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Water Scarcity, Property Regimes and Irrigation Management in Sonjo, Tanzania

TOMASZ POTKANSKI and WILLIAM. M. ADAMS

This article explores the dynamics of property rights in irrigation water in Sonjo, Tanzania. It analyses an unsuccessful attempt by the ruling political group to change the institutional arrangements of water control, to serve better their private goals. This example shows that not all internal institutional innovations in the field of utilising natural resources lead to increased efficiency of the system from the point of view of the whole community. We draw on New Institutional Economics (NIE) and Common Property Resource Management (CPRM) theory to analyse the way in which it was possible that those few within Sonjo society who are formally/nominally 'the owners' of water sought to privatise de facto collective use rights of all community members. We consider why this was done in some, but not all, Sonjo communities, and we describe why this process has eventually failed.

INTRODUCTION

Indigenous irrigation systems are often studied from a synchronic perspective and therefore viewed as static and unchanging. Studies by anthropologists and political scientists concentrate mostly on management

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patterns and rules regulating access to water at the time of study [e.g., *Hunt and Hunt, 1976; Coward, 1979; Uphoff 1986*]. However, the long-term survival of indigenous irrigation systems depends on continuous adjustment to changing environmental constraints. To sustain production, continuous innovations are necessary in both technological and management aspects of irrigation. The Sonjo irrigation system of Northern Tanzania provides a good example of such flexibility. It has allowed this society to remain in one place and practice irrigation continuously for several hundred years at least. The historical dimensions of this process are not yet well researched, although work on this is currently being undertaken [*Sutton, 1984; 1986; 1989; 1993; Adams, Potkanski and Sutton 1994*]. Nevertheless, we do have knowledge of the social dynamics of water management and ownership over the last decade, and this is the subject of this article. The article also offers the opportunity to update earlier ethnographic descriptions of Sonjo society by Gray [1963] and Potkanski [1987].

This article explores the dynamics of property rights in water in Sonjo, focusing in particular on an unsuccessful attempt by the ruling political group to privatise the *de facto* collective use rights of all community members. The basic question in this study is why irrigation water is collectively managed in Sonjo despite the existence of a strong ideological notion of private ownership. Related questions concern the mechanism through which orderly use of the collective resource was enforced, and why in some of the villages the institution of collective management evolved into private management, and why this attempt eventually failed. We draw on New Institutional Economics (NIE) and Common Property Resource Management (CPRM) theory to analyse this process. The article draws on research carried out by the authors in Sonjo through the 1980s and 1990s, particularly in 1985, 1991 and 1992, with shorter visits in 1993 and 1996.

II. SONJO: THE RESEARCH CONTEXT

The Sonjo are a small Bantu-speaking, currently agro-pastoral community, (tribe).¹ They live in northern Tanzania in the Sale Division of the Ngorongoro District of the Arusha Region. They inhabit the hills between the Loliondo and Ngorongoro Highlands, west of Lake Natron, above the western escarpment of the Rift Valley. The area is semi-arid, at an altitude of 1,500–1,700 metres, with an annual rainfall of 400–600 mm. In 1984 there were about 18,000 Sonjo [*Potkanski, 1987*] while in early 1990s there were more than 20,000 [*Adams, Potkanski and Sutton, 1994*]. These figures indicate sharp population increase in recent decades, since the 1928 population census reported only 2,300 Sonjo and the 1957 census 4,400 [*Potkanski, 1987*]. The area inhabited by Sonjo is small, less than 700 km²

(around 25×25 km), which suggests that current population density is around 30 people per km².

Sonjo live in five main villages (Samunge, Digodigo, Kisangiro, Oldonyo Sambu and Sale) and, since 1960, have a similar number of satellite villages (see Table 1) which administratively (both in customary and modern systems) fall under the main villages. One of these, Mdito, was recognised in 1993 as an administratively separate village. It is probably the most populous, although it is still a collection of hamlets widely dispersed in the bush. Sonjo in the Maasai village of Peninyi, situated on the shores of Lake Natron, left as a result of conflict in 1987, but have begun to return.

TABLE 1
SONJO VILLAGE NAMES

<i>Maasai Name</i>	<i>Sonjo Name</i>	<i>Satellites</i>
Samunge	Soyeta	Magare, Mugongo, Mdito, Yasi, Mjuti (formerly Buri)
Digodigo Juu	Kheri (now Moholo)	Tinaga
Digodigo Chini Kisangiro	Ebwe Rokhari	Meji
Oldonyo Sambu SaleOrokhata Peninyi	Kura Mdito Hajaro (abandoned by Sonjo in 1987)	Jemma

Source: From Adams, Potkanski and Sutton [1994: 21].

Originally all the main Sonjo villages were situated on the hillsides and had a compact and protected form, surrounded by lines of planted thorn thickets as well as by the double wooden gates and fences. In 1975, as a part of the villagisation programme in Tanzania, inhabitants of all the Sonjo villages were forced to move out of the compact sites onto the flatter land below. They moved only a few hundred metres, and the same irrigated fields remained in use. Contrary to the idea of villagisation, this move did not involve change from dispersed layout to a concentrated village site, but the reverse. In some of the villages like Sale, Kisangiro and Oldonyo Sambu, inhabitants soon returned to the hillsides, while those of Samunge and DigoDigo remained in the valley. The reasons for this difference are complex. The latter two villages were more exposed to wider contacts with the District authorities than others. They were also more tightly packed and the old sites were overcrowded. These facts, combined with lack of danger from Maasai raids, resulted in wider acceptance of the new shifted village sites.

All five main villages are situated in places where there are both reliable sources of water (springs or a perennial stream or river), and the natural conditions allowing for irrigated agriculture. New satellite villages are usually situated in the bush above the main valleys, in places where water supply is sufficient only for domestic purposes. Rain-fed agriculture and livestock keeping are mainly practised there. However in three cases, of Tinaga, Eyasi and Mjuti (Buri), the Sonjo claim they re-inhabited old village sites deserted 'in the time of conflicts with the Maasai'. Here there is sufficient water for a limited amount of irrigation.

Although Sonjo linguistically belong to the Bantu family, it is almost certain that over the several hundred years during which their current ethnicity has developed, Southern-Cushitic and Kalenjin elements had an influence. The current state of knowledge about Sonjo ethno-history is summarised in Sutton [1993] and Adams Potkanski and Sutton [1994]. Some aspects of their dynamic relationships with the pastoral Maasai will be discussed elsewhere [*Potkanski, in prep.*]. For our analysis the most important is the fact that they are in a sense an autochthonous group with a long tradition of habitation in this place and that they have been there longer than their current Maasai neighbours.

Over the last two centuries, the role played by Sonjo with respect to the Maasai was similar to other agricultural communities living on the outskirts of Maasailand. Their economy, based on agriculture and hunting, was complementary to the Maasai pastoral economy. Like other ethnic groups living in the orbit of Maasai, the Sonjo both accepted some elements of the Maasai culture and social structure and on the other hand successfully struggled to maintain their own identity and political independence.

This was difficult indeed due to fact that Sonjo form an enclave within the Maasai territory. At first sight they seem to have been colonised by Maasai ideas, Maasai patterns of social structure, Maasai-like types of cloth and adornments, and even Maasai names for villages and topographical features. The commonly used name of the tribe, *Sonjo*, is also of Maasai origin. Nevertheless, under this outer layer, a solid rock of Sonjo identity is preserved. Instrumental in this process is the Sonjo religion, based on belief in the cultural hero and God, Khambageu [*Fosbrooke, 1955; Gray, 1963; Potkanski, 1987*], which unifies the whole society around common values. Living in this 'surrounded fortress', Sonjo developed strong patterns of political authority which are also essential to the understanding of their irrigation management patterns.

