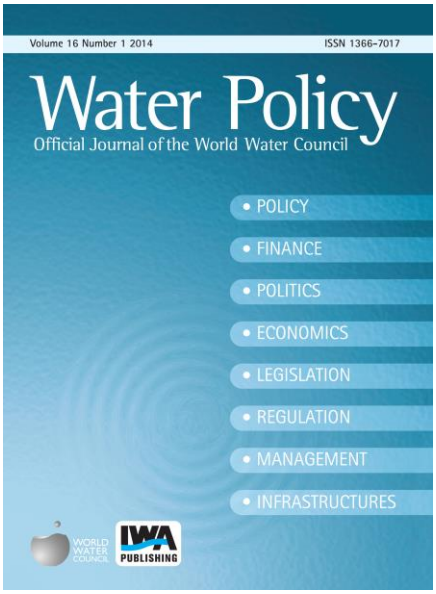

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Reflections on evolving water management institutions and institutional bricolage: a case of irrigation schemes in Iringa Rural and Kilombero districts, Tanzania

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Abstract

Over the past 40+ years, evolution of water institutions responsible for allocation and distribution of water has been enormous. This paper analyzes the evolution of both formal and informal water management institutions and how they affect today's processes of allocating and distributing water in farmer-managed irrigation schemes (FMISs). It also assesses how farmers translate and modify introduced formal institutions in the rights of the existing informal institution while trying to solve water management challenges based on the local conditions. In-depth and focus group data for the study were collected using a checklist of questions administered to 40 informants, one group discussion per village in Itunundu, Mboliboli, Mkula and Magombera villages, Tanzania. The basic argument of this paper is that water institutions have changed over time. Drawing from study findings, the evolution process of water institutions might be understood as an outcome of the government efforts to address emerging challenges with respect to increasing water demand and multi-use. However, institutional evolution is accompanied by some negatives outcomes, as they weaken social norms and threaten sound water management. The experiences from the irrigation schemes highlight the need to include locally evolved institutions while re-crafting formal institutions. Such interventions may well have significant outcomes for efficient, equity and power relations among water users.

Keywords: Evolution; Institutions; Irrigation schemes; Water management

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1. Introduction

A critical challenge for the water sector is to meet sustainable water management within a situation of competition over water access. Such trade-offs are becoming increasingly serious in many parts of the world. In 1990, 28 countries with a total population of 335 million were reportedly experiencing water stress, and the number is expected to grow to around 50 countries, affecting 3 billion (10^9) people by 2025 (World Bank, 2009). Management of water across the vast areas and among millions of users in Tanzania, in a way that is sustainable, is becoming a major political and economic challenge. Effects of economic development and climate change and variability exacerbate competition and conflicts over water among different users (Manzungu *et al.,* 2009; Bastakoti *et al.,* 2010; Kimbowa *et al.,* 2011). The emerging water resource degradation, water shortage and conflicts at micro and macro levels in recent decades, have resulted in increased water policy attention worldwide.

According to Rout (2008), the crisis in the water sector, both in terms of quantity and quality of the water, has also made explicit the inherent inadequacies of existing institutions in dealing effectively with an emerging set of challenges. This ever increasing demand for water has caused serious conflicts over water in farmer-managed irrigation schemes (FMISs). There is a need for governments, to reorient water institutions to reconcile competing claims. Such reorientations imply institutional evolution. Water management institutions are dynamic as they emerge, change and evolve over time (Saleth & Dinar, 2004; Mbeyale, 2009). Petursson & Vedeld (2012) assert that institutions evolve over time through entry and exit of particular actors, and alteration of interaction patterns or rules and power relations.

In Tanzania, water management institutions have undergone various changes, reflecting changes in socio-economic, political and ecological conditions, as well as changes in international donor trends and pressures (Maganga *et al.,* 2004; Van Koppen *et al.,* 2007). The changes have altered the institutional framework from clan and kinship-based (informal) to legal and regulatory frameworks. Major alterations have been made in water policies, legislations and related administrative structures that are judiciously established in accordance with formal requirements. The first Water Rights were institutionalized in 1914 under German rule, and subsequent amendments were carried out in 1948 (Water Rights Ordinance), 1974 (Water Utilization Act of 1974) and in 2009 (Water Resource Management Acts of 2009). Similarly, the National Water Policy of 1971 was amended and replaced in 1991 and 2002. The latest phase marked the end of the 'free water era', whereby legal water rights and water pricing policies were introduced. During this decade, financing water management and the nature of water institutions have become important political themes. Moreover, the changes that have taken place in the history of Tanzania have resulted in institutional evolution. However, little comprehensive assessment has been done on how formal rules are integrated, adapted, transformed or modified by local water user communities based on their local conditions.

Some examples where users' property rights and fees system provide inadequacies in reconciling the emerging water competing claims have been reported by Kadigi *et al.* (2008) in the Usangu basin, Msuya (2010) and Komakech *et al. (*2011a) in the Pangani River basin. Lecoutere (2010) and Dill (2010) also question such non-tradable permits under conditions of water scarcity in Asian, Australian and African countries. These are of particular interest, not only to policy-makers in Tanzania, but also to designers of irrigation schemes, water managers and planners elsewhere, notably in developing countries where similar challenges are now being faced.

