

THE ROLE OF MULTIPLE INSTITUTIONS IN THE MANAGEMENT OF MICRO SPRING FORESTS IN UKEREWE, TANZANIA



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**The role of multiple institutions in the management
of micro spring forests in Ukerewe, Tanzania**

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**The role of multiple institutions in the management
of micro spring forests in Ukerewe, Tanzania**

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This thesis is dedicated to my wife, Mary David, my children, Mhoja, Mayega and Doi and my parents, Zephania Mabula Katani and Agnes Andrea.

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Chapter 1

INTRODUCTION

1.1 Background information

As part of the environment, water is a natural resource that is basic to sustenance of human societies. The Government of Tanzania has developed several policies to make sure water is available to all the people at convenient distances. Because it considered water as a basic human need and human right, the government abolished the user payments for construction of water supply systems in 1965; and user contributions to operations and maintenance of water supply system in 1970 (Mascarenhas, 2005). And to ensure that people have access to water, the Tanzanian government and international development organisations have also invested in many water supply projects. The 1971 Water Policy set a goal of providing clean and safe water to the population within 400 meters from their residences by 1991 at a cost free basis. Unfortunately this goal was not achieved.

In 1991, the government issued another water policy stating that the central government has the responsibility of protecting water sources, and that the government is a sole investor, implementer and manager of water projects, in both rural and urban areas. To accomplish these tasks efficiently, the government removed the subsidies on water and introduced a number of institutional changes including creation of semi-autonomous water associations in municipalities (Mascarenhan, 2005). The Government of Tanzania opted to revise further its policy on water and initiated institutional reforms in 2000. These reforms came following the pressure from the international finance institutions and some donors on the privatization of water services and cost recovery of the projects. In addition, these reforms aimed at addressing the breakdown of rural water systems established in 1970s and 1980s (ibid). The National Water Policy of 2002 introduced a number of new strategies to privatize water services. These strategies include giving priority to the expansion of services through new schemes or through rehabilitation of old schemes to the communities or in the areas that called for water services and showed willingness to maintain the systems. The government would no longer be the sole provider of water to its people, and the community would pay for water services. The whole idea behind these reforms was to privatize water services through cost recovery schemes. The involvement of the private sector in the delivery of water supply services was expected to improve efficiency and effectiveness and enhance development and sustainability of service delivery (URT, 2002a).

The term privatization in the water supply sector implies ownership of water supply services by a number of different institutions, individuals and entities. The concept of privatization of water supply services in Tanzania has involved a number of players, which includes international commercial companies, local indigenous commercial companies, registered autonomous authorities and registered water users associations

and groups (Mascarenhan, 2005). So far, about 50% of the rural population and 70% of the urban population have access to water supply within 400 meters from the residences (Mascarenhas, 2005; Braathen, 2004; URT, 2002a; Madulu, 2000). These data show that clean and safe water supply in rural areas is still a problem which makes many people dependent on traditional water sources, including those in the micro spring forests.

Although water supply systems have gradually been modernized, traditional water sources still have a role to play in Tanzania. One of these traditional supply systems are the micro spring forests; these form the subject of this book. The term micro spring forests refers to forest patches with the average size ranging from 0.1 to 1 ha surrounding natural water sources. These natural wells are used by villagers for collecting water for domestic uses, and the small streams deriving from these springs are used for local irrigation. The villagers have been using these traditional water sources in micro spring forests since they migrated to these areas, and the water sources have survived several environmental and socio-economic changes.

As implied by the term micro spring forest, the management of water is often interrelated with the management of forest vegetation. As has been the case with the management of water, in the management of forest vegetation in Tanzania during the last three decades, much attention has been paid to the decentralization of the management responsibility (Wily, 2002; Mniwasa and Shauri, 2001; Wily, 2000; Kajembe and Kessy, 2000; URT, 1998). The transfer of control over natural resources management decision making to the local people creates the space to accommodate local interests and livelihood needs, and ideally empowers resource users to benefit from and influence the outcomes of the decisions made. Kajembe and Kessy (2000) outline a number of reasons behind this shift, including the failure of the state agencies to manage protected areas effectively, the increased motivation for local communities to conserve forests following recognition of their critical role in the management and the need to regain a sense of ownership by local people over their forest resources (empowerment). These reasons were also influential in stimulating decentralization in the management of water supply. The Tanzanian government certainly recognises the role of local knowledge and institutions in managing natural resources and hence the need for local community participation.

1.2 Problem statement

The Tanzanian national water policy of 1991 set the goal of providing clean and safe water to every inhabitant within 400 meters from residence by the year 2002. Presently only about 50% of rural population has access to reliable water supply, and over 30% of the rural water schemes are not functioning properly (Madulu, 2000). Sixty percent of the rural people depend on water wells (Mkapa, 2004), but about 24% of these wells are not functioning properly and the rate of well failure exceeds the rate of construction of new wells (Maganga *et al.*, 2002). Thus, the government's goal of establishing reliable rural water supply is not yet realized, and many rural

people still use traditional water sources. In this regard, there is a need to consider how these traditional sources can best be used and maintained. Also the National Forest policy emphasizes the conservation of catchment forests as sources of water for urban and rural domestic uses as well as for agricultural, industrial and hydro-electric use. Forests serve as regulators of water quality and quantity. The degradation of these forests results into hydrological imbalance, which can be reflected in the reduced amounts of water in rivers and streams during dry seasons.

Environmental conservation through people's participation in managing natural resources on the basis of their indigenous knowledge and institutionalized practices are contemporary issues in scientific research (Berkes *et al.*, 2000; Ellen *et al.*, 2000; Lawrence, 2000); this also applies to this study. In Ukerewe main Island, traditional management of water sources and forest vegetation in micro spring forests is based on local institutions. External programme interventions by international organisations and national government have introduced new ideas and technologies regarding water quality, access, use, and ownership of water and forest resources. Such external knowledge interacts with the indigenous knowledge resulting into an interface between the two knowledge systems through which local actors may find ways to translate the external knowledge to fit into their own purposes (Long, 2001). Although micro spring forests have been used for centuries as sources of water and have survived several environmental and socio-economic transformations, several of these integrated natural resource systems have recently been subjected to undergo some changes. In this respect, the present role of these micro spring forests within the new strategies for water and forest management deserves attention. The micro spring forests are not only of relevance with regard to rural water management but also with respect to forest conservation. The Tanzanian government stimulates decentralized forest management by local communities in the name of Participatory Forest Management (PFM), but there is very little insight in how local knowledge informs actual management practices, what cultural, social, and economic issues are at stake, and how local institutions change under conditions of external interventions and modernization. This research fills this gap by focusing on local institutions and people's everyday practices concerning the management of water sources in micro spring forests.

