur when infected people defecate or urinate into fresh water bodies. This is usually a symptom of poor or non-existing water sanitation facilities. The eggs reach the rivers or lakes where they hatch and the parasitic larvae grow and develop into certain types of snails. Later the parasites leave the snails to contaminate the water (Healthlink 2003).

The cases of dysentery, diarrhea, bilharzia, and scabies are associated with areas that experience water shortages and poor water sanitation facilities. These factors are prevalent in Hopewell, where some of the residents cannot access Umgeni water so they use water from either the Mapstone Dam or the Mlazi River.

The Richmond municipality has just taken over the health functions of Hopewell and has one environmental health officer covering the whole municipality. A mobile clinic visits three centers, namely Hopewell, Baynesfield Estates, and Givers farm on a monthly basis. For the months of March and April 2003, 51 cases of scabies, 14 cases of diarrhea/dysentery and 2 cases of bilharzia were recorded from the Mlazi river catchment (excluding Entembeni). The majority of scabies cases originated from Hopewell.

The Umlaas Irrigation Board

The UIB is small, with no formal administrative offices. The chairman, the secretary, the water bailiff, and the environmental officer use their homes as offices.

Management

The UIB controls the use of water for irrigation by its registered members. It only monitors the water abstraction of its members strictly in periods of drought. A water bailiff has been appointed on a permanent basis to record the actual water used or abstracted through the electricity consumed by the electric pump (CM). During the dry season (April to September/October), water restriction can be at a level of 25 millimeters per week per hectare. The expenditure incurred by the UIB in water measurements, staff time and maintenance of the irrigation pumps was estimated at ZAR 60,000 to ZAR 70,000 a year (CM).

Water restrictions are necessary during a drought and it is reckoned that this happens approximately once in 10 years. The last time there were water restrictions was in 1993, when the irrigation farmers were restricted to 1.5 millimeters per hectare per week (SE). If a violator was caught, he was given a warning. If violation continued, his entitlement to irrigation water was stopped for a certain period.

Individual irrigators pump water direct from the river. To determine the quantity of water pumped, the electric pump is calibrated against the consumption of electricity and the water bailiff records the water pumped by measuring the electricity consumed. However, this system is not accurate because the relationship between water flow and electricity consumption is calculated for a given pump and does not take into account the height the water is lifted by the pump. The UIB has purchased a single water flow meter in order to be able to improve the relationship between electricity consumption and the quantity of water used (CM).

The current UIB area of jurisdiction represents approximately half of the Mlazi catchment. Once the WUA is operating, its area of jurisdiction will increase to encompass the whole upper part of the catchment, and especially other tributaries such as the Camperdown and Mkhuzane Rivers.

Trade in Water Allocations

If a particular farmer does not use all his scheduled irrigable land, he informs the irrigation board and the secretary of the irrigation board records this information. Then, if another farmer needs to expand his scheduled irrigable land, he can be put in touch with a potential seller. The two farmers then communicate and conclude a deal. The irrigation board does not know the amounts, as this is a private deal between the two people (CM).

Payment of Water Charges

The irrigation farmer pays two charges, the water rate and the water resource management fee. The water rate is currently ZAR 165 per hectare per annum for 2003. It is related to costs incurred in the management of the UIB and the construction of the water storage dams. The water resource management fee amounts to ZAR 0.0083/m^3 for the Mvoti to Umzimkulu water management area (WMA), which includes the Mlazi river catchment. By comparison, in the

Tugela WMA, the fee is ZAR 0.0043/m^3 and, for the Usutu to Mhlatuze WMA, the fee is ZAR 0.0032/m^3. The fee is based on the current DWAF Regional Office budget (DD) and the DWAF spends more time administering the Mvoti to Umzimkulu WMA than the Tugela WMA or the Usutu to Mhlatuze WMA (CM).

The Working for Water Program

The UIB has no direct link with or control over the Working for Water Program (WfW). However, having recognized the value of this program to the water resources in the catchment, it has done all it could to cooperate with the running of the program and to encourage support among irrigators in its district. The UIB facilitated the introduction of the program to the catchment, and its success is evidenced by the enthusiasm and vigor with which many irrigators have, at their own expense, tackled the problems of alien, invasive vegetation on their properties (CM).

Membership of other Boards

The Umlaas Irrigation Board belongs to the Association of Irrigation Boards of KwaZulu-Natal. The chairman of the UIB also chairs this association. Its main function is to exchange information and ideas among the various irrigation boards in KwaZulu-Natal, but the association has become less active in recent times (SE).

The Transformation of the UIB into a WUA

KwaZulu-Natal has 35 irrigation boards that were supposed to be transformed into WUAs within 6 months of the promulgation of the *National Water Act* (Act 36 of 1998). Only three WUAs were created within the time given which was the 6 months plus extension (DD).

There was a careful review of the Schedule 5 of the NWA[10] and, based on this, a draft WUA constitution was drawn up and circulated to other members in the Association of KwaZulu-Natal Irrigation Boards for their guidance (CM).

The UIB has sent proposals for transformation into a WUA to the DWAF but these proposals were turned down because of the lack of public participation in the draft of the constitution and the lack of changes. Another reason is the reluctance of the Minister to approve proposals that come only from commercial farmers, without including HDIs (DD).

The comments from the DWAF Head Office (HO) on the UIB's proposed constitution mainly addressed the issues of gender and farm-worker participation in the Management Committee (MC). The initial proposal to the DWAF for the MC was nine rate-paying commercial farmers, two farm workers, two associate members, and two community representatives. Associate members are stakeholders who do not have formal water rights and thus will not have to pay a WUA fee (e.g., environmental representative). However, the DWAF has proposed an increase to three farm workers, three associate members, three community representatives, and two representatives from the local government authorities (CM). Hence, DWAF required at least an equal number of paying and the non-paying users in the management committee (CM).

[10]National Water Act (Act 36 of 1998), sections 91(1)(f), 93(1) and 94(4).

The UIB would prefer to have the control of the MC remain in the hands of people who pay for water, rather than people whose interests are, by comparison, relatively peripheral. The chairman of the UIB fears that the arrival of non-paying members, who could get the majority, could lead to irrelevant decisions. For instance, these members could ask for their transport costs to be paid (however, he agrees that the UIB should pay the transportation costs of HDIs). His fears were reinforced by similar problems at a recent Upper Baynesfield catchment forum meeting (CM). However, the UIB is ready to accept the DWAF's stipulations about membership of the MC, if needed (CM).

The Subcommittees

The UIB was instrumental in establishing four subcommittees in 1998: two upstream of the road to Richmond (they have now combined into one subcommittee called the Upper Baynesfield Committee), one in the Tala Valley, and one in the downstream part of the UIB jurisdiction area—the Killarney valley. The first subcommittee is very active; the second is less active; and the last is 'on and off' (EO). The Ntshongweni Catchment Management Program (NCMP) used to play an active role in running the Upper Baynesfield Committee and, to a lesser extent, the Killarney Valley committee, but the UIB was the motivating force (CM).

The NCMP and its successor, the Mlazi River Catchment Program, were run by the Farmers' Support Group attached to the University of Natal, and funded by the Water Research Commission, which terminated the program when it considered that the task was complete (CM). Initially the NCMP operated outside the jurisdiction of the UIB and only changed its name when its work expanded beyond the Ntshongweni area. Neither the UIB nor the WUA will have the right to revive any committee operating outside its jurisdiction (CM). During the establishment of the committees, everybody was careful to make sure that the HDI representatives were reporting back to their communities. There has been a meaningful building of social capital[11] and one can build on this existing structure rather than start again from scratch.

Water and the Empowerment of HDIs

The largest group of HDIs is the Hopewell community, followed by the Entembeni community, the land claimants around Baynesfield Estates, and the small-scale farmers around Hopewell and Camperdown.

HDIs' Needs

The first priority is to determine exactly what the needs of the HDIs are and whether these needs can be met by the WUA, bearing in mind what the functions of the WUA are.

Needs of Rural Communities. The needs of the Entembeni community garden members are: land, market access, water, and collective management. At present the members have sufficient

[11]Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. Social capital is not just the sum of the institutions, which underpin a society— it is the glue that holds them together (World Bank 1999).

water for their gardening, but they need more land in order to expand their gardens and improve their incomes, and the increase in land-size would require an increase in the quantity of water for irrigation. The community garden is a source of income as well as an important asset regarding food security so the other need is market access—the members sell their produce within the community at low prices in comparison to prices in the Pietermaritzburg town.

The Hopewell community consists of a mixture of urban and rural lifestyle. The needs of the community are similar to those of the Entembeni community. In both communities, there are livestock owners (cattle, goats, and horses in Entembeni). These owners do not want to sell the cattle and would rather look for more grazing land.

Needs of Emerging Farmers. The HDI community comprises of emerging farmers around Hopewell (Trust farmers and rural farmers) and the community gardens located in Entembeni. Table 3 is an assessment of HDI needs regarding farming in the study area. One member of each of the HDI communities was chosen at random and then asked to rank their problems on a scale of 1 to 7, with 7 = highest priority, and 1 = least priority. In this list of seven items, 'extension' refers to the need for more capacity building regarding farming activities; 'low margins' refers to the need for increased margins per hectare; 'collective management' refers to problems that the group of farmers experience in organizing themselves to farm together; and 'water needs' regroups the general problems related to water.

Table 3. Assessment of HDIs' general farming problems.

	Entembeni Community Gardens	Hopewell Trust Farmers	Hopewell Small Farmers
Land tenure security, credit access	7	7	7
Market access	7	7	7
Extension	5	5	7
Low margins	5	1	7
Water needs	7	7	7
Collective management	7	2	1
Need more land	7	7	1

Rank : 7=first priority, 1=least priority

Land tenure security was rated as a priority among the HDIs because, without it, they are unable to access credit facilities in order to acquire agricultural inputs or develop their farming operations. Some of the emerging farmers do not own the land they are currently farming. Instead, they rent it. Market access also came in as an important priority among the HDIs. The need for more land was another priority.

One of the small-scale commercial farmers had a different view on black empowerment (SCF1). The farmer said that there was a misconception that people in the rural areas want to be subsistence farmers. This approach creates poverty pockets. For example, at the Hopewell farm, the Department of Social Welfare gathered about ten women and gave them 500 chickens to rear. The gross margin was over ZAR 1,150 but the security guard was given about ZAR 500 and the ten women had to share ZAR 500. The farmer's suggestion was to move away from this approach and instead empower black people by assisting them to be economically viable. The farmer gave the example of Rainbow Chickens, a company that contracts with members of the community to raise chickens. The requirements are just a house to keep the chickens in and associated warming infrastructure—Rainbow supplies the chickens.

Needs of Farm Workers. The person interviewed from the DWAF Regional Office was of the opinion that the main reason to get farm workers on board the WUA was in order to address situations where a commercial farmer had allocated pieces of land to some of his workers so that they could start farming (DD). In such situations, farm workers are de facto farmers who have a stake in the management of the river. However, there are currently no farm workers who farm on their own. The farm workers who live on the commercial farms get their water for domestic uses and their sanitation equipment from their employer (LCF; SCF). Therefore, the farm workers do not have any water needs that have to be met by the WUA and currently have no direct stake in water resource management issues, since they use water from boreholes and they do not farm on their own. Other farm workers live in the Entembeni and Hopewell areas and they commute daily to work (TA, WCf). Few farm workers belong to a union (LCF, SCF).

The farm-worker community has no internal organization so it would be difficult for them to elect someone to represent them on the MC. Where they belong to a union, perhaps the farm workers could be represented by their union. However, few farm workers belong to a union (CLSF, SCF1).

HDIs' Water-related Needs. The following table presents the needs of farmers with regard to water (nonfarming users were not interviewed). In this table, 'water quantity entitled' means that farmers receive the amount of water they are entitled to, whereas 'water quality entitled' means that the quality of the water farmers get corresponds to what they are entitled to.

Table 4. Assessment of HDIs' water needs

	Entembeni Community Gardens	Hopewell Trust Farmers	Hopewell Small Farmers
Funds for infrastructure	7	7	7
Funds to pay for water distribution	1	7	7
Water licences	1	2	7
Daily management	2	5	1
Water quantity entitled	1	2	1
Water quality entitled	1	2	1

Rank : 7=first priority, 1=least priority

Funds for new infrastructure are of high priority with regard to water needs. The emerging farmer is constrained because the pumping infrastructure is old or has been stolen (as the case with EFs located at Camperdown); the pumps simply do not exist in the case with Hopewell trust farmers. According to the HDIs interviewed, there is enough water, either in the river or coming from the wetland.

Overlap between HDI Needs and UIB Functions

On the whole, the HDIs' needs and the UIB's functions do not overlap much.

1. Funds for infrastructure. The provision of pumping infrastructure is not a UIB function (CM).
2. The provision of funds to pay for water distribution is not a principal function of the UIB (the UIB might do it, but not compulsorily).
3. The allocation of water licenses is a DWAF responsibility.
4. Daily management is part of the UIB functions.
5. Water quantity entitled is also part of the UIB functions.
6. The management of water quality is not directly a responsibility of the UIB. The UIB monitors water quality in the river but only judges that the water is meant for farming use and is not meant to be used directly for domestic purposes.

