



Institutions put to the test: Community-based water management in Namibia during a drought



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ABSTRACT

In Namibia, rural water governance has changed profoundly during the last two decades. Today, in many rural communities, user associations administer water and set the rules for management practices. Their rules typically define boundaries and specify contributions that vary for members and outsiders. When the rains failed in 2012–14, the mobility of people and herds increased and put the newly formed institutional regimes to a critical test. Based on long-term ethnographic fieldwork in seven communities, we examine whether and how management regimes were either altered or applied. The results indicate that cultural models of kinship and reciprocity took priority over formal agreements during the drought. Non-adherence to formalized practices and to rules of excluding outsiders also expresses a certain resistance to the interpretation of water as an economic good.

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1. Introduction

Much research on African pastoralists focuses on pasture management and the organization of grazing (Bollig et al., 2013; Dyson-Hudson and Dyson-Hudson, 1980; Fratkin, 1997; Galvin, 2009). This research highlights a relatively weak coupling between livestock density and the availability and quality of grazing in arid and semi-arid rangelands. Both are shaped by the variation in precipitation and occasional veld fires that create a highly uneven distribution of resources across space and time (Behnke et al., 1993; Homewood, 2008; McCabe, 2004; Schnegg et al., 2013; Vetter, 2005).

Mobility is the key livelihood strategy to mitigate the risks attached to these highly stochastic system dynamics. As long as land is held communally and pastoral mobility is not restricted by political boundaries, private property arrangements or other measures of exclusion, herders can cope with the patchiness of resource distribution efficiently. Flexible access controlled via cultural means (e.g., kinship obligations, traditional authorities and neighbourhood councils) creates relatively resilient social-ecological systems (Bollig, 2006; Bollig et al., 2013; Lesorogol, 2005; McCabe, 2004).

While the organization of grazing has been studied in some detail, institutions of water management are not understood as well (but see Helland, 1997). Until some 50 years ago most African pastoralists obtained water through natural springs, surface water, and hand dug wells (Bollig, 2013; McCabe, 2004; Robinson, 2009). Open water sources were usually managed with adjoining pastures. These conditions changed significantly in the middle of the 20th century under the influence of the colonial state and its ‘modernization’ paradigm. In northwestern Namibia, as in many other parts of Africa, hundreds of boreholes were drilled to make available pastures that were only rarely used (Bollig, 2013; Gomes, 2006). After independence and inspired by the idea of Community-Based Natural Resource Management (CBNRM), the Namibian state handed the responsibility of these boreholes over to local user associations. From then on, communities had to cover the costs of water and the administrative responsibility for its distribution.

This glimpse into African pastoral livelihoods reveals that water and land rights are coupled and create multiple boundaries. While water rights were relatively unimportant and subordinate to land rights in the pre-colonial and colonial past, they became more salient in recent decades. Through the economization of water and the introduction of user associations, sharing water now forms relatively narrow boundaries around the well. At the same time, sharing of both water and land are embedded in sharing ancestries,

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risks and experiences at the larger societal scale.

To analyse overlapping sets of rights and boundaries, Sally Moore has introduced the concept of *semi-autonomous fields*. She defines these as social settings including actors who can generate rules and coerce compliance to them (Moore, 1973). Social fields are semi-autonomous, because they are connected to one another and embedded within the larger legal and political organization of society. For Namibian pastoralists, water, land and kinship form three social fields, regulated by their respective normative orders and connected to one another. For resource governance, Frances Cleaver and others have argued analogically that people have multiple social identities that go beyond their economic and productive roles (Cleaver, 2012; Cleaver and de Koning, 2015; Hall et al., 2014; Meinzen-Dick, 2007). As we have demonstrated elsewhere, institutions of water management hardly have just one purpose alone and people's interactions involve multiple roles. This multiplicity of sharing restricts the agency of actors. At the same time, it opens other forms of access (Schnegg and Linke, 2015).

Sharing resources like water, land and ancestries creates bounded groups. While both models (Moore and Cleaver) put the overlap of social fields and the embeddedness of institutions centre stage, they do not explain when one set of rules and thus one set of boundaries becomes salient. Here, theoretical ideas developed at the intersection of social anthropology and new institutional economics can be helpful. The concepts of bargaining power and relative prices are particularly useful (Chabwela and Haller, 2010; Ensminger, 1992; Ensminger and Knight, 1997; Haller, 2013; Haller et al., 2013; Knight, 1992). A relative price describes the value of a commodity in terms of other goods or services. As we see below, during drought, unbounded access to land gains in value. Wealthy herd owners are particularly willing to accept higher costs to get access. According to Knight, actors opt for institutional regimes that serve their distributional goals (Knight, 1992). The more bargaining power an actor has, the more likely s/he will be able to establish her or his preferred rules. Thus, the price actors are willing to pay to maintain or blur boundaries with respect to a given resource in combination with their bargaining power for doing so can help to explain why one set of rules and thus one set of boundaries becomes established over others.

During the last two decades, CBNRM policies have helped in crafting new institutions and thus new boundaries of water governance around the wells (Bollig and Menestrey Schwiager, 2014; Falk et al., 2009; Schnegg and Linke, 2015). When the rains failed in northwestern Namibia in 2012–14, these institutions were put to a critical test. During a drought increased mobility and highly individualistic moves of livestock herds represent a challenge to rules governing communal resource use. Increased and erratic mobility may lead to situations in which (1) rules are enforced and continue to coordinate water management, (2) rules are partly applied and partly suspended, (3) one set of rules is replaced by another set of rules, and/or (4) the institutional regime collapses entirely and gives way to open access. But, which of these situations took place in the Namibian case?