Micro spring forests have been managed traditionally by local norms and rules, taboos and other cultural beliefs. Several external interventions, revision of national policies and statutory laws related to land, water and forest have taken place in the country over the past five decades. Some of these interventions, policies and laws have contributed to changes in the management of micro spring forests. Regarding forest management, several studies in Tanzania have already documented the different characteristics of indigenous forest management systems (Munyanziza and Wiersum, 1999; Kessy, 1998; Kajembe, 1994). The same applies to the indigenous water management systems (Orindi and Huggins, 2005). But most of these studies have a sectoral approach focusing on one type of natural resource only. No specific studies have been carried out with regards to status and management conditions of micro

spring forests as integrated resource systems with multiple uses. In addition, there is still little scientific insight into the nature and functioning of local institutions for multiple resource management under changing management regimes and tenure rights. This study primarily focuses on local and external institutions dealing with multiple resource systems, especially micro spring forests, and the choices households or individuals make about using and managing these resources, particularly the traditional wells or water sources and forest products. This study is relevant not only for water policy and conservation of water sources, but also for forestry. Foresters in the government departments always focus on large state forest and give much attention to commercial production and conservation of large-size watershed protection forests. But they rarely (foresters in government departments) consider small units of multiple-uses forests managed by the village communities as relevant. Without a proper insight in local forest knowledge and management it will be difficult to understand what is socially relevant in relation to decentralization of forest management.

1.3 Research objectives

The general objective of this research is to examine the changes in institutional practices for the use and management of water sources in micro spring forests in rural Tanzania as well as to assess the role of local institutions and their dynamic interaction with newly introduced forms of management of integrated natural resource systems, especially in areas where state provision of water is still minimal. The research specifically focuses on Ukerewe main Island, which provides a good example of the nature and dynamics of micro spring forests and their water sources. The research data therefore form a relevant basis from which scientific, policy and local community relevant propositions can be made.

The specific research objectives are:

1. To examine the tenure systems of land, water, forest and trees, their historical dynamics in the Tanzanian context, and how they affect today's types of management of micro spring forests as integrated resources systems.
2. To identify local and external institutions with regard to the use and management of water and forest vegetation in micro spring forests, and to assess the dynamic interface of these institutions and how they affect water and forest condition.
3. To assess present use and management practices of water and forest resources, and to show how external intervention is embedded in local institutional practices, and how these practices differ between the cases.
4. To propose whether decentralised management of water and forest resources requires an integrated or a sector approach.

1.4 Research questions

The following research questions were addressed in relation to the research objectives:

1. How do tenure systems of land, water, forest and trees, and their dynamics affect the use and management of water and forest vegetation in micro spring forests?

Sub-questions:

- What national policies relate to management of micro spring forests and who administers these policies?
 - How have these national policies evolved over time from the colonial period to the present period and how have they affected traditional management of water and forest vegetation?
2. What are the dynamics of institutions in water and forest resources management and how are they reflected in the physical characteristics of these resources?

Sub-questions:

- Who manage water and forest vegetation in micro spring forests and what knowledge and institutional arrangements are used to achieve these purposes?
 - What institutional changes have taken place over time in the use and management of water and forest vegetation in micro spring forests due to external interventions and modernization?
 - What changes in water sources and forest vegetation condition were caused by the changes in local institutions?
 - What is the present configuration of water sources, water quality, water quantity and seasonality of water?
 - What is the present forest condition in terms of land size, tree species composition and stand characteristics?
3. What are the everyday practices of individuals and groups concerning the use and management of water and forest vegetation in micro spring forests, and what does this mean for the institutional embedding of external interventions?

Sub-research questions:

- How are external interventions embedded in local practices of using and managing water and forest vegetation?
 - How do the practices of using and managing water and forest vegetation in micro spring forests differ between the cases?
4. Does decentralised management of water and forest resources require an integrated or a sector approach?

1.5 Relevance of the study

The current National Water and Forest Policies are emphasizing the need and importance of involving local communities in the management of water and forest resources. This study focuses on the interaction between people and natural resources

and how new institutions are developed under the influence of external interventions and modernization to guide the use and management of water and forest resources. By focusing on issues regarding community-based institutional processes of natural resources management that for many years have been neglected by official state-sponsored natural resource management policies and programmes, the study contributes to a better understanding of the actual practices of the functioning of local institutions as well as the role of local knowledge in multiple resource management in the development of rural society. These issues are amongst the key themes in the field of development and social transformation in Tanzania and which need to be identified as the basis for our improved understanding of the everyday practices of local actors in managing their resources. Apart from the scientific relevance of locally embedded institutional practices, there is also a societal and practical relevance. A study on the complex nature of local institutions for using and maintaining multiple resources is also relevant. It gives a better understanding of the effectiveness of local institutions and the management status and dynamics of micro spring forests and their possible contribution towards the Tanzanian water and forest policies in providing clean and safe water and in providing forest products to population without destroying the environment.

1.6 Organization of the thesis

This thesis is organized in eight chapters and is structured as follows:

Chapter 1: *Introduction* contains background information on the status of water supply systems in rural Tanzania for domestic uses and the importance of traditional water sources in micro spring forests; problem statement; objectives; research questions; relevance of the study; and organization of the thesis.

Chapter 2: *Concepts and theoretical framework* contains the theoretical approach and the basic concepts used in this thesis. This thesis uses the concept of institutional bricolage by F. Cleaver to conceptualize the institutional process of embedding externally introduced and indigenous practices and norms of resource management. We believe that it is more relevant to follow the process of institutional interaction or local embedding than the one of assessing whether or not the institutions concerning using and managing water sources and forest vegetation are robust in view of internal conditions. The concepts of interface, and legal pluralism and actor-oriented approaches are used to study the institutional bricolage process.