The delivery of potable water is not a WUA function (CM). If HDIs have other needs (not necessarily linked to water), the most a WUA can do is to act as facilitator by bringing bodies or authorities that may be able to assist in meeting such needs into contact with HDIs (CM). It is essential to remember that WUAs will, in the long term, remain self-funded and will not have the financial resources to provide infrastructure or equipment to needy HDIs (CM).

One exception is the Hopewell community, who use water from the Mapstone Dam. This water is now less suitable for drinking purposes because of upstream farming. Hence there is a problem with defining the 'normal' quality of the river. If the Hopewell community is entitled to receive water of the same potable quality as in the past, then the commercial farmers must compensate them so that the community can freely access water of suitable quality from elsewhere. If it is declared that the 'normal' state of the river is one for irrigation use, then the problem of Hopewell's drinking water is not part of the Umlaas IB responsibilities.

However, there are several issues linking the environment management championed by the UIB and the employment potentials for the communities upstream, as explained below.

UIB Functions and Initiatives. The main function of the UIB is to control the use of water for irrigation by irrigators who enjoy existing water rights. To ensure that the water is available and there is no siltation of UIB waterworks because of erosion upstream, the UIB has to interact with the communities upstream. It employs an environmental officer to raise awareness in the community and landowners of proper land and water care activities. A proof of the importance of environmental management to the UIB is that the budget allocated to this program is approximately ZAR 120,000 per annum.

The UIB has undertaken a number of other initiatives aimed at enhancing its cooperation with the upstream communities. These initiatives are resolving cattle grazing conflicts, land rehabilitation exercises, WfW programs and the Landcare program.

The WfW program is another area of overlap between UIB and community interests. The UIB is keen to have the headwaters cleared of alien, invasive vegetation. At the same time, the community is aware that the program creates jobs and is keen to have uninterrupted alien invasive vegetation clearing exercises.

Other programs that are beneficial to the community and at the same time are potential sources of employment are rainwater harvesting and the Landcare program. In 2003, the Rainwater Harvesting was a new program that had been approved for funding by the Water Research Commission (SCF2), to take place in the Hopewell area. The Landcare program was approved for funding by the Department of Agriculture and the UIB facilitated its introduction to the Entembeni area. The Landcare program intends to tackle erosion issues and introduce proper agricultural practices that do not damage the environment (EO).

According to the chairman of the UIB, water management organizations (CMA, WUA) play a rural development role and hence, the money should not only come from the water users, but also from the National Treasury (CM).

Participation of HDIs in the Transformation Process

According to the UIB, an awareness campaign regarding the transformation of the UIB into a WUA was carried out and concluded before the UIB submitted its proposal, made up of the draft constitution and the supporting documents, to the DWAF HO in February 2000 (CM). Since that time, the transformation process has consisted solely in dealing with queries from the DWAF HO (CM). We can, therefore, only report on HDI participation in the awareness campaign and consultations about the draft constitution, etc.

Entembeni Community. The community took part in the consultation process through their representatives for the Upper Baynesfield catchment forum (CM). The forum has been successful in maintaining dialogue with the upstream communities. However, the persons interviewed from this community were not aware of the new NWA and the process of transformation of the UIB into a WUA. It may be that their former representatives of the forum did not inform them (CM).

Hopewell Community. Hopewell was not initially considered as a water user because the UIB assumed that the community, as an urban set-up, was supplied with their drinking water by Umgeni Water (CM).

In 1999, the UIB tried to get the Hopewell community to attend the transformation meetings and the catchment forum (CM). However, it was not possible to choose a representative of the community due to an ongoing conflict between the residents and the landowners. No attempt of getting them on board was made after that. The current Hopewell ward councilor was not aware that the UIB was in process of transformation.

Gender Representation. The current guidelines require that, if no woman is elected through the normal process, a list of nominees is to be compiled and the chairperson of the WUA has to organize a meeting where a female representative will be chosen by drawing lots (DWAF 1999a). The UIB suggested another mechanism, where the nominees are proposed at the general meeting and elected after the proposers have had the opportunity of furnishing the meeting with details of the credentials and competence of their respective nominees. To date, the DWAF HO has rejected this proposal (CM).

Founding Members. The obligation to transform was imposed on the UIB by the NWA. One of the reasons for the DWAF refusal of UIB proposals is that there was no HDI water user among

the founding members. The UIB has enjoyed a cordial relationship with the Entembeni upstream community but, because of the absence of an elected ward councilor, the UIB did not incorporate them as founding members (CM). According to the chairman of the UIB, nothing in the NWA suggests that the UIB should have sought outsiders with no knowledge of the UIB or the NWA to act as founding members. In addition, the function of the founding members is limited to conveying and holding the first general meeting of the WUA for the election of the management committee and the incorporation of other water users (CM).

Integrated Water Resource Management

Forestry

The forestry sector is reluctant to join the proposed WUA as they feel they may have to pay the WUA fee in addition to the water resource management fee they pay to the DWAF[12] (NC; MW). The UIB is prepared to welcome the forestry sector as rate-paying members but not as associate members of the management committee (CM). According to the chairman of the UIB, if the forestry companies become members of the WUA, they will have to pay fees as contribution towards administrative costs, plus a share of the cost of construction of a dam that has been found necessary because of the impact of forestry's water consumption (CM).

It is not compulsory for the forestry sector to join a WUA. However, in order to manage the water resources efficiently, all the water users must be part of a water management organization, preferably at a localized level, like a WUA. It would therefore make sense for the forestry sector to be a member of the WUA.

Municipalities

In February 2000, at the time the WUA proposal was first submitted, there were no formalized local authorities exercising jurisdiction in any part of the irrigation district (CM). Now there are three local municipalities in the area of jurisdiction of the UIB, namely Richmond, Camperdown, and Msunduzi. Moreover, these three local municipalities fall under the uMgungundlovu District Municipality and, according to the chairman of the UIB, this may pose problems in the selection of a local authority representative (CM).

The municipalities are supposed to set up a Water Development Plan, which is restricted to drinking water, as part of their Integrated Development Plans (IDPs). The chairman of the UIB thinks that this plan should also cover water resources development. The Richmond municipality is interested in joining the proposed WUA (MA). For the Msunduzi municipality, it is not a priority because it already supplies the 6,000 liters of basic free water to the Entembeni community.

The management committee (MC) should only comprise of people interested in the water resource management. Trying to force people who are not interested to get on board will only render the management of the MC more difficult, especially in terms of gathering the needed quorum to take decisions (DD). In particular, the municipalities that are not interested in water resource management should not be forced to send representatives to the MC, although they should be incorporated as water users.

[12] *Water resource management charges: Foresters understanding what you pay for*. (DWAF brochure 2003).

The Upper Baynesfield Catchment Forum

The forum consists of the following stakeholders: the environmental officer, who serves as the secretary, some representatives from the Entembeni and Willowfontein communities, and representatives from Mondi Forests. The Willowfontein community is not part of the Mlazi river catchment but they are invited to participate in the forum meetings, because their cattle have an impact on the upper reaches of the Mlazi River catchment (EO). The purpose of the forum is to discuss developmental issues, as well as being a conflict resolution forum.

Languages Used in Forum. The forum meetings are conducted in both English and Zulu. The participants can communicate in the language they are more comfortable with. The secretary compiles and distributes English minutes to the forum participants. The English minutes are later translated into Zulu. The major problem is the lack of report-back to the communities (MW). Moreover, at the forum meetings, there is always a new Willowfontein representative and this makes the reporting back even more difficult (EO).

Following are two recent programs discussed at the Catchment forum meetings.

The Working for Water Program (WfW). The implementing agent for the program in the Mlazi River catchment is the Umgeni Water Board, from the beginning of June 2003. Umgeni Water will continue with its current contracts and responsibilities and the DWAF will be responsible for policy formulation and monitoring the program (IFM).

Mondi Forests and the Rural Communities. Previously there used to be conflicts between Mondi Forests and the upstream communities, Entembeni and Tafuleni, because of the damage caused to trees by cattle, arson, and theft of timber. Cattle that strayed into the Mondi forests in search of grazing were impounded and the owners had to pay a fee to retrieve them. This situation has been resolved with the community by allowing the cattle to graze in the open spaces between plantations, while a herdsman, trained by Mondi in proper cattle management, will accompany the cattle.

Mondi Forests are currently exploring the feasibility of linking the community to some cattle market to give them the opportunity to sell their cattle at a good price (MW), because the present cattle numbers are large compared to the size of the grazing pastures and the current situation is not sustainable.

Baynesfield Estates have promoted the idea of a craft center where craftsmen and women will have a steady market for their craftwork. Baynesfield Estates have made available a house to serve as the craft center, with renovations paid for by Mondi. Baynesfield Reserve, which is a private company that operates a camp with lodges for tourists. They lease the camping site from Baynesfield Estates and have offered to locate the camp reception office in the craft center and to provide the personnel to man the center. This would provide a unique opportunity for the community craft products to be exposed to the tourists and visitors, as the tourists would make bookings and payment of permits through the craft center. Many tourists, both local and foreign, come to visit the reserve every year.

The craftsmen and women harvest the reed materials from Mondi Forests wetlands in a sustainable manner without causing environmental damage, as only a limited number of people are permitted to be engaged in this area of work.

Another issue that has been raised at the forum is the problem of cattle coming from the Willowfontein community, without herdsmen, hence the need to engage this community in the

forum. In future, the Willowfontein community will probably have their own forum, spearheaded by the NCT, whose lands are close to the Willowfontein grazing pastures (EO).

Link with the Catchment Management Agency

The Mvoti to Umzimkulu Catchment Management Agency (CMA) proposal was finalized in November 2002, but there is still no decision by the DWAF HO regarding its Catchment Management Committees (CMCs), four of which were suggested in the CMA proposal (CM). There is already one for Umgeni; there will also be North, Central and South committees. One of the major drawbacks of the CMA process was the lack of community participation (CM). The Mvoti to Umzimkulu is an especially difficult area because it is made-up of 200 small catchments. In most of these catchments, the headwaters belong to some rural community, and it is very difficult to identify somebody to represent them because there is no formal organization among them; the Tribal Authorities are only recognized by some, not all. The councilors could be seen as representatives, but they are often not interested. According to the chairman of the UIB, their disinterest is a mistake because water is really an important issue for these communities (CM).

The UIB is at present carrying out some functions of a CMA in the Mlazi river catchment and is of the opinion that it should obtain rebates on its catchment management fees (EO). While the DWAF RO agrees in principle, it cannot say when this may be achieved (DD).

Conclusion

The case study analyzed the transformation process of the present UIB into a WUA that will involve both large and small-scale users. The transformation aims at opening the management of water resources to other farming and nonfarming stakeholders.

The Mlazi river catchment does not currently experience a deficit of water resources but this situation is not likely to last. The definition of the Ecological Reserve is currently not fully decided but it is likely to have an impact on the adequacy of the water resources. The emerging farmers are likely to increase their farming operation in the event land is made available and would then require more water for their irrigation. Their needs relate mainly to the access of water through the water licenses and irrigation infrastructure. The rural communities, at present, have sufficient water but of a quality that is likely to impair their health.

Compared to other irrigation boards, the UIB is really active in terms of the management of environmental issues, having had a full-time environment officer in charge for the past 7 years. There is also currently an active discussion between large and small-scale users. Through the Upper Mlazi catchment forum, cooperation is initiated between the upstream communities and both the commercial farmers and the forestry companies. This successful cooperation originates mainly from the fact that the upstream community activities can have an impact on the other large-scale users—erosion can lead to the siltation of the dams built by the commercial farmers, and the cattle may harm the forestry plantations. Some general solutions have been found for these problems. The upstream community will work on erosion problems and will receive some employment in exchange through the Working for Water program, and the forestry will lend some fields for grazing under certain conditions and allow for the harvesting of reed materials from its wetlands.

With regard to the consultation process, a discussion took place through the Upper Mlazi Catchment Forum. The forestry companies were not formally associated with the process because their future position within the WUA remains unclear. The upstream communities were informed about the WUA, but are not formal founding members, mainly because of their lack of internal organization. The Hopewell community was not part of the public participation process.

The issue of the internal organization of the HDI communities needs to be tackled. At present there is no clear policy as to who is responsible for their internal organization and this includes financial responsibility.

In rural communities, there are traditional authority structures and local municipal authority structures in place. The municipalities, through elected ward councilors, would probably be better equipped to tackle the mandate for the internal organization of the rural communities.

With regard to farm workers, their union organization, if any, would be the ideal vehicle. The UIB may incorporate the elected leaders as members of the HDIs.

The unresolved issue of gender participation requires all interested parties to find a common solution and, if necessary, invite women's organizations to give their views and opinions. This is in the spirit of stakeholder participation as envisaged by the NWA.

The commercial farmers should not fear the empowerment of the HDIs as a necessarily zero-sum game (i.e., what one wins, another loses). There might be win-win solutions, and discussions at the WUA level between large-scale users and well informed small-scale users will probably be the most efficient tool to find these win-win possibilities. Moreover, the DWAF will delegate its powers of decision as soon as it feels that there is a level playing field for large and small-scale users.