The objective of this paper is to develop a better understanding of evolution of both formal and informal water management institutions over the past 40 years (1970–2010) and how they affect today's

processes of managing and using irrigation water in Tanzania. Specifically the study aims to answer two research questions: (1) How have both formal and informal water institutions evolved over the past 40 years (1970–2010) and how do these affect today's processes of allocating and distributing irrigation water in selected FMISs in Iringa Rural and Kilombero districts? (2) How are formal rules and rights introduced by the government being interpreted, or modified or contested (the bricolage nature of existing rules and organization in-use) at FMISs? Attempting to answer these questions, the paper builds upon the work on the theory of institutional bricolage as conceptualized by Cleaver (2002, 2012). Of importance in the theory of institutional bricolage is the way informal institutions replace or modify the legal sanctions or combine them while devising water governance mechanisms at local levels. Other aspects are: the practices of cultural borrowing, adaptation of institutions to multiple purposes, and prevalence of common social principles, which foster cooperation between groups of water users. The second section is devoted to explaining the concept of institution and the theoretical basis of institutional bricolage, the third section describes the study areas and methodologies, while the fourth section presents results and discussion. The last section provides policy implications, conclusion and recommendations.

2. The concepts of institution and institutional bricolage

Institutions in this article are the 'rules of the game' in a society, the formal and informal rules, values, norms and constraints, which provide incentives for individual action and reliability (North, 1990; Scott, 2001; Cleaver, 2012). Further, Cleaver (2002, p. 13) distinguishes between bureaucratic and socially embedded institutions. Bureaucratic institutions are those with formalized arrangements based on clearly defined organizational structures, contracts and legal rights and are often introduced by governments or development agencies. Socially embedded institutions are those based on culture, social organization and daily practices, commonly referred to as informal. The author argues that sometimes the two are not easily distinguished; bureaucratic institutions may be socially embedded and vice versa. Organizations are distinguished from institutions as a group of people or teams bound together by a common goal and working within the framework of the rules and procedures to achieve specific objectives and provide structures of human interaction (Merrey & Cook, 2012). An organization is a means for leading, coordinating and implementing plans and where working rules, values and norms are exercised.

In recent years, there has been a good deal of discussion among economic, social and political scientists about the adequacy of natural resource management institutions in mediating sensible resource use (see North, 1990; Ostrom, 1990; Katani, 2010, Cleaver, 2012). Among other things, one concern has been over the fit of the institutional framework and arrangements within which resource management decisions are made (Mehta *et al.,* 2001; Van Koppen & Tarimo, 2014). Such frameworks evolve over time in response to pressures from unsolved problems on one hand, and partly from the emergence of new ideas and changes in social, economic and political values on the other hand. Literature reviews indicate that Ostrom's design principles and New Institutional Economics (NIE) approaches are useful tools to analyze institutional development for Common Pool Resources (CPRs) within a neoclassical school of thought (Katani, 2010; Huntjens *et al.,* 2012). However, there is a concern that these approaches focus more on internal arrangements, while ignoring the influence of external features such as legal rights, rules or powerful actors. Cleaver (2002) argues that NIE does not sufficiently

explain the linkages and articulation between formal and informal institutions, and limits the understanding of overlaps between different institutional domains. She asserts that a heuristic approach to institutional change that stresses the constraining as well as enabling aspects of institutions can be found in the concept of '*institutional bricolage*'. We adopted institutional bricolage as a theoretical framework for this study because it goes beyond CPR frameworks and gives attention to the dynamic and variable interfaces of informal and formal institutions.

The concept of bricolage in institution thinking was adapted by British anthropologist Mary Douglas from the French anthropologist Claude Lévi-Strauss. Lévi-Strauss (1962) used the concept of 'intellectual bricolage' to explain the two modes of thoughts, namely the mythical and the scientific. He argues that magic and science should be considered as parallel modes of acquiring knowledge rather than considering the first as being incomplete and subordinate, and the latter as being complete and superior knowledge. He used the term 'intellectual bricolage' to refer to the mythical thought and argued that the bricoleur uses whatever is available to accomplish a task at hand without an a priori set of ideas or objectives of how to use them. However, the materials and tools available are heterogeneous and are not necessarily related to the job at hand. Douglas applied the concept to institutional thinking for assessing problems of rational choice. She argued that viewing institutional formation as a bricolage process, allows us to understand the process of collective action by recognizing the involvement of individuals and their cognition in institution building (Douglas, 1986). Cleaver adapted both Douglas' and Lévi-Strauss' conceptualization in developing the concept of institutional bricolage in understanding the manner in which the existing institutions are borrowed, adapted and combined in the processes of solving resource management problems by collective action (Cleaver, 2001, 2002).

According to Cleaver (2002), institutional bricolage means constructing and borrowing different existing institutional elements in order to create different frameworks for decisions and practices. It is based on an idea that institutions are constructed through analogies and styles of thought already as part of the existing institutions (De Koning & Cleaver, 2012). This perspective recognizes the agency of individual actors in negotiating, transforming and adapting newly introduced institutions in the management of irrigation water. Katani (2010) employed the concept of institutional bricolage in the role of multiple institutions in micro-spring forest management in Ukerewe district, Tanzania and found that farmers are capable of developing self-governing systems that are robust and that lead to sustainable forest and water resource management systems. According to Cleaver (2001) institutions emerging through bricolage may serve the interests of certain powerful actors thereby reinforcing existing social inequities. This could be explained by the fact that actors in State and community-based organizations have a key role in shaping institutions (Cleaver, 2001). The process of institutional bricolage includes several strategies depending on the bricoleur. Cleaver (2002) identifies three aspects namely: multiple identities of bricoleurs; frequency of cross-cultural borrowing and of multi-purpose institutions; and prevalence of arrangements and norms, which foster cooperation, respect and non-direct reciprocity over life courses. With regard to these three aspects it can be implied that the bricoleur can form new institutions by relating to different institutions (institutional shopping) selectively adapting norms of external organizations, gradually changing a socially embedded institution (reinventing), referring to socially embedded institutions as reasons to accept or not to accept, new external institutions, and mixing traditional and modern arrangements (Katani, 2010). Using the concept of institutional bricolage we show that the formal initiatives and locally evolved arrangements are being re-interpreted, modified and, in some cases, rejected by smallholder irrigators.