Chapter 3: *Methodological approach of the study* contains the description of the study area; research design; selection of study location and respondents; methods for data collection; characteristics of the respondents; and data analysis.

Chapter 4: *Tenure systems administration and dynamics* gives the historical development of tenure systems in Tanzania and discusses the current tenure systems for land, water, forest land and trees. In addition, it gives an account of how these

tenure systems are administered in Tanzania from the national to district and village levels. Then, the historical perspective of the villagization programme in Tanzania is discussed; and it includes its impact on tenure systems for land, water and forest, as well as the consequent implications on the condition of water and forest resources.

Chapter 5: *Dynamics in water sources management and the present physical characteristics of water sources in micro spring forests* describes the types of institutions and actors involved in the management of water source under different periods. Then, the chapter presents the study findings on present physical characteristics of water sources and their implications for traditional water source use and management.

Chapter 6: *Dynamics in vegetation management and the present condition of micro spring forests* describes historical changes in forest ownership, changes in vegetation condition, and dynamics in forest management. Also, a description of the present forest condition is given. The dimensions considered in the present forest condition include land sizes, tree species composition and stand parameters. Stand parameters include the number of trees per hectare, basal area per hectare, diameter class distribution and dominant tree species.

Chapter 7: *Resource use and management practices in micro spring forests* provides empirical data on the present practices of using and managing micro spring forests and their water sources in Ukerewe main Island. The chapter contains four sections: the organization of water and forest management; use practices; management practices; and the summary.

Chapter 8: *Scientific conclusion and final discussion* address the research questions and provides a general overview of the most important issues addressed in the study findings. A systematic comparison of different institutional practices in six cases is presented and discussed. Also, a reflection of the research findings to scientific community, policy makers and local population is presented. Finally, a general conclusion on the study is drawn.

Chapter 2

CONCEPTS AND THEORETICAL FRAMEWORK

2.1 Overview

This study focuses on the use and management of micro spring forests in Ukerewe main Island, Tanzania. Micro spring forest integrates two natural resources used by the local people, namely water and forest vegetation. The management of water sources is often interrelated with the management of forest vegetation. Water sources and forest vegetation are mutually dependent. Micro spring forests are basically common-pool resources. A useful model to assess the arrangements for managing bounded natural resources by a bounded unit of resource appropriators is the common-pool resource (CPR) management system (Ostrom, 1990). This model focuses on one natural resource at a time but it does not address situations of multiple and mutually dependent resources, as is the case with micro spring forests. The CPR approach also looks specifically at the internal arrangements of local management organizations, and gives little attention to external influences. This study therefore moves beyond the Ostromian framework by giving more attention to the dynamic and variable interfaces of indigenous and external institutional arrangements in the development of water sources in micro spring forests.

A common-pool resource (CPR) is characterized by Ostrom (1990: 30) as “a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use”. The resource units withdrawn from the common-pool resource system by individual or group appropriators are governed by exclusionary principles. This means that the appropriation of resource units by an individual or group reduces its availability for use by others (Becker and Ostrom, 1995; Ostrom, 1990). Examples of common-pool resource systems include irrigation canals, streams, lakes, fishing grounds, grazing areas, underground water and forests to which a particular identifiable group of people may claim common property rights. The term common property regime refers to a particular social arrangement regulating the preservation, maintenance and consumption of a common-pool resource (Ostrom, 2003). The common-pool resources are not necessarily governed by common property regimes, and may be owned by national, regional or local governments, communal groups, private individuals or corporations.

Problems of congestion, over-exploitation, pollution and potential destruction of common-pool resources arise when many individuals use the resource system without devising control mechanisms and/or enforcing them; such problems are usually referred to as tragedies of the commons (Hardin, 1968). Ostrom (1990: 90), and Becker and Ostrom (1995) argue that institutions are robust when both institutions and resource systems have survived for long periods of time and can be characterized by most of the following design principles:

- Clearly defined boundaries of resource appropriators as well as the CPR itself.
- Congruence between appropriation and provision rules and local conditions
- Collective-choice arrangements
- Monitoring
- Graduated sanctions by officials accountable to the appropriators
- Conflict-resolution mechanisms
- Minimal recognition of rights to organize.

The debate on Hardin's theory on the tragedy of the commons (1968) and Ostrom's (1990) theory on design principles for common-pool resource management primarily focused on the features of internal characteristics and the norms used for use and management. However, increasingly the use and management of common-pool resources are also influenced by external institutions e.g. forest and water legislations (Cleaver, 2001). In order to assess the impacts of such external influences a more flexible institutional approach that assesses the challenges of the indigenous institutions in keeping up the 'common-pool' character of micro spring forests may be used.

As a result of the acknowledged need for decentralization policies (see Chapter One) at present much attention is given to the concept of community based natural resource management. However, Agrawal and Gibson (1999) warn that the term community is open to misconceptions. Rather than viewing community as small spatial unit, with a homogeneous social structure and having common interests and shared norms, the authors argue that a community must be examined in the context of development by focusing on the multiple interests and actors within communities and on how these actors influence the decision-making process of the sustainable use of the resources. Also, social networks of local people in the community may stretch well beyond the physical unit of co-residence (Long, 2001). This study agrees that the concept of community is problematic for three reasons. Firstly, the physical co-residence of people who use the same spring or forest is not necessarily a community since they may be socially, culturally and economically heterogeneous, although they are co-residents of a village. Secondly, villagization in some parts of Tanzania (see Chapter 4) has uprooted cultural and social roots of communities by disrupting clan-based settlements and social structures. This disruption has consequences on the common-pool resource management. Thirdly, external interventions on traditional water sources in micro spring forests by the Ministry of Health through Sanitation and Water Programme (HESAWA) and the Ukerewe District Council (see Chapter 5) have further challenged local institutions for common-pool resource management by introducing water well committees and formal Water User Groups.