III. ECONOMY

Irrigated agriculture is the basis of the Sonjo economy. Technically it is a simple hill-furrow irrigation system operating by gravity [*Adams, Potkanski*

and Sutton, 1994]. Irrigation canals are unlined. Two main sources of irrigation water are exploited. The first are small springs rising at the base of hills around main villages. Water from several springs is often consolidated into small streams before being diverted on to fields in the wide flat valley for irrigation. This is typical for the villages of Samunge, Digodigo and Sale, and the factor limiting agricultural production there is water for irrigation not land. The second source of water is the much more substantial Lelessuta River and its tributary in the main valley (the villages of Oldonyo Sambu and Kisangiro).

Broadly similar headwork structures are used in both small spring-fed streams and on larger river offtakes, although the latter are very much more massive structures. In both cases a dam or weir is constructed across the stream at an angle, and water is taken off into a canal at the downstream end. In small streams, dams can be simple barriers of boulders, strengthened with branches and mud. Below the offtake, water is directed through a complex system of canals on to the fields, where it is applied by breaking the earth banks of canals. Small basins are irrigated in turn, with water being moved from one to the next using an iron hoe to cut and rebuild banks and simple sluices. Because the distance from springs to the fields can be as much as one or two kilometers and canals are unlined, transmission losses are considerable. This fact is important for our analysis.

The agricultural system of Sonjo is described at length in Gray [1963], Potkanski [1987] and Adams, Potkanski and Sutton [1994]. There are two kinds of irrigated land. *Hura* occurs at the bottom of the valley, often in the floodplain of the rivers or streams. *Magare* is situated slightly higher on the slopes. *Hura* has alluvial heavy soil, is relatively fertile and tends to be cultivated every year in dry season between September and February, then fallowed for the rest of the year. There is a clear division of labour by gender. Men clear and burn fields, women cultivate the land and plant. Men irrigate, while women harvest and carry home the crop.

The main crops produced on *hura* are sorghum, sweet potato and beans. *Magare* has light sandy soil that is well-drained. Planting (with maize, sorghum, millet, cassava, sweet potato and various kinds of beans) takes place mostly in March, as the rains begin, with the harvest after they end in June. Nowadays the *magare* fields are often cultivated all the year round, but the rule that they should lie fallow in the alternate years is usually observed. This is possible since people usually have several fields in different areas of *magare*. In some places (for example in the village of Oldonyo Sambu) *hura* predominates, and is economically the most important land. In other places, like Samunge, the *hura* area is of limited size, and the *magare* produces most of the crops. In other villages the two are of equal importance.

Demand for irrigation water in Sonjo has been increasing. This is due firstly to population growth, and secondly to the introduction of new crops. There has been considerable development of the crop repertoire of the Sonjo since the 1950s. Gray [1963] recorded only sorghum, sweet potato, beans and cowpeas, and noted the recent introduction of cassava as a famine crop. Since that time maize, other types of sorghum and beans, as well as banana, papaya, vegetables such as cabbage, lettuce, tomatoes and onions, and even rice and tobacco have been introduced. In the last decade, vegetables especially have become a cash crop, sold in the District Headquarters at Loliondo, and cultivation has expanded at the expense of grain crops in the irrigated area. One important aspect of this is that the new crops except for cassava are more water demanding and have to be watered once per week, that is twice as often than sorghum and beans. Furthermore, new types of grain crops are less drought resistant, so with the development of the crop repertoire demand for water has increased.

In addition to irrigated agriculture in the main valleys, there has been a rapid development of rain-fed cultivation in the satellite villages, mostly of maize. The scale of this expansion is striking to the external observer, and large tracts of what was bushland some years ago are now under extensive cultivation. It seems that in the mid-1990s, the total area of fields depending on rainfall exceeded the total area of irrigated fields, although exact data on the relative extent of the two forms of agriculture are not available. In years of good rainfall, the harvest in the satellite villages is much better than in old villages, while in years of bad rainfall the reverse is true. In such a case, inhabitants of satellite villages depend on food produced on irrigated fields by their kin in old villages.

Besides agriculture there are two other types of economic activity. The most important is livestock keeping, the other bee-keeping. Till the 1960s Sonjo kept only smallstock, but not cattle, most probably in fear of the Maasai raids. Until recently, Maasai regarded smallstock as second rank animals, neither economically nor culturally worth risking armed conflict with agro-pastoral Sonjo. However, there are good reasons to believe that when the Maasai arrived in the area in the nineteenth century, replacing agro-pastoral Tatoga, Sonjo were still keeping cattle. They could have lost them during the rinderpest epidemics in the 1890s, or perhaps abandoned cattle-keeping to stop raids by Maasai. Memory of violent clashes between both groups is preserved in the Sonjo oral tradition. These practical reasons for avoidance of cattle-keeping were hidden under the cultural norm forbidding Sonjo to keep cattle, expressed in the myth of culture-hero Khambageu [Fosbrooke, 1955].

After the Second World War, when the military threat of the Maasai raids finally disappeared, the Sonjo began cattle keeping. Consequently the

myth of Khambageu was adjusted; Gray recorded it in 1963, but by the mid-1980s it no longer contained so specific a stipulation against cattle-keeping [Potkanski, 1987]. However, it is important to realise that for Sonjo, as for all agro- pastoralists, cattle are not as much the primary means of subsistence (since the human: livestock ratio is around 1:1) but rather a store of value and means of exchange, especially in case of marriage payments [cf. Turton, 1980].

Bee-keeping is another economic activity of secondary importance. This skill is a part of the hunting and gathering cultural complex present in Sonjo culture [Potkanski, *in prep.*]. Honey is used for social occasions and is bartered or sold for cash to the neighboring Maasai. Ownership of bee-hives is observed as strictly as water-rights and ownership of cultivated land.

IV. THEORETICAL FRAMEWORK

Three important questions arise from the field data that need to be related to theory. First, why was water managed as a collective resource even though it was the subject of private ownership through individual ownership of water sources? Second, what was the mechanism for enforcing orderly use of the collective resource? Third, why did the institution of collective management evolve into private management in some villages, and why did the attempt to make this happen eventually fail?

Whether a given resource is managed under a private or collective regime depends on the contents of social convention which defines who is the legitimate owner in a given place and time. Analysing water management in some of the Sonjo villages we will observe the way in which this social convention may change. The way institutions are created and evolve, particularly in terms of macroeconomic processes is theorised by the New Institutional Economics (NIE) [e.g., North, 1990; Ostrom, 1990]. Institutions are understood here as 'the humanly devised constraints that shape human interactions' [North, 1990], or simply the established patterns of co-operation/interactions in the society which relate to certain aspect of social life. Institutions define the choice-set available to people and organisations, setting specific 'rules of the game' [North, 1990]. There is clearly a cultural aspect to these 'rules'. In a practical sense, institutions are created and change as a result of actions and decisions of active, rational and self- interested individuals who are, for a variety of reasons, followed by others. The theory argues that those active individuals carefully and rationally evaluate expected costs and benefits of any change in operational rules. Institutions are created or they evolve when benefits expected by principal actors from new rules of co-operation outweigh the transaction costs of doing so [Ostrom, 1990; Ensminger, 1990]. Common Property

Resource Management (CPRM) theory is a sub-set of NIE, dealing with the creation and evolution of 'common property' institutions, the ways in which shared resources can best be protected and used for their joint benefit. It also involves the conditions and mechanisms which generate peoples' co-operation with this respect.

A formal definition of a broad class of 'common resources' is 'a natural or man-made facility that produces a flow of use units per unit of time ... where exclusion [of others] from a resource is difficult or costly to achieve and the resource can potentially be utilised by more than one individual or agent simultaneously or sequentially' [*Ostrom, 1986: 604*]. Bromley points out that with rights also come duties to respect the rights of others. Common property can often be thought of as a 'private property with consensus among the relevant primary decision units,' that is members of the group [*Bromley, 1986: 598*].

