

Rural water supply in Namibia: effects on natural resource management and livelihoods

Bernadette Bock, Thomas Falk and Michael Kirk

Philipps-University of Marburg
Department of Business Management and Economics
Institute for Cooperation in Developing Countries
Am Plan 2, 35032 Marburg, Germany

E-mail: bernadettebock@daad-alumni.de;
thomas.falk@staff.uni-marburg.de;
kirk@staff.uni-marburg.de

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ABSTRACT

Calls for new paradigms in water resource management have emerged from a broad range of commentators over the past decade. These calls arose as it became increasingly clear that the pressing problems in the water resource management have to be tackled from an integrated perspective, taking into account interdependent economic, societal, environmental, institutional and technological factors. Adhering to the calls, Namibia introduced various development and management approaches involving water, land and related resources with the objective of maximizing the resultant economic and social welfare in an equitable manner and without compromising the sustainability of vital rural ecosystems. Integrated management systems pursue the democratization of water resources through increased stakeholder participation. However, understanding the barriers to integrated and adaptive management requires a critical reflection on conventional modes of governance. In this regard, Namibia has achieved great strides by shifting from public water management systems and processes towards increased community-based management of water resources.

This paper investigates how newly formed collective action institutions which form a part of a recently introduced rural water supply reform impact on the natural resources management in three communal areas of Namibia. The analysis takes into account effects of the historic lack of decision-making power over natural resources of the rural communities on the management of their newly acquired rights and responsibilities. Moreover, the shift from perceiving water as a free public good to valuing it as an economic good by means of introducing a full cost-recovery facet, calls for an analysis of reform effects on household livelihoods.

An important aspect is that reform results vary across regions. New water institutions have gradually taken over wider functions in some communities, while competing with older local institutions in others. Impacts on livelihoods differ in particular due to socio-economic, environmental and technological factors. Our research shows the need for a regionally adapted implementation of integrated decentralization policies.

KEYWORDS

water management, decentralisation, livelihoods, community-based, Namibia

1. INTRODUCTION

The increasing demand for and the diminishing supply of water resources on a global scale has caused suffering for over 1 billion people across the globe from inadequate access to fresh water to satisfy the minimum levels of basic needs (Revinga et al. 2000; Rosegrant et al. 2002). It must be seen against this background that it is one of the Millennium Development Goals to halve the proportion of people who are unable to reach or to afford safe drinking water (UN 2000). Sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses has become an internationally recognised human right. An adequate amount of safe water is necessary to prevent death from dehydration, to reduce the risk of water-related disease and to provide for consumption, cooking, personal and domestic hygienic requirements. The direct and indirect costs and charges associated with water, and water facilities and services, must be affordable for all (UN 2002).

Especially in arid or semi-arid developing countries water users are predicted to face severe cuts in available per capita water (Johansson et al. 2002). 'Water-stressed' countries (Seckler et al. 1998) such as Namibia are therefore increasingly confronted with demands for new water supplies due to their expanding populations. At the same time their aquifers and watersheds are diminishing in size (Vajpeyi 1998). In most of the cases, it is the rural poor who are the most severely affected by the water scarcity. Additional water demand may lead to even stronger competition among water uses and users, forcing decisions to be made about the allocation and conservation of water that are compatible with societal objectives such as economic efficiency, sustainability and the equity imperative (Agudelo 2001).

Increasing water supply and water use efficiency has become a key challenge for future development in Namibia. With a population of approximately 2.1 million people living on 842,000 km² Namibia is one of the world's most sparsely populated countries. It is also one of the driest in the sub-Saharan Africa (Lange, 1997). Roughly 80 per cent of its territory consists of desert, arid and semi-arid land (Brown, 1994). Besides low and extremely variable rainfall, Namibia is characterised by high evaporation rates due to high temperatures. The country has a long-term average rainfall of about 250 mm per year. The majority of the regions receive less rainfall than the minimum amount considered necessary for dry-land farming (400 mm per year) (Heyns et al. 1998). Rain-fed crop production is limited to very small parts of the North. Most of the country is only suitable for extensive livestock keeping or wildlife grazing (Barnes et al. 2002).

High rates of rainfall evaporation mean that only 1 per cent of the annual rainfall contributes to the groundwater recharge and only 2 per cent is retained in reservoirs (Republic of Namibia, 1991). Demand for water currently stems from users in the domestic (urban and rural), agricultural (livestock and irrigation), mining and tourism sectors. Between 1980 and 1993, demand for potable water increased at an average rate of 3.5 per cent per annum (Heyns et al. 1998). Enhance the efficiency of water supplies and storage is therefore sorely needed (Bock and Kirk, 2006).

Johansson et al. (2002) describe an efficient allocation of water resources as one that maximizes net benefits to society using existing technologies and water supplies at a short term perspective. Efficient water allocation maximizes net benefits over variable costs of supply, and results in equalizing the marginal benefits from resource use across sectors in order to maximize social welfare (Dinar et al. 1997, Agudelo, 2001). In the long run, maximizing net benefits also involves the optimal choices of fixed inputs. An allocation that maximizes net benefits in the absence of taxes or other distorting constraints results in a first-best solution and may serve as a model of reference. However experience has shown that distorting informational, institutional or political constraints exist and an allocation that maximizes net benefits under the constraints

generates second-best efficient outcomes only (Tsur and Dinar 1997). Historically, the Namibian rural water supply was characterised by strong subsidisation creating a low-quality water sector while making the rural population highly dependent on government handouts (Bock and Kirk, 2006). Chapter 3 will reflect the history of rural water supply under the apartheid system and its implications for today.

Currently, a fundamental reform of rural water supply is implemented in the country in order to change the paradigm of control and command by empowering water users and to increase water management efficiency. Chapter 4 will discuss the effects of this reform on the natural resource management.

Efficiency of water supply is, however, not the only objective of the Namibian government. Economic development and population dynamics lead to strong competition among water uses and users, forcing decisions to be made about the future allocation and conservation of water that are compatible with societal objectives such as economic efficiency, the equity imperative (Agudelo, 2001) and natural resource preservation. In particular, an equitable distribution of resources and other assets has become a priority of the Namibian government due to the country's political history of apartheid (Republic of Namibia, 2004: sec. 3). Equity concepts deal with options on how wealth should be distributed among society's members (i.e. the 'fairness' of allocation across economically disparate groups); they may not be compatible with efficiency objectives (Dinar and Subramanian 1997). Chapter 5 will analyse if the rural water supply reform also meets the equity considerations and through what instruments this is achieved.