Thus, the local people in rural areas in Tanzania are increasingly getting new ideas, technologies and resources for the management of their original water sources and forests. For example modernization which is brought about through watching television programmes, listening to radio programmes, reading newspapers and

visiting towns and cities has had enormous influence on the people in terms of acquisition of these new ideas and technologies. Based on their existing institutions when faced with external interventions like villagization or HESAWA, the local people develop new strategies to negotiate or transform the external institutions; they also develop new ideas leading to new institutions that suit their local settings. The concept of modernization does not necessarily have an effect to all communities equally and that there are fixed ingredients of modernity; rather, this study shows that individuals and groups may perceive modernity in different ways depending on their values, history and perception of the future life. Arce and Long (2000) argue that the assumed properties, practices and ideas of modern society are constantly reshaped, digested, consumed and re-used in the course of everyday life and experiences.

Different actors see resources in different ways depending on their knowledge and experiences. For example, the health officials from the Ukerewe District Council see traditional water sources in micro spring forests as being mismanaged in terms of water quality. This is because the water sources are not covered and treated with chemicals such as Chlorine to kill microbes. The improvement of traditional water sources by HESAWA programme considers these water sources as lacking proper management and technological facilities to improve water quality. The programme introduced water tanks, taps, well committees and Water User Groups to ensure sustainability of these water sources.

The Ukerewe District Forest Department sees micro spring forests as small woodlot resources that do not meet the requirements of catchment forests or watersheds. Foresters use the land size covered by the resource as a determinant factor for the resource to fall under their mandate, and they tend to disregard the relatively small micro spring forests (see Chapter 4). Finally, the village water users see the water sources and forest vegetation as integrated resources with multiple uses and which are related to each other, and this is reflected in their norms, rules and cultural beliefs. These differences among the actors have implications on how external actors intervene in the management of traditional water sources and how water users negotiate and transform external interventions, and integrate the new rules and regulations with their local norms and rules.

The Tanzanian government through district councils has for a long time not been able to reach rural areas in support of the management of traditional water sources found within micro spring forests. Historically, the management of water sources in micro spring forests has been based on local institutions determining people's behaviour by cultural beliefs and taboos. However, from 1980s several interventions on these water sources ranging from local initiatives in the villages to national projects supported by international organizations have introduced different technological, institutional and organizational rules. This has been the case with HESAWA and government interventions in the Ukerewe main Island in Lake Victoria. This study focuses on the actual practices and dynamics in the use and management of these water sources and forest vegetation on Ukerewe main Island to explore the extent at which the newly

formed institutions are embedded in the local institutions and their effect on people's uses and management of water and forest vegetation.

The analysis of the process of forming new institutions is based on Cleaver's (Cleaver, 2002) concept of institutional bricolage which holds that people draw on internal and external knowledge to form 'new institutions'. The concept emphasizes the critical role of human agency in solving social problems. To understand this process of institutional bricolage and how actors make it happen, an actor-oriented approach is used (Long, 2001; Arce and Long, 2000; Long, 1997). The current study focuses on the practices and roles of village people, traditional leaders and external actors in managing micro spring forests and how they relate to institutional development. External actors, especially government health officials, consider intervention as a top-down linear process that is important in bringing institutional change in the society. This study views external intervention not just as something that achieves its objectives through a linear process, but as something which can actively be negotiated and transformed by local people who are the subjects with the agency, rather than being passive objects of intervention.

According to Olivier de Sardan (2005) the interaction between external interveners and those intervened takes place in a particular context, which affects the outcome of the intervention. The context includes external factors that are beyond control of external interveners and those intervened. For example, in the case of Ukerewe main Island, the management of water sources in micro spring forests by local people could be affected not only by the current intervention of HESAWA, but also by external factors such as climate change, people's experiences with previous interventions, and modernization. From this perspective, it is useful to apply the concept of interface that focuses on the outcome of planned development programmes as a result of linkages between different actors (Long 2001). The concept of interface sheds light on the actual practices of social interaction, and the power differences, negotiation and conflicts involved in an institutional bricolage.

This study regard human agency as central in the formation or construction of institutions, it is necessary to consider how actors draw upon the existing multiple legal systems, like customary tenure systems and constitutional land tenure rights. This consideration can be made by using the concept of legal pluralism. This concept became well-known in the 1970s mainly by lawyers and is referred to by Merry (1988: 870) as "a situation in which two or more legal systems coexist in the same social field". This concept focuses on how state laws shape and reconstruct other normative orders and how non-state normative orders negotiate, transform or reject state laws (Merry, 1992). The use and management of micro spring forest entail a number of both internal and external actors. These actors create different rules, norms and regulations in using the resources. The concept offers the opportunity to understand how individuals or groups of people in rural areas are constrained or enabled in forming new institutions for resource use and management. As Fuller (1994) argues that deploying the concept of legal pluralism reduces the danger of

relying only on state law, which distorts the understanding of the other non- state normative orders. The concept allows the researcher to see the internal diversity and dynamics of rules and norms with regard to the use and management of micro spring forests in Ukerewe. In the following sections, the basic concepts on which this study is based are further elaborated.

2.2 Actor oriented approach

The actor-oriented approach is useful for understanding the multiple realities and variability of social practices of different actors. The approach makes the actors a central focus in assessing their everyday life experiences (Long and Long, 1992). The actor-oriented approach focuses on the human agency to interpret and change the existing institutional rules and regulations, rather than focusing on fixed institutions and norms. In analyzing social life and social change, the approach begins with explaining differential responses of individuals and social groups to similar structural circumstances. The differential responses can be determined by producing an ethnographic description of situated social practices of actors and showing how their actions are achieved during interventions; by paying attention to social networks, meanings and constructions of values in different arenas; by examining the organizing and ordering processes, as well as knowledge and power constructions in different interfaces (Long, 1997: 3).

Not all interventions entering the social life at Ukerewe Island are accepted without being mediated and transformed by the affected individuals and social groups. This study illustrates the fact that social actors are not passive recipients of intervention, but they actively participate in shaping and adapting them to local situations and conditions. When analyzing the institutions and how they bring change to social life, the precise paths of the changes and their significance to those involved cannot be understood only in terms of them being imposed from the outside, nor can they be explained in terms of some fixed structural logic. The actor-oriented approach recognizes the existence of multiple realities within a community and its actors; therefore, it helps us to see how individuals and groups themselves bring about social changes that shape these multiple realities (Long, 2001). This study aimed at understanding the way the people in Ukerewe use their experiences with external interventions by the government, use their own knowledge and beliefs about water sources, and the way they transform and mix new and existing rules and regulations through a bricolage of institutional arrangements.