Before we can examine in detail how the ecological crisis influenced the institutional dynamics around water and land in Namibia, we delineate the pastoral water management and the ethnographic context of our study. Next, we introduce our methodological and data analytic approach. We then briefly describe the way water was managed before the drought in order to better explain how institutions were challenged during the crisis. We examine the severity of the drought and its impact on livestock mortality and mobility. Against this background of the ecological crisis, we ask how rules of resource tenure were applied and whether and how they changed when challenged.

2. Case study

2.1. Pastoral water management in Namibia

In pre-colonial and early colonial times, the research area experienced intense conflicts among armed local groups over the few reliable water sources. Since the 1920s, the colonial administration controlled such conflicts by appointing 'fixed' chieftains to govern land and embedded perennial water sources (Wallace and Kinahan, 2011). In addition, households that dug or, on rare occasions, paid for the digging of seasonal wells in a river bed, a task involving the investment of significant physical labour, had exclusive rights to the use of these wells. The seasonal wells required relatively little social coordination as costs (digging, day to day management) and benefits (water for a couple of months) were shared in a numerically small social group of closely related people. However, cases of conflict connected to the illicit use of such wells did occur occasionally. They were addressed by the neighbourhood council and occasionally minor fines (e.g., a head of sheep) had to be paid. However, such conflicts were rare and access rights to such temporary water sources were perceived as fairly well defined through kinship and household membership (Gewald, 2011; Werner, 2000).

Access to pastures and water was ensured through the complex ties of a double descent system among the Herero speakers, where access rights were guaranteed to all those related to the 'owner of the land' (*omuni wehi*) patrilineally or tied to him through the matriline. Whereas patrilineal tended to settle in identifiable areas (without any exclusive rights to land), matrilineal were spatially highly dispersed. Hence, geographically far flung genealogical ties were an important means to access resources, to reduce risks and provide multiple options for spatially highly mobile herds. In the late 19th and early 20th centuries several big men established themselves in the region and established an access system that guaranteed use rights in a region also to non-related clients.

This complex picture radically changed in the middle of the 20th century when the South West Africa administration under the jurisdiction of the colonial South African state started drilling hundreds of boreholes on communal lands. The drilling of boreholes needs substantial technological input and is costly. Boreholes are drilled up to 300 m deep and nowadays a drilled borehole costs 15,000 to 30,000 US\$. Between 1960 and 1990 the number of water points in the northern region of Kunene increased almost by a factor of ten and profoundly altered land use (Bollig, 2013:323). Extensive pastures previously only viable during or shortly after the rainy season when seasonal rivers and filled pans were abundant, now became available year round (Bollig, 2013). This 'hydrological revolution' allowed residents to sustain higher stocking numbers and altered mobility patterns significantly. Often, the changes also laid the basis for a more sedentary lifestyle. Major parts of the management of these boreholes were accomplished by the administration of South West Africa under the jurisdiction of the colonial South African state.

As long as the state covered the costs for establishing, running, and maintaining the infrastructure little local coordination was required. Since water was by and large freely available at all boreholes, access remained regulated through land and water rights were firmly embedded within land rights. As the costs of waterholes were not shared locally, institutions regulated access to pastures adjoining boreholes. Access rights (i.e., benefit sharing) were regulated within a chieftaincy and through a somewhat vaguely defined linkage between a household head and a traditional authority. Users were 'under' a chief acknowledged by the administration and respected his rights to regulate access. Newcomers to a grazing area would have to ask the chief for permission

to settle and to make use of pastures and water. Here, kinship often eased the way. The consent to use grazing in a given area implied the right to access water within this area.

This situation drastically changed in the 1990s with a new water policy entering the stage. Inspired by the idea of Community-Based Natural Resource Management (CBNRM), the most salient natural resource management paradigm in the immediate post-Rio 1992 political environment, and by pertinent quests for decentralization (Benjamin, 2008; Blaikie, 2006; Poteete and Ribot, 2011; Ribot, 2003), the newly independent Namibian state handed the responsibility and partly also the ownership of central natural resources over to local users. This happened on the provision that communities provided management plans defining and delineating user groups, governance structures, and modes of cost-benefit sharing (Bollig and Menestrey Schwiager, 2014; Falk et al., 2009; Schnegg and Linke, 2015). During the organizational and institutional realignment, pastoral communities had to develop 'new' rules for how to share the costs and the benefits accruing from water sources under their management. The negotiation of these regimes did not take place in an ideological vacuum but was largely shaped by the ideas of CBNRM and structured by NGO and state representatives associations (Blaikie, 2006; Jones and Weaver, 2008; Silva and Mosimane, 2013; Vette et al., 2012). CBNRM includes three salient components of special interest for our contribution: (1) the notion of a fixed and bounded user group, (2) the idea that sharing costs and benefits of water 'owned' by a well-defined group of people efficiently foster sustainable use, and (3) the idea that institutions can be designed and engineered to achieve specific distributional goals and ecological sustainability.

The key principles – fixed boundaries and formalized group membership – were (also) justified scientifically. In her path-breaking analysis, the late Nobel laureate Elinor Ostrom showed under which conditions communities were able to manage communal resources successfully over long periods of time. She identified eight characteristics, which became known as the 'design principles' of common pool resource management (Acheson, 2011). These principles influenced environmental policies during the past two decades significantly (Saunders, 2010). The first principle reads "Clearly defined boundaries: The identity of the group and the boundaries of the shared resource are clearly delineated" (Ostrom, 1990:90). Ostrom found that the association between a well-defined social group and a resource facilitates successful communal resource governance. Further, she argued that common pool resources are managed successfully if "most individuals affected by the operational rules can participate in modifying the operational rules" (Ostrom, 1990:90). In her later work, Ostrom relativized the importance of fixed group boundaries for pastoral economies (2009). However, the impact on policies and pastoralists remained, as we outline below.