2. METHODOLOGY

The paper draws on both primary and secondary data collected in Namibia between 2001 and mid-2006. The research process started with desk research on the history of Namibian rural water supply as well as on the institutional framework of the currently implemented reform. Between 2001 and 2004, the impact of the rural water supply reform on the water management has been analysed empirically in three settlements in three regions of Namibia. As the investigation was conducted within the framework of the BIOTA Southern Africa research programme, the site selection was carried out in accordance with the BIOTA transect design.¹ Primary data were collected in Mutompo (18° 18' S, 19° 15' E) in the Kavango region in north-eastern Namibia, Okambo (22° 01' S, 17° 03' E), in the Ovitoto communal area in central Namibia, and the Nabaos observatories (26° 23' S / 17° 59' E) in the Berseba constituency of the Karas region in the south of Namibia. For this part of the analysis semi-structured interviews and participatory observation have been applied.

Between 2004 and 2006 the analyses have been deepened in the Kavango and Karas regions. Information on water management and the reform impact on rural livelihoods have been gathered at household level from a total of 18 communal settlements in these regions. Sample villages were selected on the basis of their vicinity to the BIOTA observatories Mutompo and Nabaos (see above). A total of 60 households were studied in four villages in the Kavango region. Since the Karas region is characterized by even greater distances between villages and a smaller number of inhabitants per settlement (household numbers range between 2 and 20 per settlement on average), a total of 14 settlements were included here in order to draw upon the same total number of 60 households. The total sample size of the in-depth analysis is thus 120 households. The households were selected by a random sampling technique.

¹ www.biota-africa.org.

The survey questionnaire is based on modules on the household's socio-economic characteristics and the natural resource use behaviour as well as on the policy and environmental awareness and perceptions. The focus groups were selected and pre-tests were executed to determine measurable attributes related to the natural resource use in addition to income and expenditure habits and levels. The household income and expenditure were recorded in order to be able to identify the effects of natural resource policy on the household budgets. Further, respondents have been interviewed regarding their perception of the organisational framework of natural resource use. Semi-structured interviews with key informants at the relevant ministries, non-governmental organizations and community-based organizations completed primary data collection. These interviews focussed on regional- and national-level issues concerning water policy, processes of policy formulation and implementation, water allocation institutions, infrastructure and technology, as well as water demand and supply patterns.

The analysis of the impact of the reform on the natural resource management is qualitative in nature. Perceptions regarding the organisational framework of the natural resource management have been analysed using descriptive statistics. In order to assess the impact of the Namibian rural water supply reform on rural livelihoods a wealth classification of respondents has been estimated based on hierarchical cluster analysis. The 'furthest neighbour' method was used based on the Pearson correlation measure. Calculations have been done by SPSS 15.0 for Windows. For each of the calculated clusters household characteristics have been analysed mainly by means of descriptive statistics and correlation analysis. All monetary terms have been computed in US Dollar based on the exchange rate of January 1, 2006: US\$ 1 = N\$ 6.37 (Oanda, 2008).

3. HISTORY OF RURAL WATER SUPPLY IN NAMIBIA

Water has always played a central role in the Namibian natural resource management as water availability determined land use. Up to now parts of the Berseba communal area in the Karas region are scarcely grazed because of insufficient water supply. Before the 1970s, inland Kavango was hardly used for grazing and cultivation. Only in the 1970s a first permanent settlement evolved around the Mutompo area (Mendelsohn et al. Obeid, 2003: 114). The main reason for this late start of agricultural use of land was insufficient water supply. Only after the installation of boreholes the local population grew quickly and a more rapid land transformation begun.

Under these natural conditions access to water and access to land are inextricably. This is reflected in the water management systems of different ethnic groups prior to the colonial times. Although there was no uniform customary law in place, in the majority of the groups first-comers were granted privileged property rights as they could decide over modalities of access to and use of water and land. Traditional authorities played a key role in the natural resource management because of their hierarchical governance structure which was mainly based on inheritance rules. To date, traditional authorities play a central role in many Namibian communities with regard to granting access for instance to water and regulating the use of water and water related resources.

Although traditional, indigenous knowledge on water management still exists, water rights have been fundamentally transformed with the arrival of the European settlers. A dual system of natural resource ownership has evolved. On the one hand, the colonial community applied European private tenure to support the commercialized agriculture; on the other hand the local communities had communal ownership of resources based on traditional authorities' control (Tewari, 2001).

This dual water management system existed throughout the colonial and apartheid period. When South Africa implemented its Apartheid regime in Namibia in 1948, this rigid policy was extended to Namibia lasting until 1989. A critical aspect was that water rights were derived from land tenure (Tewari, 2001). This philosophy is reflected in the

South African Water Act of 1956 which is the basis of the legislation on water in Namibia until independence. In combination with land expropriation of the non-white population and their discrimination on land markets the non-white population were consequently deprived of their water resources (Tewari, 2001).

Under the Apartheid water access and availability was seen as important only for one racial group (Tewari, 2001). This is reflected in a discriminating agricultural policy which allowed heavy subsidization of water use in order to encourage racially biased and large-scale agricultural development programmes (Dewdney, 1996). Vast investments were committed to broaden the existing water infrastructure through large, innovative water schemes (de Lange and Maritz, 1998). Many water users considered water as a naturally available and abundant good, and available at low cost (Tewari, 2001). Thus, in this period water was not recognised as a scarce resource (de Lange and Maritz, 1998). While this factor may have contributed to the fast growth of mining and agricultural sectors in the 1970s, the policy has helped to raise unsustainable expectations among beneficiaries regarding water use. Long-run costs proved to be much higher than initial costs e.g. installation of infrastructure. Explicitly subsidizing the water use led to an extreme exploitation of aquifers and surface-level water resources in order to meet the water needs of (white) commercial livestock farmers, and of South African mines (Forrest, 2001).

The provision of water supplies to the so-called communal areas – disproportionately small areas of land where the majority of the black population were restricted to live – was overtly neglected. In 1990, it was estimated that only 50 per cent of the Namibian rural population had access to a reliable source of safe drinking water (Republic of Namibia, 1996). Basic needs of the majority of its citizens living in these areas were not a high priority at that time (Blackie and Tarr, 1999). The living conditions in the communal areas were characterized by high unemployment and underemployment, low purchasing power, and highly subsidized, low-quality government handouts. As a part of this policy, most rural communities received water at no cost. Thus, investments in infrastructure as well as running costs have been provided by the government. This resulted in an underdeveloped communal water infrastructure, a pronounced dependency syndrome in communal areas as well as in a general perception that water is, and should remain, a free good. Rural non-white communities have never over-utilised water to the same extent as for example the highly subsidised commercial agricultural sector. Nonetheless, considering the natural availability of water resources, communal citizens have also used water inefficiently (Dewdney, 1996).

In the past no formalised mechanism existed to exclude people from water use in any of the researched sites. However, geographical closeness determined whether a water point could be used or not. In most of the cases, people living outside of a settlement could not use water from the settlement as they had to walk too long distances with their livestock to reach the water point. As a result, those who have been granted access to land received access to the next closest water point only. High transaction costs of reaching a water point ensured that access to water was indirectly regulated through land access. Access to land, in turn, was and is regulated by traditional authorities for all researched settlements. Through this interrelatedness, traditional authorities were de facto controlling access to water (Falk, 2007: 101ff).