3. Methodology

3.1. The study areas

This study was conducted in Iringa Rural and Kilombero districts, Tanzania (Figure 1). The two districts are potential areas for irrigated rice production in the Rufiji basin. Besides, high population density, climate change impacts and dynamic processes in land use changes have all been reported to intensify water shortage and pressure to meet various uses (Kadigi *et al.,* 2008; Rajabu & Mahoo, 2008). These activities are affecting water resources with serious implications for irrigated agriculture in Kilombero wetland and Pawaga lowland and biodiversity conservation in Ruaha National Park. Yet, they also have impact on hydropower generation in Mtera, Kidatu and Kihansi plants, which produce about 50% of the national electricity. Agriculture is the main economic activity in both districts. Livestock keeping (more in Iringa than Kilombero), fish farming, and beekeeping are other livelihood activities. Paddy is a main irrigated crop in both districts, while maize, Irish potato, sweet potatoes, and bananas are rain-fed crops. In Kilombero farmers also grow plantains and sugar cane. There is an influx of pastoralists and other ethnic groups from all over the country to the Rufiji basin.

Iringa Rural district covers an area of 20,576 km^2 out of which 19,877.5 km^2 are land surface and 678.5 km^2 are water bodies. The Southern part of the district receives mean annual rainfall of between 1,000 and 1,600 mm, but the northern zone (where Itunundu and Mboliboli study villages lie) is a relatively drier area with annual rainfall ranging between 500 and 600 mm. Rainfall distribution in the district is unimodal and occurs between December and April. The district has 254,032 people, and the average household size is 4.2 (United Republic of Tanzania (URT), 2013). Kilombero district lies along Kilombero valley, covering an area of 14,918 km^2. Rainfall regime in the district is bimodal,

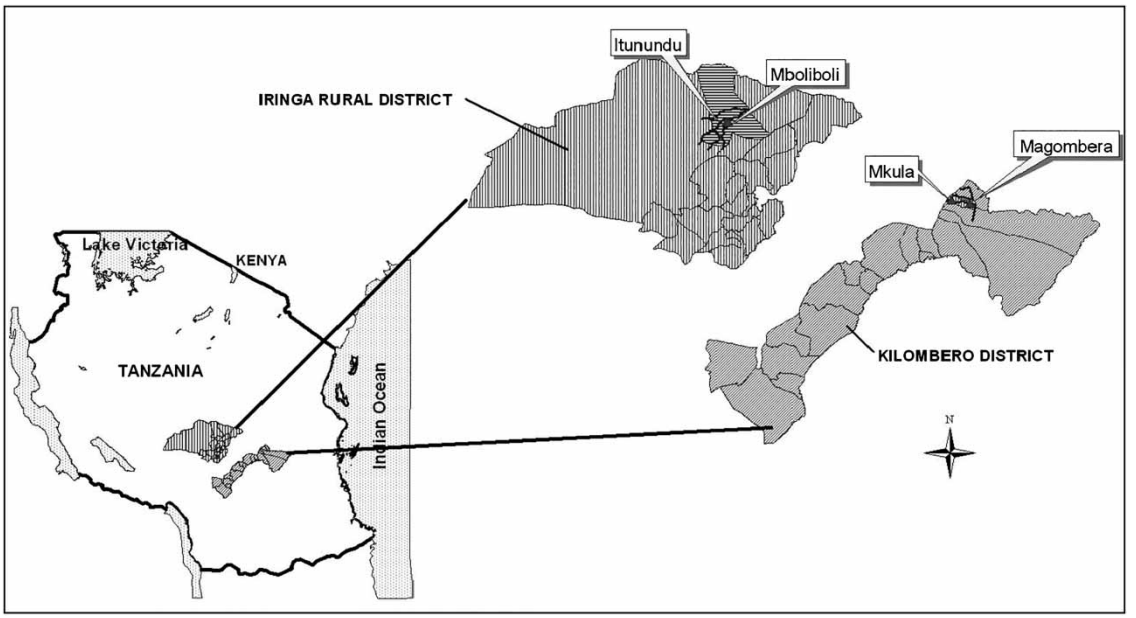

Fig. 1. Map of study districts and villages.

with a short and a long rainy season. The short season occurs between November and January, while the long season is between March and May. It has a mean annual rainfall ranging between 1,200 and 1,600 mm. According to the 2012 Tanzania population census, there are 407,880 people in Kilombero district and the average household size is 4.3 (URT, 2013).

3.2. Research design and sampling procedure

We adopted a cross-sectional research design, which allows collection of data in multiple cases at a single period of time and detection patterns of association among variables. In sampling procedures, the first stage involved selection of one ward per district based on the presence of FMISs. The second stage involved purposive selection of two irrigation schemes from each ward making four FMISs. The third stage involved selection of one village from each FMIS that means two villages per district were designated. The two villages per district selected were based on the fact that the two villages are located on the same agro-ecological zone for easy accessibility, one should have traditional irrigation scheme and the other have improved irrigation scheme and have a common core irrigated crop. In addition, the villages were chosen through consultation with district officials during the reconnaissance survey conducted in 2012 to cover a wide but not exhaustive range of self-farmer managed irrigation schemes in the study districts. With this respect, the FMISs and villages selected were: Mlenge semi-improved irrigation scheme (Itunundu village) and Mkombozi traditional irrigation scheme (Mboliboli village) in Iringa rural district. While Mkula semi-improved irrigation scheme (Mkula village) and Magombera-Kibyoko (MAKI) traditional irrigation scheme (Magombera village) in Kilombero district (Figure 1).