Through the changes in rural water government water rights gained center stage. The newly formed water associations had to share the costs of providing water, they could develop and apply rules for addressing how to deal with non-members. Access to land and water was now regulated through water rights that defined relatively small localized user groups and largely ignores kinship organization that operates on a larger social and geographical scale. When the rains failed in 2012–14, the newly developed institutions of water governance and their boundaries were put to a critical test. As said, mobility is commonly recognized to be the key strategy to cope with stress. However, and in line with the CBNRM policy, the newly established water associations restrict mobility by fixing group boundaries (which translate into spatial boundaries) and linking mobility across such boundaries to a number of disincentives.

2.2. Ethnographic context – seven communities

Pastoral livelihoods in Namibia are constrained by low and unpredictable precipitation (Bollig, 2006; Schnegg et al., 2013; Sullivan, 1999; Ward et al., 2000). Annual rainfall increases from west to east and most rainfall occurs in summer, between November and April. Under these ecological constraints, more than 25–30 ha of land are needed to keep one head of cattle (Burke, 2004). Pastoralism is the dominant subsistence strategy and in the entire research area cattle, goats, and sheep are the heaviest water consumers. According to the 2011 housing census and the veterinary census of the same year roughly 90.000 inhabitants own about 240.000 cattle and 310.000 small stock the Kunene Region (Namibia, 2012). The rate of urbanisation is below 10 per cent and most inhabitants depend on rural livelihoods.

Fig. 1 shows the three research areas in northwestern Namibia. The communal settlements in southern Kunene, located near Fransfontein, are inhabited by members of various ethnic groups, mostly by Damara, Nama, and Ovaherero. Under South African colonial rule, the area was part of the so-called homeland, Damaraland. In comparison to the other two research areas, land is relatively scarce in Fransfontein. Households on average possessing 26.4 cattle (std. 352; min = 0; max = 155) and 59.0 small stock (std. 60.9; min = 0; max = 256) have to rely on diverse economic strategies to make a living. High population densities and the resulting inability to live from the land alone were integral to Apartheid politics and forced the integration of people into the colonial labour market. As the range of the distribution reveals, livestock is unevenly distributed on the communal farms around Fransfontein. Some of the largest herds are owned by absent farmers. These part-time pastoralists live in urban centres and own businesses or are employed by the government (Schnegg et al., 2013).

Despite the uneven distribution, all households own some cattle and/or small stock and pastoralism shapes daily life in all three communities in the Fransfontein area in which we conducted research. Grootvlakte and Kleinrivier are the smallest of the seven communities in this area and both consist of only nine houses (community names are pseudonyms). Brakwater is significantly larger and consists of 17 households. In all three communities elderly people and children not yet schooling make for the major part of the population, while the middle-aged work in towns and children stay at boarding schools. In addition, workers, often migrants from other areas, live in the rural hinterlands. In contrast to many pastoral societies, it is not younger men, but elders, often also women, who are responsible for the livestock. In all three research communities cattle and small stock return to the homestead each evening and settlements are permanent. If people move their animals for economic, social or ecological reasons, they move their entire homestead as well.

The three communal settlements in the central Kunene region (Ombura, Omutati and Ondundu) are located near Otswana and are mainly inhabited by Ovaherero and Ovahimba pastoralists. Under South African colonial rule, the area was part of the so-called homeland, Kaokoland. Households on average possess 98.7 cattle (std. 82.3; min = 11; max = 315) and 79.3 small stock (std. 81.6; min = 0; max = 252) and mainly rely on livestock selling as an income strategy. Furthermore, state pensions form a regular cash income for many families.

Although households in Otswana possess on average more cattle than households in the Fransfontein region, livestock is equally unevenly distributed, as the standard deviation and the range reveal. It is often female-headed households and households of young men that farm with few livestock while wealthy households often belong to elderly, polygamous men. Young men, especially the sons and nephews of a household head, manage the livestock

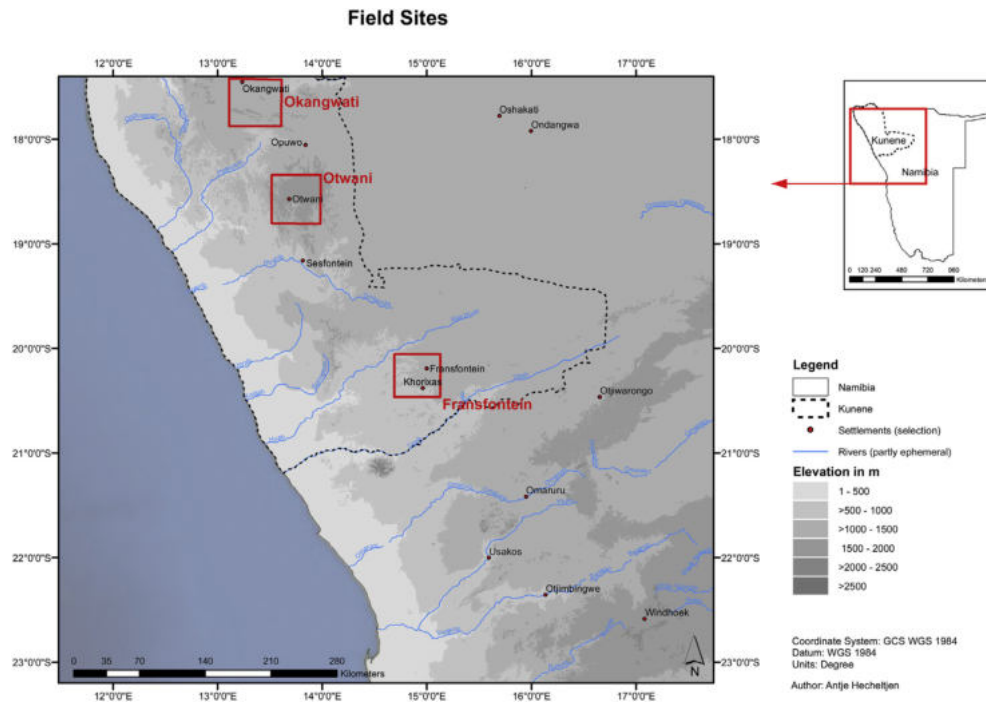


Fig. 1. Research area in northwestern Namibia.

on a daily basis. In some cases, however, herders from other ethnic groups are employed as shepherds. In 2011, Ombura consisted of 17 households, Omutati of 13, and Ondundu of 15. More than 75% of the households oscillated between a main homestead (*onganda*) and a cattle post (*ohambo*) during the course of the year. Half of the population of the three researched communities is younger than 18 years old.