4. THE NAMIBIAN RURAL WATER SUPPLY REFORM

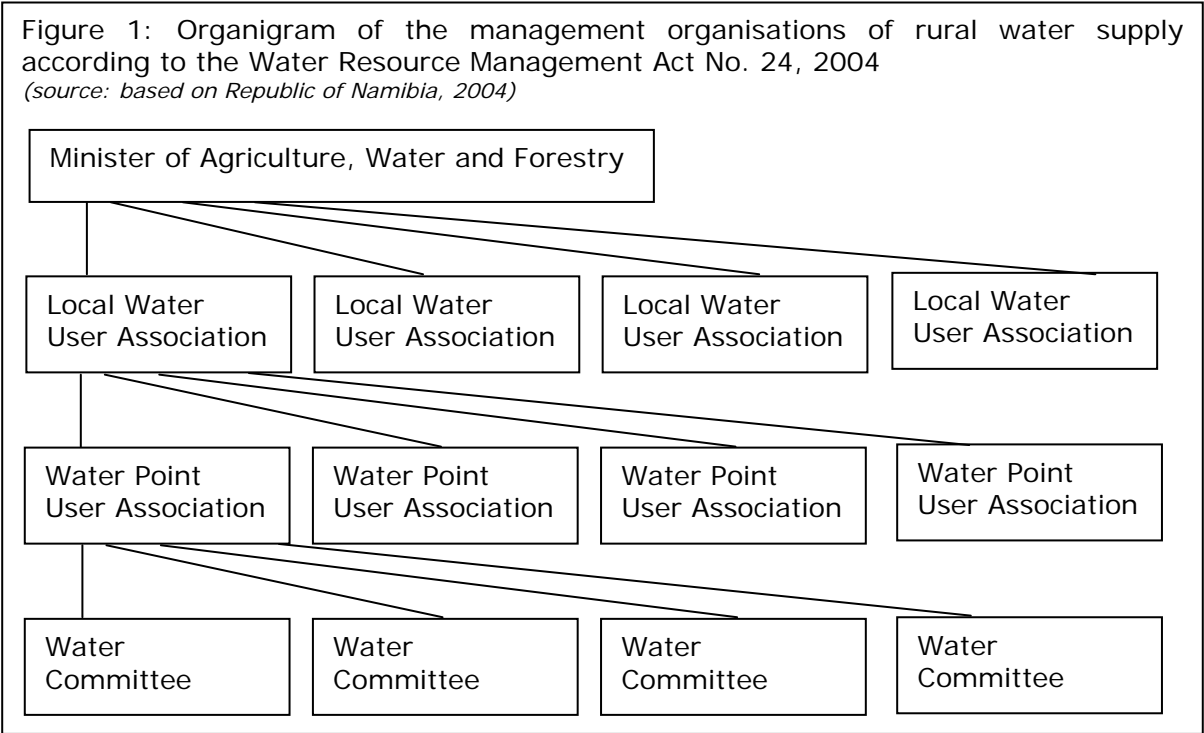
The currently implemented rural water supply reform has the objective to reverse the racial-based inequities regarding access to and use of water resources. Various laws and policy papers address the issue (Republic of Namibia, 1990, 1993b, 1997b, 1997c, 2000a). In particular the Water Resource Management Act provides the legal framework for the implementation of the water reform (Republic of Namibia, 2004). The act acknowledges safe drinking water as a basic human right. An equitable access to water

resources for every citizen, in support of a healthy and productive life is the most important principle of the act and the key objective of the reform (Republic of Namibia, 2004: sec. 3). Policy makers are aware that in the long run this objective can be achieved only if water resources are managed ecologically sustainable. Human needs and environmental ecosystems must, therefore, be harmonised. Economic, environmental and social dimensions have to be incorporated into water management (Republic of Namibia, 2004: sec. 3).

The new legislation has not changed anything regarding the ownership of water resources, which remains also after apartheid in the hands of the State. Water ownership is conditional as the state has to ensure that water is managed and used to the benefit of all people (Republic of Namibia, 2004: sec 4). This legal perception is not uncontested, because state ownership is in contradiction to the customary law of at least some ethnic groups. Customary law is recognised by the Namibian Constitution (Republic of Namibia, 1990: Art. 66).

Disregarding the centralised ownership constellation, decentralisation and subsidiarity are key strategies in order to achieve the objective of economic, environmental and social sustainable water management. The Water Supply and Sanitation Sector Policy of 1993 states that "... equitable improvement of services should be a result of the combined efforts of the government and the users based on community involvement, participation and mutual responsibility" (Republic of Namibia, 1993b). Reformed rural water supply is now based on three fundamental principles: a) maximum involvement of users, b) delegation of responsibility to the lowest possible level and c) an environmentally sound utilisation of water resources (Republic of Namibia, 1993a: 18). In 1997, it was decided that within ten years' time the responsibility for managing and paying for water services should be progressively devolved to community organisations (Republic of Namibia, 2000a).

Figure 1 gives an overview over the management structures of rural water supply as proposed by the Water Resource Management Act. Following subsidiarity principles, the reform strongly focuses on the establishment of water point user associations (WPA) (Republic of Namibia, 2004: part V). They consist of those community members who permanently use a particular water point. The WPAs have the right and the duty to



operate and maintain their water points, in order to foster a sense of ownership (Republic of Namibia, 2004: sec 18 (1)). In their constitution they may decide about water use regulations and permit or forbid water access according to their rules. They are further given power to adopt measures to prevent the wastage of water and to protect water infrastructure against vandalism and other damages (Republic of Namibia, 2001d: 6.2.2, 2004: sec 18, 19).

The water point user associations are supposed to elect water point committees in order to run the day-to-day management and financial activities (Republic of Namibia, 2004: sec 16 (1), (2)). The water point committees are empowered to monitor and enforce the compliance with regulations e.g. by introducing penalties. Penalties against violations have to be specified in the Management Plan (Republic of Namibia, 2001c). The ultimate punishment against any offence is the suspension of membership of the association (Republic of Namibia, 2001d: 6.2, 8.2, 9.2), which simply means exclusion from the water supply. In cases of conflicts, a mediator is appointed. Depending on the wish of the residents, this may be traditional authorities, government officials, church leaders or anyone else (Republic of Namibia, 2001e: 10). Such an approach is intended to allow for efficient conflict resolution as an authority is chosen who best represents the interests of the involved parties and whose decision is accepted. Social and moral-based institutions thus minimise the need for external enforcement.

In the case that the WPAs do not manage to deal with any issue they can call on the next higher management structures. These are local water user associations (LWA) which are formed by the WPAs of a constituency. The rights and duties of the LWAs are very much the same as the ones of the WPAs (Republic of Namibia 1997a, 2004: sec 16). Again following subsidiarity principles, the LWAs are in particular supposed to coordinate the water management of the region (Republic of Namibia, 2004: sec 18 (2)) and to solve problems which can not be solved on the local level.