The role that the UIB currently undertakes with regard to the local integrated water resources management is satisfactory but more can be expected by involving other nonfarming stakeholders. The UIB has committed financial resources to the IWRM by employing an environmental officer, who checks the water quality.

The Upper Baynesfield Catchment forum is a suitable platform for interested stakeholders to discuss conflict resolutions and development issues with the upstream stakeholders (Mondi Forests and Entembeni community). There is room to expand the forum to include other stakeholders, such as municipalities, downstream communities, and forestry. However, the future relationship between the forum and the management committee of the WUA is still to be designed.

The Komati and Lomati Irrigation Boards

The studied zone—called Nkomazi—encompasses the part of the Komati and Lomati catchments situated downstream of the Swaziland border.[13] In the Nkomazi area, two Irrigation Boards (IBs) manage water allocation. They had not been transformed into WUAs by August 2003.

This case study was done between July and September 2002, with a follow-up in August-September 2003. Two other studies were recently completed on the Inkomati basin, regarding the process of creating the CMA (Waalewijn 2002; Anderson 2002). The data gathered comes from various DWAF reports and attendance at three meetings of the Governing Board of the Lomati IB. The different stakeholders interviewed are presented in table 5. The reference codes given in this table will hereafter be placed in brackets and used at the end of a relevant sentence to signify that a specific stakeholder is the source of information.

The first two sections of the case study describe briefly the methodology used and the Inkomati catchment area. The next section depicts the different water issues that call for integrated management in the Nkomazi region, and provides some ideas of what could be the role of the WUA in addressing these issues. The following section provides the same analysis for the goal of uplifting the HDIs. Some elements of the current relationship between the Irrigation Boards (IBs) and other organizations are presented in the last section.

Context

Brief Description of the Basin

The 2,400 km^2 of the zone studied is in the shape of a triangle, which is surrounded by Swaziland on the western side, by the Kruger National Park on the north, and by Mozambique on the east (figure 4). Under the previous dispensation, the area was shared between the Republic of South Africa in the northern part and the KaNgwane homeland in the south.

Waalewijn's study (2002) provides a description of the basin: the history, the current water resource, as well as the uses. This description will hence not be repeated in depth in this case study.

[13]In this text, Upper Komati describes the portion of the Komati River situated between the Swaziland border and the junction with the Lomati River. Lower Komati stands for the downstream part up to the Mozambique border. In reports dealing with the whole catchment, Upper Komati describes the part of the river upstream of the Swaziland border.

Table 5. Stakeholders interviewed in the Komati and Lomati IBs.

Stakeholders	Rererences	Number
DWAF Nelspruit	DP1, DP2, DP3, DP4, DP5	5
DWAF Driekoppies	DPD1	1
Mpumalanga Parks Board	MPB1	1
Mpumalanga Development Corporation	MDC1, MDC2	2
Mpumalanga DoA	MDoA1	1
Department of Labour	DoL1	1
Lomati Irrigation Board		
Large-scale farmers	LIBCF1, LIBCF2. LIBCF3	3
Engineer	LIBE1	1
Small-scale farmers	LIBE1, LIBE2, LIBE3, plus 6 farmers from the Mfumfane irrigation scheme	9
Komati Irrigation Board		
Large-scale farmers	KRIBCF1	1
Small-scale farmers	KRIBER1 to 3, plus 5 farmers from the Ngogolo scheme	8
Engineer	KRIBE1	1
Komati River		
Small-scale farmers pumping diectly from the river	SSF1 and 2	2
Mpumalang African Farmer Union (MAFU)	MAFU1, MAFU2, MAFR3	3
Nkomazi Municipality	NKO1	1
Schedule 1 water user	SCH1	1
TSB	TSB1	1
Consultant	C1	1
Total		43

DWAF (2002) summarizes the main figures regarding the hydrology of the basin. Two dams have been recently built. The first is the Matsamo (or Driekoppies) Dam on the Lomati River, which became operational in 1998 and has a capacity of 237 MCM. The second dam is the Maguga Dam, built on the Komati River in Swaziland, which became operational in 2003 and has a capacity of 332 MCM. Besides these dams, several weirs have been built in the Lower Komati.

In the Nkomazi region, the water uses are basically for irrigation purposes (222 million m^3), drinking water (11 million m^3), and forestry (12 million m^3) (see DWAF 2001, 2002). The National Water Resource Strategy (NWRS) assesses a current negative balance of 39 MCM. This calculation does not take into account the Maguga Dam, which will increase the yield by 65 MCM (NWRS, DWAF 2002).

Water Uses

Irrigation. The economy of the area is based on irrigated agriculture, which consists mainly of sugarcane farming. Overall, at least 45,000 ha are cultivated, of which around 29,000 ha are irrigated. Table 6 lists the ratable areas in both IBs, which provide approximate values of the

surfaces under irrigation (the DWAF disagrees with the figures for the Lomati IB, cf. “Disagreement over Water Rights on the Lomati Side"). There are currently approximately 120 commercial farmers and 1,000 small-scale farmers in this area.[14]

Table 6. List of ratable areas (in ha).

		Subtotals	Totals
Komati	Commercial farmers	approx. 12,000	20,000
	Emerging farmers	approx. 8,000	
Lomati	Commercial farmers	9,209	11,775
	Engineering farmers	2,566	

The production of sugarcane was introduced in the former homeland in the early 90s. Ten years later, the overall picture of this small-scale irrigation is one of relative success. The first reason is a very strong organization of the whole sugarcane production channel; the mills crushing sugarcane undertook numerous initiatives to help the emerging farmers start their activities. Second, through a contract between the mill and the grower, each small-scale producer is able to sell his/her production at a more or less given price. Finally, sugarcane is a relatively easy crop to cultivate, and new farmers were soon able to obtain good harvests.

The commercial farmers pump directly from the river, while the emerging farmers manage several small-scale irrigation schemes. The two Irrigation Boards in charge of managing water are the Lomati IB (LIB) and the Komati IB (KRIB). They were created to control the amount of water pumped by the commercial farmers during periods of drought. In 1995-1996, both IBs’ areas of jurisdiction were broadened to encompass the small-scale growers.

Domestic and Industrial Use. A large part of the studied area belongs to the former KaNgwane homeland, which is densely populated by around 220,000 inhabitants (DWAF 2001). Several drinking water schemes bring water to the communities (table 7).

Table 7. Regional Potable Water Supply Schemes (from DWAF 2001).

Scheme name	Raw water source	Rural population supplied	Scheme capacity (*1000 m^3/d)	Water supply provider
Tonga	Komati river	93,000	18.50	DWAF
Driekoppies	Matsamo Dam	28,000	8.56	DWAF
Kmashlushwa	Lomati river	12,000	6.00	Nkomazi Municipality
Masibikela	Komati	37,000	5.20	Nkomazi Municipality
Mbuzini	Mbuzini Dam	16,000	1.94	Nkomazi Municipality

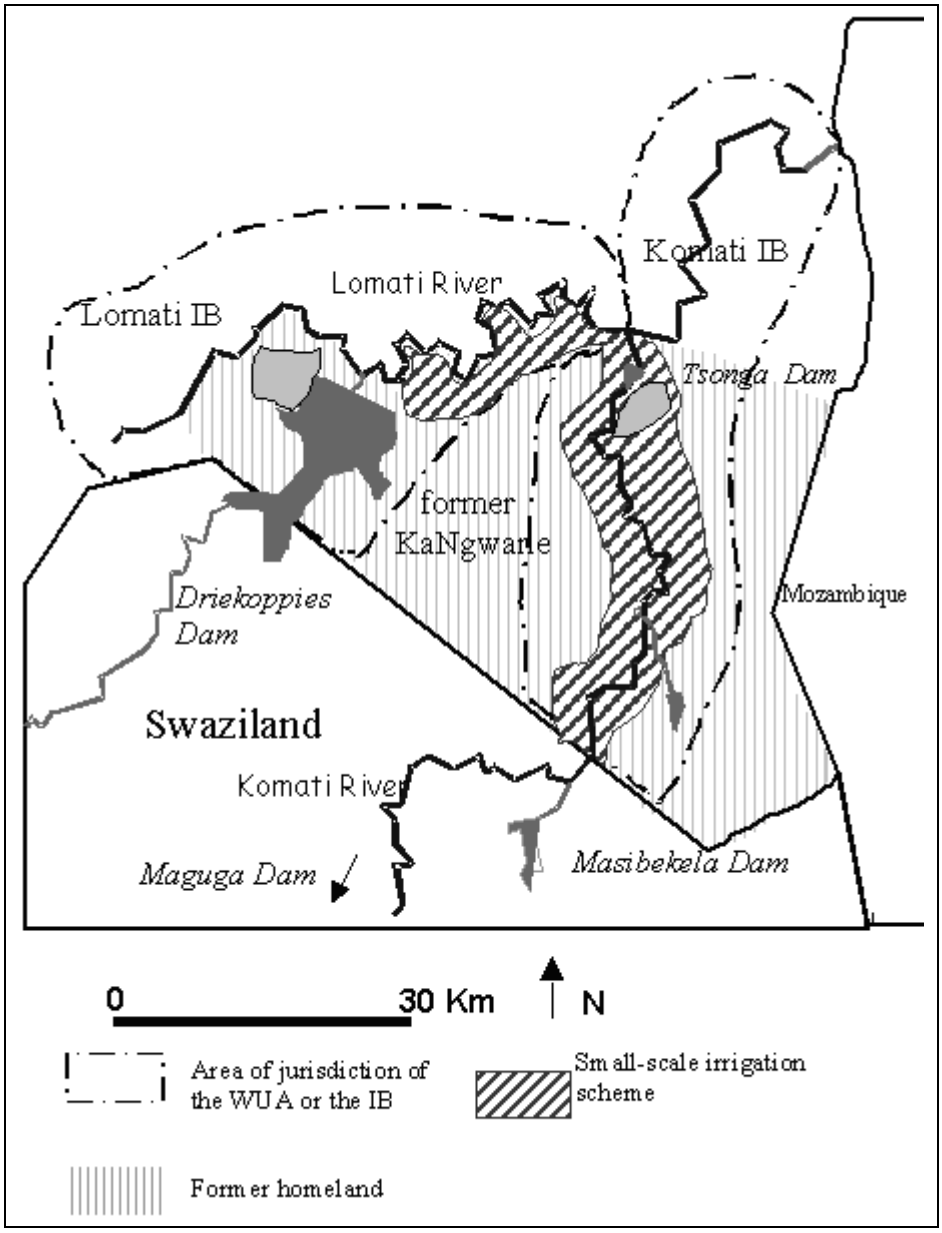
The local Nkomazi Municipality is the Water Service Authority. All the schemes will eventually be equipped with individual taps and meters but, for the moment, only the Kamshlushwa scheme has individual water taps and meters.

[14]See also DWAF (1999a) for a socioeconomic analysis of the Nkomazi region.

There are neither large towns nor water-consuming industries in the catchment.

Environmental Use. There is a game reserve in the studied area, situated between the IBs, outside their areas of jurisdiction. Some fishing is done from the river. In the downstream part of the river, the Inkomati Tiger Fish Action Group lobbies for the protection of fish on the Lower Komati River.

Figure 4. Schematic description of the Nkomazi region.



The Komati and Lomati IBs have sent proposals for their transformation into WUAs, both on the same pattern. These proposals were turned down by the DWAF because of a lack of public participation in the draft of the constitution and a lack of changes. New proposals were submitted at the beginning of 2002, but they had not been accepted by August 2003.

Integrated Water Resource Management

This section presents the needs for integrated management and opinions expressed by the stakeholders regarding these water issues.

Water Quantity

In the 1990s, several severe water shortages occurred in the region. Water availability is a constraint for development for both commercial farmers (CFs) and emerging farmers (EFs). Before the building of Matsamo Dam, there used to be tensions between EFs and CFs of the LIB, as well as among CFs during periods of drought (Waalewijn 2002). Since this dam has started operating, it has released water for both the LIB and the Lower Komati. There was almost no rain in early 2003 and the severity of the drought is estimated as being between 1 in 50 years and 1 in 100 years (LIBE1). Since the Maguga and Matsamo Dams were not full at the beginning of this period, the quotas for irrigation were severely reduced in April 2003.

In the Upper Komati, the emerging farmers interviewed look upstream to solve their current problem of water scarcity. They think that Swazi farmers take an unfair part of the water in the Komati River. They also believe that the Swazi farmers take part of the water that the KRIB farmers sometimes buy from the Vygeboom Dam in South Africa, upstream of Swaziland (KRIBEF1 and 3).

In the Lomati River and in the Lower Komati, the irrigation use never prevents the drinking water schemes from functioning correctly but, in the Upper Komati, there is a need to integrate irrigation and drinking water uses. In this part of the river, the Tonga Weir is used by the Tonga drinking water scheme to provide water to the surrounding villages (see figure 5). In periods of water scarcity, the small-scale irrigation schemes in Upper Komati sometimes have to stop irrigating so as to ensure that there will be enough water in the weir for the Tonga scheme pump to function correctly. The decisions to restrict irrigation upstream of the Tonga Weir are taken informally by the DWAF, the KRIB, and representatives of the district and local municipalities (NKO1). Moreover, there is a need to expand the drinking water schemes in the Upper Komati. It will be necessary to take into account the need for this high-priority demand in the management of the Maguga Dam.