In the northern-most region around Okangwati, pastoralism is the dominant economic activity. Equally part of the former homeland, Kaokoland, its integration into the South African colonial system was less extensive. Most of the inhabitants of this part of Kunene consider themselves as Ovahimba. They are only marginally linked to labour and sales markets. However, currently the involvement of the state and more importantly of NGOs is highest in this area. The remoteness and the potential for ecotourism may explain part of this interest. In the Okangwati region we were only able to do research in one community, Ombaka. Ombaka consists of 13 households that own large numbers of 139.9 cattle (std. 86.2; min = 16; max = 322) and 213 small stock (std. 138; min = 16; max = 464). Again, livestock ownership is very unequally spread and 6 households own more than 200 cattle. During the dry season, parts of the cattle herds are transferred to mobile cattle camps. Some livestock camps move to pastures as distant as southern Angola or the southern parts of the Kunene Region. Those who adopt this strategy may at times stay away from the main household for a number of years.

3. Material and methods

The data analysed here were collected in northwestern Namibia by a team of anthropologists between 2010 and 2014 (Bollig, Schnegg, Kelbert, Menestrey, Linke, Gradt) as part of the German Research Council (DFG) funded research project LINGS (Local institutions in globalized societies). The two principle investigators, Bollig and Schnegg, have conducted ethnographic fieldwork in the region since 1994 (Bollig) and 2003 (Schnegg) respectively and are

responsible for the overall design and the comparative analysis of the data. In the first phase of the current fieldwork, three anthropologists (Menestrey, Linke, Gradt) stayed for roughly one year between 2010 and 2011 in the southern (Fransfontein), central (Otwani) and northern (Okangwati) parts of the research area to get an in depth understanding of the process of negotiating and crafting new institutions through daily routines. The detailed results will be published in separate monographs. During this time we conducted a unified household census with all households in seven communities (N = 93). The data about livestock possessions were collected through the census.

When we recognized toward the end of 2013 that the precipitation would again be low and people started to complain about drought conditions, we revisited the communities in order to explore how the ecological crisis impacted the social and institutional fabric. Björn Herold, a contracted anthropologist, collected data in the field and visited all seven communities to investigate how the drought affected water management in March 2014. The research team prepared his visits and Herold was able to collect condensed information in a relatively short amount of time. On average, he spent two days in each of the seven communities and interviewed key informants known as both accessible and knowledgeable to the research team from their prior year-long stays. Since information about livestock possession and loss is public and known to most adults, relatively few informants can provide reliable data. In each community between two and four households were interviewed (out of the 9 to 17 households in the communities). The household whose members were interviewed were selected to include different economic strata. While we aimed at a gender balance, 14 interviews were conducted with male household heads and 11 with females. However, in most cases other household members were present and engaged in the conversation. Since the data is not gender sensitive, we do not expect it to be biased by the slightly skewed gender distribution of our informants. The semi-structured questions centred on issues including the ways the drought was perceived by local people and

the losses it entailed, whether it affected the composition and the working of the newly formed committees, and how significantly mobility of people and animals impacted the governance of water sources.

4. Results

4.1. Institutions and organizations of water management

As in many comparable cases in Africa, the building of new institutions was orchestrated from above, e.g. the state and NGOs (Benjamin, 2008; Blaikie, 2006; Poteete and Ribot, 2011). Extension officers from the Ministry of Agriculture, Water & Forestry (MAWF) and/or NGOs contracted by the government oversaw the early phases of transition in water management. During this phase, both the organizational and the institutional arrangements were negotiated. At the organizational level, two bodies were established. The Water Point Association (WPA) that includes all adult individuals who live in a place and want to use the public water point (Schnegg and Linke, 2015). According to the understanding of the administration the WPA “is established to ensure the sustainable management and utilization of the water point, the fair distribution of water to members, and the recovery of costs of operating and maintaining the water point from members and other users” (Namibia, 2006:8). The WPA appoints a governance board, the Water Point Committee (WPC) “that manages the water point on behalf of the WPA and in accordance with the management plan” (Namibia, 2006:8). In this way institutions for water and pastoral management were separated. Whereas pasture management remained under the control of traditional authorities and informal neighbourhood councils, the control of wells was given to a newly established organisation: the WPA/WPC. In this way institutions of natural resource management were to be engineered to achieve more sustainability and economically efficient use of a scarce resource (Bollig and Menestrey Schwiieger, 2014).

The water point association builds on the notion of discrete user groups such as those discussed before that figure centrally in CBNRM. Membership in the group confers usage rights. At the same time this does not imply that outsiders have no access at all. They may apply for temporary use rights with the WPC. The differentiation between inside and outside is crucial and becomes most evident when examining the contributions to be made for the maintenance of the water point. Those contributions are an essential and often the most debated and conflict-laden part of the overall water-point arrangement and communities found different solutions for how to deal with them. Users are required to pay the diesel for pumping the groundwater and to cover the maintenance costs involved. In the end, these costs determine the price of water for the household.