On the top level the Ministry of Agriculture, Water, and Forestry, and in particular the Directorate of Rural Water Supply, has been newly assigned with the role to serve as 'facilitator' instead of 'provider' of rural water services (Republic of Namibia, 1994). The Minister has mainly policy making and strategic planning functions (Republic of Namibia, 2004: sec 5). She/he establishes any water management structure and registers or deregisters for instance the WPAs and LWAs (Republic of Namibia, 2004: sec 5(2)f, 21, 22). A national Water Advisory Council advises the Minister on water-related matters (Republic of Namibia, 2004: sec. 11). Basin Management Committees are set up to manage water catchments (Republic of Namibia, 2004: sec 12, 13). One of their functions is to promote community participation in the protection, use, development, conservation, management and control of water resources (Republic of Namibia, 2004: sec 13b).

5. IMPACT OF THE REFORM ON WATER MANAGEMENT

The following chapters will discuss how the rural water supply reform has been implemented in the three settlements Mutompo, Ovitoto and Tiervlei. We will assess how effective the new water-related institutions are in their role to promote an efficient use of water and natural resources.

5.1. Mutompo/Kavango region

Mutompo is situated in the Kavango communal area. It was set aside as the Okavango Native Territory in 1937 (Yaron et al. 1992: 182). Its dominant vegetation type is Woodland of the Northern Sandplains with medium-to-dense bush and forest (Mendelsohn and el Obeid, 2003: 64f). An average rainfall of more than 500 mm allows for dryland rain-fed cultivation around Mutompo. The whole Kavango region has a population of about 202,700 people, which is 11 percent of Namibia's population living on

5.5 percent (48,456 km²) of Namibia’s land area (Republic of Namibia, 2001a, Mendelsohn and el Obeid, 2003: 11). Population density and the resulting pressure on natural resources in particular in the inland Kavango region is yet low (Okavango Challenge, 2004). In Mutompo, 2.2 people live per square kilometre which is only half of the Kavango average (4.2 persons per km²) (Republic of Namibia, 2001a).

Only in the 1970s the first permanent settlement evolved in the Mutompo area. At this time, land for grazing and crop cultivation became more and more scarce along the banks of the Kavango River where water was abundant (see also Yaron et al. 1992: 87, Werner, 2002: 15, Mendelsohn and el Obeid, 2003: 82), as the population in the Kavango area has augmented by more than 40 times during the 20th century (Mendelsohn and el Obeid, 2003: 12). In 1970s a water hole was drilled and a hand pump was installed in Mutompo in order to establish a water point in the inland of the Kavango region. The water supply has further improved with the installation of a diesel pump and a water reservoir in 1989. The improved water supply attracted more people coming from the river to the inland area and the settlement has since grown rapidly. Overall, with the installation of a water point in Mutompo, the pressure on the riverbank land decreased but the transformation of almost untouched inland forests began. (Falk, 2007: 101ff).

As a measure of the reform, a water point user association was founded in 1997 and a water committee was elected. The committee is officially responsible for managing and running the water facilities and collecting fees. However, until 2007 no water point constitution and management plan has been formulated. One reason for this shortcoming might be insufficient external support in drafting a constitution. Another aspect is the low awareness amongst water users of the relevance of such formalised rules in an area where traditional authorities de facto still organise water supply and decide water questions together with the other residents. The low relative importance of the water committee in comparison to other organisations can be assessed on the basis of a survey on organisational diversity carried out in Mutompo and neighbouring settlements. The traditional authorities are most trusted as Tables 1 and 2 show. They are wished to play the most central role in the respondents’ lives. This does, however, not mean that a democratically elected community committee or the judiciary and executive government system are disregarded.

<i>Table 1: How much do you trust the following organisations (in percent; N=60)? (source: own research)</i>				<i>Table 2: How much influence should the following organisations have (in percent; N=60)? (source: own research)</i>		
	Very much	moderate	not at all	very much	moderate	not at all
Water committee	85.0	13.3	1.7	76.7	6.7	16.7
Traditional authorities	91.7	8.3	0	90.0	8.3	1.7
Gov. officials	68.3	21.7	10.0	65.0	20.0	15.0
judiciary	83.3	6.7	10.0	76.7	6.7	16.7
police	90.0	6.7	3.3	86.7	10.0	3.3
political parties	71.7	20.0	8.3	65.0	18.3	16.7
NGOs	60.0	16.7	23.3	58.3	21.7	20.0

As one reform outcome, incentives to save water and to maintain infrastructure, however, have begun to take effect. Around the water tap in Mutompo, the villagers collectively built a fence to protect the tap from animals. In order to control water use and waste, the tap is kept locked except at specific times of the day. Thorn-bushes were placed

around the open reservoir ever since some people have started to take water directly from there. Even if such rules are not uncommon all around the world, in the researched area they have been introduced only after the implementation of the rural water supply reform. Our research showed that awareness of the problem has increased and more and more residents accept the rule that only those who pay for water should obtain it. Nevertheless, there are still problems. Two padlocks were broken and the thorn-bushes removed. Thereupon, the headwoman threatened some households to be excluded of the settlement although with little success.

By 2004 the residents of Mutompo had not seen yet much benefit from the institutional arrangement. Their capacity-building was limited to technical training for the caretaker related to pump operation and maintenance. The Water Committee did not receive any management training (compare with Republic of Namibia, 1997a: 7). The fact that Mutompo residents can formally be excluded from water use did not affect their lives very much. Already in the past, only Mutompo villagers used the water point. If people from other settlements wanted to use the water they had to ask for permission and to pay a monthly fee. The same applied if the pump in Mutompo was broken and local users had to go to water points of other villages (Falk, 2007: 101ff).

5.2. Tievlei/Karas region

Tiervlei and its neighbouring settlements are situated in the Berseba communal area in the southern Namibian Karas region. The vegetation type of the region is Nama Karoo. Average annual rainfall is 142 mm (Huysmans, 2003). Rainfall variability in the semi-arid summer rainfall areas of southern Namibia is about 70 to 80 percent (Mendelsohn et al. 2002). Low and unreliable rainfall significantly limits natural resource use opportunities (Republic of Namibia, 1992; Akhtar-Schuster et al. 2005). The most important one is small stock farming.

As mentioned above Tiervlei as well as its neighbouring farming units do not form a coherent settlement. They belong to what is commonly called 'Odendaal Farms'. These were commercial farms until the 1960s which were purchased by the government in order to consolidate the existing scattered 'native reserves' into one joint Namaland homeland (Fuller and Turner, 1996: 16, Rohde et al. 2000: 335). The farm camps are fenced and distributed amongst the communal farmers. Therefore the residents know the exact size and borders of their resource base. Since the 1960, some of the camps have been used by the same families, increasing their sense of ownership and control over the plot (Fuller and Turner, 1996: 16).