Two theoretical approaches to the communal use of natural resources are discussed in this article. The Assurance Problem (AP) approach [*Runge, 1981; 1986*] explains why people cooperate with respect of resource utilisation, addressing the rationale behind collective management of resources. The Property Rights School explains why and when collective management regimes evolve into private management regimes. The third paradigm in CPRM, the 'tragedy of the commons' [*Hardin, 1968*], is not applicable to Sonjo irrigation water use, since (contrary to its name) it only refers to open-access (public) property.

AP analysis argues that under specific conditions people will cooperate for their common good without provision of external (state) coercion. Members of the user groups usually tend not to have access to full information on the costs and benefits of their decisions, but they can communicate and observe each others' decisions and have a chance to alter their decisions (to follow the rules or not) before the next round of the 'game'. AP analysis suggests that if everyone in a group of collective owners is assured that a critical mass of others will obey a common property arrangement, then it is in each person's individual interest to do likewise. This approach therefore stresses the importance of 'mutual assurance' between actors for successful co-operation in collective management of resources.

Runge argues [*1986: 35*] that where a community has a low income, is critically dependent on a local resource base, and at the same time faces a high uncertainty with respect to those resources, then collective forms of management are likely to emerge because they are cost effective and efficient in allowing temporary access to others resources, acting therefore as a safety-net. **The more homogenous a community, the more likely that the optimal outcome will be communal management, since people will share**

similar economic goals and uncertainties as well as socially-accepted norms of co-operation. However, even in more heterogeneous, differentiated rural communities, where a certain number of producers may have an interest in 'free-riding' on customary institutions, if only a 'critical mass' within a community coalesces around co-operative norms, communal property can come to being [cf. *Moorhead and Lane, 1993*]. Some enforcement of these arrangements is likely to be necessary, but this enforcement may readily emerge from inside the group, (rather than outside), for example through cultural norms emphasising co-operative behaviour, and socio-cultural and economic sanctions for defecting, as is the case among the Sonjo.

There is a wealth of evidence suggesting that CPRM systems do indeed operate in this way for irrigation water in both homogenous and heterogeneous communities, for example in Kenya [*Fleuret, 1985*], Morocco [*Mahdi, 1986*], the Swiss Alps [*Netting, 1976; 1981*], Spain [*Maass and Anderson, 1986*], and the USA [*Ostrom, 1990*]. Cooperation is brought about by a common feeling of uncertainty with respect to availability of resources and the fact of strategic interdependence between decisions of all users. The burden of initiating and running the common property institutions is carried by the user group only, although national legislation can substantially support the system in place.

The Property Rights school (PR) is an economically grounded theory of evolution of property rights to resources (from common to private tenure) in relation to technological and demographic changes [*Demsetz, 1967; Behnke, 1985*]. According to Demsetz [1967], common property regimes exist where resources have low value and the cost of control over their use is relatively high. As resources acquire greater value or scarcity, the prevalence of individual maximising behaviour provides an incentive to over-exploitation, and institutional innovations occur to conserve it. These generally take the form of a shift from non-exclusive (collective) to more exclusive (private) forms of access to property [cf. *Moorhead and Lane, 1993*]. They are often accompanied by technological or legal innovations, or a change in price relations, which make the benefits from control over the resources exceed the transaction costs of excluding others and controlling access to it.

The PR approach suggests that there are two logical outcomes when communal property regimes face demographic growth, commercialisation of the economy and socio-economic differentiation within the local community. The first predicts that the communal property will be privatised. The second predicts that collective owners facing these constraints will develop a new management institution or simply adjust the rules controlling access by non-owners to prevent mismanagement by some users. (for example, preservation of the status of the Swiss alpine meadows and forests

as communal property [Netting, 1981]). The success of either of these alternatives is enhanced when it is supported by state legislation [Moorhead and Lane, 1993].

We shall argue below that the process of privatisation began in some Sonjo villages in the 1980s and at the beginning of the 1990s. Further developments in property regimes in 1992–93, however, reflect the working of the second model. The PR school thus creates a framework which allows us to understand in economic terms why the evolution of management of water and consequently its property status took place in some Sonjo villages, and why it did not take place in all of them.

Privatisation of the collective resource was stopped in Sonjo by adjusting the current rules, but only because of an external initiative by the district authorities. The PR model does not explain why this external intervention was necessary, or the mechanism for the change in rules. For the latter we have to refer to Ostrom's model of institutional choice [1990: 192]. This assumes that individuals' decisions at the aggregated level of the group affect the rules governing the institution. The model assumes that there are four sets of variables affecting individual choice, internalised norms of co-operation (that is, existing patterns of behaviour), discount rates (attributing less or more value to benefits in the immediate or alternatively a distant future), expected benefits and expected costs of a change in rules. Internal norms of co-operation and the discount rate are affected by the physical and economic security of group members and by their cultural values and principles. Individuals are perceived in this model as weighing expected benefits and costs in making decisions as they are affected by internal norms and discount rates. This model shows direct intellectual affinity to Barth's anthropological model of social change [1966].

Ostrom [1990] argues that in 'the institutional-choice situation', an individual may either (a) support existing status-quo rules (in Sonjo for the 'owners' of water to continue distributing water free on request), or (b) support a change in one or more of these rules (for example for the 'owners' of water in Sonjo no longer to distribute water free on request but to sell it, and for other users of water to agree to that). The strategies available to the individual can only support existing rules and not choose them because no single individual makes institutional choices (changes in rules depend on the level of support for the change at the level of the whole group). All these analytical categories are relevant to the evolution of rights in irrigation water in Sonjo that is discussed below.

V. SOCIAL AND POLITICAL STRUCTURE IN THE CONTEXT OF WATER MANAGEMENT

The social and political structure of Sonjo are described by Gray [1963] and updated in Potkanski [1987]. The basic category of social structure is the descent groups, the clan or lineage. These groups have a major role in resource control. All the villages have their own myths explaining details of their creation and relationships *vis-à-vis* other villages. The number of clans in each village ranges from four to 12. Myths describe which of them were the founding clans of the village and which were late-comers, often from neighboring Sonjo villages [Potkanski, 1987]. Only the founding clans 'own' resources, like water and bushland with valuable species of trees around villages.³ However, 'clan ownership of water' is in a sense a formal notion since there are always particular individuals from these 'founding' clans who are the hereditary owners of water-sources, like springs or dams (in Kisangiro and Oldonyo Sambu).

Before forced re-settlement in 1975, clans also possessed particular clan-areas on the hills where villages were situated. Settling outside required approval of the 'owners'.

Gray [1963: 170] came to the conclusion that clans had played a more important role in village politics and water management in the past than at the time of his research. This conclusion still seems reasonable, following analysis of the concept and practice of ownership of water by clans among the Sonjo's closest neighbors, the Maasai [Potkanski, 1994]. It seems probable that in the past individuals owned resources on behalf of clans and that their position became more 'individualised' recently, perhaps in the twentieth century.

The second structure is provided by the age-system. There are four male age grades among Sonjo:

- (1) *Vijori*, (sing. *kijori*) – uncircumcised boys, who are mostly engaged in herding duties out of the villages.
- (2) *Batana* (sing. *motana*) *barirage* – younger warriors – after circumcision and initiation, with military and herding duties, and exempted from other economic duties.
- (3) *Batana bakolage* – older warriors – with the same duties but recently allowed to set up families and start their own economic activity.
- (4) *Bamalankolo* (sing. *montomonkolo*) – elders – entitled to set up and support family through their own economic activity.

The Sonjo age-system is quite similar to that of the Maasai, although it is much simpler and does not play a political role. The group of elders is not differentiated into minor sub-grades which pass political leadership to each

other since the political authority is in hands of a hereditary ruling group (*wenamiji*), membership of which is not available through simple climbing of the age-ladder.