The rules of contribution are summarized in Table 1. The data are taken from the 20 management plans we could collect in the research area and detail the institutional regime of community-agreed-upon cost-sharing. The management plans were formulated in a number of community meetings organized and facilitated either by a contracted NGO or by extension officers from the

ministry. Over a number of sessions, the document was drafted, refined, and finally signed. The management plan must be read as a document that formulates a consensus reached at some point in time. Clearly, the ideals of the state and international policies largely circumscribe the institutional solutions discussed and implemented. In those documents all communities agreed that contributions for insiders should be different from the contributions of outsiders. In all cases outsiders are supposed to pay more, if their animals come to drink at the water point. The rate is usually more than double the insider fees. In many communities the non-payment of fees is punished. In six cases (28.6%) sanctioning is different for outsiders than for insiders. Extension workers were often the ones who introduced differential treatment of outsiders and insiders. The rationale behind higher charges for outsiders is simple: free-riding is to be discouraged and mobility between waterholes is regarded as a disturbance to the institutional regime. Hence, if outsiders are charged higher amounts at water sources they should take care to manage their own water-point sustainably. At the same time, the benefits of sustainable use of water by one community could be jeopardized by the claims of others who did not use their own resources wisely. As a result disincentives should strongly discourage the use of resources beyond the realm of one's own water-point. While people often asserted that they think it is rational to charge outsiders more money than insiders, we also observed that in practice committees rarely insisted on such increased payments and/or found it difficult to procure them. However, in normal times, the mobility between boreholes is comparably low and thus these institutions and their boundaries were not often put to a critical test.

4.2. The ecological crisis

In public discourses and the media the 2012–14 drought is labelled as the worst ecological crisis in three decades. In May 2013 the Namibian government declared a drought emergency and committed about 20 M US\$ to immediate drought relief measures. This money was dedicated to relief food but also to the drilling of about 40 new boreholes. Unfortunately, the official meteorological documentation of the drought is poor. In Kunene, not a single meteorological station from the Namibian Meteorological Service has documented a long-term average nor is there a record of precipitation during recent years. At the local level, the information is even scarcer and for none of the seven communities does reliable data exist.

Therefore we rely on satellite data to estimate the extent of the drought. The Tropical Rainfall Measuring Mission (TRMM) was launched in 1997 as a joint U.S.-Japan satellite mission to monitor tropical and subtropical precipitation and to estimate its associated latent heating (<http://trmm.gsfc.nasa.gov/>). The rainfall measuring instruments on the TRMM satellite include the Precipitation Radar (PR), an electronic scanning radar operating at 13.8 GHz; TRMM Microwave Image (TMI), a nine-channel passive microwave radiometer; and Visible and Infrared Scanner (VIRS), a five-channel visible/infrared radiometer. In a second step the data collected by the satellite are calibrated using other available information consisting of GMS, GOES-E, GOES-W, Meteosat-7, Meteosat-5, and NOAA-12 data. Over the years TRMM has proven to be a reliable source to estimate precipitation and its variation (Kummerow et al., 1998). For our analysis we first calculated the average precipitation between 1998 and 2011. This is 377.2 mm per year. During 2012 and 2013 in comparison, only 204.4 mm were measured in the research area. This is a reduction of 45.8%.

Fig. 2 maps the difference between the long-term average and the most recent years in space. The line to the West shows the shore and the line in the North the Angolan border. The colour indicates

Table 1
Payment according to group membership (N = 20).

Payments for outsiders	Number of communities
The same as insiders/members	0
50% higher than insiders/members	1
Twice as much as insiders/members	7
More than twice as much as insiders	12
Sum	20

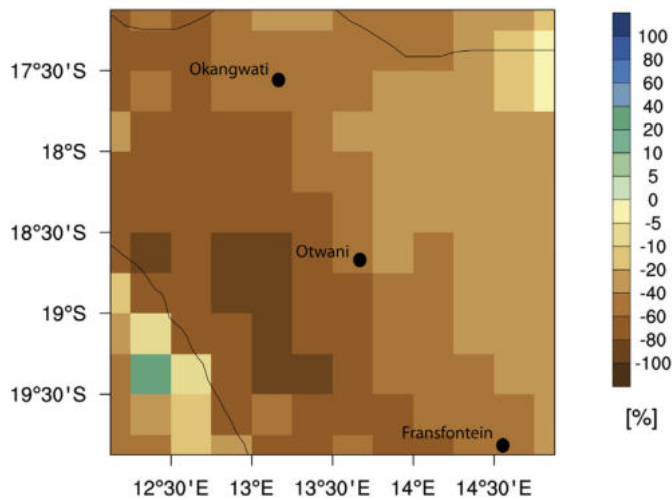


Fig. 2. TRMM difference between 1998–2011 and 2012–13 in northwestern Namibia.

the deviation from the longer term (1998–2011) average. The results reveal that across the three research sites the precipitation was significantly lower than usual. This coincides with the understanding of people who consensually perceive the rains of 2012–2014 as much too little.

In addition to the amount of precipitation, the loss of livestock is an important indicator of the severity of a drought. Cattle losses can arise from a number of different sources. During the drought of 2012–2014 cattle losses resulted first from thirst or dehydration and starvation. Informants, however, rarely report thirst to be a major cause of death in their herds indicating instead a lack of adequate grazing, i.e., starvation as the major problem. Second, predators, most importantly hyenas, easily attack and kill weakened livestock. Third, illnesses spread and affect weakened animals. According to the veterinarian in Opuwo most death cases among cattle are currently due to Anaplasmosis, a gall disease caused by parasites that increase due to the drought. Fourth, livestock theft increases. As we detail below cattle move more often during drought and livestock moves are also much less controlled than under regular conditions. In addition, potential thieves know that people expect their animals to die in the field and that it is difficult to link the loss of a single animal to a criminal act.