2.3 Social interface

Social interface refers to actors with different interests, resources and power. Long (2001: 65-66) defines social interface as: “a critical point of intersection between life worlds, social fields or levels of social organization where social discontinuities, based upon discrepancies in values, interest, knowledge and power, are most likely to be located”. A social field refers to a situation with different distribution of resources,

technologies, institutions, discourses, values, capacities, information, individuals, groups and physical structures and with no single ordering principle framing the scene (ibid: 58). In this study, for example, a micro spring forest - apart from being a physical element - also represents a social field because of the different histories of management development, water users with different power relations negotiate over conflicting practices and perspectives of the forest and water source; and different institutions involved in governing the uses and management of the water source and the forest.

Studying the management of micro spring forests, social interface analysis is important because: (a) it reveals the linkages and networks that develop between individuals or parties, (b) it identifies the source and dynamics of contradiction and ambivalence at the social interface, (c) it helps to understand the cultural or ideological positions of the different actors, and (d) it helps to understand the resultant knowledge which is a product of that interaction, dialogue, and contestation of meaning. Social interface analysis can contribute to the understanding of how planned intervention enters the life worlds of individuals and the groups affected and the social strategies they develop to deal with it.

The interactions at the social interface facilitate the process of negotiation, accommodation and transformation of some aspects of development programmes. The interaction pattern of social actors is dynamic in nature and provides an arena for modifying the outcomes of development programmes (Pant, 2000). An arena refers to a social or spatial location or situation where actors confront each other over resources, interests and values. This confrontation does not necessarily involve face to face encounters, and only local interests and values, but it may also involve external and geographically distant actors and institutional structures that influence the social process, strategies and actions occurring in localized settings (Long, 2001: 59). In this sense, one may conceive an external intervention not as a linear process, but rather, as Long (2001) puts it, as an initiation of arena in which individuals or groups can define their own world view against those imposed by external actors.

The outcome of the intervention can mean quite different things to different social actors. A continued interaction sometimes can become an organized entity of interlocking relationships and intentionalities; and this can also be a source of conflict due to contradicting interests or unequal power relations (Long, 2001). The historical intervention by HESAWA in the study area is a case in point. The multiple realities experienced by water users as a result of intervention by HESAWA and the process of modernization have created an arena where the younger generation contests the validity of cultural beliefs in the use and management of water sources and micro spring forests of the older people. Also, an arena has been created between water users, the district council and HESAWA programme workers over the water quality based on traditional and professional criteria. Both scenarios can affect the use and management of micro spring forests.

Development intervention should be viewed as an ongoing relation that evolves between local actors and external actors. Long (2001: 32) views intervention as being part of a flow of events generated within the broader framework of the activities of the state and international bodies. This perspective tries to dissolve the boundaries of time and space which have often been used in characterizing development intervention. Conceptualizing an intervention in this way, allows to view social interface as a phenomenon that is not only being influenced by aspects of current intervention, but also by aspects originating from previous interventions or from interventions implemented in different areas. The aspects originating from other interventions are not necessarily the same, or may have a direct relation with the current intervention, but the social actors can relate them to the current situation and make different meanings which suit their case. Also, the conceptualization of this kind allows considering the manner in which people in areas without intervention in a particular field can borrow or apply the ideas and mechanisms from the intervened places to address their problem.

2.4 The concept of institutions

Another body of literature focuses on intervention from an institutional perspective. The concept of institution has been defined and classified differently depending on the conceptual choice of the authors. Neo-institutionalists like North (1990) and Lowndes (2002) define institutions as codes of conduct that define practices, assign roles and guide interactions. Uphoff (1986: 8-9) defines institutions as: “complexes of norms and behaviours that persist over time by serving collectively valued purposes”. The latter author differentiates institutions from organization; to Uphoff (ibid) an organization is a structure of recognized and accepted roles. This scientific definition of an institution is wider than the popular understanding of institution as identified with governmental organization. Cleaver (2002: 13) distinguishes between bureaucratic and socially embedded institutions. Bureaucratic institutions are those institutions 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 institutions based on culture, social organization and daily practices, commonly referred to as informal. She argues that sometimes the two are not easily distinguished; bureaucratic institutions may be socially embedded and vice versa. An example is a village administration as an organization, which may include both formal and informal institutions at the same time.

In anthropology, social and cultural institutions range from bureaucracies to kinship organizations irrespective of whether they are formal or informal. Most authors who define institutions focus on standard behaviour patterns, but they relate the term with structural aspect of these patterns in different ways. Some relate the term with the standardized behaviour per se while others relate it with factors and forces that constrain or mediate these patterns of behaviour in terms of the rules of the game, or

governing structures, or norms and belief systems (Nelson and Sampat, 2001; Ostrom, 1990).

Institutions, both in theory and in practice, influence the use and access to the water sources and forest vegetation in the study area. This study distinguishes institutions based on rules, regulations and norms generated by governmental, non-governmental, political and social organizations. Governmental institutions refer to the policies, laws, rules and regulations issued by Ministries and Departments concerned with the management of water and forests. In Tanzania these organs include Local Governments in the Prime Minister's office; the Ministry of Natural Resources and Tourism; the Ministry of Lands, Housing and Human Settlements Development; the Ministry of Water and Irrigation; and the Ministry of Health and Social Welfare. The ministries provide policy orientation and technical support while the district departments and village governments implement the policies and enforce the laws, rules and regulations. Although the management of natural resources is decentralized by devolving powers to local communities, the implementation of national and local policies has not been very successful due to the lack of financial and human resources at the district and village levels.

Non-governmental organizations are important in supporting local communities in managing natural resources. The government departments and agencies cannot implement all the national and international policies; and non-government organizations often play a role through the implementation of development programmes. During the implementation of their programmes or projects, these organizations introduce some rules and regulations to meet their agenda. Non-governmental organizations range from local community groups to international organizations like HESAWA (the Swedish funded Health through Sanitation and Water organization). Also political leaders, through their political parties, play a great role in sensitizing the citizens participating in development activities.