Water Quality

There are few problems of water quality on the Lomati and Komati Rivers. There is no industry upstream and the flows in the rivers are usually large enough to dissolve the outflows of the rare sewage systems. A Water Resources Situation Assessment for the Inkomati Water Management Area (DWAF 1999) analyzed the mineralogical quality of the rivers. Seven measuring stations on the Lomati and its tributaries assessed the water, which appeared to be of good quality (total dissolved salts inferior to 260 mg/l). On the Komati River, there is only one properly functioning

measuring station, but, according to its assessment, the water is of satisfactory quality (total dissolved salts comprised between 260 and 600 mg/l). According to the same study, the fecal contamination risk of surface water is low in the Lomati, the Lower Komati, and the groundwater (data are missing for the Upper Komati).

According to the DWAF Operation Division, the main problem is the presence of mud and some bacteria during the rainy season. Both problems should be solved soon with direct pumping from the Matsamo Dam for the schemes on the Lomati River, and by the use of the Maguga Dam on the Komati River.

All farmers interviewed do not feel there is any problem with the quality of water. However, according to the Mpumalanga Parks Board (MPB), erosion has started to occur on the banks of both rivers which causes a certain amount of sand to be deposited in the rivers.

Environment

The productive uses of the water have created many changes in the recent past, which could lead to irreversible damage to an interesting ecosystem (MPB1).

First, the numerous weirs on the Lower Komati prevent the migration of fish, of which there is a high diversity in the area. A ladder for fish has been installed on only one of the weirs. Moreover, the flows in the downstream part of the river are often too low.

Second, many recent developments for irrigation—legal as well as illegal—harm the riparian vegetation and the wetland upstream of the Masibekela Dam. These developments will increase erosion and bring more sand into the river, which also damages the ecosystem (MPB1).

There is a general feeling that there is no environmental problem among the farmers (LIBCF1, KRIBCF1), but this opinion may also stem from a lack of knowledge.

Health

The place is prone to a high incidence of malaria (DWAF 1999) so there is a need to ensure that post-irrigation drainage is always sufficient to limit the risk of malaria. In 2001, 100 cases were reported in the Vukuzenzele, Masibekela, and Sibange villages (Lowveld Info 2003).

Moreover, there was an outbreak of cholera in the Tonga area in April 2003. Because of over-pumping by emerging farmers upstream, the drinking water scheme pumped less water than usual so some villagers broke a pipe in order to obtain water. The users downstream of this pipe (Block B of Tonga) did not get water and fetched it from the river (DPD1). The cholera probably came from hospital effluents and high levels of both animal and human waste in the water (Lowveld Info 2003). There were 200 cases in this outbreak, with four fatalities (DPD1).

Water Management

In the past, the IBs were mainly in charge of investing in small waterworks, e.g., the weirs in the Lower Komati, and monitoring water use in periods of low flow in the river. During normal flows, farmers could pump as much as they wanted but, in periods of drought, the IBs would allocate quotas, controlling the volume pumped by every farm.

In the former homeland, the KaNgwane government was in charge of the drinking water schemes.

Most of the time, the Matsamo Dam on the Lomati and the Maguga Dam on the Komati should ensure enough water for both the already existing farmers and the requirement of 1.1 m^3/s flow downstream at the junction with the Crocodile River.

The completion of these two dams opens the way to more active management of the two rivers. The Komati Basin Water Authority (KOBWA) is in charge of the dams, with the aim of satisfying the needs of the farmers while meeting the international and legal requirements of a tripartite agreement between South Africa, Mozambique, and Swaziland, and the forthcoming definition of an ecological reserve in South Africa.

The two IBs and KOBWA are currently initiating cooperation regarding water management. Every week, each commercial farmer sends records of his/her consumption of water during the past week, the water demand for the next week and an estimation of the demand for the week after to the respective IB. The emerging farmers do the same, but at the scheme level. The IBs collate this information and order a total amount from the KOBWA, which then releases enough water so as to make sure that the requirement at the downstream junction with the Crocodile River is met.[15] Moreover, with the weekly records of farmers' consumption, KOBWA will be able to refine their hydrologic model and estimate the accruals from the small tributaries along the rivers.

In normal years, farmers are allocated a quota of 8,500 m^3/ha in the LIB and 9,950 m^3/ha in the KRIB. Water meters installed in the LIB enable control of the quotas there. In the KRIB, only the Lower Komati was equipped with water meters in August 2003. The two systems are slightly different. In the LIB, the farmers receive a message each week on their cell phones indicating the amount of water they are entitled to. They schedule this amount into an electronic device attached to the water meter installed on the pump, which stops the flow once the quota is attained. Each week, each farmer also sends his/her water consumption details to the LIB office, which organizes some random checking.

The KRIB chose a more complex system, with a telemetric transmission of water consumption and an automatic cut-off system once the quota is attained.

In order to manage the 2003 drought, KOBWA organized a Water User Forum, with representatives of the LIB and the KRIB, as well as representatives of the Swazi schemes downstream from the Maguga Dam.

The DWAF published the general volumetric quotas per zone in the National Gazette on 18 July 2003 to manage the drought. In the LIB, this allocation led to a 35 percent availability of the quota for the CFs and 60 percent for the emerging farmers (LIB2). These figures amount to approximately 2 hours of irrigation per day for the CFs and 4 hours for the emerging farmers. In the KRIB, the allocations amounted to 20 percent availability for CFs and 35 percent for the EFs (KRIBE1). The rationale for this difference is primarily based on a past agreement between the former Republic of South Africa and the former KaNgwane homeland. Since this agreement, the emerging farmers have not fully developed according to the initial plans, while the CFs have over-developed their areas under irrigation (DWAF2).

[15]Due to the interactions with accruals, groundwater, etc., depending on the period of the year, the amount of water released may be more than or less than the sum of farmers' orders and the desired flow downstream.

Integration of Nonfarming Users into the WUAs

The Nkomazi municipality is a nonfarming user that has to be associated with the management of the WUA, first as a representative of the drinking water users, to solve issues like the management of the Tonga Weir, and second as the local government, since irrigated agriculture is the backbone of the economy in this region.

The MPB can bring useful expertise to the problem of implementing the ecological reserve. The reserve does not actually correspond to a given amount of water the whole year—the flows required for a sound ecological state of the river vary throughout the year. Moreover, in periods of drought, the MPB can help find ways to soften the impact on the ecosystem. For this reason also, it would be fruitful for the MPB to be a fully-fledged member of the Water User Forum in charge of discussing management strategies with KOBWA.

Many IBs in South Africa manage both a water distribution scheme and a dam upstream. In the Nkomazi region, the management of the major dams is the responsibility of the KOBWA and there is no water distribution scheme: all users withdraw water directly from the river. Therefore, the WUAs will have less responsibilities with regard to the technical side of water distribution and will be all the more focused on the role of sharing information, both top-down and bottom-up, and will constitute a central place for discussions among stakeholders.

In both proposals for transformation into WUAs, the main activity remains the management of water quantity, i.e., the maintenance of existing works (weirs), and the management of the water metering system.

Three categories of users are defined in both proposals. Category I users are users belonging to the existing IBs, i.e., the CFs as well as the EFs. Category II users are nonfarming users that have a water license for drinking water use and industries. Category III users are stakeholders with no specific water license, e.g., the DWAF or the CMA. Hence, the opening of the Board to other users is proposed through the definition of Category II and III users.

In the current proposals, the municipality is defined as a potential Category II user, while the MPB—which could be a Category III user—is not cited. There are three reasons for the nonintegration of these nonfarming users.

1. There is a significant lack of communication between the IB and the nonfarming users
2. The users that would have to be incorporated—for domestic water use and environmental use—are still in the process of organizing themselves
3. The co-management should be formalized

Communication between the IB and Nonfarming Users. First, the public participation organized for the setup of the WUA in March 1999 was very limited. The MPB and the Nkomazi Municipality were given less than 3 weeks to comment on the proposal.

The farmers' point of view is that since much discussion took place during the process of setting up the CMA, the MPB should know the people to contact if they want to come on board the WUA (LIBCF1). Moreover, according to a CF, the Nkomazi Municipality does not want to be a formal member of the WUA because they know that they will then have to pay for their water consumption (KRIBCF1). By contrast, the Nkomazi Municipality claims that the IB did not invite them (DP2), an opinion shared by the MPB (MPB1).

Organization of Users that have to be Incorporated. The local Nkomazi Municipality has been the Water Service Authority since 1 July 2003 but, for a while, some schemes were still run by the DWAF (cf. table 6). The transfer of the management of the Tonga and Driekoppies schemes from the DWAF to the municipality was still under discussion in August 2003. Moreover, no user pays for drinking water for the moment (with the exception of the Kamshlushwa scheme where a private company has been contracted out to manage the fees recovery). The current situation is one of transition—the Nkomazi Municipality is not yet fully in control of the drinking water management in the area, and the DWAF is still managing the Tonga scheme, which is the main reason for interaction between the drinking water users and the IBs.

According to the two proposed constitutions, the municipality is not part of the initial WUA but may join afterwards as a Category II user.

According to the Mpumalanga Parks Board, the organization of the few institutions which are representatives of the environment is inefficient. First, the MPB is in charge of assessing and protecting the biodiversity for the whole province. It has the field expertise but it does not have any regulatory power when it comes across an activity that damages the environment. Its acting capacity is also limited, with only two persons in charge of the in-field studies for the whole Mpumalanga province. Second, the Department of Environmental Affairs and Tourism, in charge of a more holistic approach, has some regulatory powers but does not have the expertise, and the communication between the two organizations is not satisfactory (MPB1).

Finally, in the Nkomazi region, only the Inkomati Tiger Fish Action Group NGO advocates the protection of the environment, whereas, on the Olifants River and the Sand River, a park or game reserve downstream has both an interest and some economic power to raise the issue of protecting the environment. In the Nkomazi region, the users are only productive users—there is a general lack of interest in the environment, and thus a lack of understanding of the current damages and risks.

Need to Formalize Co-management. Co-management of the area needs to be formalized because there is little cooperation and poor sharing of knowledge, responsibilities and powers at present. First, the CFs consider that there is no urgent need to incorporate the drinking water users in the WUA since the priority given to drinking water use does not give room for negotiation and because this use does not represent a large amount of water. Moreover, the different stakeholders on the ground consider the informal management at the Tonga weir efficient (KRIBCF1, NKO1). However, DWAF RO has had to intervene in the past and thinks that this is not its role any more. They believe that the Nkomazi Municipality should be a fully-fledged member so that this issue can be completely solved at the WUA level, without any input from the DWAF RO (DP2).

Second, there is still a lack of knowledge about the real importance of the different environmental issues, for example, farmers disagree with the MPB on the importance of the erosion process. This lack of a common viewpoint impedes perception of the necessity to have farmers and the MPB sitting together and solving problems at the local level.

Many commercial farmers on the Management Committee acknowledge that the proposals sent to the DWAF were about setting up an institution not very different from the previous IB (LIBCF1, LIBCF2, LIBCF3). They accept that the WUA should be a completely new organization, which can be joined by anybody—paying or nonpaying users—and whose membership is not compulsory. In their view, the functions of the WUA in managing the water

in the catchment will be delegated from DWAF or the CMA so the latter organizations should provide the needed funds.

Potential for Uplifting HDIs

Because sugarcane is grown there, the Nkomazi region has certain specific features regarding HDI empowerment. First, compared to many other places in South Africa, emerging farmers have the assurance that they can sell their products at a roughly given price. The economic sustainability of these small-scale units is guaranteed, provided there is sound management at farm and scheme levels.

Second, the local sugarcane mill, Transvaal Sugar Limited (TSB), has a direct stake in the success of these small-scale farmers, who account for 41 percent of the cane crushed at the mills (Waalewijn 2002). In the long term also, the involvement of small-scale growers will be a definite asset for the maintenance of the current system of subsidized sugar prices. Hence, the TSB is ready to take a role in providing extension, credit facilities, etc., to these small-scale growers.

In order to analyze the water issues that affect HDIs, it is possible to divide this community into four groups: (a) the drinking water users, (b) the farm workers, (c) the emerging farmers (i.e., the farmers who are part of a sugarcane irrigation scheme and hence have a water license), and (d) the upcoming farmers who are still waiting for a water license from the DWAF to start their farming projects.

Apart from the issue of formalizing the management of the Tonga Weir, there are no real opportunities for the WUA to be involved in uplifting the first group, i.e., the drinking water users.[16] According to an officer from the Department of Labour, many of the second group, i.e., farm workers, drink untreated water from the balance dams (DoL1). However, officially, they are supposed to receive all their domestic water needs from their CF employers. None of them farm on a small plot so they have no irrigation needs. The drinking water users and the farm workers are, therefore, not included in the IB or in the current proposals. The following analysis will concentrate on the two other categories: the emerging and the upcoming farmers.