Besides the major functions such as creating cognitive and structural order within and for the society, the major function of the Sonjo age-system is military. Passing of each age grade lasts for about six to seven years and ceremonies of passage tend to be co-ordinated with the relevant Maasai ones. Sonjo age-sets have double names. The main name is jointly invented by the ruling groups of all the villages at the time of initiation to the warriors' age-grade, but in parallel, the names of Maasai age-sets are referred to in contacts with Maasai. It is a part of a conscious strategy of appropriation of the Maasai customs, a part of what we see as a long-term self-defence strategy.

The Sonjo age-system is male oriented. Women (as in the Maasai case) follow men without formalised categorisation. Age groups unite males of the same social age from all villages and different clans, and also provide a platform for their integration within the tribe.

The most important aspect of the age-group system for our analysis of water management is the internal organisation of the warrior age-grades. Members of *batana barirage* in each village elect several persons among them, according to clan membership, as their leaders (*bekorani*). They are collectively responsible to the *wenamiji* of the village for the organisation of military activity and canal maintenance as well as other duties laid on warriors by the *wenamiji*. The position of *bekorani* is for life, and continues when the group passes to the next grade in the age-ladder, although among *bamalankolo* (adult men or elders) their political role diminishes significantly since they remain in the shadow of *wenamiji*.

The Sonjo political system is a segmentary one. Each of six villages is an independent political unit, ruled by the hereditary group of men called *wenamiji* (meaning literally: 'owners of the village') numbering from eight to 18 men. There is no form of central government in the customary political system of Sonjo. However, the social and political life of the tribe is co-ordinated by the *wenamiji* of all the villages. Age-grade and religious ceremonies are co-ordinated in time and take place in each village one by one. Sonjo religion provides the strongest basis for the integration of the society.

Some preliminary description of Sonjo religion can be found in Gray [1963] and Potkanski [1987]. Belief is closely linked to the mythical history of the tribe and is based on the worship of the hero god named Khambageu. He was not the founder of the tribe, but came to this world at the time when Sonjo already inhabited their villages and practised irrigation. During his life he lived in several villages, protected their inhabitants against

misfortunes, ensured good crops, etc. He is believed to have been resurrected after death, and came to be worshipped as a god. The whole of Sonjo society, except now for a few Christians, takes part in the religious ceremonies connected with the cult of the god – which provide the strongest platform for the social integration of the tribe.

The Khambageu priests (*baghorowane*), being in charge of worship and shrines, are of critical importance in the process of evolution of water rights in Sonjo, although their role is informal, because in the public or more generally in social life they act through the *wenamiji* only. However, for the analysis of the personal quest for water control in particular villages, their role does not seem to be very important. They are not numerous, and both they and their closest families are excluded from the economic life of the tribe. They do not possess fields or produce their own food. They live off the offerings to the Khambageu shrines. It seems that they are more important as a group, as a part of the socio-political system, rather than as individuals capable of influencing particular decisions.

The political system at the level of a village, from the point of view of water management, consists of three categories of people. The first is the *wenamiji*, the ruling group, who 'own' water (with Khambageu priests as their 'advisers'). The second is the *wakiama*, their assistants in water management. The final group consists of the other people in the village. These form a majority of the society. They neither own, nor have secondary rights to, water for irrigation.

The authority of the *wenamiji* is based on the social legitimation of being descendants of the founders of the village (that is, the owners of the place and its resources) and on the symbolic complex which surrounds them. This is expressed in the fact that only they can 'purify' water which is necessary for successful irrigation (for example, in the case of somebody being killed in the village or a quarrel over irrigation) and only they can initiate a new cultivation season on *hura* and *magare* fields. In general no important decision can be taken in the village without their agreement. In practice, they are those who run village communities, consulting with the Khambageu priests in matters concerning tradition, and with clan elders in matters concerning clan affairs. They define village policy towards the neighboring Maasai and co-ordinate it with other villages, though in case of military conflicts the warriors' leaders (*bekorani*) are the military field commanders. In social life their role can be visualised by the fact that they are those who, on behalf of the society, accept new marriages and divorces. They also ought to be informed on every single case of birth or death of village members. They are judges in cases brought to them by the people.

In all villages the customary leading political role of the *wenamiji* is based on and strengthened by the fact that they directly or indirectly control

the use of water. However, this position is especially strong in villages where water is scarce and *wenamiji* distribute it between people. In this way the *wenamiji* in Samunge, DigoDigo and Sale, through direct control over allocation of a basic resource, have become even stronger than the *wenamiji* in other villages. To show us the difference, our informants stressed the fact that ceremony of 'purification' of water in 'water plentiful' villages can only be performed by all *wenamiji* acting as a group, while in 'water scarce' villages, each member of the *wenamiji* can successfully act as a single person, because 'even individually they are strong enough to do that'.⁴

Wenamiji exist in all five major Sonjo villages. People in the small satellite villages are under control of the *wenamiji* of the nearest 'parent' village. However, in the case of Tinaga and Eyasi, which were re-inhabited after a long time of abandonment, the institution of *wenamiji* was also recreated. In Eyasi these were descendants of former *wenamiji* who for generations found refuge in Samunge. However, in Tinaga nobody from the descendants of the ruling group came back to the village, so people have chosen a group of people to act as managers of water, although they do not have ownership rights to it. They are customarily called *wenamiji* but they are not so in a strict sense, being rather a 'committee for distribution of water'.

To understand the character of this institution, the procedure for recruitment to the ruling group must be discussed. In all the major villages there are eight *wenamiji* (except for Samunge with 18). The number usually has a background in village mythology (for Samunge/Soyeta see appendix in Potkanski [1987]). Position in the ruling group is hereditary and passes from the father to his eldest son. However, these positions require substantial personal skills and high moral qualifications, so members of the *wenamiji* may refuse to accept the eldest son and ask the family to choose another son of the deceased co-member, who again has to be accepted by them. If the late member of the *wenamiji* does not have an adult son at that time, one of his brothers can take the post. However, after his death the post will come back to the line of the deceased man.

Despite this strong regulation, a wide space for negotiations within the family and between the family and other members of the *wenamiji* remains, with the limitation that the position can not be handed over to another family. A successful accepted candidate is obliged to organise a feast for other *wenamiji* of the village, which can sometimes take a form of an 'entrance fee' in kind of a negotiable number of cattle and goats. Problems with negotiating and collecting such fees may extend in time. In Samunge in 1991–93 there were two and later three vacant posts. However, as we shall see later, at this time the *wenamiji* in Samunge had 'privatised' water and started to sell it for money, so that the position had acquired new value.

This may be part of the possible explanation.⁵

The role of *wenamiji* in distribution of water differs between 'water scarce' and 'water plentiful' villages. Where water is scarce (Samunge, DigoDigo, Sale) *wenamiji* distribute all the water first among themselves and then among all other users. Most probably, in the past, water was sufficient for all villagers, but in the 1970s and 1980s this ceased to be the case. In 'water plentiful' villages (Kisangiro and Oldonyo Sambu) the *wenamiji* carry out general supervision of the use of water, and are personally responsible for work such as organisation of reconstruction of dams after the rainy season. Participation by representatives of all the families in the village in the time-consuming work of dam reconstruction is practically the only condition on access to water throughout the year, since the latter is plentiful. In practice the daily duties of supervising the use of water are carried out not by the *wenamiji* themselves but by their assistants, the *wakiama*.

The *wakiama* (sing. *mokiama*) act as the assistants of the *wenamiji*. Each *mwenamiji* appoints one to three *wakiama* as his personal helpers. *Wakiama* have secondary rights to water for irrigation, which will be explained below. In both 'water scarce' and 'water plentiful' villages, their role concerns daily supervision of orderly use of water on the fields and the solving of simple organisational problems on the spot.