Social-culturally embedded institutions are common in Ukerewe and villagers protect their natural resources based on local cultural norms. Christian and Islamic religions are common in the study area; their organizations are sometimes involved in development activities. However, the leaders in both groups teach their believers not to involve themselves with cultural beliefs and ritual activities as it is against God's commandments. This contradiction between religious and cultural or ritual institutions have an influence on people's behaviour in that some people in the villages have ceased to respect certain cultural beliefs and taboos related to traditional management of micro spring forests, and this has diminished leaders' authority in management rules. In addition, kinship and social networks are very important institutions in mobilizing resources and collective action in managing traditional water sources and forests. The inter-generational and individual value changes are important aspects of institutional change in the use and management of micro spring forests.

2.5 Institutional bricolage

The different concepts discussed above are important to appreciate the relevance of the concept of institutional bricolage in the process of institutional development and change. 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, 2002 and 2001).

Turning to the Ukerewe example, we see that the issue of how best to manage the natural resources used by many individuals for common purposes depends on several factors, including having institutional arrangements, and the manner in which these institutions interact and support each other. Actors in formal and informal institutions have a key role in shaping institutions (Cleaver, 2001). The effective management of diverse natural resources with multiple uses requires specific local knowledge and institutions, especially regarding competing claims over time (Ribot, 2003). The institutional arrangements for multiple resource systems may be spatially focused or resource-focused; they are often nested (Wiersum, 2004; Nabanoga, 2005). This study agrees with Gibson *et al.* (2000 and 2005) who argue that in the past most attention was given to identifying the design criteria of Ostrom (1990) for such institutions. But recently increased attention is given to the 'culture' of conservation (Goldman, 2003) and to the processes of change and institutional bricolage (Cleaver, 2002; Lowndes, 2002). This study uses the concept of institutional bricolage as described by Cleaver to conceptualize the institution formation process resulting from a mixture of indigenous and externally introduced practices and norms of resource management. This contrasts with the usual approach of identifying design criteria for assessing whether or not the institutions concerning the use and management of water sources and forest vegetation are robust in view of internal conditions.

The study has followed the dynamic concept of bricolage to understand the process and variable practices of water and forest vegetation management through time and place at six selected micro spring forests in Ukerewe and which differ in terms of location and intervention history. This approach allows us to recognize the agency of individual actors together with the role of institutions as actors. Many approaches for studying institutions have been focusing on formal organizations with the idea that institutions can be designed and crafted; and that their evolutions are the results of simple and unilinear path dependencies. The concept of institutional bricolage shows the multiplicity of institutional change and development. It also challenges the idea that new institutions are specifically introduced to solve a particular problem; rather the institutions are multi-purpose and are generated by both conscious and unconscious processes (Cleaver, 2002). Moreover, the process of bricolage implies uncertainties because the newly formed institutions may not necessarily be weak and unsustainable in addressing resource use and management problems, instead they can be robust and effective (ibid, 2000).

As indicated by Cleaver's argument, local systems for natural resource management should not be considered traditional, because they have also been influenced by external institutions, whether in the past or recent history. Nonetheless, several specific features with respect to such locally evolved management arrangements which are often referred to by the term indigenous institutions may exist, because they have a local customary or historical connotation (Berkes, *et. al.*, 2000; Wiersum, 2000; Ellen, *et. al.*, 2000). However, as emphasized by the notion of bricolage, and the concept of interface, such indigenous management practices should be conceived as constantly being reproduced and adapted to new conditions (Cleaver, 2002, Long, 2001). This study provides insight into the manner in which different productive and social roles of individuals in the community contribute to the construction of new institutions in natural resources management.

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 co-operation, respect and non-direct reciprocity over life courses. The author does not clearly specify whether the list of aspects is exhaustive or variable depending on the circumstances. However, from the 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 organization
- gradually changing a socially embedded institution (reinventing)
- referring to socially embedded institutions as reasons to accept or not to accept new external institutions
- mixing traditional and modern arrangements

The bricoleur's power, economic wealth, knowledge, personality or authoritative position determines the position and influence of the institutions (Cleaver, 2002). This implies that not all individuals involved in the resource use and management can be bricoleurs, or not all newly constructed institutions have the same meaning for collective action. In the Ukerewe case, for example, bricoleurs are owners of the forest land, owners of water sources, water users, water committee members, Ukerewe district council managers or religious leaders.

The theoretical approach by Cleaver (2002) on institutional bricolage provides good opportunities for studying the institutional transformation process. Unfortunately, some of her arguments are little elaborated. She asserts that during the bricolage process socially embedded institutions can replace legal and formal sanctions or be combined with them; without such process, the externally introduced arrangements are unlikely to be effective. She does not, however, indicate if the bricolage process takes place only when there is external intervention or whether it can even take place under the initiative of local people when they themselves devise mechanisms to solve resource use problems under conditions of modernization. Modernization of rural people in Tanzania takes place through formal education and communication media including TV, radio and newspapers. The study considers both situations, that institutional change or transformation takes place with or without external intervention. Considering institutional bricolage as a continuous process without boundaries of space and time constituted by external interventions helps us to understand how the bricolage process takes place in local communities upon their own initiative and agency, and not necessarily only through external intervention. Furthermore, Cleaver (2002) discusses institutional bricolage at a local level without explicitly explaining whether it can take place within development organizations or at a national level, such as within Ministries. As Mehta *et al.* (2001) argue this theoretical approach needs to be extended by incorporating the aspect of scale, history and by relating the local institutions with policy processes occurring at the national and global levels. This study agrees with this argument because some institutional bricolages are not related to only external intervention, but to a wider context of national policies and modernization. To put the bricolage concept into perspective, a conceptual framework has been developed (see section 2.8).

2.6 The concept of natural resource management

The sociological concepts discussed here are applied to a particular form of natural resource management, as in studying micro spring forests as integrated natural resources. Local people in Ukerewe main Island consider micro spring forests as important for conserving water sources as the sustainability of these water sources depends on the management of the forests. This local perception enables us to consider the management of water sources and forest as integrated. The term management has been defined differently by different authors from different perspectives. Generally, management comprises the planning, organizing,

coordinating, directing and controlling of any organization or effort for achieving a certain goal (Mishra, 2005).