After the schemes were selected, we purposely selected 10 and 12 key informants (men and women) per scheme for in-depth interviews and focus group discussions (FGDs) respectively. These were the most experienced persons on the study topics identified during the informal gatherings with village leaders and members of water user groups. This design was used because of its potential usefulness; it is down to earth and attention holding. As Maxwell (2013) noted, the design and qualitative approach are essential in developing, testing or confirming theories. It has also been used to generate or contribute to a body of knowledge or new suggestions for improvement.

3.3. Data collection and analysis

This study applied both field and secondary data. The secondary data were reviewed from published and unpublished reports found in District councils, Rufiji River basin, Sokoine National Agricultural Library and websites. In-depth key informant interviews, FGDs, and historical trend line were techniques used to collected primary data. Prior to the field survey, we developed a check list of questions to guide the in-depth interview and FGD. A total of 40 informants aged above 55 years were interviewed. During the interview, the narratives were recorded to capture the essence of historical review of how and why rules, norms and beliefs guiding water allocation and distribution have evolved for the past 40 years. The discussions also provided detailed information on the way irrigators interpreted, transformed or modified water rights and regulations based on water availability and locally evolved institutions. Sikcho & Trent (2006) emphasized the importance of oral historians, such as old people, as sources of knowledge, likening them to public libraries. This was important for this study in order to add a practical dimension and make findings context specific and reflective of reality at the ground.

We also interviewed staff from Iringa Rural and Kilombero district councils, Rufiji Basin Water Office (RBWO) and World Wildlife Fund Office. The interviews at this level focused on the historical review of the water management institutional framework in the water sector and in the Rufiji water basin in particular. In addition, leaders of the irrigators' associations (IAs) in the four schemes and village government leaders (chairperson and executive officers) were interviewed. The interviews with the leaders provided information on the functioning and responsibilities of their organizations, and their interaction with other administrative organizations related to management of water resources. It also set the foundation for analysis of the transformation of the water institutions over time and the challenges they face in water allocation and distribution.

One FGD per village was conducted, comprising 12 members (six water users, two village leaders, three leaders of water user groups and one village agricultural officer) who provided additional information on the subject matter. The composition of a group in terms of gender, age and class was taken into account. Field observations were also done to follow up on the day to day water management practices at the irrigation systems and during periods of collective actions. To produce results that serve the needs of the basin and the country, the research findings were triangulated in a 1-day feedback workshop with water users, district natural resource department heads, representatives from the RBWO and Tanzania Electric Supply Company Limited (TANESCO). The workshop further assisted us in understanding how new institution development and changes are viewed and valued by various stakeholders. The information collected was subjected to content analysis with constant comparison techniques. The content analysis helped us to reduce the volume of recorded information to a set of categories that represent some characteristics of the research.

4. Results and discussion

4.1. Evolution of water management institutions in Tanzania

Although the objective was to develop a better understanding of water institutional evolution for the past 40 years (1970–2010), considering the past would pave a better way to view the present. Results indicate that Tanzania has undertaken several water institutional reforms since the colonial era (Table 1). This was an effort to address emerging challenges in water resource management and development.

Institutionalized Water Rights Ordinance started in 1914 under German rule (1880–1919) and this officially launched in 1923 under British rule. During this period paddy and cotton cultivation were established in Kilimanjaro, Arusha and Mbeya regions by colonial settlers. The Ordinance was basically started to oversee water management by prescribing conditions on water extraction to minimize water usage (Sokile *et al.,* 2003). In 1948, the 1923 Ordinance was subsequently replaced by the Water Rights Ordinance of 1948 in response to the increasing water shortage against increasing needs. The 1948 Water Rights was designed to regulate distribution of irrigation water by favoring the colonialists and commercial farmers while excluding local people. Although the 1948 Act nationalized ownership of water resources, it still recognized the rights of native Africans to abstract water for irrigation in respect to customary rights (Lein & Tagseth, 2009). However, the recognition was unilaterally weakened after independence by the Water Utilization (Control and Regulation) Act No. 42 (1974).

Under the new institutional Act No. 42 (1974), the Government of Tanzania became the owner of the country water resources, and was fully entitled to charge its citizens. Access and use of water was officially regulated by formal rules and government departments/units. These initiatives weaken the

Table 1. Key historical events in evolution of water management institutions in Tanzania.

Year	Events
1914	Formation of first water law in Tanganyika by German settlers
1923	The first water law approved under British rule
1948	Institutionalized Water Rights Ordinance, which recognized the rights of native Africans to use water in accordance with their taboos and customs
1974	Introduction of the Water Utilization Act No. 42, 1974
1981	The amended Act No. 10 of 1981 devolved the responsibilities for water management to hydrological units (river basins)
1989	The Minister responsible for water affairs gazetted nine basins
1991	The Water Policy (1991) was formulated emphasizing clean and safe water to all people at no cost
1991	Establishment of Pangani Basin Water Board and Office
1993	Establishment of RBWB and Office
2000	Revision of 1991 Water Policy to incorporate principles of IWRM
2002	Institutionalization of New Water Policy (2002)
2003	Amendment of the water legislation to reflect the new policy of 2002

Sources: Maganga *et al.* (2002); Sokile *et al.* (2003); Van Koppen *et al.* (2007); URT (2002, 2009).

informal rules and norms. The amendment Act No. 10 of 1981 set the foundation for water management along hydrological boundaries and mainland Tanzania was divided into nine river basins (Sokile *et al.*, 2003). Each basin is managed by a Basin Water Office and Basin Water Boards.

Again, in 2000, the 1991 Water Policy was revised to incorporate the concept of Integrated Water Resource Management (IWRM) eventually resulting in the new Water Policy of 2002 and the Water Resource Management Act No. 11 of 2009. The current Water Resource Management Act No. 11 (2009) was designed for better protection of water resources, with prioritization of water for basic human needs and environment.