Although we are not able to provide exact numbers, the number of livestock lost varies between communities as is shown in Table 2. In each of the seven communities we interviewed two or more people about the livestock they lost due to the drought and converted the answers to rough percentages. Since we have lived in the respective communities for relatively extended time periods and know people and their economic circumstances well, the data should be comparably reliable. Table 3 (below) shows that in most instances the loss is less than one third the original herd. In three communities we estimate losses at only around 10%. For the

Table 2

Loss of cattle in the seven communities estimated from information about at least 2 households in each community.

Community	Estimated loss of cattle during the drought conditions 2012–2014
Grootvlakte	Around 40%
Brakwater	Around 10%
Kleinrivier	Around 10%
Ombura	Around 20%
Omutati	Around 10%
Ondundu	Around 30%
Ombaka	Around 20%

Table 3

Temporal in- and outmigration during the drought.

Community	Household number in 2012	Outmigration	Immigration
Grootvlakte	9	0	0
Brakwater	17	0	0
Kleinrivier	9	0	0
Ombura	17	0	0
Omutati	13	3	0
Ondundu	15	3	7
Ombaka	13	2	0
Sum	93	8	7

purpose of this article we note that losses were substantial but not catastrophic. The consequences of the drought are more comparable to the drought of the mid 1990s than to an earlier and more extreme drought of the early 1980s. The centennial drought of 1980/81, locally called Otjite, “The Dying”, is still remembered by people as the drought that “finished the livestock”. According to data collected by Bollig the regional cattle herd was decimated by 85% (Bollig, 2006). In terms of mortality the 2012–14 drought is less a hundred year drought like the one of 1980/81 but rather a series of poor rainy seasons typically occurring once every ten years (Bollig, 2006). While social institutions temporarily collapsed in the early 1980s leading to displacement and depastoralization, there is more experience and cultural memory for handling moderate droughts.

4.3. Institutions put to the test

We have singled out important components of the new institutional regime of water management: boundary fixing and accompanying payment rules for in- and outsiders. During drought, the availability of grazing decreases significantly and especially around boreholes (Samuels et al., 2007). At the same time and due to the borehole infrastructure built during the last 50 years, the availability of drinking water is not affected. Only a small proportion of the groundwater in Kunene derives from local rains. Long aquifers connect Kunene to the north and especially to Angola where the rain enters the ground. Hence, the drought has relatively little effect on the availability of water in boreholes. Thus the relative price of land, weighted against water, rises. In response to the low level of grazing and its patchy distribution, pastoralists also typically increase their mobility in crisis situations and thus the clear association between people, cattle, pastures, and water, accurately fixed in the management plans, is challenged.

4.3.1. People on the move

It is generally accepted that mobility is the key pastoral strategy to cope with drought. In the research area the opportunities to increase mobility and to search for better pastures differs across the three research sites. The population density is lowest in the north. However, due to the drastic extension of boreholes, stocking rates

there are high and pastoralists do not have reserve pastures for drought years anymore. In the area around Otswana settlements are more permanent and mobility is more restricted. During the dry season herders commonly take their animals to pastures further away from the community where more grazing is available. In the southern most research area the mobility of households is lowest and when people move for social, economic or ecological reasons it is often with the intent to start a new settlement and not with the idea to return after conditions have improved.

Since land is under the control of traditional authorities and committees across all three sites, people need permission to settle with their livestock anywhere other than their own designated land. In order to gain grazing rights, they have to consult with the traditional authority of another region. In order to use a borehole the local water point association has to be consulted. In times of drought, gaining such permission is problematic, especially if the incoming herd is large. Any new herd owner permitted to settle will increase the stress on both grazing and water.

In 2012, 93 households lived in the seven communities we studied. Of those, 9 had left temporarily in early 2014 due to the drought. In return, 8 households had entered the communities. In- and outgoings are thus slightly biased toward people leaving the community, as Table 3 reveals.

In total, relatively few households left any settlement and none of them left permanently. Many informants argued that drought conditions prevailed in the entire region so that moves over short distances did not make any sense at all but only weakened the livestock. In some cases, however, substantial parts of the cattle herds had left the settlement accompanied by a number of herders while the majority of household members stayed behind. Those whose herds left generally have larger herds than those who kept their herds locally. Wealthy livestock owners do depend a lot on the capacity to freely move their large herds of cattle. Under the stress of scarce grazing large herds are much more difficult to manage than small herds. They depend on mobility and the capacity to split herds and adjust mobility to the needs of each part of the herd differently, i.e. oxen herds can move larger distances and stay longer without water than herds with lactating cows. Hence, wealthy herders have a specific concern for free movement and are most interested in maintaining the conditions for mobility. In most cases, kinship ties opened the gates to new pastures. Being linked through kinship often makes it difficult or even impossible to refuse a corresponding demand to share land and grazing. In all cases, migrants had to accept the rules the committee negotiated. However, only in one of the cases, were the new arrivals treated as outsiders and charged accordingly. In all other cases they paid the same rates as the people settled in the communities and became temporary members of the WPA. This occurred despite the management plan stating exactly the opposite. The clause disadvantaging outsiders in the constitution, was probably made for ecologically critical times in an attempt to prevent over-exploitation. The results indicate, however, that in a social environment where most people are related through kinship ties it is difficult to maintain or construct a boundary between “we” and “them” in critical times. During good years it may be possible to maintain such distinctions, but critical circumstances clearly show that social networks based on solidarity extend much further than the gazetted formal water-point association. In bargaining situations it is often wealthy herders who put all their weight in for free (or at least uncostly) access to natural resources.