Besides grazing, water is the most crucial resource for Berseba farmers (Fuller and Turner, 1996: 28; see also Republic of Namibia, 1992). The ground water in the area is extremely sensitive to over utilisation. In low rainfall years, boreholes dry up and cause severe strain to human and livestock population (Republic of Namibia, 1992: 52). The Tiervlei Water Point Association controls five windmills in five camps, serving 27 households. All water points are suitable for livestock but only four of them for human consumption.

In the late 1990s, Tiervlei residents formed a Water Point User Association. They elected a water committee and drew up a water constitution. Residents are aware of their newly introduced rules. They agreed for instance that one has to stay at least 20 m away from a water point to wash themselves, their clothes or their cars. Furthermore, the amount of water allowed to be used for gardening has been limited. The fact that water users formulate their own rules indicates that the reform motivates them to save scarce water resources. The reforms approach of decentralised formulation of institutions makes sure that rules are adapted to a particular place. It further reduces monitoring and enforcement costs of water resources. Experimental analyses of the BIOTA colleague

Vollan imply that farmers in the Berseba area significantly are more likely to cooperate under externally set rules if the affected people agreed on them (Vollan 2008).

In particular, in the Tiervlei area an important element of the water reform is that members of the Water Point User Association have the formal right to grant or deny access to their water. This also applies to access to other natural resources. Members of the water point committee were convinced they had the right to stop people from using Tiervlei resources.² Whoever controls access to water in these semi-arid environments also controls access to land. The right to exclude others from water and land gives many farmers the confidence to decide how resources are used.

The fact that the water reform directly affects the regulation of access to land, however, creates problems. Confusion over the roles and jurisdiction of the water point committee intensifies a lack of cohesion within the communities. The allocation of land is a customary right of traditional authorities. On the one hand, Tiervlei residents report that the committee becomes involved in permitting access to land, on the other hand traditional authorities are also involved in water issues. A traditional councillor intervened for instance when non-residents used Tiervlei water without permission and without paying water fees. Contradictions between the Rural Water Supply reform and the Communal Land Reform deepen confusion and mistrust. According to the Communal Land Reform Act, no person may be prevented from drawing water from any water point on a commonage except with written permission of traditional authorities and ratification of the land board (Republic of Namibia, 2002b: 29(4)(d)). This law thus undermines the power of the water point committee.

In contrast to many other communal areas in Namibia, at present, traditional authorities are basically absent at a local level around Tiervlei and lack of financial and human capacity (Keulder, 1997: 27, 44). The closest members of the traditional council live approximately 25 km away; both chiefs of the Berseba area live outside the communal land (Keulder, 1997: 27). Traditional authorities are further weakened as there are two persons competing for the chieftaincy of the Berseba area (Adams and Werner, 1990: 96; Keulder, 1997: 12; Klocke-Daffa, 2001: 63, 66; Kössler, 2001: 348). In addition, the chiefs complain that the younger generation, in particular, does not appreciate customary institutions any more. Following independence, the Berseba traditional court stopped working as judicial body for the community and traditional councillors only assist Namibian police with minor cases (Keulder, 1997: 28; Hinz, 2000: 126). As a result, there has been an increase in crime (Keulder, 1997: 28).

The gap of missing local government and traditional authorities is partly filled by water organisations. Water committees have increasingly become a forum in different Namibian communal areas for community discussion on natural resource issues (see also Twyman et al. 2000: 132). Table 3 and 4 show that the Tiervlei water committee is more trusted than any other organisation and that the vast majority of respondents want that the committee becomes the most influential structure in the settlement. The fact that this structure was established only ten years ago on the initiative of the government and is now the most appreciated community organisation is an impressive success of the reform.

Thus, the impact of the rural water supply reform goes far beyond a mere promotion of sustainable water management. It creates a stronger sense of ownership and incentives to invest in natural resource preservation in general. The reform strengthens the rights of residents particularly when traditional authorities have become weak or are little respected. Although this situation may lead to new conflicts (Bock and Kirk, 2006: 354) it

² *Spearman-Rho correlation*: „member of committee“ and „can somebody be excluded from resource use“; coefficient: 0.385; significance: 0.057; N = 25.

can be stressed that strengthening the rights of local users increases incentives for them to manage natural resources in a more sustainable manner.

<i>Table 3: How much do you trust the following organisations (in percent; N=60)? (source: own research)</i>				<i>Table 4: How much influence should the following organisations have (in percent; N=60)? (source: own research)</i>		
	Very much	moderate	not at all	very much	moderate	not at all
Water committee	53.3	36.7	8.3	86.7	10.0	3.3
Traditional authorities	28.3	26.7	45.0	76.7	16.7	5.0
Gov. officials	30.0	48.3	21.7	73.3	13.3	8.3
judiciary	50.0	23.3	16.7	70.0	16.7	13.3
police	48.3	23.3	26.7	83.3	13.3	3.3
political parties	18.3	33.3	46.7	50.0	20.0	21.7
NGOs	20.0	15.0	28.3	45.0	11.7	11.7

5.3. Okamboro/Otjzondjupa region

In Okamboro, only exploratory research has been carried out because the focus of the BIOTA project shifted away from this site after 2004. Nonetheless, the results supplement the more detailed analysis in the Kavango and Berseba areas.

The settlement of Okamboro belongs to the Ovitoto communal area in the central Namibian Otjzondjupa region. Ovitoto belonged to the Herero reserves which were established by the German administration in the early 20th century. In this area 21 settlements are distributed over a territory of approximately 60,000 ha. In the period between 1954 and 2003 the population of Okamboro doubled from 80 (Wagner, 1957: 29) to 158 inhabitants (Schneiderat 2004). Most of the region is sparsely inhabited commercial farm land. Moreover, the population density in the Okamboro area is seven times the average of density in the Otjzondjupa region (0.4 persons per sq. km) which results in a high pressure on the natural resources around Okamboro. Hence Okamboro residents complain about the fact that their land is overcrowded, a perception which is supported by these statistics (Falk, 2007: 125).

Also in Ovitoto the management and control of water points is a crucial element of the natural resource management. Villages are organised around watering points and the village grazing territory is largely determined by the fact that cattle do not walk further than 7 km away from the water point (Werner, 2000: 253). An old borehole exists around the settlement; a new one was drilled in 2002 in the frame of the rural water supply reform. While the government remains responsible for the old pump, the new one was immediately handed over to the community. The community also received a closed water tank which improves the water quality. It is government policy to repair all water points before they are handed over. Even when the new pump broke in 2003 the government repaired it.