Emerging Farmers

Emerging farmers' main issues are vulnerable revenues, water scarcity in the Upper Komati, irrigation efficiency, organization at the scheme level, and knowledge of water management issues.

Fragile Revenues. The overall image of the set of small-scale irrigation projects called Nkomazi Irrigation Expansion Program (NIEP) is one of success. The emerging farmers' benefit is between ZAR 7,000 and ZAR 50,000 per annum, with an average of approximately ZAR 35,000 or around ZAR 3,000 per month (TSB1). It amounts to satisfactory revenue, given the low employment opportunities in the region.

Nevertheless, there are large differences among the irrigation schemes. Some of them are successful and are currently in the process of improving their irrigation schedules (for instance,

[16]This involvement might be meaningful, for instance, when a historically disadvantaged community uses water from a large scheme that is managed by an IB.

the Mfumfane scheme). In others, farmers are struggling to pay back the loans and sometimes fall into a downward spiral—the lack of money prevents them from hiring the necessary workforce, which leads to a smaller harvest (e.g., the Ngogolo scheme).

Furthermore, farmers are exposed to risks that may significantly decrease their revenues, for instance, a break in one of the scheme's pipes that causes both an increase in the scheme costs to repair it and a delay in sugarcane irrigation. Such an incident happened in the Ngogolo scheme in August 2002.

Water Scarcity in the Upper Komati. In the Upper Komati, many schemes have suffered from the restrictions during the years before 1999. When the restrictions were in force, farmers could only irrigate for 7 hours from Monday to Friday. In 2003, the restrictions led to a quota of 6 hours of irrigation per day, instead of the usual 12 hours.

Irrigation Efficiency. Even 10 years after having started sugarcane cultivation, some farmers still apply very simple and inefficient irrigation rules. For instance, in the Ngogolo project, farmers apply too much water when the sugarcane is young. Because of this over-irrigation, some schemes have difficulty in not exceeding their water quotas. Moreover, such over-irrigation is damaging because electricity costs constitute the second highest cost after fertilizers, averaging ZAR 1,500/ha (cf. appendix).

For the moment, there is no complete set of water consumption data that would enable one to assess the exact amount of over-irrigation. However, it is commonly agreed that it can reach 30 percent.

Organization at the Scheme Level. A lack of organization among farmers may lead to unpaid electricity bills. The South African electricity company, Eskom, then stops providing electricity, which may lead to the same downward spiral mentioned previously. The schemes also suffer from a lack of maintenance of the pumps. Finally, this lack of organization prevents farmers from accessing markets in order to diversify their crops.

Knowledge of Water Management Issues. Water management is currently being integrated between the KOBWA and the IBs. They will basically attempt to allocate water according to the current water licenses while meeting the requirements of the agreement between the three states and the legal requirement of an ecological reserve. During a drought, the allocation of water will be a much more transparent procedure where the KOBWA will allocate in consultation with the Water User Forum. There is, hence, a strong need for emerging farmers to understand the issues of water management at the catchment level, to be able to defend their positions, like the CFs, in case of drought.

Involvement of TSB. As pointed out earlier, the sugarcane industry has its own interest in getting enough good-quality sugarcane from the small-scale growers. That is why it set up a comprehensive program to assist these growers.

First, a specific entity, Umthombo Agricultural Finance, is in charge of the management of emerging farmers' finances. Once an EF sends his/her production to the mill, the payment is calculated, scheme costs are subtracted from this initial amount, and a fraction of it is set aside to finance the inputs for the next year. The EF receives the balance. This system guarantees that, both at the farm and at the scheme levels, farming will go on the following year.

Second, TSB has set up an extension program. A member of South African Sugar Association staff has taken responsibility for the local office of the Mpumalanga Department of Agriculture Extension Officers, and will coordinate the extensions services of TSB and the DoA (TSB1). There will then be nine Extension Officers to advise the small-scale growers.

Third, TSB is helping to set up a contract between the irrigation projects and a private company that would take charge of pump maintenance.

Some emerging farmers have installed drip irrigation. Nevertheless, the TSB team in charge of providing extension considers that the most urgent need is to improve irrigation scheduling; in their opinion, the change in irrigation techniques is of interest only in the middle term (TSB1).

Current Involvement of EFs at IB Level. Currently, the situation in the two IBs is one of general agreement between CFs and EFs. Few issues now divide the two communities whereas, before the completion of Matsamo Dam, there were fierce disagreements between EFs and CFs during periods of drought, especially on the Komati (Waalewijn 2002). Since the completion of the Matsamo Dam, water to the CFs on the Lower Komati was supplied by this dam and it helped ease the tensions.

The EFs who suffer from low flows in the Upper Komati blame upstream authorities. They think that Swaziland should release more water and, hence, do not have a problem with the water rights of the downstream CFs. Besides, more generally, the EFs consider that their needs (access to land, subsidies and extensions) should be answered by the government, not the IB. There is a general lack of overlap between the IB responsibilities—distributing water according to the allocation rules established during the apartheid regime—and the needs of the emerging farmers.

Moreover, a general lack of knowledge prevents emerging farmers from really taking part in the discussions. It is the chairmen and some CFs who are aware of the issues and the technical options at hand and they are the ones who make proposals.

These two reasons explain why, in the recent past, consensus has been achieved for all decisions taken by the Management Committees.

In the two current proposed constitutions, the Management Committee is designed with an area of operation that is divided into two zones—one in the former Republic of South Africa and one in the former homeland. Each zone elects an equal number of representatives, i.e., for each zone, six Category I members for Lomati, eight or ten for Komati, one Category II member and one Category III member. These proposals do not prescribe the voting mechanism at the Management Committee. At the General Assembly, each member has a vote in proportion to his share of water license for a given zone: the two zones get the same overall amount of votes. Since Category II users will probably be representatives of HDIs, the HDIs will have a slight majority. However, the possibility of having to go through a formal vote appears to be theoretical, given the tradition of trying to achieve a consensus and the commercial farmers' domination in the discussions at the MC.

Finally, the current atmosphere of cooperation stems also from the chairmen's' personalities. The EFs see them as progressive farmers who care about their emerging farmers' problems.

Current and Potential Role of the WUA. To what extent can the WUA answer the needs of emerging farmers, now and in the future? First, regarding the vulnerability of EFs' revenues,

there might be room for the WUA to help them during periods of drought. The CFs have built balancing dams, which enable them to avoid the consequences of restrictions in irrigation to a certain extent. Emerging farmers do not have these dams and they still have to pay back large loans. It could be possible to set up a rule that EFs should be less affected by irrigation restrictions but, in 2003, the decision with regard to the levels of water restriction for CFs and EFs was made by the DWAF and the KOBWA, without any involvement of the IBs.

The main role that the WUA could play in uplifting EFs is, therefore, to help them understand. The EFs who suffer from low flows in the Upper Komati blame upstream authorities. They think that Swaziland should release more water and, hence, do not have a problem with the water rights of the downstream CFs. For instance, the LIB hired an English-Siswati translator in September 2002 so that emerging farmers who were not fluent in English could understand the more technical issues and could also feel more comfortable when asking questions. Such an initiative only costs ZAR 140 per meeting and will be very useful in helping EFs to understand water management issues better.

In 2002, the LIB hired an engineer, whose main responsibilities were to set up the new system of water management with water meters and communication with the KOBWA. The EFs understanding of this new system is necessary for the success of the system itself, since it cannot function correctly without their cooperation. It is also advantageous for the EFs because, in case of drought or any unexpected events, they should be able to negotiate on a level ground with well-informed CFs. The engineer is required to go into the field and meet emerging farmers there, instead of the previous situation, where EFs had to go to the IB secretary in Malelane in case of a problem (LIBCF1).

The WUA is also the ideal place for EFs to learn to understand better, not only water management at the WUA level, but also the whole system managed by the KOBWA, for the same reasons as given above. “The WUA is the closest to the people, so they are the most able to explain the impact of some decisions to the people” (LIBCF2).

In many places in South Africa, the WUA would be the relevant body to manage irrigation extension services. In the Nkomazi region, the sugarcane industry takes the responsibility for improving irrigation efficiency but the engineer hired in 2002 by the LIB should also take some initiatives regarding this issue.

Can the WUA contribute to investments into infrastructure for the HDIs? Such a choice is legally possible and financially achievable because the water management costs—IB plus DWAF fees—still represent a very small amount of the commercial farmers’ costs (4.5 percent in the KRIB, cf. appendix). Commercial farmers could, therefore, afford to pay some fees through the WUA that would help the HDIs.

However, the case of the Sibange Weir provides an example of the failure to promote cooperation among organizations for investment in infrastructure in the former homelands. This weir was situated in the Upper Komati and was used to raise the level of water so that the pump of the Mfumfane scheme could use water without sand in it. The weir was constructed by the Mpumalanga Department of Agriculture, which handed it over to the KRIB after completion. However, the weir was washed away by the 2000 floods, and for a long time afterwards, neither the DWAF, the Mpumalanga DoA, nor the KRIB would accept the responsibility of building it again and paying the necessary ZAR 7 million. Finally, a middle way was chosen, with the KRIB installing some rocks and the DWAF investing ZAR 1 million into adding a pump that

only pumps the surface water. There might still be a problem in the future, if the rocks are washed away again by another flood.

As an emerging farmer puts it, "there is a need to assess what should be the same for commercial and emerging farmers, and what should be different" (LIBEF1). In his opinion, all farmers should pay the same for a given amount of water but emerging farmers should be able to get more land as soon as possible.

Upcoming Farmers

In the Nkomazi region, the main problem is not related to emerging farmers, but concerns the lack of water licenses for new farmers. The place is highly populated and agriculture is almost the only source of employment. Having a formal water license is necessary for obtaining a loan from the bank, as well as land from the chief (LIBEF3).

Water Allocation. A large numbers of water allocation demands have been handed to the DWAF Regional Office in Nelspruit, which systematically turns them down. These demands range from small-scale to large-scale projects and, for some of them, the Mpumalanga DoA has undertaken a Business Plan that shows their economic sustainability. Overall, the volume of water demanded would irrigate approximately 26,000 ha (DP1).

The division of DWAF responsible for reviewing water allocation demands is the Hydrology Division. Their current refusal to grant any more water licenses is based on three reasons:

1. A perceived general lack of water
2. The need to protect against risk
3. Willingness to wait for global assessment

Perceived general lack of water. The Inkomati River flow at the junction with the Crocodile River has often been lower than the necessary 1.1 m^3/s. The Maguga Dam was in use in 2003, but there was still a need to keep more water in the river, because of the forthcoming ecological reserve, as well as growing demands from Mozambique. The 2003 drought was also a very important factor to stop any further allocation of water licenses.

Need to protect against risk. A long drought occurred during 1992-1994. During the most difficult periods of this drought, water could be used only for drinking purposes. Commercial farmers managed to get through this period, but emerging farmers could not cope with the same restrictions, since they had to pay back large loans.

The willingness to wait for the global assessment. The DWAF wants to wait for a complete picture of the needs to assess the amount of water still available, and hence the amount of water that could be reallocated. This global assessment will be achieved through a Compulsory Licensing Process (CLP).

This assessment of the current need for water is disputed by the Mpumalanga DoA. Even after the completion of its ongoing second phase, there are still 30 MCM available according to the initial agreement between the Republic of South Africa (RSA) and KaNgwane. However, the legal value of such past agreement between the RSA and KaNgwane is unclear under the new

dispensation. The DWAF argues that there is no more water available because the consumption of drinking water has increased, and, since this use must be guaranteed with a higher insurance, i.e., a higher percentage of years during which this use receives the amount of water allocated, it amounts to approximately 18 MCM. Nevertheless, in the opinion of the DoA, this increase corresponds to an augmentation of the primary water use, and thus all water users—CFs as well as EFs and industries—should have their water licenses decreased (MDoA1).

The Compulsory Licensing Process. The legal tool set up in the NWA to change the water licenses pattern is the CLP. The DWAF has decided that the Komati Basin will be among the first where a CLP will be set up (DWAF 2002). This process is all the more important now that not much water can be expected even after building the new dams (DP2).

The registration of users was almost complete by August 2003, when the DWAF would soon be able to start the verification of the registration. This will be done by a combination of field studies and an assessment of the areas under cultivation using remote sensing techniques. At the same time, the requirements of the ecological reserve should be determined.

Once this technical knowledge has been gathered, the DWAF and the water users will negotiate about the level of the reserve (which corresponds to a certain extent to an increase in the demand from Mozambique) in order to find a balance between the environmental and economic needs, and also about the allocation of water among new and existing users.

The CLP will also be linked to a global development plan for the Nkomazi Region. For instance, the question remains open as to whether water should be allocated to meet the existing demands in the former homeland area, or whether water should be allocated during a land redistribution process.