However, there is a practical difference between the two types of village. Being a *mokiama* in a 'water scarce' village means having secure access to water distributed by the patron *mwenamiji*. Such a *mokiama* can even sub-distribute his share to others, which is a value in itself. Contrary to this, in 'water plentiful' villages the role of *mokiama* is more honorary and is restricted to simple organisational tasks like daily supervision of the orderly use of water from the dam which 'belongs' to his patron *mwenamiji*, endorsing a daily sequence of irrigation of individuals' fields, solving quarrels, etc. In both cases the social position of a *mokiama* is very high, and being a *mokiama* is itself a matter of personal prestige. However, in case of 'water scarce' villages, this position gives also a secure access to a scarce resource. In order to keep their position, *Wakiama* are obliged to pay a 'fee' to their patrons in the form of goats, honey and honey-beer. There is no fixed amount, but a 'fee' may be demanded often, according to needs of a particular patron *mwenamiji*. Money began to be demanded from *wakiama* from the late 1980s in 'water scarce' villages.

Parallel to the customary political structure, there is the modern political structure of state administration. Involvement of state administration in the daily life of Sonjo began at the time of the establishment of British rule in Tanganyika after the First World War. After Tanzania gained independence in the 1960s the modern political structure competed to some extent with

customary institutions. There was a short period of open confrontation in 1975 during the 'villagisation' programme but subsequently the two structures managed to coexist peacefully, and a certain *status quo* was achieved in matters of their respective prerogatives [Potkanski, 1987]. The two structures are nowadays more complementary than competitive, and very often cooperate on most important issues.

VI. WATER DISTRIBUTION IN 'WATER PLENTIFUL' VILLAGES⁶

Although the management of water in all villages is in hands of *wenamiji* there are, as we have seen, significant differences between their role in 'water plentiful' and 'water scarce' villages. In 'water plentiful' villages (Kisangiro and Oldonyo Sambu) the amount of water is sufficient to irrigate constantly all the cultivable fields. Here it is land which is in short supply, not water. Water which is applied on to the fields is diverted from the main river (or streams in Kisangiro) at several dams [Adams, Potkanski and Sutton, 1994]. The latter are customarily said to be 'owned' by particular founding clans, but in practice there is always a particular single owner – a member of the *wenamiji*, as has already been said. Clan ownership of dams is nowadays only a formal notion, since people who have fields in the area irrigated with water from a particular dam belong to different clans and clan elders do not play a role in management or maintenance of 'their' dams. Nevertheless, the fact that the notion has survived until the present,⁷ makes us think that in the past 'clan ownership' was probably instrumental in determining how basic resources (water and land for construction, cultivation and hunting) were controlled.

In Oldonyo Sambu there are eight dams, in Kisangiro five. Since there is no need to distribute water down different canal systems, the role of *wenamiji* and *wakiamama* lies in organising labour for dam and canal maintenance. Every owner of a field served by a particular dam has a duty to contribute labour to its seasonal or emergency reconstruction. Since this is heavy work, and continues with breaks for one to two months, it is done almost entirely by the young men (*batana*). These are usually sons of the users of water, but are sometimes users themselves. If a user family fails to contribute labour, they will be prohibited from using water at any dam in the village. Since labour is contributed periodically over a month or more, the absent family is first fined with a goat, before being prohibited from using water. In living memory this had happened only a few times. Families which have contributed labour have a right to use water and a sequence of using it is agreed on the spot every day in the morning or the day before in the presence of the *mokiamama* of that dam. Water is sufficiently plentiful at Kisangiro and Oldonyo Sambu to allow irrigation from all dams simultaneously.

In order to look at the water management system in 'water plentiful' villages from a theoretical perspective, we have to distinguish two types of water. The one is water flowing in the river or perennial stream, which is typically collective property or, due to its abundance, effectively public property. The second type, the one we are interested in, is water specifically for irrigation. This is diverted from the river at privately owned dams.

The latter might be expected to be regarded as private water. However, water is managed in these villages as collective property under a controlled access regime. The social convention governing its property status assumes that access to water for irrigation is open to all members of the local community who have fields in the irrigated area and contribute the necessary amount of labour in repairing dams during the year. The eight private owners of dams agree to this, because, in practical terms, neither are they able to maintain dams themselves, nor do they need all the water. All the users of water, including the dam owners, are in an interdependent situation where only collective labour can put the system into operation after the floods, and where water is sufficient to irrigate all the cultivable land. Cultural values support the idea of co-operation, which makes this way of understanding the problem a natural one.

Relating this situation to Ostrom's model of institutional choice, we can see that there are likely to be few incentives to change this type of arrangement in the foreseeable future. Because the economic security of food producers in Oldonyo Sambu and Kisangiro is still high, due to abundance of water, the costs of change in the system for individuals would be far higher than expected benefits. Even if enterprising individuals in the future were to engage in large-scale intensive food production for market purposes (which is unlikely given the remoteness of Sonjo from potential markets), they would probably concentrate on purchasing more land from their neighbours (since cultivable land which can be irrigated is a bottleneck of food production), rather than try to change rules governing water management. Any such change in the rules would demand new arrangements to supply the labour necessary for dam maintenance. There is little incentive to redefine the concept of water ownership in the direction of more exclusive rights.

VII. WATER MANAGEMENT IN 'WATER SCARCE' VILLAGES

Management of water in the 'water scarce' villages is more complicated. We will describe it using an example of Samunge village, but interviews in DigoDigo and Sale revealed the same patterns. Water sources are owned by the group of *wenamiji*, and water is their joint private property. They divide it between themselves on the rotational basis of equal time shares. The

scarcity of water means that it can be directed only to one portion of the village fields at a time. Therefore there must be a practical system for allocating water to one part of the irrigated area within a village and then another in turns, to limit the transmission losses. As a result, irrigation scheduling requires matching of two rotational systems, the first between *wenamiji*, and the second between areas of fields.

On the other hand, the maintenance of canals and water-sources does not pose great organisational challenges in water-scarce villages. It involves only a few days of work twice a year, devoted mostly to cleaning of canals before starting irrigation on *hura* and *magare* fields. Elders (*bamalankolo*, including members of *wenamiji*) work in the upper part of the canals around the sources, while young men (*batana*), supervised by a few *wenamiji*, clean the network of canals in the valley. Those who fail to participate in the communal work are fined and finally not allowed to use water for irrigation. Failure to participate in this communal work is one of the most serious offences against local law [*Fosbrooke, 1955*]

Until the mid-1980s there appears to have been an established system of division of water shares between *wenamiji* in Samunge. This allocation was the point of departure for the further distribution of water to all other users. The irrigation system works round the clock, and the 24-hour period was divided into sub-periods of unequal duration. In 1985 there were four such periods [*Potkanski, 1987*], although more recently the number has been reduced to three. These are a long period starting in the late afternoon (approximately 5 p.m.–3 a.m.), a shorter period beginning at night and running to the next morning (approximately 3 a.m.–9 a.m.), and a day-time period of medium length (approximately 9 a.m.–5 p.m.).

The *wenamiji* group in Samunge has 18 members. They are divided into six groups of three *wenamiji* each. Each group has a right to all the water in the village over three consecutive days. Within these three days each *mwenamiji* has the right to water for one sub-period per day, different each day. After three days the right to water passes to the next group of three *wenamiji* who divide it among themselves, based on the same time sub-periods. The whole cycle takes then 18 days, and each *mwenamiji* has right to water for three consecutive days, each day a different sub-period.

No *mwenamiji* avails himself of the whole time to which he has the right. He distributes it first among other *mwenamiji* without remuneration, as a loan to be returned when their roles change. Next he satisfies the needs of his *wakiamu* who apply to him and pay traditionally in kind. Finally, he divides the remainder among the other inhabitants who need water and do not enjoy the traditional privileges in its distribution. In 1985 the payment was in cash (small and rather symbolic amounts) or agricultural products. Close relatives or friends may give labour or get water free.