Moreover, the current water policy and its act are silent on locally evolved rules and norms, consequently the formal and informal institutional arrangements are loosely connected. This segregation further weakens the informal rules and norms, while the formal ones continue to be re-formed or even rejected on the basis of their local conditions. This finding confirmed Cleaver's (2002) argument that communities do not simply adopt externally crafted institutions, but mix these or even reject them on the basis of culture through an institutional bricolage process.

4.2. Institutional evolutions in the case studies

Turning to the case studies, and reviewing the statistics against the base year of 1970, key informants from Mkula, Itunundu and Mboliboli villages have reported to observe evidence of the capabilities of farmers to engage in fruitful collective action since 1972. This is different from Magombera village where irrigation started early in 1994. Demographic factors and disappointment in rain-fed agriculture were reasons for irrigation intensification. In 1972, the cultural significance of elders and clan heads as institutional actors was highly recognized and respected. The clan leaders were able to monitor and guide access and use of irrigation water as well as being responsible for sanctioning those who broke the traditional rules and carrying out conflict mitigation. Besides, they led sacrifices for rainfall in cases of persistent drought.

The rights to access water and land were guaranteed only to clan members, while outsiders who asked permission for access would either receive or be denied it depending on the amount of water available in the rivers. Informants indicated that between 1970 and 1972 farmers strongly adhered to the traditional water management regime. The use of social norms and cultural beliefs to guide who should do what, how, when and where in using and managing water was respected. As a result available water was fairly distributed among users and synchronized to livelihoods. The cultural importance of trees and shrubs on river banks and water catchments which denoted the homesteads of ancestral spirits were respected creating a sense of respect and ownership of natural resources. This suggests that the trees and shrubs in water resources were not only crucial for sound use and management of water, but also for spiritual purposes, e.g. as sacrifice for rain making and for forgiveness for norm violators.

The most important radical change in the study areas and in Tanzania in general, occurred between 1972 and 1976, when the implementation of the *Ujamaa* (socialism and self-reliance) policy started reinforcing state control over the natural resources. This saw compulsory relocation of rural dwellers into the newly established villages while abolishing clan settlements. Since then all villages were reorganized under a system of village government, giving formal power to elected village leaders. The villagization created more heterogeneous communities potentially causing disruption of traditional practices as well as making it difficult to follow formal rules, which could conserve water resources. It also changed significantly the ownership of water resources, responsibilities and the system of regulating and managing irrigation water in the study cases, but had little impact on how water is distributed in irrigation furrows.

Currently, the village governments are the owners of the irrigation system and work closely with formal irrigator associations, as the lowest entities in irrigation water management and use. It was found that all case studies had constitutions, but when looking beyond the relatively simple formality of having a written constitution (that can be copied from a publicity available document), only Mlenge and Mkula are official organizations. Only improved irrigation schemes, had registered their Water Users Association (WUA), but in actual practice these are irrigator associations (as they did not include other water users) with an assumption that they carry the mandates of water user associations. During FGDs, discussants explained that an irrigation association comprises appropriators/water users of an irrigation system, whose membership is primarily recognized by having land ownership in the irrigation schemes. All appropriators of a system have to make compulsory contributions towards the upkeep of the system through labor and cash contributions. All four cases had written rules and regulations linked to the allocation and distribution of water, resource mobilization for repairing and maintaining, charging fines for being absent during repair and maintenance, and penalties for the defaulters. Table 2 shows a picture of informal institutional arrangements existing in the FMISs. There was no difference in institutional arrangements between semi-improved and traditional schemes.

The rules for managing water focus on achieving a fair distribution of water and emphasizing the rights to access water, maintaining irrigation furrows, controlling free riders and resolving conflicts. Specification of fines among the cases does not differ very much, but varies with the nature of the violations. The fines are dual purpose, they are meant to punish violators as well as build up the financial capacities of user groups, e.g. having money for repair of the intake structures or canals. Enforcement of the rules and payment of fines still depends on the commitment of the irrigators and services provided by the association. However, focus group discussants explained that 'lack of will and social closeness among members makes weak adherence to rules and regulations'. In traditional schemes, still there were a few traditional practices and beliefs operated (Table 2) but among the younger generation more men

Table 2. Existing social norms, rules and practices in Iringa and Kilombero districts.

Rules	Description
1970–1973	
Fees	
Ownership of irrigation system	• No water fees, no water permit • Family and clans had ownership of the irrigation furrows • Family and clan heads were key institutional actors
1975–1990	• Village government became the owner of the irrigation systems.
1990–2013	• Membership by fee contribution
By-laws (formal)	• Membership is only to a person who lives in a village, aged above 18 years old and owns a plot within the irrigation scheme • There is an entry and registration fee of 10,000 TZS • Bathing, washing clothes and utensils and watering animals inside the canal is prohibited, and a fine of 5,000–10,000 TZS applies, • Illegal water users and whoever was found irrigating at night are liable for a fine of 10,000 TZS • Whoever absents himself or herself during collective actions is liable to pay a fine of 5,000 TZS. In Iringa district, the fine ranges between 20,000 and 300,000 TZS in most cases paid by pastoralists who happen to graze their livestock into farmers' fields before harvesting • Marginalized farmers (e.g. elders over 60 years old) in Iringa district access irrigation water freely and are excused from collective action
Taboos and cultural beliefs (informal)	• In Mboliboli village any man whose wife is pregnant is not allowed to participate in intake blocking believing his participation will wash away the intake • Tree cutting in the river banks leads to drying of water in the rivers • There is a belief that abandonment of traditional taboos and provision of ancestor's sacrifice have resulted in punishment including unreliable rainfall

Source: Field data, 2013/14.

are questioning the validity of the belief that a lack of sacrifices and respect to the ancestors could lead to drying up of water sources. Nevertheless, during the interviews older people still asserted that violations of such beliefs had led to the current drought and water shortage in rivers. To sum up, the study found that the institutional evolution and change have shown a shift in focus over the years and have little impact on irrigation water management and use optimally, sustainably and equitably as intended by the Water Policy (2002) and Management Act No. 11 (2009).