Other Potential Tools. The CLP aims at being a comprehensive process and it is expected to be lengthy. The NWRS estimates that the CLP will be completed only around 2008 (DWAF 2002). Hence, because of the high rate of unemployment in the Nkomazi region, there is an urgent need to 'find' some water in the short term to allow some of the projects to start, and to set up a mechanism to define an order of priority for the existing demands. There are two possible tools that could be set up, since they do not need to withdraw water compulsorily from existing users:

1. Improved water use efficiency
2. The use of a water market

Improved water use efficiency. Improving efficiency of water use to give extra water to HDIs makes sense mainly when there is potential to improve efficiency at the scheme level, e.g., when there are seepage losses along canals. The only schemes in use on the Komati and Lomati Rivers are the recent smallholder ones, which distribute water efficiently. Water use efficiency must therefore be addressed at the farm level, where there is still much room for improvement, both for EFs and CFs. A study in 2001 found that, for some CFs, the efficiency could go below 70 percent (Waalewijn, personal communication).

A farmer will usually improve his/her water efficiency to expand the area under irrigation. For instance, a commercial farmer managed to decrease his water consumption by 2,000 m^3 from 9,000 to 7,000 m^3/ha by changing from sprinkler to drip irrigation. The investment cost ZAR 6,000/ha, i.e., he saved ZAR 3/m^3 (KRIBCF1). More efficient equipment (drip irrigation, pivot) can also save energy and labor costs. It might, therefore, be possible to set up a contract

between the state and the farmer, where the state would co-finance investment in a more efficient irrigation system on the condition that it can take back part of the water allocation saved through the improvement.

The use of a water market. An organization could buy some water licenses from the CFs on behalf of the HDIs, as has been done in the Western Cape (source: DWAF Regional office in Western Cape). Theoretically, the EFs could also get loans to buy these licenses, but they would probably not be able to afford this additional financial burden.

While these tools are legally and technically possible to set up, there must first be an assessment of how much water could really be made available through each of these tools and at what cost.

Finally, there might be also an opportunity to renegotiate the allocation between the three countries sharing the Inkomati River, since the population in the Nkomazi region has increased faster than in other places, especially compared to upstream Swaziland (DP2). Currently, among both CFs and EFs, the first source of water allocation increases proposed is an increase of the flow from Swaziland, where like everywhere else around the world, in case of water scarcity, the downstream users tend to look upstream. Nevertheless, renegotiating international treaties takes a long time.

Potential Role of the WUA. The WUA will be the natural focal point for users during the CLP, because the IB is already a well-established organization, where users are accustomed to discussing water issues together. Social capital has built up over the 6 years of joint management.

Moreover, there are not many users upstream of the area of operation of the Lomati IB, and the flow coming from upstream of the KRIB is regulated by an international agreement. It therefore, makes sense to assess the issue of water reallocation at the level of the Boards' operational areas .

The WUA can play a role in improving both emerging and upcoming farmers' understanding of water management issues, so that they can have a voice in the CLP, where there will often be very technical arguments. Moreover, the small-scale farmers need to be able to come with a vision and some proposals. There is an informal committee of commercial farmers, a 'think-tank' that discusses water issues in the region and sends their ideas to the DWAF (LIBCF1). For instance, they propose to link both a land claim process and the CLP issues by building a dam in a nearby catchment with the capital given to EFs through the land claim settlement. The water would be collected from this catchment and distributed in the area of the former KaNgwane homeland. The HDI community, however, lacks the capacity to elaborate such proposals.

A first way to improve their knowledge of water management issues is to invite representatives of upcoming farmers to the Management Committee as observers. For instance, in the Lomati Irrigation Board, the chairwoman of the local group of the Mpumalanga African Farmers Union used to come as an observer.

The Ancillary Function of Supporting HDIs

The WUA can play a role in supporting HDIs by helping them to understand the local water resource management system. This role is all the more important because the DWAF does not

organize capacity building directly and the DoA extension officers are not trained to provide this kind of support.

The empowerment of HDI users can also be of benefit to commercial farmers. First, the Compulsory Licensing Process is not necessarily a zero-sum game (i.e., what one wins, another loses). There might be win-win solutions, and discussions at the WUA level between large-scale users and well-informed small-scale users will be among the most efficient tools to find these win-win possibilities. Second, the DWAF will give away decision-making powers when they feel that the playing field is leveled between large-scale and small-scale users.

The LIB went for a simpler water management system than the KRIB. They do not use telemetry. While this choice may require more time spent on reading meters, it requires the LIB engineer to go to the EFs' schemes and thus gives him the opportunity to interact with the emerging farmers and explain the system and the situation with regard to water management.

Link Between the WUA and Other Water Management Organizations

Many organizations are currently involved in water management: the DWAF, the KOBWA, the IBs and soon the CMA. A rather integrated management of water quantity, involving the KOBWA and the IBs, is in the process of being set up. These organizations will be involved in the day-to-day management, while the CMA will look more at strategic, long-term issues like the Catchment Management Strategy (CMS) and the allocation of water licenses. The DWAF's long-term role is one of monitoring and linking local issues with national issues (DWAF 2002).

The relationship between the two IBs and the DWAF has been shadowed by past and present arguments (Waalewijn 2002).

Disagreement over Water Rights on the Lomati Side

In August 2003, there was a disagreement over the areas scheduled for irrigation—the DWAF did not recognize the LIB's List of Ratable Areas and contended that they did not fit the past broad allocations given to the commercial farmers.

Around 1992, the Nkomazi area became a Government Control Area, in a procedure described in the 1956 Act. This procedure entailed that the DWAF measured the irrigable area on each farm, as well as how many hectares were actually irrigated. Once an evaluation of the water resource was achieved, the DWAF granted each farm a given allowance according to the irrigable area (LIBCF3). The DWAF then published a list with the areas scheduled for irrigation, which was then open for appeal. Once the different appeals had been addressed, a final list was issued. In the Nkomazi area, the process was disturbed by the discussions regarding the forthcoming National Water Act, so the final list was never published and there are still pending issues regarding the areas scheduled for irrigation (LIBCF3). The DWAF considers that farmers have over developed land when compared to the contents of the 1992 Treaty between South Africa, Swaziland, and the then KaNgwane homeland. This disagreement could concern up to 4,000 ha.

Refusal to Pay Water Management Fees

The commercial farmer from the KRIB who was interviewed said that the KRIB had to build weirs because Eskom, the South African electricity company, started diverting water out of the Komati basin upstream to Swaziland 20 years ago. He suggested that the KRIB should therefore not pay the water services fees, unless the DWAF took over the weirs and the repayment of the loans that had to be taken out to build them (KRIBCF1).

With the decentralization of water management and the forthcoming setup of CMAs, the users had to start paying for the costs of water resource management. These activities were undertaken until then by the regional offices of the DWAF but, after April 2002, users had to pay water management fees.

However, in August 2002, the DWAF and the IBs were still disagreeing over two issues: who was responsible for collecting money, and the fact that charges were calculated on a per-hectare basis. Regarding the first issue, the IBs' position was that they were not 'natural' executive arms of the DWAF—if they took charge of collecting fees, they should be paid for it. The DWAF answered that the water management fees should then be increased by the corresponding amount.

In the Great Letaba WUA, the association had already been collecting fees to pay for DWAF management for a long time, without being paid for it. However, in the Great Letaba situation, the DWAF manages the dams upstream and hence fulfils a clear role of water resource provider. By contrast, the two dams upstream of the KRIB and the LIB are managed by the KOBWA so the day-to-day action of DWAF staff is less obvious to the CFs.

Regarding the basis for calculating the amount to be paid, the farmers argue that water should be charged for by volume in order to encourage the practice of saving water. The DWAF agreed in principle, but nevertheless asked for per-hectare charges because they ensure that a given amount of money will be collected, whatever the climate and whatever the volume of water pumped by farmers. All in all, this argument was merely a symbolic fight between the DWAF and the IBs, since the fee required from farmers, CFs as well as EFs, amounts to only ZAR 65/ha, i.e., approximately 0.6 percent of all the costs incurred (cf. appendix).

Lack of Information. The CFs resent the publication of the distribution of irrigation restrictions in the Gazette, without any explanation of the way the figures were decided. There is currently a large asymmetry of information that could hinder the whole process of integrating water management. The users do not have access to the data used by the DWAF to assess the basin resources, and especially to decide the amount of water that can be allocated. The hydrologic model is managed by the DWAF HO, with few communications regarding the implications for the users and the assumptions made. It might be of interest to get users involved in the decision about the amount of water rights that are allocated and thus the amount of risks the users will have to take.

The CMA

The commercial farmers will be the biggest contributors to the CMA. They are advocating for a light CMA structure and low water management fees. Hence, the CMA revenue will probably not be sufficient to start actions to protect the environment or uplift HDIs, at least in the short term.

Conclusion

The general conclusion of this study is that the transformation of IBs into WUAs is indeed an opportunity for HDI uplifting and increased local integrated water resource management in the Nkomazi region, even though there is a need to incorporate the municipality and representatives of the environment. Moreover, the WUA can play a limited but efficient role in building HDIs' capacity with regard to the management of water resources.

The CLP will have a strong link with the global development plan for the Nkomazi region, since irrigated agriculture constitutes the backbone of the local economy. The Nkomazi Municipality will play a key role in achieving this integration.

Land Redistribution

In the short term, there should be a land redistribution process. HDIs could be uplifted by granting higher irrigated sugarcane production quotas to emerging farmers because the integration between the sugar industry and small-scale growers has been successful— sugarcane is easy to cultivate, and the issue of market access has been solved.

The implementation of such changes would probably be less expensive if it were done through purchasing parts of CFs farms that are already cultivated with sugarcane, rather than setting up new schemes in the former KaNgwane homeland (KRIBCF1). The main change would consist in modifying the irrigation equipment to fit the organizational requirements of the arriving EFs (KRIBCF1).

Crops with Higher Added Value

In the long term, the cultivation of crops with higher added value per amount of water could be organized. The CLP as well as any process of land redistribution will change the distribution of the capital and, hence, will direct more of the revenue from sugarcane to the HDI community. Nevertheless, the CFs use the same labor-intensive process to grow sugarcane as the EFs. Hence, the amount of employment provided through a CLP or land redistribution will not increase as long as the production remains based on sugarcane. To increase the employment in the region, there is, therefore, a need to save water and increase production.

In the long term, drip systems, or at least pivots, could irrigate all sugarcane fields. However, as Woodhouse and Hassan (1999) pointed out, sugarcane is a very water consumptive crop—many other crops offer better revenues per drop, even if the downstream industry is taken into account. In the long term, it could be of interest to decrease the area under sugarcane, and try to set up other channels of production for small-scale growers, like the cultivation of vegetables. Commercial farmers often grow fruit trees, like mangos or litchis, aside from their sugarcane. The production of these fruits can give high revenues but is also risky because of the frequent variations in world prices. Currently only large-scale farms can afford to cope with these variations.

The Hereford Irrigation Board

The first two sections of this case study describe the methodology followed and the study area. The next section focuses on the current situation with regard to water management in general in the Hereford Irrigation Board (HIB) area. The last section presents the current issues around the involvement of the HDIs in the HIB.

Methodology

The study was based mainly on semi-structured interviews with the different stakeholders: commercial and emerging farmers, the Department of Agriculture and the Department of Water Affairs and Forestry (DWAF), etc. A total of 12 people were interviewed (table 8). This study complements another on-going study by IWMI, investigating the farming structures of the emerging farmers. The reference codes given in this table will hereafter be placed in brackets and used at the end of a relevant sentence to signify that a specific stakeholder is the source of information.

Table 8. Stakeholders interviewed in the Hereford IB.

Stakeholders	Reference	Number
Hereford Irrigation Board	HIB1, HIB2	2
Commercial Farmer	CFI1, CF2	2
Department of Water Africa and Forestry	DWAF1, DWAF2	2
Emerging farmers	EF1, EF2, EF3	3
Department of Agriculture	DOA1	1
Farm Worker Union	UN1, UN2	2
Total		12

Context

Three Irrigation Boards use the water from the Loskop Dam (figure 5). The Loskop IB manages the water distribution along two main canals, which carry water directly from the dam. The Hereford IB lies on the left bank of the Olifants River, and manages a canal that takes water from the Hereford Weir, 16 kilometers downstream of the Loskop Dam. Finally, the Olifants IB manages the water abstraction on a stretch of the Olifants River between the Hereford Weir and the downstream Flag-Boshielo Dam (previously Arabie Dam).