In practice the 18-day cycle of water shares among *mwenamiji* is integrated with the second cycle, dictated by the need to irrigate fields in turn from each of the five main irrigation canals to ensure that enough water is delivered to its desired destination. The areas under cultivation differ from one season to another, depending on whether the *hura* or *magare* fields are cultivated. The most efficient use of water occurs when one area of fields is irrigated only when the previous one is fully supplied.⁸

For the inhabitants of the village this apparently complicated system arising from imposition of the cycle of water rights (between the *wenamiji*) on to a cycle of irrigating subsequent areas of field within the village, was simple and understandable. On the previous day they made appropriate decisions and made due payments if necessary. Possible conflicts were settled by the *wenamiji*, who were supposed to be guided by the good of the whole community.

Cases of water theft (irrigating within somebody else's time without approval and/or payment) were relatively rare because the legal access to water was available to practically all potential users, in one way or another. However, if such an offence was disclosed, the guilty person was required to pay one goat as a fine to the *wenamiji* and if caught several times they were excluded from using water at all. This was a powerful punishment but not much used. It appears that the water distribution system in 1985 worked effectively, serving the needs of all interested users. However, the emergence of satellite villages at this time, and the existence of fields permanently out of cultivation, does suggest that problems of water shortage or inefficiencies of distribution were emerging.

It is interesting from the theoretical point of view that while water in the 'water scarce' villages was clearly a subject of *private* property rights, it was in practice managed as a *collective* property. What mechanism secured this orderly use?

Following Runge [1986: 35], the high level of uncertainty with respect to securing livelihoods because of environmental factors, and the strategic interdependence of the *wenamiji* and ordinary users (particularly in the burden of cleaning canals, which still required co-operation of all the men in the village, twice a year for a few days) might have promoted collective management. However, it seems that it was not in fact these practical arguments about labour sharing that were decisive in managing 'private' water as a collective resource, but rather the psychological and symbolic complex which surrounds the *wenamiji* group in each village. They are, in the symbolic sense, not only the 'owners of the place' and resources, but also 'owners of all the people'. In practical terms this means they feel responsible for well-being of all members of the society.

Until the late 1970s water was sufficient for all interested users so there

were no reasons for excluding anybody from its use. By the 1980s, a shortage of water was developing, but the balance was still kept through voluntary emigration of excess population to 'satellite villages'. Furthermore, although ordinary users were already paying for water in the 1960s, in the mid-1980s payments were still quite modest (they were regarded as such by informants), and affordable because they were related to the purchaser's wealth. These payments were more an order-making tool than a means for the *wenamiji* to accumulate capital. Payments for water (especially those in kind of goats and honey) were not only used by *wenamiji* for their own consumption but as offerings to the Khambageu, and for public consumption during the religious ceremonies which took place at least three times a year [Gray, 1963; Potkanski, 1987].

From this perspective the collective management of 'private' water was a kind of social agreement between the *wenamiji* and the rest of the society, which emerged in times when water was relatively plentiful. In order to mobilise the ordinary villagers to take care of the resource, stealing of water was regarded an offence against all the collective users, not only the formal owners. Punishment was rare and flexible. Although *wenamiji* interviewed denied that cases of stealing were frequent, Gray witnessed such situations, and so has Potkanski. Occasional stealing of water must have disorganised the functioning of the system to some extent, although it might save the thief's crops. Small-scale water stealing played the role of a safety-valve in the system.

Why was that arrangement stable for decades? Insights from New Institutional Economics suggest that institutional change is likely to occur when, for the critical mass of individuals concerned, the expected benefits of change outweigh the transaction costs involved in that change.

We do not have empirical data for the period until the mid-1980s, but Gray's report and other indirect information suggest that this was not the case for any group (*wenamiji*, *wakiama*, or ordinary users) and the arrangement was stable. Most probably, shared culturally-based norms which stress the importance of co-operative behaviour were still strong enough at that time to counterbalance any incentives for 'defecting'. Consequently by 'defecting' or acting against the norms (in the case of ordinary users, stealing water, and in the case of *wenamiji* demanding high payments), an individual or individuals were facing opposition from the whole society in all aspects of social life. For would-be 'defectors' transaction costs (mostly social costs) were higher than the expected (economic) benefits of change. Consequently the social agreement held and both owners of water and users co-operated.

VII. THE EVOLUTION OF WATER MANAGEMENT IN 'WATER SCARCE' VILLAGES

During the late 1980s and early 1990s an important change in the system occurred, as the demand for water substantially increased in 'water scarce' villages. This was primarily due to continued high population growth and the introduction and rapid development of vegetable cultivation, calling for watering every week during the dry season. Despite the movement of people out of the main villages to satellite settlements dependent on rainfed agriculture, shortage of water increased. The problems deepened as a consequence of low rainfall in 1991–92, which led to the almost total failure of rain-fed crops in the area. As a result, many people wanted to turn back to irrigated cultivation. Over these years the *wenamiji* in all three 'water scarce' villages gradually redefined the system of distribution of water, both in a sense of making it a private asset that could be sold for cash to those who could afford it, and the sense of altering physical patterns of water distribution to reflect individual transactions in water.

In 1991 the price of water in Samunge was 200 Tanzania Shillings per hour of using whole water output. Water for 10 hours cost as much as one goat. We have not conducted any detailed economic survey or undertaken an economic analysis of the profitability of different types of crop production, so it is difficult to assess whether such a scale of payment for water for food production was high compared to profits, especially in that other crops failed at this time. However, informants complained at the cost, when asked in private. The effective duration of irrigation was also much shorter by 1991. The 14-day rotational cycle of irrigation, which limited transmission losses, was abandoned and replaced by the 'customer oriented' system where water was sent within the same day to whatever area paying customers had their fields. Members of the *wenamiji* in Samunge asked by us why they adopted such a technically inefficient system answered that they were under pressure from people whose crops (often vegetables) would have dried up and been lost. They did not, however, say that they simply sent water to those customers who paid cash for it.

The roundabout way in which *wenamiji* answered this question reflected the fact that selling of water for cash or in kind was condemned by the modern district administration, and was therefore to some extent secret (at least with respect to outsiders). However, members of the local administration in Sonjo villages were not powerful enough to interfere with this practice. Ordinary people passively accepted the change of the system, explaining that otherwise they would have lost their crops. Nevertheless, internal opposition to the *wenamiji*, for raising the price of water grew, and became a subject of concern for local and district authorities. It seems that

the group of people who were active agents of this change were the *wakiama*, the assistants of *wenamiji*, who were locally regarded as the richest and most enterprising group in the village. The precondition of being *mokiama* is to have a substantial personal wealth, to be able to meet demand of the patron *mwenamiji*. They were the first to develop vegetable production, being able to cover the increasing cost of water from the profits they made from selling them outside of the Sonjo area. The economics of these transformations requires further analysis.

The question to be answered at this stage is how it was possible that a majority of ordinary users of water allowed this drastic change to take place in the way the system worked. At the theoretical level, what we observed was *de facto* privatisation of the water until then collectively managed. Demsetz [1967] argues that more exclusive (private) forms of tenure will arise as resources acquire greater value or scarcity, and the expected benefits of exclusive control over the resource exceed the transaction costs of excluding others or controlling access to the resource. It seems that this happened in 'water scarce' villages in Sonjo in the late 1980s and early 1990s.

Over this period, ordinary users of water in Sonjo (that is most people) had to either agree to pay for water (acceding to privatisation), or refuse to pay, risking either an open conflict with *wenamiji* and their allies, or lack of access to water. Ostrom argues [1990: 193] that an individual will evaluate expected benefits in the light of comparative information concerning the benefits (or harm) likely to flow from existing rules and alternatives. For the ordinary Sonjo water users, the fact of rising costs of food production on irrigated fields appears to have become a great burden by the late 1980s. Presumably they would have openly preferred the old system of water distribution ('to each according to his needs'). However, faced with the risk of conflict with *wenamiji* they were forced either to agree to the new system or to leave the village and move into rainfed farming in a satellite village. Their position was insecure, while the position of *wenamiji* in the customary social and political system was extremely strong. Although nobody was able to give an example, there was a common feeling shared by many informants that a person in open conflict with the *wenamiji* was practically forced to leave the village. Furthermore, they were unlikely to find a place in other Sonjo villages, because *wenamiji* in different villages tend to cooperate. This fear was not based on facts or peoples' own experience but rather on expectations and indirect information. The reason for existence of this atmosphere of secrecy is connected with the role of Khambageu priests as the close advisers of the *wenamiji*.