The residents of Okamboro have formed a Water Point User Association (WPA) and in the late 1990s a water point committee was elected. It consists of twelve members including the village traditional authority. The committee meets if water problems have to be discussed and jointly decides with the remaining community. For instance, committee

members mentioned that some households waste water and that more awareness amongst the residents is needed in order to preserve the scarce resource. Hence, a caretaker, responsible for daily operation and maintenance work, was employed. Under the supervision of the Directorate of Rural Water Supply the WPA formulated a water constitution which defines regulations on water use. Representatives of the directorate's office in Ovitoto emphasised that rules and punishments had to be formulated by the community itself in order to be adapted to their specific situation. Thus the Directorate of Rural Water Supply only tries to sensitize the people. This approach increases the chance that social and moral-based institutions become effective. Should these institutions prove to be inefficient in particular cases, the constitution gives the WPA the opportunity to take offenders to court. The threat of formal punishment supports the enforcement of informal ones. The fact that villagers discuss the pollution and waste of water indicates that the new water policy promotes more sustainable water management. Moreover, one fifth of the households mentioned that they helped to repair and maintain the water infrastructure which reveals an increasing feeling of responsibility amongst the residents for the water point. It can be concluded that the new water policy showed positive effects regarding sustainable resource management in Okambo. Most farmers seem to be willing and able to contribute to the water supply.

6. IMPACT OF THE NAMIBIAN RURAL WATER SUPPLY REFORM ON RURAL LIVELIHOODS

Strengthening the rights of water users is, however, only one strategy to improve water management in Namibia. A backbone of the reform is capacity-building related to water supply, operation, maintenance and conservation aspects (Republic of Namibia, 1993a: 29f). Policy makers are aware that water is a scarce and valuable resource. Therefore, it is of high priority to them to place an economic value on water in order to avoid externalities and to encourage efficient and sustainable resource supply. This view was reflected in the National Water Policy Review process in 1996 and is anchored in the water legislation. Cost-effective water supply is one of the fundamental principles of the Water Resource Management Act (Republic of Namibia, 2004: sec. 3). Policy making is based on the premise that the overall sustainability of water supply crucially depends on the ability of suppliers to become financially self-sufficient. For the formerly marginalized communal farmers, this means stronger self-support and more responsibility for water facilities as they are supposed to own and operate their installations (Republic of Namibia, 1993a: 29). Users' payments should cover operation and maintenance costs. Decentralising expenditure responsibility shall increase incentives to manage water infrastructure more carefully, to reduce maintenance costs and to provide incentives to steer water consumption towards most efficient uses. Another positive effect of user fees is that they are sometimes interpreted as a person's claim to natural resource rights (Fuller and Turner, 1996: 23). The perception of secure property rights reduces the discount rate of resource users and increases incentives to manage resources more sustainably.

It is, however, a common problem of decentralisation projects that lower level administrative structures lack the capacity to meet ambitious expectations of devolving responsibilities to them. Within the Namibian government concerns rise whether the cost-recovery of rural water supply may not put too high burdens on water users. At least in some regions insufficient attention was paid to the ability of water users to pay. Cost recovery was phased too rapidly and training was inadequate (Republic of Namibia, 2000b: 20). Low levels of water usage make it difficult to recover costs without charging excessive amounts to users (see also Goldin, 2000: 390). This resulted in poor management and maintenance (Republic of Namibia, 2000b: 20) and is assumed to have, in turn, negative effects on rural livelihoods. The Water Resource Management Act prescribes that essential water supply services must be available to all Namibians at an affordable price (Republic of Namibia, 2004: sec. 26). The focus on equity aspects is understandable having in mind the extreme income inequality in Namibia which is reflected in a very high Gini-coefficient of 74.3 in 2007 (UNDP, 2007). Hence, the

government recognises the need to adapt the implementation of the rural water supply reform to the capacity of each community to cater for itself, in order to quantify needs for subsidisation (Republic of Namibia, 1993a, 1997a, 2000a). Decentralising expenditure responsibility should not have negative poverty impacts.

Our three case studies shall give an impression to which extent the Namibian government manages to balance positive and negative effects of decentralising rural water supply. Crucial in this context is the approach that each of the WPA has the mandate to set an own water fee structure. In this way payment schemes can be adopted to natural, cultural, technological, and economic conditions of each community. As a result one can observe a wide variation of payment systems amongst the different WPAs. The Water Point Committees (WPCs) reported that they use perceived living conditions and average income levels of households in their areas as a basis for determining the water price, such that households should be able to afford the water fee (Bock and Kirk, 2006).

At present the payment of water fees is regulated in a confusing way in the researched *Kavango* settlements. There is no monthly payment system implemented. If and when the water in the reservoir is depleted and diesel is needed to run the pump, the traditional authorities collect what the households are willing and able to pay in cash or in kind. For this reason a contribution to water supply varies significantly between the households. Our analysis will help to reveal how much each group actually pays.

Under the Apartheid water supply system the government was responsible for maintaining water infrastructure and replacing defective parts. Until 2007 nothing has de facto changed about this situation. The Mutompo pump has been regularly maintained, as records of the Directorate of Rural Water Supply prove. However, technical infrastructure has not been improved as a direct result of the reform. The water point was not yet officially handed over to the WPA; there is much confusion amongst water users over ownership claims and maintenance questions. Diesel to run the pumps was provided until 1998 by the government and even trucked to the settlements. Since then the amount of diesel freely allocated has been gradually reduced. Since August 2002 the villagers have had to buy diesel at their own costs (Falk, 2007: 101ff). The money collected in Mutompo and the surrounding settlements is hardly enough to buy fuel; no funds for future repairs are saved. Transaction costs make up a high percentage of the total costs. Since 2001, the government no longer transports diesel to the settlements. Villagers have to travel to Rundu to buy fuel. The plan to establish shops along the tarred road to sell parts and diesel was not implemented until 2007.

In the *Berseba* settlements the payment system is more transparent. Each household pays approximately US\$ 1.50 per month. The WPA discussed the development of a more differentiated scheme with pensioners receiving a discount or a payment per livestock. Such schemes have not been implemented because the members of the WPA could not agree on a broadly accepted rule. At this site fees are saved to be used for future maintenance work of the water infrastructure. Since the pumps are run by windmills, no diesel has to be purchased. This limits the costs of the water supply. Despite the low fees, getting all members to pay their contributions is a problem.

In *Okamboro*, payments are linked to consumption. Since livestock is a main consumer of water (Bock and Kirk, 2006: 350) payments are dependent on the livestock numbers of a household. By the end of 2002, households were paying approximately US\$ 0.15 for each head of cattle per month. The collection of water fees works well and covers not only the costs of the purchased diesel. Money is saved in a bank account for future repairs. Although residents pay relatively high sums for water only few complained about the new institutional arrangement. Nevertheless, quarrels came up with some livestock owners who were not willing to pay the fees. The owners and their paid workers are under high

social pressure and risk their water supply being cut off. Until 2004, no case of such exclusion was reported.