Increased mobility not only effects water management in receiving communities, but also in those communities from which people temporarily emigrate. This became most evident in Ombaka, where two of the most prominent members of the committee migrated. During the drought, not a single official meeting of the

water point association was held. Such meetings had been irregular even before but completely faltered during the drought. Decisions on borehole management were taken in a more informal manner. At the same time, a number of severe challenges occurred and were met without formal meetings of the WPA, as the following case study reveals:

In 2013, part of the engine broke and the Department of Rural Water Supply (DRWS) refused to cover the costs. The households in Ombaka had to collect the money required. This task is usually up to both the chairperson and the treasurer of the WPC. Both had left the community in search for better pastures when the engine broke. Instead, another member of the WPC organized the collection of money and most households contributed 100 N\$. This also had been the case in situations before the drought, for example, when elders went to attend to funerals. It took those who remained about three weeks to organize until the problem was fixed and they could use the borehole again. A similar incident happened again in 2014, and it was again the same WPC member who took the responsibility to organize collecting the money required for repair and transport. If elected office holders are absent, they cannot fulfill the duties ascribed to them. However, they are swiftly replaced. Kinship and social status put certain people in a position to coordinate community matters. The newly formed organizational structures did not replace formerly existing means to solve problems. These are still deeply embedded in the larger social fabric and rest upon a person's status in a kinship network, the personal symbolic capital one commands, and their position within a social network. As long as the collection of contributions for a common good is respected as legitimate any person with sufficient status and respect, may volunteer and organise the pooling of funds.

4.3.2. Cattle on the move

More numerous than the movements of entire households or cattle camps are cattle moving by themselves. Here, two cases can be distinguished. Firstly, some cattle are herded during the day and the herder arrives with his livestock at a well beyond the confines of his community (i.e., under the control of a WPA he is not member of). He then asks for permission to water his livestock there once (or for a few days). In this case, he is expected to contribute and thus pay some of the diesel costs to cover the immediate additional expense resulting from more animals drinking at the well. Depending on the strength of the borehole between 5 and 10 L of diesel allow filling a water reservoir of some 30.000 L once. King (1983:17) assumes that tropical cattle need a minimum of 16 L per day to do well. Wilson gives a slightly higher estimate and assumes that a head of cattle drinks about 27 L a day whereas goats/sheep need only 2.2 L (Wilson, 2007:60f.). If we take the mean of 21.5 for a rough calculation, 100 animals can safely be supplied with drinking water for two weeks with a full can of diesel. However, and in contrast to the agreement in none of the cases we observed did newcomers have to pay according to the number of cattle they brought to drink or even the amount fixed in the management plan for outside users.

In most cases, the cattle are not herded during the day and move on their own. Under normal conditions, they habitually return to “their” water point in the evening or every second day to drink. However, if grazing is poor around the homestead, the cattle may keep on moving in search of better pastures and stray for days. Where they find grazing, they will next search for water. This leads to a drastic increase of uncontrolled mobility of cattle in all seven communities. As we have seen above, water point associations build on the notion of fixed membership. All management plans provide for excess fees for cattle who come from outside. However, this was never exercised. In none of the seven communities, was this rule, that was agreed upon and fixed in the management plan, enforced

Although formal rules stipulate that a scarce good has to be used economically and that disincentives have to be put forward to deter potential free-riders, informal rules are motivated by other considerations; in the long run everybody's cattle will stray at times and particularly so during a drought. It is of utmost advantage to know that almost nowhere will cattle that arrive at a well be turned away. This is particularly beneficial for wealthy livestock owners. Their abundant oxen herds are most likely to be straying while cattle herds mainly consisting of cows are supervised more closely by herders. Herders however, are not blind to the fact, that this liberal regulation invites free-riding. They are sensitive to cattle that frequently stray to a well to which the herd-owner does not contribute. In such cases, a warning is sent to the livestock owner and if this does not help, then the denial of water to cattle is a last option observed in a few cases in Ombaka and surrounding villages. The denial of water then is a final sanction for non-cooperating individuals, but not a tool in economizing the use of the well.

The densely woven networks of kinship and relatedness are certainly one explanation for the reluctance to enforce extra-levees on temporary well use by outsiders. Kinship ties and obligations going with them make it hard and often even impossible to charge one another. The obligations implicated in patron-client relations are certainly a second one. In situations where decisions on inclusion and exclusion have to be made, actors have to carefully weigh the costs of sanctioning potential and actual exchange partners and the costs of increased and deregulated use of their well.

As one of our informants explains to us:

MICHAEL: ... so, those cattle, if they come to drink at your farm, you wouldn't charge them?

PIET: No.

MICHAEL: No?

PIET: No, we don't. First, they just come with the herders, but later, the herders become lazy too. So the animals just move freely. And, Bammpos, Mopanie, Olifantput, Brakwater and Bergpos; the people are just family. Ja, they are families.

MICHAEL: And this means that you cannot charge them?

PIET: They are family. Maybe one day, we will also get in a problem and drink free. But, we also informed them that, if they are using the diesel, they can assist. So some of the people they used to come with diesel; 5 L every time, or every 3rd day with the diesel. Or once in a week. (Interview conducted by MS, 20.3.2014, Fransfontein area).

In the interview, Piet makes very clear that payments are expected but not enforced. He reasons that people are related and share more than water. Beyond that, the interview already indicates that reciprocity and the expectation that one will interact with others for longer periods of time plays a major role. Hence, there is always ample (almost indefinite) time for reciprocation. People have long experienced that precipitation in the semi-arid environment is scattered and that grazing may soon be better in other places. At that stage, they themselves depend on cooperation. Such cooperation cannot be equated in monetary terms. Any reckoning of temporary grazing rights would be extremely cumbersome (though of course not entirely impossible). Monitoring and enforcement costs would be high. The shadow of the future is long, as Hermann further underlines:

HERMANN: So that they can also assist us tomorrow. If we are in need. That is one side. Then what we usually do is, we just inform them, so they know; 'your cattle are here.' We give them

water. So that they cannot refuse tomorrow, if my cattle come there, then they must also do the same, what I did to them.

MICHAEL: So you tell the people, what you did, that you were nice? 'Cause the cattle are not gonna tell them.