People remember that in 1975, when the District authorities backed by military units resettled Sonjo villages from the old sites on the hills to the

valleys, they also forbade *wenamiji* to distribute water (an arrangement regarded as incompatible with socialism). Initially distribution was taken over by the existing elected village councils, but soon after the military left the area, this role was handed back to the *wenamiji* again. Our informants said that Khambageu priests warned people that the God would punish all who acted against the *wenamiji*. The local administration at the village level did not give up easily in this conflict, but in the final analysis it had no arguments to convince ordinary people they would be safe. The rivalry between state and priests never took on the form of an open conflict, and after a few years a stable compromise was achieved based on division of responsibilities between the two types of authority [Potkanski 1987: 216]. To settle the 'irrigation issue' and to give legal sanction to the existence of the *wenamiji*, the administration officially recognised their status and termed them 'The Committee for the Distribution of Water' (*Kamati Ya Ugawaji Maji*). This compromise left the power of the *wenamiji* essentially unchanged.

Having this experience in mind, ordinary people did not enter into open conflict with the *wenamiji* in the late 1980s and early 1990s. Feeling they had no choice, they agreed to changes in the system of water management. In practice the cumulative result of these individual decisions led to redefinition of the socially accepted property status of water. In 1991 and 1992 all the informants were already deeply convinced that water in 'water scarce' villages belonged only to the *wenamiji* and they could dispose of it as they liked as private owners. It should be noted that this view was in complete contrast to the view of water rights in the neighboring 'water plentiful' villages. Additionally, it was not vigorously opposed since the process of evolution of people's consciousness was extended in time over a few years, and was not very painful, at least at the beginning. The *wenamiji* and *wakiamia*, of course, gained directly and materially from the changes and they worked at promoting new arrangements at the village level.

In theoretical terms, the observed changes reflected the view of the *wenamiji*, facing increased demands for the resource they controlled in late 1980s and early 1990s, that the transaction costs of changing the distribution rules were lower than the expected benefits of adjusting the rules. This was true both in that they derived cash income from selling water, and also in that it allowed them to balance demand and supply of the scarce resource, which otherwise could have been overused. Attempting to satisfy the needs of all might, for example, have extended the cycle of irrigation which could have led to drying up of crops. On the other hand, ordinary users, acting as individuals, found themselves too weak to carry the transaction costs of defending their previous rights of access to water, and agreed to adjusting the rules. Most probably, as all individuals actively or

passively agreed to the adjustment of the management rules, the necessary level of support was achieved. It seemed in 1991 that the new arrangements would last a long time.

VIII. EXTERNAL INTERVENTION IN WATER MANAGEMENT

However, 1992 was a dry year. More people wanted to come back from satellite villages to the main villages to farm irrigated land. Village chairmen tried to mediate and the *wenamiji* made some concessions, for example, collecting fees for irrigating *hura* fields at the time of planting of seeds. However, this did not prevent deepening dispute. Finally the District authorities were informed about the rising conflict.

The District Commissioner came to Samunge and organised a public meeting with the *wenamiji*. After a long discussion he ordered that from that day the distribution of water was to be handed over to the Village Council (*Halmashauri*) and warned that the same would happen in the remaining 'water scarce' villages (DigoDigo and Sale) if *wenamiji* there did not completely stop collecting fees. The District Commissioner acknowledged that the *wenamiji* had customary rights to water, but forbade them to distribute it.

Members of the *wenamiji*, having publicly faced the decision made by the representative of government, backed by the police force, had to agree. They chose a strategy of minimising their losses, and accepted the honorary position as advisors to *Halmashauri* in matters related to irrigation. They agreed to be still responsible for organising of seasonal cleaning of the canals. Their position as customary political leaders was thus not undermined, and they publicly promised to perform rituals of symbolic 'purification' of water when they became necessary. From the next day the village council took over the role of water distribution. The old rotational system of irrigating successively each area in turn was reintroduced. A sequence of using water in a given area was discussed and agreed at the daily meetings organised by the village council. All interested users had access to water but the full cycle of watering all fields extended to over two weeks.

Ordinary users of water were satisfied by this change in the management system. Visiting Samunge in August 1992 we found that a higher proportion of fields were under irrigated cultivation than in the relevant period in 1991. Some people, however, complained that the discipline of water use had declined and cases of stealing water had become numerous. This fact needs some explanation. Because the number of potential users increased substantially after the District Commissioner's intervention, the period between waterings on individual fields, that is the length of the irrigation cycle,

increased. Some fields with vegetables were left without water for a longer period than before. Therefore people tried to steal water, in order to make the cycle shorter. Such action further reduced water availability to others.

Besides this material explanation, there is a parallel, psychological one. Previously the *wenamiji* had powerful social sanctions at their disposal for would-be defectors. The village council's power to sanction was much smaller, indeed practically non-existent. In a theoretical sense one might say that the transaction costs of 'defecting' decreased when the village council took over the distribution, and because the benefits of additional water were higher than the likely social and economic costs of water theft, the number of cases increased.

Within six months, a market for water, based on cash payments, appeared to have emerged, in which rich food producers, for whom an equal share was insufficient, were using part of the time allocated to their neighbours. It was reported that it was mostly very poor people (for example widows) who were sharing their irrigation time with others. Thus, alongside the increased equity of access to water, new inequalities were emerging.

The story does not end here. Three months after the change of the management system there was an election to the position of the Chairman of the village branch of CCM,⁹ the ruling party in Tanzania. In 1992 this was still an important position in the village administration, enabling the holder to exercise indirect influence over decisions of the Village Council. This opportunity was used by the *wenamiji* in Samunge to attempt to regain legally at least part of their lost power over water distribution.

There were two candidates for the position of the Chairman of CCM. One was the youngest and most dynamic member of the local *wenamiji*, and the second was the member of the District Council for the area. There was a long election campaign, in which both candidates competed vigorously, for example, promising free water distribution and better education opportunities for local children. Both sides mobilised all possible voters, and finally the councillor won by three fifths of all votes.

This result should not be interpreted as implying a drastic decrease in the authority of the *wenamiji*, whose customary position is still strong due to the whole symbolic and religious complex, of which they are a part, but simply as an expression of the fact that majority of voters preferred free distribution according to the model 'to all according to their needs and the availability of resources'. At the theoretical level, this public election effectively sanctioned the redefinition of the property status of water in 'water scarce' villages. Water was managed as the collective property of the whole village community, although it had become once more private property (of the *wenamiji*).

It seems clear that without the external action of the District Commissioner, the 'privatisation' of water would have continued. For ordinary users acting alone, the transaction costs of opposing the adjustment of the rules (that is, effective privatisation) were too high. The power of the *wenamiji*, backed by the whole symbolic cultural complex, was too strong. However, external intervention by the district government allowed the majority of ordinary users to regain access to the vital basic resource in the Sonjo economy.

The epilogue to this account of struggle for control over resources is also interesting. In 1996, the level of uncontrolled stealing of water reached such a level that the lack of power of the village council to control it was publicly recognised. A new agreement was made between the villagers and the *wenamiji*, on the basis of which the latter started again to play an active role in keeping order. A new committee responsible for distribution of water was formed. It consisted of three people: two young progressive members of the *wenamiji* and the Village Chairman.¹⁰ The latter was the guarantee of continuation of the new system of distribution, while the inclusion of the *wenamiji* guaranteed execution of orderly use.

It seems that both sides are satisfied with this solution, as are the ordinary water users. In the remaining 'water-scarce' villages, Digodigo and Sale, water is still being distributed by *wenamiji*, but with no payments being demanded. Consequently, water in all three villages is still privately owned but managed as a collective property.