The impact of the Namibian rural water supply reform on rural livelihoods will be assessed hereafter in more depth for the Kavango and Berseba area. Since it is assumed that the impact varies depending on the wealth status of water users, the respondents have been classified into groups. Since wealth is a multidimensional concept especially in an at least partly subsistence economy, cluster analysis has been applied to separate three groups. Variables used for the classification are:

- 1) Annual non-farming income per capita;
- 2) Annual farming income per capita;
- 3) Value of livestock per capita.

In the following chapters the three groups are called a) the committed farmers, b) the income diversifiers, c) the poor.

6.1. The committed farmers

Approximately one third of the first and largest group is living in the Kavango and two third in the Berseba area. This group is called the 'committed farmers' as they receive a comparatively high income share from farming and they further own on average a significant number of animals. Average value of livestock per capita in this group is US\$ 1,676. With almost 60 years, the average age of the household head is the highest of the three classified groups. This explains that approximately half of the households receive income from pensions. Pensions are by far the most important source of income from non-farming as well as farming activities. Despite the relatively high livestock numbers the daily total income per capita is with US\$ 1.13 on average very low. This amount includes already the most important sources of subsistence income. The livestock possession stabilises their lives. One needs to keep in mind that the livestock is for many communal farmers simultaneously unemployment, retirement, health, and life insurance, a means of production, the savings account, as well as a source of food (Falk, 2007: 77ff, 170ff).

The committed farmers pay on average the largest amount for water supply. Currently approximately 1.7 percent of their total budget is spent for water fees. This is half the proportion of what the 'the poor' pay. Intra-community fairness becomes the more an issue if one considers that livestock is consuming the biggest share of available water (Bock and Kirk, 2006: 350). With US\$ 0.99 paid per Livestock Unit (LSU) the households pay by far the lowest amount in proportion to their consumption. The results show that discounts for pensioners as discussed in the Berseba WPAs would rather not improve the fairness of water payments. Pensioners in tendency own larger livestock numbers, consume therefore more water and have due to their pension a regular monthly income.³

The payment of US\$ 26.6 per month seems to be affordable for the committed farmers. In 2007, the government was, however, still responsible for most of the water points. In the past, whenever damage of the water infrastructure had to be repaired, the residents were not allowed to do so but had to inform the local government. Communal farmers were very dissatisfied with this set-up because repairs usually took a long time. In a study undertaken by the Ministry of Agriculture, Water and Rural Development in 1992, the majority of respondents expressed the wish to maintain the water points themselves

³ *Spearman-Rho correlation*: "livestock numbers owned by household" & "having pension as source of income"; coefficient: 0.200; significance: 0.028; N = 120.

provided they are equipped with the necessary tools (Republic of Namibia, 1992). After going through major repairs some few Berseba water points have been handed over to WPAs. For the majority of the water points the government is therefore still responsible for any repairs; even for the ones which have been handed over, the WPA is responsible only for minor maintenance.

Table 5: Household characteristics of the cluster 'the committed farmers' (N = 73)

Average annual income from non-farming activities per capita	US\$ 255.4
Average annual income from farming activities (including subsistence) per capita	US\$ 157.3
Average total annual income including subsistence per capita	US\$ 412.6
Average total daily income per capita	US\$ 1.13
Households owning livestock	98.6 percent
Average value of livestock/animals per capita (including chicken)	US\$ 1675.7
Average number of people staying permanently in household	5.9
Average age of household head	59.2 years
Average school grade of household head	4.1
Household receives income from full-time employment	11.0 percent
Household receives income from part-time employment	21.9 percent
Household receives income from small business	30.1 percent
Household receives pension income	49.3 percent
Household receives remittances	49.3 percent
Average annual water payments per household	US\$ 26.6
Share of total household budget spend on water payments	1.7 percent
Average water payment per LSU	US\$ 0.99
Ratio Kavango / Berseba	37 / 63

As mentioned above, the rural water supply reform has the objective to introduce cost-recovery principles of water supply. Some exemplary calculation for the Tiervlei WPA will show the potential impact of this policy on committed farmers' livelihoods. According to the Chief accounting officer of the Directorate of Rural Water Supply in the Karas region, average maintenance cost per wind-driven water system (windmill) amounts to approximately US\$ 750 per annum. The Tiervlei WPA is controlling five pumps, which means the total annual costs would be approximately US\$ 3750. At the moment the Tiervlei WPA members pay approximately US\$ 350 per year. As soon as the Tiervlei farmers would be fully responsible for the infrastructure maintenance they would have to pay on average seven percent of their total budget for water. If the total water costs of the WPA would be distributed proportionally to the livestock numbers, as implemented in Okambo, some of the Tiervlei 'committed farmers' would have to pay more than their current total farming and non-farming income for water.

6.2. The income diversifiers

In the second largest group, slightly more Kavango farmers are represented. 'Income diversifiers' are less dependent on farming but rather on income from farm and non-farm employment, small business but also pensions. They are on average younger than the

‘committed farmers’ and better educated. This group has the highest total non-farming as well as total income compared to the other groups. Nonetheless, a daily average income (including subsistence) of US\$ 1.56 indicates that businesses are really small and employments are in most cases unqualified ones. The ‘income diversifiers’ own few livestock. Their livelihood security depends on their daily work. This makes them more vulnerable to risks like unemployment or disease. In 2002, the prevalence of HIV was in the Karas region at 16 percent, and in the Kavango region at 22 percent (Republic of Namibia, 2002a). At the moment, for this income group hardly any attractive savings and insurance mechanisms exist alternatively to livestock (Falk, 2007: 237).

Table 6: Household characteristics of the cluster ‘the income diversifiers’ (N = 33)

Average annual income from non-farming activities per capita	US\$ 528.5
Average annual income from farming activities (including subsistence) per capita	US\$ 41.3
Average total annual income including subsistence per capita	US\$ 569.9
Average total daily income per capita	US\$ 1.56
Households owning livestock	57.6 percent
Average value of livestock/animals per capita (including chicken)	US\$ 131.1
Average number of people staying permanently in household	5.5
Average age of household head	48 years
Average school grade of household head	4.8
Household receives income from full-time employment	30.3 percent
Household receives income from part-time employment	54.5 percent
Household receives income from small business	39.4 percent
Household receives pension income	48.5 percent
Household receives remittances	33.3 percent
Average annual water payments per household	US\$ 21.1
Share of total household budget spend on water payments	0.8 percent
Average water payment per LSU	US\$ 6.8
Ratio Kavango / Berseba	58 / 42

‘Income diversifiers’ pay on average less than ‘committed farmers’ but slightly more than ‘the poor’ for water. This group spends on average less than one percent of its total income for water which seems to be affordable. Nonetheless, also this group would be negatively affected if it would have to cover the full costs of water supply. One needs to concern about this group also because their sources of income are relatively insecure and especially the younger part of this group quickly runs risk to shift to the group of ‘the poor’ as soon as they become sick, are unemployed or when their businesses collapse.