History

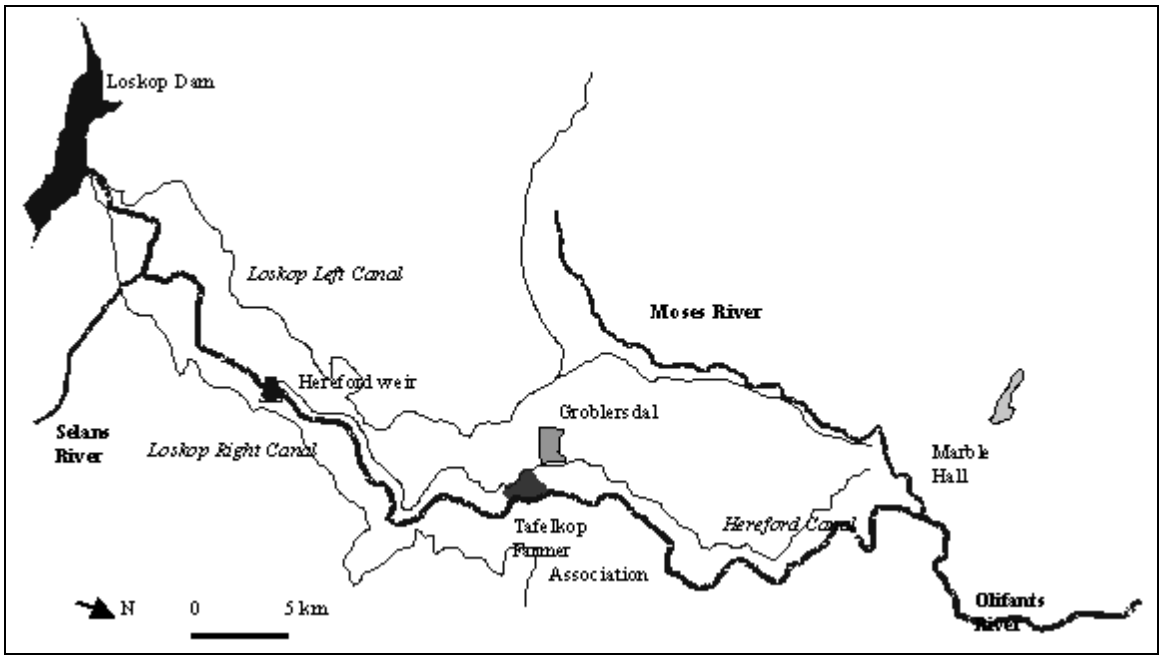
The Hereford Irrigation Board (HIB) was proclaimed in 1926 and the initial works were completed in 1930. First, the HIB upgraded a small diversion weir at Kameeldoorn Farm, known then as the Meissner Weir and now as the Hereford Weir. Second, a 51-kilometer canal was built as far as the Moses River, in order to irrigate 2,140 ha (Turton and Meissner 2003). The area of jurisdiction of the HIB has not changed since the inception of the board (Tren and Schur 2000).

When the board was established, the Water Court ruled that the total water allocation would be 29.9 percent of the normal water flow of the Olifants River but, in 1935, the Loskop Dam was built, which led to a need to modify the water rights. The HIB was then allocated 26.68 MCM per annum free of charge from the Loskop Dam.

Once the figure of 26.68 MCM was decided on, the same quota was used as the one already in place, i.e., 7,700 m^3/ha. Hence, the HIB was entitled to irrigate 3,426 ha. The HIB was entitled to take 35.1 MCM from the Hereford Weir—8.3 MCM were supposed to come from the tributaries between the dam and the weir. These 8.3 MCM were allocated to cater for the losses in the earthen canal. However, the Selans River is the only large tributary between the Loskop Dam and the Hereford Weir and the IB on this river does not let much water flow downstream (DWAF1). Hence, right from the start, the farmers of HIB have not received an allocation that took into account the losses in the canal.

The HIB is different from the Loskop IB, which has 16,169.7 ha scheduled at the same ratio of 7,700 m^3/ha. However, the allocation from the Loskop Dam allows for a loss of 30 percent (the actual figure of losses is around 24 percent, DWAF1).

Figure 5. The Loskop Dam and the Hereford, Olifants River and Loskop Irrigation Boards.



Water users

The members of the HIB are mainly farmers. There is no industry.

Commercial Farmers. The HIB encompasses 36 large-scale farmers. In years when the dam is full, they farm approximately 3,160 ha in the whole scheme. The cropping pattern is made-up of around 1,000 ha of wheat (provided the international prices are good), 1,200 ha of citrus, 300 ha of grape, 60 ha of tobacco, 100 ha of cotton, and 500 ha of vegetables. In 2003, because of the

reduction of the yearly quota, the general pattern changed. Only 30 ha of wheat were planted (another reason was the low international price), and 30 ha of vegetables, the rest of the crops having the same acreage (HIB1).

In the past, when the DWAF announced that the yearly quota was decreased because the Loskop Dam was not full, farmers decreased the area under vegetables and wheat as a buffer to cater for the drought. However, in recent years, there has been an evolution towards more fruit trees because, in 2000, there were only 760 ha under citrus (Tren and Schur 2000).

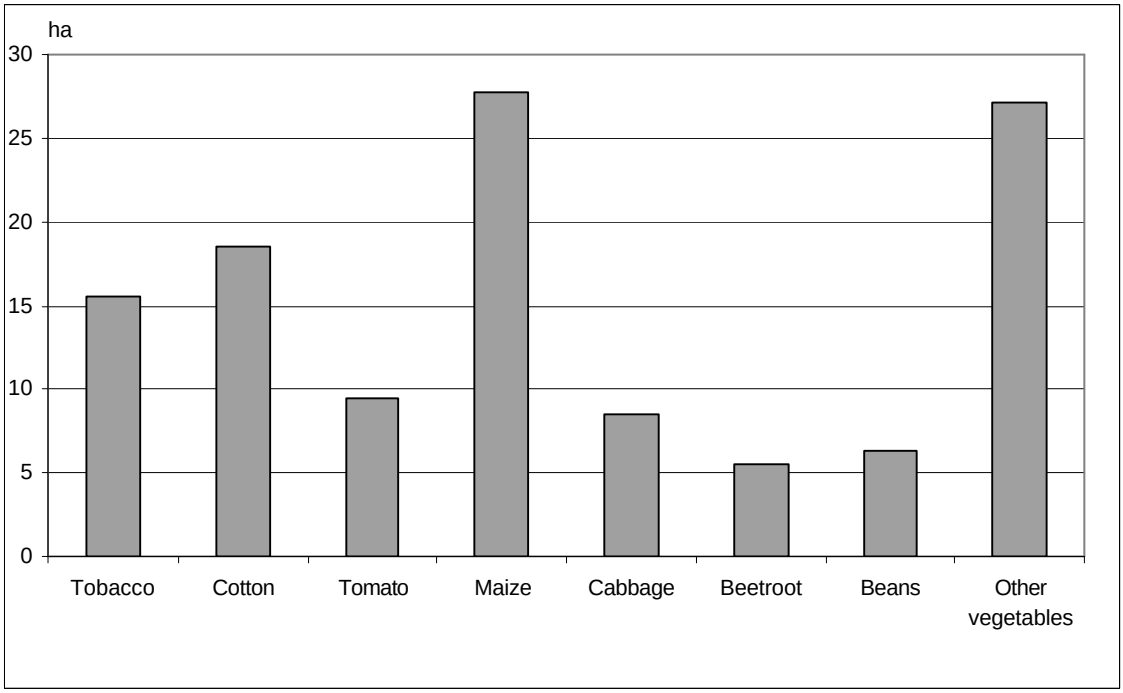
Emerging Farmers. The HIB has 33 emerging farmers. In 1993, a group of farmers in Tafelkop—a community near Groblersdal—created the Tafelkop Farmers Association (TFA) and, in February 1997, 33 farmers from the TFA moved into an unoccupied piece of land within the HIB, belonging to the state. The previous tenant farmer had left some years ago.

The emerging farmers settled down, started farming and created their own organization. The whole farm encompasses 220 ha, with 160 ha scheduled for irrigation. Figure 6 presents the crops farmed by the TFA farmers in 2002.

After the TFA settled on the land, the land was transferred from the Bureau of Credit to the Department of Land Affairs and, every year since then, the latter signed a contract of lease plus option to buy. In 2003, the Survey General Office started dividing the four plots into 34 sections—33 for the farmers and one section for the community (roads, dam, etc.). Once the Survey General Office registration is achieved, the Department of Land Affairs will present the project under the Land Redistribution for Agricultural Development (LRAD) program. The farmers will then become owners of the land (DOA1).

Out of the 33 farmers, 30 are actually farming, of whom 8 (26 percent) are women.

Figure 6. Crops farmed by the TFA farmers in 2002.



Drinking Water Use. There are two nonfarming members in the HIB: the Groblersdal Municipality has 131 registered ha and a school has 48 ha. In both cases, the water rights are rented out to commercial irrigation farmers.

The TFA emerging farmers take drinking water from the canal. They have a simple treatment system where water is oxygenated in a tank and then passed through two sand filters. No chlorine is added. In 2003, the TFA farmers were due to shift to boreholes as a source of drinking water.

The other drinking water users are farm workers, many of whom are living on commercial farms. While most of them get water from boreholes, other farm workers drink water from the balance dams on the farms, which is actually the water from the canal. This occurs especially on the smaller farms (UN1, UN2).

Issues Pertaining To Water

Water scarcity is the main problem for the HIB because the canal is not lined with concrete. As a result, there are large losses (estimated at 60 percent, DWAF1). Since these losses are not accounted for in water allocation from the Loskop Dam, farmers have much less than 7,700 cubic meters per scheduled hectare.

The HIB is due to start lining the first 28 kilometers of the canal with concrete (out of a total length of 42 kilometers) around August 2003. Commercial farmers thought about it some years ago, during the previous regime, but the DWAF promised that it would take care of it (CF1). Eventually, because funds dedicated to the support of commercial farming were decreasing, the farmers of the HIB decided to fund the lining themselves.

There is no specific data on the water quality in the canal. However, the water in the Loskop Dam is clean (the DWAF office in Aquaville uses the water from the Loskop canal adding chlorine to it) and there is no discharge between the Loskop Dam and the Hereford weir (DWAF1).

The water is conveyed in the canal and there is, therefore, not much interaction with the catchment but the lining of the canal will affect the riparian vegetation.

The Hereford Irrigation Board

The HIB is managed by a Governing Board of six members and employs one water bailiff and six permanent workers to look after the canal. According to Tren and Schur (2000), the total costs of the IB are around ZAR 400,000/year, divided into ZAR 200,000 for salaries and wages, ZAR 100,000 for maintenance and ZAR 100,000 for administration costs.

The WUA water fee was ZAR 150/ha/yr in 2001. In 2002, the fees were increased to ZAR 300/ha to cater for the forthcoming lining of the canal, and farmers started paying catchment management fees of 1 cent/m^3, i.e., ZAR 77/ha. The HIB does not pay for the operation and maintenance of the Loskop Dam, according to a 1930s court judgment. The lining of the upstream part of the canal will cost around ZAR 23 million. To cater to this, the fees were increased to ZAR 1,000/ha from June 2003, and will remain at this value for the next 20 years.

Water Management

Water Allocation

Once a year, in March, the DWAF office in Groblersdal schedules the allocation of water from the Loskop Dam for the coming year. If the dam is not full, the DWAF may decrease the annual allocation (which can be increased again in October if there have been sufficient rains). In March 2003, the dam was only 52 percent full and it was decided that all irrigation quotas would be decreased by 50 percent.

The DWAF measured the flow at the gate of Loskop Dam as well as at the Hereford Weir and, in June 2003, it was found that the flow between the two measuring points had decreased by 40 percent. One of the reasons for this decrease was illegal pumping by commercial farmers. Because of the losses (illegal use upstream and leakages in the canal), the HIB had to translate this 50 percent cut from the Loskop Dam into a 75 percent decrease at the farmers' gates.

Besides, the board acquired the weir on the Kameeldoorn farm and in return supplies irrigation water free of charge to this farm and the original Beukes farm (Tren and Schur 2000). In fact, these farms have rights to pump water from the Olifants River. They get the water from the canal, but their allocation is not part of the HIB allocation. The integration of these farms within the HIB is meaningful in terms of water management but is still being negotiated—it will require adding their allocations to the HIB's (CF2).

Canal Management

The HIB orders water from the Loskop Dam once every 2 weeks and it takes 48 hours for the water to arrive in the Hereford Weir. When the canal is flowing at full capacity, the flow at the Hereford Weir is 0.99 m^3/s or 31.3 million m^3/year.

When there is no restriction in farmers' quotas, the canal flows continuously and each farmer is required to use his water. He cannot postpone taking his share until later because of the limited carrying capacity of the canal.

In periods of water restriction, the canal operates only during specific periods. In June 2003, with a 62 percent decrease in water allocation, the canal functioned only for 100 hours every 2 weeks to make sure that farmers at the downstream part of the canal receive at least a limited quantity of water. At such times, every 2 weeks, farmers can decide whether to use their quota or to postpone its use for later period in the season. For instance, farmers growing grapes or citrus prefer to use their quota in September and October (HIB1).

The canal is closed about four times a year for cleaning purposes. It is cleaned by hand and not with herbicides because it is a source of drinking water.

Water Allocation at Farmers' Gates. A water bailiff is in charge of opening the gates of the farmers. In order to calculate the required height, he uses a specific Excel spreadsheet designed by the DWAF and consultant engineers. First, depending on whether each farmer has decided to irrigate or not and his overall allocation, a spreadsheet calculates how many cubic meters he should receive per day for a given 2-week period. Then another spreadsheet calculates the required height of the gate, given the depth of the water at the farmer' gate, the daily volume calculated in the previous spreadsheet and the width of the gate. The water bailiff goes from one gate to another to operate them. He is the only person with the keys to the sluice gates.