IX. CONCLUSIONS

If the evolution of the water management system in Sonjo is analysed in terms of aggregate economic benefit (that is, consequences for the whole community) the core of the problem is one of scarce resources being utilised by the rapidly growing local community. The 'equity option' chosen by the majority of users has broadened the range of beneficiaries of water in the short term, although the poorest households may well be losing out. However, further future growth in the number of water users, and in crop water demand, may reduce the utility of the 'equity option'.

Neighbouring Maasai villages where irrigation takes place (Engaruka, Peninji and Malambo-Ngabololo) offer a model of possible future problems in Sonjo villages. Maasai regard large water sources (such as flowing streams suitable for irrigation) as a communal resource, and not as the private property of the first settlers [Potkanski, 1994]. In addition to this, they have not created mechanisms for limiting the number of new users of water for irrigation (in contrast, for example, to their approach to grazing resources). In irrigating Maasai villages the cycle of irrigation is extending

enormously and crops are watered too rarely during the dry season [Potkanski, *in prep.*]. In this case the controlled-access regime of collectively owned resource evolves in practice into a nearly open-access regime, where technical efficiency, productivity and economic performance of the system rapidly declines. We are approaching here the old discussion on the 'tragedy of commons' (Hardin [1968]; versus, for example, Sandford [1983]).

Hardin was right that a 'tragedy of the commons' is both theoretically and practically possible where resources are managed in an open-access regime, particularly when external state intervention has deprived communities of control over their local resources. However, in practice, when an imbalance between local demand and availability of resource emerges, the local community is often able to adjust the rules of access (setting up limits for new users) or rules of use in order to reach a balance again.

What we observed in Sonjo was a part of a process of locally-managed adjustment of rules of access to resources. The *wenamiji* 'privatised' (that is restricted access) to water in order to attain a balance between demand and supply, or this is how they presented their role in the process. They still feel responsible for protecting a resource which serves the whole community. To some extent one has to agree with their perception, since the social system did not collapse, and the income gained by the richest food producers, was to some extent redistributed within the community. However, as a side effect of this process, the water became a market asset sold for cash, and part of the income was monopolised by the *wenamiji*. There was therefore opportunity for capital accumulation by *wenamiji* and *wakiama*. It is not clear what patterns of political economy would have resulted had this process of resource privatisation been allowed to run its course. In the event, the development of the cash market for water was the primary factor prompting external intervention.

The 'equity option' that presently prevails in Sonjo may of course not be in the long term an ecologically sustainable solution, since the mechanisms of controlling access to the resource have become weaker. However, it is possible that in future they will strengthen again. Sonjo society has proved over hundreds of years its ability to adjust flexibly to the environmental constraints, and may continue to do so. Only the *wenamiji* have strong social sanctions against 'defectors' at their disposal, as was revealed in Samunge in 1996. In the water-scarce villages of Digodigo and Sale *wenamiji* still control the irrigation system without collecting fees. It is possible that *wenamiji* could maintain the 'equity option', and over time (ideally in consultation with others in the local communities) gradually adjust the rules to meet the changing situation. They might, for example,

seek to control the adoption of water-consuming vegetables and promote a return to less water-demanding crops, although it is not clear if this would be economically feasible. Future research should monitor developments.

From the perspective of Common Property Resource Management Theory, Sonjo irrigation water is in the unusual category of a private resource belonging to a tiny minority of community members, which due to a specific socio-cultural context and labour demands, is successfully managed as a collective resource. Furthermore, we can observe in this case a process of negotiation over time concerning the status of a resource which is essential to survival of a community. The turning points in this process are those moments when the value of the resource for the local community rises, or it becomes physically scarce compared to effective demand. In such cases, over-exploitation might be expected, typically followed by adjustment of the management regime, most likely in the direction of more exclusive rights (privatisation) by enterprising individuals or elites. However, especially when backed by the state action or external legislation, collective management based on rules of equity of access can be strengthened. Decisive in this process is the decision of the majority of resource users, who, carefully judging benefits and costs, have to back either the private or the collective management options. The case study of Sonjo provides an insight into the mechanisms by which such changes take place.

This study of Sonjo irrigation water reminds us that not all internal institutional innovations produce benefits for the whole community, or provide sustainable improvements in the efficiency of overall resource use. Necessary adjustments of the management rules may lead to increased technical efficiency and specialisation. **However, it is clear from the Sonjo study that the resulting surplus can be either equally distributed or used or appropriated by a few.** Alternatively, the resource management can be adjusted to maximise equity, but perhaps only with in-built limits to access to the resource by newcomers. If these limits fail, then at some stage the resources may cease to be used in an economically optimal way. If the cycle of irrigation in the village becomes too long, there may be a crop failure for all, or almost all.

It is also clear in the Sonjo case that customary organisation can perform effectively, due to strict social control, even at a time when the system is reaching the limits of its capacity. Although the scarce resource or irrigation water was being shared fairly equally in Sonjo, the transaction costs of 'defecting' (that is depriving others of access to it by stealing) decreased, because no longer backed by the customary authority and effective social sanctions. The latter situation was, however, adjusted again in 1996. This experience shows that customary resource management regimes remain

highly dynamic, and relations between local institutions and the state are complex and tightly interactive.

This study suggests wider insights of relevance to planning for irrigation development. Sonjo irrigation water management does not offer simple answers to the problems of effective intervention by development agencies into existing indigenous irrigation schemes, or a simple recipe for improvements in the ways new irrigation projects are designed and organised [Adams, Potkanski and Sutton, 1994]. However, it does show something of the range of choices in resource tenure, and the diversity of possible outcomes. Indigenous irrigation systems based on customary values and commitments may be organised to maximise equity, while formal irrigation schemes organised bureaucratically by the state conventionally seek to maximise technical or economic efficiency. Successful irrigation management demands an understanding of the institutional processes involved in negotiating shifts between different goals, priorities and systems of management.

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NOTES

1. The name Sonjo is of Maasai origin. Their own name for themselves is Batemi. However, it is Sonjo that is in common use in the area, and has been used in the literature, particularly by Gray [1963], and we have therefore used this name in this study.
2. Economists distinguish between three ideal types of resources and related property regimes. Pure private resources are the subject of 'private, free-hold property'. Access to the resource is restricted to the owner and no-one else has a right to use or dispose of this resource. Access to 'pure public resources' is open to all interested users, as 'public property', although in a strict analytical sense this is a 'non-property' since there are no specific owners. Between these extremes lie 'common or collective resources' where access is restricted to members of a legitimate user group. Consumption of the collective resource by an individual (one of the co-owners) takes away something of another's ability to consume the same resource but, within limits, enables others to benefit jointly as long as it is possible to exclude others (non-owners) from its use.
3. Ownership of bushland around villages is still recognised, especially if one wants to cut down a valuable species of tree growing within the area. The owning clan elders have to approve such felling beforehand.
4. The distinction between 'water plentiful' and 'water scarce' villages is introduced by the authors as an analytical category, a reflection of a striking functional difference important for the analysis, which, however, is not reflected in the local categorisation and naming.
5. Another part of explanation has to take into account that one of the deceased *wenamiji* in Samunge and all of his sons had become Christians. Full explanation remains a secret of the group.
6. See note 4.
7. Every dam in 'water plentiful' villages has its own distinct name and is known as belonging to a particular person (family) from one of the clans, whose founder/members constructed it for the first time in this place.
8. Efficiency here is taken in the sense of reducing water transmission losses. In Samunge water

- can reach fields at the end of the new channel two hours or more after it was diverted from the previous channel.
9. CCM – *Chama Cha Mapinduzi*. Still the ruling party in Tanzania. Until 1993 the only legally existing party.
 10. The Village Chairman is elected by all villagers in direct election. With introduction of the multi-party system in Tanzania, the informal role of the CCM Village Chairman significantly decreased.

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