6.3. The poor

This group includes only 14 out of the 120 households. All 14 households are living in the Kavango region. This means that almost one fourth of the Kavango households fall within this group. Group members are rather young and have a very low level of education. Their main source of income is crop cultivation supplemented by casual work. A daily income including subsistence of US\$ 0.24 justifies classifying them as being poor.

The poor pay the lowest total amount but the highest share of their budget (3.5 percent) for water. The picture becomes even more severe if one remembers that livestock is the main water consumer. The poor pay on average US\$ 212 for each livestock unit (LSU) they own per year. This income group would extremely benefit from a payment scheme which relates water fees to the livestock number. A budget proportion of 3.5 percent does not sound unaffordable. Nonetheless, one needs to raise the question whether any additional burden is socially acceptable for a group within the society which lives from such a low income.

Table 7: Household characteristics of the cluster ‘the poor’ (N = 14)

Average annual income from non-farming activities per capita	US\$ 15.5
Average annual income from farming activities (including subsistence) per capita	US\$ 73.1
Average total annual income including subsistence per capita	US\$ 88.5
Average total daily income per capita	US\$ 0.24
Households owning livestock	7.1 percent
Average value of livestock/animals per capita (including chicken)	US\$ 8.4
Average number of people staying permanently in household	6.1
Average age of household head	39.8
Average school grade of household head	3.9
Household receives income from full-time employment	7.1 percent
Household receives income from part-time employment	85.7 percent
Household receives income from small business	28.6 percent
Household receives pension income	7.1 percent
Household receives remittances	35.7 percent
Average annual water payments per household	US\$ 17.7
Share of total household budget spend on water payments	3.5 percent
Average water payment per LSU	US\$ 212.0
Ratio Kavango / Berseba	100 / 0

6.4. What are the likely future implications?

Exemplary calculations for the Mutompo WPA will show the possible effects of a full cost-recovery of water supply. According to representatives of the Directorate of Rural Water Supply, average maintenance cost per diesel-driven water system amount to approximately US\$ 2350 per annum. At the moment the Mutompo WPA receives approximately US\$ 400 per year. This amount covers, however, only the running costs for buying diesel. The maintenance costs would have to be added, which means that the total annual water supply costs of the Mutompo WPA would be approximately US\$ 2850. This sum is 14 percent of the total income all Mutompo household receive (including subsistence income). People report selling crops and livestock in order to cover costs for water. This has multiple impacts on their livelihoods (Falk, 2007: 170ff) and affects food security in a region where 28 percent of the children under the age of five were severely underweight in 2000 (Mendelsohn and el Obeid, 2003: 85).

The alternative would be that ‘committed farmers’ in Mutompo finance water supply by livestock sales. They would have to sell annually seven percent of their herd only to

cover water costs. Considering high livestock losses in the area this would lead to a gradual reduction of livestock numbers. Even the relatively wealthy farmers in the settlement would slowly reduce their only capital base and are at high risk to end up in the group of the poor as well. In order to avoid impoverishment, it is probably that wealthier farmers rather return to the area close to the Kavango River where land is scarce but water available. In this case, however, they will not cross-subsidise the water consumption of the poor either.

7. CONCLUSION

In all researched communities the rural water supply reform had a positive effect on the management of water resources. New regulations have been introduced and the ownership perception amongst water users improved. Water users' investments in maintenance and management show that incentives are effective, and new community based decision making organisations emerged. They fill in some communities critical institutional gaps. The rural water supply reform therefore improves the natural resource management in some communities even beyond an immediate impact on water management. The reform is flexible enough to allow customary law and traditional authorities to be incorporated. This enables a site-specific formalisation and recognition of internalised water management rules. Our analysis shows that where traditional authorities are strong and accepted they also play an important role in the new system. Nonetheless, there are some contradistinctions between the different laws, in particular, between the Water Resource Management Act and the Communal Land Reform Act regarding the authority of water management. Such contradictions should be sorted out by the Namibian policy makers because they can lead to confusion and conflicts. Further research is necessary to assess to which extend management improvements have a positive effect on the resource base. This was beyond the capacity of our study.

The impact of the rural water supply reform on rural livelihoods is ambiguous. In particular, the effects of an introduction of water fees have been analysed. At least some of the water users can not afford to cover full costs of water supply. The Ministry of Agriculture, Water and Rural development is aware of this problem and proposes intra-community cross-subsidies to satisfy the basic needs of low income users (Republic of Namibia 1997a, 2001b) without specifying how such subsidisation could be implemented. A study conducted for this Ministry concluded that most communities would not be able to cover water costs on a per-household basis but only on a per-head-of-livestock basis. The Mutompo example supports such results. Much depends therefore on the willingness of farmers who are relatively richer in terms of livestock to pay higher charges (Blackie, 2000: 144). The observed fee systems in the Kavango and Berseba WPAs favour owners of large livestock numbers. Compared to their water consumption and total income, poorer community members are rather overtaxed.

The water payments make up only a small proportion of the total household budgets. The question arises, however, whether any additional burden is acceptable for communal farmers. Two third of the respondents have a daily income of less than US\$ 1. The government's expected annual net savings realised with the reform (Republic of Namibia, 1997a: 15) would thus be taken from a very poor segment of society. The Namibian government can therefore only be encouraged in its current strategy to slow down the implementation process. This should not be understood as a call to stop or even reverse the reform. However, a further implementation must consider the danger of aggravating poverty, at least for a part of the affected farmers. As a measure to achieve its equity objectives, the Namibian government could, for example, identify ways to provide financial incentives for a sustainable natural resource management in contrast to a past subsidisation of unsustainable resource use.

Our research also shows that regionally adapted implementation approaches are necessary. Cultural values and organisational structures differ from region to region. The

introduction of democratically elected committees has had very different effects at the different research sites. In addition, natural factors vary, such as climate and soil conditions (Agudelo, 2001) as well as groundwater levels. This again influences the choice of the most appropriate technology of water infrastructure. In some areas too many pumps need to be maintained while in others running costs are a problem. Relevant socio-economic factors include the consumer's preferences and income levels (ibid; Gazzinelli et al. 1998), the distance between the homestead and the water point (Sandiford et al. 1990), and the household size (Sandiford et al. 1990). An important aspect is also how many people share the costs of maintenance. Further, it is extremely crucial to consider the different livelihood situations of water users. Our study showed that one has to worry much less about Tiervlei farmers than about some Kavango farmers. The Kavango farmers are the most negatively affected by the implementation of the cost-recovering principle but they have not seen significant improvements in the infrastructure. They have been further not committedly in need of the establishment of new community organisations due to the existence of strong traditional governance structures. The Water Resource Management Act recognises the regional diversity of Namibia and mentions the need to decentralise responsibility to the lowest possible level of government, consistent with available capacities at such level (Republic of Namibia, 2004: sec. 3).

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