4.3. Institutional framework for water resources management in Tanzania

Following the Sub-Saharan donor traditions of institutional framework development for water management, Tanzania has developed a mass of state agencies (Figure 2). These include the National Water Board, Basin Water Boards, Catchments and sub-Catchments Water Committees, Water Users Association, Regional Secretariats and District Councils, all sharing water management responsibilities. These organizations are supervised by the Ministry of Water (Central State Authority), which principally develops water resources in rural and urban areas. The Ministry revises and formulates policies and legislations, and creates a conducive environment for sectorial coordination and integration. The Water Resource Management Act No. 11 recognized the basin as a principal organ for managing

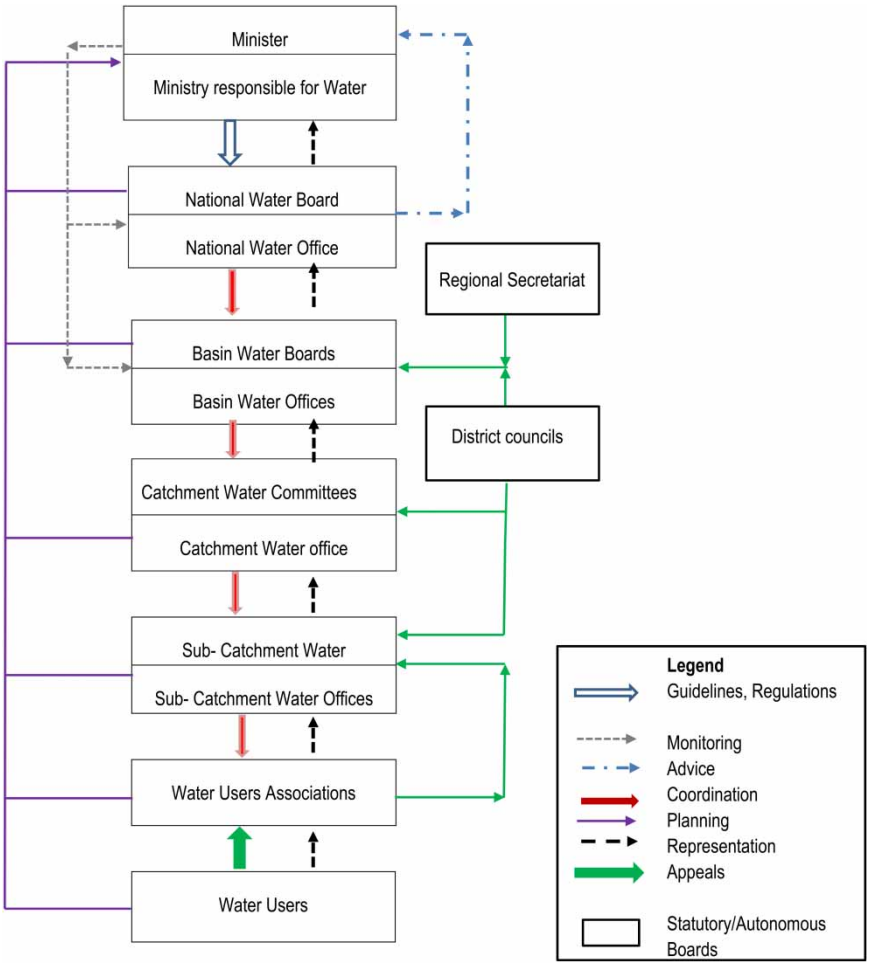

Fig. 2. Institutional Framework for Water Resources Management in Tanzania (*Source:* SAGCOT, 2012).

water at the river basin. Rufiji Basin Water Board (RBWB) and RBWO were established in 1993. The vision of the RBWO is to ensure basin water resources are sustainably managed for the socio-economic and environmental needs, interests and priorities of the basin population. It has mandates on: monitoring water availability, quality and uses at the basin, facilitating hydrological research and supervising water users in the management and conservation of water resources (Southern Agriculture Growth Corridor of Tanzania (SAGCOT), 2012). At sub-catchment level a diverse range of actors including officers from district councils (Iringa Rural and Kilombero), wards, water catchment offices, and Non-Governmental Organizations (NGOs) make decisions on water management and usage.

Despite the systematically organized Institutional Framework for Water Resources Management, discussants in policy dialog revealed capacities to implement the reforms are severely constrained, especially at decentralized levels. There is lack of basic coordination and cooperation among these organizations. For instance, the RBWO is supposed to carry out an inventory on water flow analyses to determine the amount of water available before a scheme is established and a water permit is

issued, on one hand. While on the other hand, the district council is responsible for development of irrigation projects and provision of detailed data on crop water requirements. The growing claims that the officers at the district level often bypass the RBWO by constructing the irrigation project just before water flow analyses are conducted. The growing influence of external support from politicians that excludes ideas from basin water officers was also reported. Surprisingly, the RBWO has an office in district headquarters and not in the wards or villages where water users live. The office has no crop requirement data, making it reliant on data from the district agricultural office. Similarly, Sokile *et al.* (2003) found that along the Usangu plains, the RBWO has no research arm, thus the officers totally rely on findings from other researchers and rhetoric from conflicting sources. During the interviews with RBW officers, the major concern was limited funds and human resources to implement their mandates. The wider discussants opinion seems to accentuate that water fees collected are not sufficient to monitor and carry out the basin responsibilities as intended. This suggests that the basin office still needs financial and institutional support from the government in order for water governance structures to materialize.