The definition of forest management can be based on a professional forestry definition or on indigenous forest management. In professional forestry, forest management is defined as the conscious manipulation of the environment and the resource itself to promote productivity or maintenance of the resources (Anderson, 1990). The manipulation of the environment and the resource depends on the objective of management, which includes conservation of water catchments, timber production, biodiversity conservation and nature conservation. According to Wiersum (1997) forest management should involve not only silvicultural practices but also all human activities aimed at maintaining forest vegetation. **The activities may focus on technical practices in relation to the resources or organizational practices of the resource users. Different laws, regulations, rules and norms guide the way people interact in regarding natural resources management**

Indigenous or community forest management is referred to as the process of making decisions and enforcing the decisions regarding the use and maintenance of forest vegetation based on social interactions and shared interests of the local people using the resource in a particular social setting (Wiersum, 1997). **According to the definition of forest management as a technical practice or a socio-technical practice, professionals and local people may perceive the resource in different ways, but their management forms may complement each other. The management of micro spring forests by local communities in Ukerewe is a case in point.** The effective management of diverse natural resources with multiple uses requires specific local knowledge and institutions, especially with regards to competing claims through time (Ribot 2003). Clan ownership of water sources in rural areas of Ukerewe main Island is an example of a common property institution. The resources are clearly bound in space, both environmentally and socially; they are used by a kin group or a community and their access and use are subject to community-based rules and regulations. Water sources and forest vegetation are seen as mutually dependent. Forests provide shade that reduces evaporation, allows water to infiltrate into the soil and reduce runoff, thus regulating water quantity. Forests also regulate the water quality due to the reduction of rapid runoff and associated erosion, and which makes that little sediment enters into the watercourses. Sustaining the hydrological services of forests requires maintenance of a good forest cover so that the interactions between vegetation, soil, and water are not disturbed. Water is an integral part of the environment and its availability and quality are indispensable to the efficient functioning of the biosphere.

Water is a natural resource that is basic to the sustenance of human societies and there is no social or economic development without a safe and stable water supply. In most common-pool resource management studies water has received appreciable attention, but much attention was actually paid on irrigation and marine resources and much less

on freshwater sources for domestic purposes. According to Singh (2006) little attention has been given to a holistic study of water management situations in small communities where a real distinction between domestic and productive aspects of water may not be made and where the uses of water may even extend beyond the material requirements to embrace the spiritual needs of the users. Traditional water sources within micro spring forests in Ukerewe main Island are indeed such integrated resources with multiple uses including domestic, irrigation, animal watering; and the resources also have spiritual value. Likewise, this study intends to expand the existing knowledge concerning water and forest management institutions for both productive and consumptive household uses in small rural societies of Tanzania.

2.7 Legal pluralism

Management of natural resources involves different actors who experience and know different legal or rule based systems of assigning property rights to land or water and which all together generate a basis for the negotiation of property rights and management obligations. Therefore, to understand the rights of land, forest and water we need to go beyond statutory law and consider also other normative systems. International organizations, government agencies, development projects, religious organizations, local authorities and local people all have different precepts regarding natural resources, which make them generate their own principles, rules and regulations related to natural resource management (Meinzen-Dick and Nkonya, 2007). Depending on what provides the best option, a person may use formal law or defend accessing water sources on the basis of local customary practice. Law is not a monopoly property of the state but can be seen as cognitive and normative orders created and sustained by the social field. Individuals make use of different strategies to claim the use of resources (Meinzen-Dick and Pradhan, 2001). Focusing on one resource use system obscures the linkages between systems and how one system has adapted to the other (Bavinck, 2001). This means that even in the presence of formal property rights over a certain resource, if those formal property rights do not favour the interest of that particular individual or group of people, different strategies are devised to legitimize the rights to use the resource.

The concept of legal pluralism seems implied in the process of institutional bricolage by Cleaver (2002) but she does not explicitly explain what constitutes legal pluralism. Interestingly, her conceptualization of socially embedded institutions may mask other sources of claims of resources use that constitute indigenous or local institutions including tenure systems of land, forest, trees and water. Therefore, it is very important to consider property rights and their implications to resource use and management. As Meinzen-Dick and Pradhan (2001) argue, property rights institutions are very influential in mediating interaction of people with natural resources as compared to other institutions. They are not only determining how the resource is owned, used by whom, how and when, but they also have an influence on the extent at which individuals or group of people should invest in maintaining the resource base over time. Thus, to consider the existence of multiple legal systems under external

intervention in managing natural resources is relevant, especially when one considers the implication for property rights on resource use and management. The laws or rules created by different levels of government and non-governmental actors may have common or contradicting interest and often partly overlap. This may have implications for access and use of the resource. The concept of legal pluralism can be applied differently in different resource uses and in the following sub-sections a clarification is made in the manner in which legal pluralism is related to specific land, water and forest resources.

Legal pluralism and land rights

Property rights refer to “a secure claim or expectation over a future stream of benefits arising from a thing or situation” (Bromley 1989 as cited by McCarthy, 2006: 10). Informal or formal structures are devised to enforce these rights by excluding users without legitimate rights and regulating access of users with legitimate rights. Land tenure as one of the property regimes is an institution devised by societies to regulate behaviour on land use and management. The institution defines how property rights to land are to be assigned within societies. Legally, tenure is a bundle of both rights and obligations: the rights to own, hold, manage, transfer or exploit resources and land (FAO, 2002; Otsuka and Place, 2001), but also the obligation not to use these resources in a way that harms others (MNRT, 2001). Land tenure relationships may be well defined and enforceable in a formal court of law or through customary arrangements in a community. Alternatively, they may be defined relatively poorly with ambiguities open to exploitation (FAO, 2002).

FAO (2002) categorizes land tenure as: (a) private property when rights are assigned to an individual, a group of people or a corporate body and has the right to exclude others (b) communal property when rights are assigned to a community of users, outsiders are excluded and users can self regulate (c) open access when specific rights are not assigned to anyone and no-one can be excluded (d) state property when resource rights are held by government, access and exploitation regulated by the government and the general public may have access as granted by the government . In practice, these categories might not be distinct, but rather constitute a continuum of rights. This is because of the legal pluralism whereby people may apply a mixture of rights, depending on the situation and strategy.