HERMANN: And sometimes, if we cannot recognize the cattle, we take the brand mark, that number. We send it to the veterinary service office. We ask those people, and they tell us who the owner is.

MICHAEL: You send via cell phone or...?

HERMANN: Ja, ja, you just take the number down and send SMS to someone who is working there. I know people, the lady there. I sent for her and she just looked at the computer and sent; they are from Horizon, it's from Sageus Hoab, or something like that. (Interview conducted by MS, 18.3.2014, Fransfontein area).

Hermann makes two points: First, reciprocity is a strong motive for allowing outsider stock to water at the boreholes. Second, since the livestock moves on its own it becomes important to inform people that you are doing a good deed for them so that they can actively reciprocate. In most cases, people will recognize the owners of livestock. However, if that is not the case they use informal channels, by asking persons working in the veterinarian office to look for the branding in the registrar so they can inform the owner. Sometimes if the owner is not reachable by cell phone the information is even passed through the public radio station. The radio is the most important means of communication and many people listen to it the entire day. In the morning hours, people can call in and pass a message about upcoming events (family feasts, etc.), and other news they wish to share. Even more than with a private message to the owner, a public discourse is created and reciprocity expectations are raised. Cell phones have only recently spread widely in the research area but, as this case indicates, they are being creatively incorporated into practices of pastoral livestock management where a network is available. Reciprocal obligations that existed before the water associations developed are reified and moral signposts are put up depicting a community bound in solidarity yet exceeding the borders of WPA association locales.

Reciprocal obligations implicated in kinship relations and patron-client ties are, of course, also present and important in normal ties. However, during a crisis such ties establish a community much larger than the water point association and that process expands the bundle of natural resources and entitlements available to implicated users. Local actors are intensely linked by a number of social transfers: marriages, child fostering, mutual borrowing and lending of cattle. In critical times, the boundaries nicely fixed in the management plans are disregarded and people act as members of a larger social and economic group. Pastoralists know that they live in a common environment that distributes rain and resource unevenly and unpredictably. Both factors create a sense of belonging and shared dependency that forms a social group on the larger scale.

5. Discussion and conclusion

During the last two decades the ways Namibian pastoralists manage water have changed significantly. While the South West Africa administration under the jurisdiction of the colonial South African state covered the costs involved in operating and maintaining boreholes till the mid 1990s and local water rights were largely fixed through land rights, more recently communities have taken active charge of these activities. This has meant finding institutional arrangements to cover the costs of water and to

regulate and restrict access to wells. In line with CBNRM guidelines and scientific knowledge on common pool resource management the emergent institutional regimes drew fixed boundaries around resources and established rules for how decisions about usage should be made following the idea that institutions can be engineered towards achieving relative economic efficiency and ecological sustainability. Payment for water varied between community members and outsiders. Outsiders were expected to pay more if their cattle come to drink. In normal years, these institutional arrangements are put into practice and are – by and large – applied by water point communities.

During 2012–14 these relatively new institutional regimes were put to a severe test. A drought hit northwestern Namibia. In the communities we study, this had effects. Grazing became scarce, unevenly distributed, and its relative price rose. Between 10% and 40% of the cattle died. Deaths were commonly due to a lack of grazing, illnesses or theft. We could not observe a direct effect of a lack of water and accompanying dehydration. Yet the lack of rain had severe consequences with regard to the movement and eventually the distribution of cattle. While in the current drought a few households moved temporarily with their animals, more frequently animals moved on their own. They followed better pastures, searched for water there and thus put the recent institutions to a test. The management plans stipulate that people whose cattle wander from outside into local watering sites have to pay accordingly, even much more than if they were members of the community.

The evidence presented shows, that those newly negotiated rules are not applied in crises. At the most, external herd owners are asked to provide some diesel to cover immediate costs. This can be explained against the background of sharing multiple resources in densely knit societies. With the drought, the price of ground-water remained largely unaffected. We did not observe that wells dried up and pumping costs stayed the same as before. In contrast, the availability of grazing declined drastically and the relative price of land rose. In this situation, especially the wealthy herd owners pressed for open access to pastures. With rising prices, one could also assume that it could pay off to maintain or even defend the boundaries around one's well (and the adjacent pastures). However, those with most cattle are typically also those with most bargaining power to pursue their interests. As we have seen, people in the research area are linked through kinship patron-client relations on a large geographical scale and it is costly to deny a relative's animals an essential resource and impossible to let it die in front of a water point. In an environment where water scarcity is one of the main threats to all life, mutual access is such a strong cultural value that it is difficult to refuse someone, all the more so a relative. Refusal would imply a severe conflict with much higher costs. In addition, people are well aware that precipitation is scattered and unpredictable. Having grazing today does not imply having it again next season. Reciprocity and sharing at the larger societal and geographical scale are salient strategies for coping in pastoral economies and override the narrowly drawn boundaries in critical times. This does not imply that kinship does not change or even lose its role for organizing society on a relatively large scale. However, currently this is not yet the case and it may require more severe changes of the technological and economic infrastructure to push for such a shift.

Coming back to the options posed in the introduction: We have asked, whether rules are (1) enforced, (2) partly applied and suspended, (3) replaced, and/or (4) the institutional regime collapses entirely. Our case study reveals that during the moderate drought of 2012–2014 the newly created institutional water regime was suspended and temporarily superseded by an institutional regime based on a more general morale (options 2 and 3). Two salient

cultural models, kinship and reciprocity, replaced the formal rules laid down in the constitutions of water point associations. The fact that the temporary replacement of formal rules happened without much conflict suggests that the normative and moral framework of access via extended social networks continues to be a legitimate and trustworthy option for actors, even if an alternative more formalized regime has been created basing access on formalized rules and conferring advantages to group members. Non-adherence to formalized practices and to rules of excluding outsiders also expresses a certain resistance to the interpretation of water as an economic good.

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