In Tanzania, separation and merging of various departments and even the ministries to meet political requirements at the peril of the management is a challenge for creating effective institutions and organizations. Van Koppen & Tarimo (2014) note that 'a new governance layer of catchment councils and WUAs formally sidelines rural district and local government structures which, since independence, have had the formal mandate to develop and manage water' has significant negative impacts for sound management of water resources. In addition, such metamorphosis of institutional framework for water management does not bear in mind the unique role of the social networks and community-based organizations.

The study further found that the inter-sectoral linkages between water management organizations and others managing natural resources within the basin are weak. As an example, the board has no influence on forestry and agricultural practices, e.g. catchments management and cultivating along the river banks, which negatively affect the sustainability of water resources. Within such an organizational setting, visible symptoms of a managerial vacuum are already emerging with serious consequences for sectoral functioning and performance. This suggests that proliferation of institutions and the fragmentation of responsibilities are an outcome of an *ad hoc* institutional evolution, which is rooted in demand of state and international politics, thus continuously being contested or re-molded by local communities. The above trend gives a clue on the fragmented water management institutions in Tanzania. The reform efforts have shown a shift of focus over the years, and yet capacities to implement the reforms are severely constrained, especially at decentralized levels.

4.4. Existing water institutional settings and their bricolage nature in FMIS

4.4.1. Water rotation. In the study districts, water rotation (popularly called '*Zamu za Maji*') is common practice in semi-improved FMISs especially during the dry season. Its origin can be traced to 2000, occurring when there is an inadequate water supply in the rivers and an increased water demand due to population increase. In Kilombero district, where water was adequate until the recent decade, it is a new intervention introduced by an agricultural extension officer who has experience on how the rotation practices work. Field observations show that the rotation begins at the upward fields and proceeds to down-stream fields. Usually, a 3-day rotation forms one complete cycle per zone in which each piece of land receives water. During each farmer's water turn which is roughly

proportional to the area of that farmer's plot of land, he/she has the right for all the water flowing in his/her field. It was further noted that the management of rotation is mutually decided by farmers in the irrigation schemes, and the agency does not interfere unless a dispute arises. This socially evolved tradition of rotation irrigation water has now developed itself into more formal sets of rules with written procedures and monitoring by IAs.

4.4.2. Social networks and multi-purpose institutions. The tradition of social networking (neighborhood farm groups, and self-help groups) in the study areas still prevails and remains a strong domestic norm, often operating alongside the formal IAs. The neighborhood labor group refers to members of an irrigation scheme whose farms are close to each other, and share the same irrigation system. The labor group is an example of an embedded, multi-purpose organization that combines production and social functions. Members in the study cases not only cooperate in farm activities but also join together helping each other in times of sickness and for traditional ceremonies, and functions draw on both traditional and modern forms of interaction. One key informant from Itunundu village said *'…. I was assisted by my fellow farmers in harvesting and marketing paddy while I was admitted at the hospital.'* This means that the neighborhood groups are co-opted for new purposes, and serve economic and social functions. Lein & Tagseth (2009) assert that informal rotation and labor groups operated at the community level have provided a place for potential contacts and mutual interaction, although this potential has not been fully realized.

The study further found that, though IAs are geared to improve water management, operation and maintenance of irrigation systems, as well as conflict resolution, they are also engaged in monitoring water abstraction from the rivers and other tasks that presently cannot be carried out by RBWO or water departments due to human and financial resource constraints. In this regard, the IAs are externally and internally co-opted by government, NGOs and local people. They do not act as independent organizations, but are rather seen as part of the community and of the district organization system. In all the study cases, IAs have become an organization that also deals with environmental conservation programs and organizes the market for selling agricultural crops. Yet, it acts as an entry point for both government and non-government project interventions. Consequently, this means that the IA is a multi-purpose organ with multi-purpose functions.

Internally it means, leaders of the IA are people within the villages, and most of the key positions are held by key actors from the community, thus opinions given by elderly people are valued and respected. This implies that cultural and social respects are deeply embedded.

4.4.3. Customary rights, water rights and fees. According to the Water Resources Management Act of 2009, all water users including small-scale irrigators who want to abstract water from a river must apply for and obtain a water use permit. This system requires registration of water users, formation of IAs and water charging mechanisms within an existing traditional institutional landscape. The permit defines the amount of water to be abstracted, with specified source, uses and duration. In traditional FMISs, with long-established practices of irrigation, the prescribed measures have been met with different notions of rightful access to water and what constitutes proper management of water. There is still a cultural belief that water is a basic human right and cannot be restricted or sold.

One respondent in the FGD in Mboliboli village said *'…Why do irrigators pay for water rights while in the past water was free of charge*?' Another one added *'… An annual water fee has risen from U$D 3 in 2012 to 6 per acre in 2013, but at what agreement, is this fair madam researcher?'*

This is consistent with findings from Sokile & van Koppen (2004) in Usangu basin and Msuya (2010) in Pangani River basin. Farmers in the two basins claimed that irrigation has been practiced for many decades using traditional irrigation furrows and no water fees were paid. Generally, respondents said that it was hard for smallholder irrigators to pay because their expectations for adequate water services had not yet been met and the water rights were not transparent. The respondents further said that the government agencies have not been able to administer water rights due to financial and human resources constraints. The existing water right use was not related to specific areas or crop water requirements, but based on traditional rights. In India, Bandaragoda & Firdousi (1992) found that pricing and other market mechanisms were hardly a panacea for the ills of irrigation water management.