In June 2003, all farmers were allocated 7,700*0.25=1,925 m^3/ha. Given that there are 27 sets of 2 weeks in a year and that the canal flows for 100 hours during these 2 weeks, if a farmer decides to spread his water use evenly among the weeks, he is entitled to a flow of 1,925/(27*100) = 0.71 m^3/ha/hour. For instance, the emerging farmers are entitled together to water for 160 ha, i.e., 114 m^3/hour, i.e., 32 l/s.

Because the canal does not flow continuously (due to its being cleaned or in periods of water shortage), all commercial farmers have large balance dams on their farms. However, until June 2003, this was not the case for the emerging farmers, who used to have four small balance dams of roughly 2,000 cubic meters each.

Lining the canal will cause a significant decrease in water losses. For instance, in the concrete-lined Loskop Canal, the losses due to evaporation and leakages are estimated at around 24 percent (DWAF1). The current system of water allocation will still be used after the canal is lined.

The commercial farmers are not leaving management of the current drought solely up to the IB; they have been managing the current drought on farms too. They have planted much less crops annually (e.g., vegetables) in order to save water for the fruit trees. Some of them also changed from pivots and sprinklers to drip irrigation (HIB1, CF1).

Involvement of HDIs in the Irrigation Board

Initial Difficult Integration

In the past, the involvement of HDIs within the IB has been barred by two problems: the TFA's nonpayment of the HIB fees and lack of trust regarding the amount of water they received.

Nonpayment of HIB Fees

The HIB tried to recover the fees for the water obtained by the TFA, first from the emerging farmers, second from the Department of Land Affairs, which is still the formal owner of the land. They did not manage to get the fees (DOA1, HIB1) so the water has been provided for free by the HIB since the arrival of the TFA.

The HIB has so far accepted that nobody would pay for TFA water, which represents only 4.7 percent of the total water entitlement. They will continue to provide them with their share of water. Nevertheless, the HIB fees are due to be raised to ZAR 1,000/ha/yr and it is likely that, while the emerging farmers could have paid ZAR 150/ha/yr, they will not be able to afford the new rate.

There has been a disparity from the outset with regard to the situation between the TFA and the HIB. On the one hand, the Tafelkop farmers are beginners who face many difficulties and they think that they should be given some help in terms of provision of water, although they did not pay for water even before the beginning of tensions regarding water allocation. On the other hand, the HIB has for many years been an association of farmers with their own budget, without help from the government. They think it is the government's responsibility to help the emerging farmers.

Lack of Trust Regarding Water Received

The Tafelkop emerging farmers have 160 ha of registered water rights. In September 2003, they planned to shift from an internal irrigation system made of earthen canals to underground pipes that will enable pressure irrigation.

In the previous system, they received water through four sluice gates, each of them dedicated to a specific scheduled irrigated area.

Table 9. Areas serve by sluice gates.

Sluice gate	Ha
1	24.80
2	27.03
3	70.70
4	30.26

The sum of these scheduled areas amounts to 152 ha, not 160 ha. The TFA farmers have been receiving water corresponding to these 152 ha since their arrival. The TFA farmers were not aware of this difference and nobody took the initiative to correct the situation (anyway, the difference amounts to only 5 percent of the total TFA allocation).

In the previous TFA irrigation system, there were large losses in the balance dams and along the earthen canals within the TFA area. If a very approximate figure of 50 percent is taken, it means that, within years of full quota allocation, TFA farmers received only 3.850 m^3/ha, i.e., enough water for only seven irrigations per year (with an average figure of 500 m^3/ha per irrigation). With a 75 percent decrease in the water quota, the figure goes down to 960 m^3/ha/yr, i.e., approximately two irrigations. This does not take into account the fact that farmers were using flood irrigation on fields that were not suitably prepared for it.

Many meetings with the water bailiff and the emerging farmers were held in 2001 and 2003 in order to explain the methods of calculation. Nevertheless, the emerging farmers still do not trust the water bailiff's calculations.

Breakdown in Communication

The chairman of the TFA Hereford farmers attended the HIB management committee meetings from 1998 to June 2001. The TFA farmers' nonpayment of the HIB fees and lack of trust regarding the amount of water they received led to a breakdown in communication between the TFA and the HIB. Moreover, the position of the TFA vis-à-vis the HIB is blurred by the facts that the TFA does not own the land it farms and nobody is paying for the water it uses. Currently, an engineer from the Department of Agriculture represents the Department of Land Affairs, which is still the owner of the land that the TFA leases, at the HIB Governing Board. He circulates information between the TFA and the Board.

However, the TFA farmers are not satisfied with this situation and wish to be fully part of the decision-making process at the Governing Board of the HIB (EF1). They are keen to be on

the board of the HIB and the future WUA. Like all the other members of the HIB, the TFA farmers clean their part of the canal during the periods of maintenance (HIB2, EF1).

Because of the breakdown of communication between the Tafelkop farmers and the management of the IB, the TFA farmers do not choose when to receive water in periods of water scarcity, as the other commercial farmers do. Thus the bailiff dispatches their (TFA farmers) water allocations evenly throughout the year.

New Opportunities to Facilitate TFA Involvement in the HIB

There are now opportunities to solve the two problems of nonpayment of TFA fees and of lack trust vis-à-vis the water they receive.

Funds for Lining the Canal. The TFA farmers can benefit from a specific grant from the DWAF, which is available for any investment in collective equipment: pumps, pipes, canals, weirs, etc., but not in-field equipment (DWAF2). Emerging farmers belonging to either a WUA or an IB can access the funds, which amount to ZAR 10,000 per hectare, with a maximum of ZAR 50,000 per person. In the case of a project involving both commercial and emerging farmers, the grant can be used to pay for the proportional share of the emerging farmers.

This is exactly the case in the Hereford IB. The share of emerging farmers is ZAR 23 million*4.67 percent = 1.07 million, i.e., ZAR 6,713/ha, which is less than the maximum subsidy of ZAR 10,000/ha.

This subsidy must be used only for upgrading the infrastructure and cannot be used for paying the WUA fees related to operation and maintenance. Once this grant is paid, the operation and maintenance costs (around ZAR 150/ha) still have to be paid. The TFA emerging farmers could pay these fees (EF1).

New Irrigation System. In 2003, the Prime Minister of Mpumalanga granted ZAR 6.5 million to upgrade the TFA irrigation system. First, a rather large balance dam was completed in July 2003, with a capacity of 128,000 cubic meters. With a full quota, TFA receives 160*7,700/365 = 3,375 m^3 per day. Thus, TFA would be able to fill the dam in 128,000/3,375 = 38 days. With the current restrictions, it would need 150 days to be filled.

Second, the whole TFA area will be upgraded to enable pressure irrigation. The project is scheduled so that each farmer can irrigate his/her farm in 5 days, i.e., 20 percent per day. There will be two pumps, which will function 24 hours a day. Each farmer will have to move the sprinklers three times a day (8 hours per position). Thus each farmer will irrigate 1/15 of his/her farm at a time. The rate of application will be 7 millimeters per hour. Therefore, 560 m^3/ha will be applied in 8 hours, which is a standard amount of water for an irrigation. The irrigation network should be completed by September 2003.

There will be three automatic gauges: one at the entry of the canal leading to the dam, one at the entrance to the dam, and one at its exit. The operation and maintenance of these meters are still under discussion. Moreover, each farmer will also have a meter on his or her outlet pipe. The latter is a requirement for efficient water management among TFA farmers. Indeed, the new system will require a much higher degree of cooperation among farmers.

Once the system is delivered to the farmers, they will be in charge of the operation and maintenance costs.

As in the Komati Irrigation Board, commercial farmers and extension officers disagree on the best irrigation technique for the emerging farmers. The commercial farmers state that the emerging farmers should get drip irrigation immediately, in order to save both on water and electricity costs (CF1, HIB1). They contend that this technique is easier than sprinklers. On the contrary, the individual of the Department of Agriculture who designed the Business Plan, argues that drip irrigation is a very difficult irrigation technique and the TFA farmers could not start this technique from scratch (DOA1).

Once the new TFA irrigation system is completed, there should not be any issue around the allocation of water to the TFA, thanks to the meter at the entry of their canal. The emerging farmers will be able to check for themselves the water they receive and the new metering system will be a key element in improving the trust between the TFA and the HIB.

The Hereford Water User Association

After the enactment of the National Water Act, a meeting was held with the DWAF and the three IBs. It was at first proposed that they would form a single WUA but this idea was eventually discarded, as there are actually three distinct management systems. The HIB submitted a proposal for the constitution of a WUA in 2001 and they are still waiting for an answer. The proposed constitution will probably have to be rewritten, since the TFA were not explicitly part of the first version. Their presence at the MC, entrenched in the constitution of the WUA, will probably be the key to the acceptance of the constitution by the DWAF.

Farm Workers

Currently, some farm workers are de facto users of the canal as a source of drinking water. With the WUA being in charge of all water use in a system, whether for formal use or not, the WUA has a responsibility vis-à-vis this issue.

However, it might not make sense to improve the water quality of the whole canal because of this use, which is very small in terms of quantity. The WUA might then try to facilitate dialogue between farmers and farm workers, in order to install the necessary boreholes. In the Lower Olifants WUA in the Western Cape, there is a representative of farm workers on the Management Committee to bring such issues to the table. For there to be a farm-worker representative on the management committee of the new WUA, it would be necessary to make sure that the representative is really knowledgeable about the situation on all farms of the HIB. The local farm-workers' union could play a role in this regard.

The responsibility of the WUA vis-à-vis this problem is not linked to the current water resource management functions of the HIB, hence it should be entrenched in the constitution of the WUA.

Conclusion

The study investigated the current management of the Hereford Irrigation Board, and especially the issue of the involvement of HDIs, as represented by the TFA farmers.

During the past several years, the TFA farmers have not been involved because of a lack of communication and trust between them and the HIB.

Three elements will provide an opportunity in the short term to really entrench HDI involvement in the HIB. First, the upgrading of the TFA area will decrease TFA demand for irrigation water, and the setting up of a water meter will contribute to improving the trust between the emerging farmers and the HIB. Second, the TFA farmers should soon own their land and thus the land will be formally scheduled for irrigation within the HIB. Third, the DWAF subsidy could pay for the TFA share of the costs of lining the canal, and thus make it possible for the TFA to fulfill its financial obligations as a member of the HIB.

Appendix: Financial Breakdown of Farmers

Some figures are given below to provide a general understanding of the different costs. However, they do not aim at giving an exact evaluation of average values. The commercial farmer's figures are derived from an interview by Waalewijn (2002). The values for the emerging farmer are calculated as an average of data from five EFs (source: TSB1). The overall figures are calculated for 200 ha of sugarcane for a commercial farmer (other crops are not included), and 7 ha for an emerging farmer. In the following calculation, one ton of Recoverable Value amounts to ZAR 1,100.

Table 1. Financial breakdown of farmers.

		Per ha		Overall	
		CFs	EFs	CFs	EFs
Costs	Fertilization	1,600	2,000	320,000	14,000
	Electricity	1,800	1,000	360,000	7,000
	Labour	1,800	850	360,000	5,950
	Fuel	500		100,000	-
	Weed control	450	250	90,000	1,750
	Disease control	30	450	6,000	3,150
	Transport	2,500	3,990	500,000	27,930
	Cutting	800	800	160,000	5,600
	Scheme fee	400	50	80,000	350
	Water management fee	65	65	13,000	455
	Cane levies	230	230	46,000	1,610
	Other/MDC (1)	-	865	-	6,055
	Total costs	10,175	10,550	2,035,000	73,850
Revenue	Harvest (t)	120	107	24,000	749
	Rate of recoverable value	-	-	28	1
	Recoverable	17	14	3,360	101
	Gross income	18,480	15,890	3,696,000	111,227
	Addition of VAT (2)	18,480	17,320	3,696,000	121,237
Net benefit		8,305	6,770	1,661,000	47,387

MDC: Mpumalanga Development Corporation

Since emerging farmers are not formally registered as producers, the TSB pays them an equivalent of VAT. Moreover, the EF also pays a loan of ZAR1,334/ha (some CFs have also to pay back loans).

Water Fees

Farmers have to pay three types of fees:

1. The scheme fee, that pays for the management of the IB and for the reimbursement of past investments, e.g., weirs
2. The water management fee
3. Fees for the Matsamo and Maguga dams. The DWAF wanted farmers to pay for the guaranteed quotas (8500 m^3/ha/yr for Lomati, and 9950 m^3/ha/a for Komati), but farmers managed to negotiate so as to pay only for the water released.

The following table gives the corresponding amounts for the KRIB.

Table 2. Fees paid to the Komati River Irrigation Board.

	Scheme fee		Water management fee		Dams (3)	
	c/m^3	c/ha	c/m^3	c/ha	c/m^3	c/ha
CF		400.00	0.70	69.70	2.20	219.90
EF		50.00	0.70	69.70	-	-
Domestic use and industry			0.90		18.90	
Forestry				10.00	18.90	

As explained above, farmers currently do not pay for the guaranteed quota but only for the water released by the dams.

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