Although, the water resource management Act of 2009 says that there will be no use of water unless water users obtain an official water permit, there were informal negotiations carried out to access water before paying fees. In 2013, farmers from Mlenge and Mkombozi FMISs, for example, said that they had water rights after a formal agreement with RBWO to pay a sum up of 3,700,000 (US$ 2,290) and 2,700,000 TZS (US$ 1,670) respectively after harvest. Respondents further said that most farmers who failed to contribute cash were allowed to contribute in kind, e.g. with cereal grain. On the other hand, farmers did try to align the formal water permits with customary land rights creating an interface between the two making a new institutional landscape. When the official water rights tried to make use of the informal arrangements, e.g. pay soon after a cropping season or in kind, it was found to be more effective than the official rule of paying before using water. Some countries' customary laws are more important in claiming the resource rights than state laws, though policy-makers do not recognize this reality (Komakech *et al.*, 2011b). This gives an indication that informal institutions need to be recognized and respected because together they intend to meet the needs of local communities.

4.4.4. Water management practices. During field visits, it was found that some farmers dig small and narrow irrigation furrows that speed up water flow and reduce the amount of water percolation into the soil. This is one of the socially embedded customs continuously being practiced in managing water in irrigation systems. It is particularly done while constructing tertiary irrigation canals. In addition, the traditional use of available materials to construct an intake structure was clearly observed in traditional FMISs. Even when the use of logs, shrubs and locally available materials to abstract water from a source is not an efficient and recommended practice, it does, however, suffice where there are no improved irrigation infrastructures.

4.4.5. Institutions for land allocation. Despite the National Land Policy of 1997 and Legislations (Land Act No. 4 of 1999 and Village Land Act No. 5 of 1999) designation that land is public, vested in the President as a trustee on behalf of all citizens, where other segments of the society are given the rights of occupancy (URT, 1999) customary land law is still recognized. Two types of land ownership are recognized in this case: statutory granted land and customary land rights of occupancy. While the former is granted by the state for a specific period of time with specific terms and conditions, the latter has no time limit. The customary land ownership more often lacks written document and obligations and rights are rested on the customs of a tribe and are usually inherited from generation to generation. Moreover, the Village Land Act No. 5 of 1999 translates customary tenure rights into a written document known as *'Hati ya Kumiliki Ardhi ya Mila'* to improve the security of customary land ownership (URT, 1999).

Few farmers in Iringa Rural district reported that certificates of land occupancy are used to secure land ownership and loan collateral. The majority of farmers in both traditional and semi-improved FMISs studied had no formal land rights and, hence, customary rights are important in administering land. This impacts on entitlement to water access. As indicated earlier, any person who owns a plot within the irrigation scheme is obliged to pay membership fees and an annual water fee (Table 2). This reflects the degree to which formal water governance systems are embedded and interwoven with the traditional land norms thus making for an easy process of fee collection and collective action.

4.4.6. Collective action. A system of collective work in the study areas has evolved over time separate from the externally introduced interventions. Access to water is based on farmers' participation in communal collective actions. Particularly in Mlenge and Mkula semi-improved FMISs when streams are prone to flooding, intake weirs need cleaning five or more times especially during the cultivation period. This is normally done at the beginning of a cropping season and at any time as the need arises. In traditional FMISs in Mboliboli and Magombera villages, construction of temporary intake structures were frequently management activities. If the intake has been washed out, needing emergency repair, all water users are called at the intake for urgent repair. Information is communicated to farmers through an announcement made by a specific person from the water user group who walks around the village to inform the farmers. This kind of labor mobilization for collective and urgent works in all study areas is known as 'Msaragambo'.

Msaragambo is an old, traditional practice originating from the Pare land, but currently has been included in most village by-laws around the country. According to Msuya (2010), it is an old institution associated with cultural integrity and social relations. It was observed that both men and women undertake communal work, though women are assigned simple tasks (collection of light wooded materials, packing of sand into the bags) while heavy duties (blocking the intake, digging the canals, carrying stones) are male tasks. In case a water user fails to participate in collective works, he/she is fined 5,000 TZS (US$ 3). The contested water fee is by comparison 10,000 TZS/year (US$ 6), reflecting the importance of maintaining the communal work institutions. For farmers who contribute their labor in the construction and maintenance of their irrigation systems their involvement is part of their community life and fits in with the complex set of economic and social relationships linking them with their fellow farmers and with their leaders.

5. Policy implications, conclusion and recommendations

Water management institutions in Tanzania have evolved substantially in the past 40+ years, and it seems likely that they will continue to evolve in the future. The findings of this study revealed that water institutions have evolved even pre-1970, from ideals of collective provision to the current emphasis, in which water is viewed as an economic good, employing principles of water permits for an individual or group who wants to exercise the benefits of water flowing in the rivers and irrigation systems. As a result of such institutional evolution, clan and family heads that were traditionally responsible for the management and maintenance of irrigation furrows and water resources became dysfunctions. Such evolution has not yet provided a sustainable solution in water management and use since misunderstandings between the administration organizations and poor cost recovery from water fees are still common. Furthermore, the common understanding of the water management in the basin and farmer-managed

irrigation schemes is yet full of political ideologies. Such conflicting ideas will not solve the problems of water management (water conflicts), nor will they provide the desired solution of sound utilization of water for economic growth.

The study findings generally imply that the introduction of water rights and cost recovery systems has not yielded an intended management goal. This attribute is confirmed by the fact that farmers in the case studies have been constantly trying to adapt, or contest or re-mold the formal rules based on their experiences and socially embedded institutions that fit with their local conditions. The notion that formalization and re-formalization of water policy and its act as a solution to rectify institutional imbalance should be avoided and the informal arrangements should be incorporated in the process. Based on this finding, we recommend that the water policy and law of the future should be significantly different from the current ones, reorienting them according to the experiences of local water users and socially embedded institutions. Using the concept of institutional bricolage, we have found that the challenge on water management is not merely a policy concern that will provide sustainable water management means but also the informal arrangements. Any attempt to formulate new institutions and organizations should take on board the experience and functionality of local norms that have an impact at grassroots level. Based on these findings, it is recommended that moving towards the direction of the theory of institutional bricolage (merging formal and informal arrangements) is a path to consider for the future.

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