In Ukerewe district, the land occupied and used by an individual, family, or clan in the villages is under customary law. The land is inherited from one generation to another along patrilineal lines whereby the eldest son has the right to inherit the family land. Customary rights of land are sometimes formalized by governments through the provision of certificate of customary right of occupancy. Formalization is thought to increase land security for people in rural areas and provide them with opportunities to secure loans from banks. However, it is difficult to be implemented especially in developing countries, as it requires a lot of money for surveying and processing the certificates. During the formalization process there is a high risk for the poor and disadvantaged groups in the community to lose security because they lack

the resources required in the process e.g. money, information and time (Meinzen-Dick and Nkonya, 2007). In the absence of formal rights, customary rights in many rural areas remain to be very important in addressing land problems. In the case of Ukerewe main Island, formalization of individuals' lands or clan land in the villages has not been done (Chiligati, 2009) and customary laws have remained very important in administering these lands. Individuals or groups of people can have land use rights that do not necessarily include the same rights to the water sources found on that particular land.

Legal pluralism and water rights

Since the study deals with local water sources management, there is a need to consider the legal pluralism of water rights. Given the nature of water as a fluid and dynamic resource, occupying multiple locations with multiple uses and users due to its flowing and seeping characteristic, it makes the exercise of water rights to be complex, and hence there is rarely a single consistent system (Meinzen-Dick and Bakker, 2001). With respect to statutory law, water right is a legal right to abstract or divert and use or store a specified quantity of water from a natural source (FAO, 2004). A natural source includes a stream, a river, a swamp or pond, a spring and underground water. Three categories of water rights can be identified namely public, private or common property (Meinzen-Dick and Nkonya, 2007). Public water rights refer to the rights which the government allocates to users and in most countries; this is based on the public trust doctrine. Common water rights refer to the rights held by the community and it has the mechanism for inclusion or exclusion. The users under this category can contribute voluntarily to the sustainable management of communal water sources if there are motivations for collective action, otherwise they can opt to free ride the resource (Ostrom, 1990). Private water rights are the rights held by individuals or corporate groups and which they are recognized in terms of permits or licenses with specified uses and amount. The different types of water rights are for analytical purposes, but in practice, they do overlap due to the nature of water. For example, surface water can be communal property but when it percolates into the water table and is accessed on a private land from a bore well, it becomes private water. In rural areas in Africa and Asia (Meinzen-Dick and Nkonya, 2007) the co-existence of multiple normative systems of water rights and management is common.

Because government agencies in Tanzania have not been able to administer water rights due to financial and human resources constraints, customary rights which are enforced by local norms and community sanctions have often been more effective as state law in claiming water rights (Meinzen-Dick and Nkonya, 2007). Sometimes customary laws have even been more effective than state based laws, though, the state policies do not recognize this reality (Mumma, 2007). Ignoring legal pluralism in water resource management can contribute to conflicts between different users, especially when customary water uses by rural people are made subordinate to rules of the external powerful users who want to invest in for example large scale irrigation. This means customary laws need to be recognized by the state and supported rather than seen as competing powers. Supporting them do not necessary mean formalizing

them, rather to use them in parallel with the state laws especially when they are all intended to meet the interest of local communities. Customary laws are not static as most people think; they always change to cope with everyday practices of resource use. Formalization of customary laws makes them to be bureaucratic and static in the sense that changing them will need to follow the long process of approval, which is very common in most government apparatus. Sometimes formalization involves standardization of customary rules and practices, which may make these rules incompatible with the local realities and hence they may become obsolete.

The water source located on open access land creates more bases for different people to claim for water rights. However, individual persons or groups of people can legitimize the water rights of such water sources by investing money, time and labour to improve or make some modifications (Meinzen-Dick and Nkonya, 2007). Although a traditional water source in rural areas of Ukerewe is named according to the person, who first discovered or dug it, these water sources are considered communal property rather than private property. This has implications for the interventions, which promote privatization of these water sources to Water User Groups. Water may be both a source of conflict and of co-operation depending on the property rights arrangements. In the Andes region water as a communal property has created cohesion among community members as opposed to individualist privatization of water rights, which has contributed to social breakdown and fragmentation (ECLAC, 2005).

The multiple uses of water and their peculiarities in terms of demands and economic value create competition between the users. The mechanisms to control such water sources developed by state government or development programmes need to integrate all the potential actors including local communities in the villages where these water sources are found. Most of water policies in different parts of the world focus on large-scale irrigation and only recently, drinking water in the cities has reached a similar level of importance. Even less attention has been given to small scale and indigenous water management for local community livelihood and food security (Boelens *et al.*, 2007). This implies that much attention is biased towards uses that have more economic importance, and that less attention is given to indigenous small-scale irrigation because it contributes relatively less to the national economy.

In many places it can be noted that in institutional formalization of fresh water use and management there is a problem of different departments treating water as mono-purpose resource (irrigation, drinking or agriculture). But in real life, water is multi-functional, a fact that is acknowledged in customary rights. Failure to consider customary rights and overriding them with formal permits can contribute to conflicts among different water users. Promoting formal water permits as a single system and replacing the customary rights increases the risk of failure in addressing water problems due to limited options (Van Koppen, *et al.*, 2007). There is some regularity that one system might be more appropriate than another in addressing a certain water problem. For example, conflicts related to water rights under customary water

management can often be resolved by local leaders like community elders, user group or religious leaders. Local government administrations are considered a last resort (Mehari *et al.*, 2007). Furthermore, even when community-based rules might not be able to solve water problems on their own or some of their principles might not function well under very intense water problem, they are still very important bases for establishing new ways of solving the problems (Van Koppen, *et al.*, 2007). Therefore, considering both formal and customary rights of water resource is important in sustainable water source management.

Legal pluralism does not mean a harmonious practical integration of different rules and regulations. In fact, it may show conflict and power inequalities. Customary laws may become inefficient in water source management when the users are increasingly composed of people from different cultural and religious backgrounds (Meinzen-Dick and Nkonya, 2007). Many values and different bodies of knowledge about water are created when the community is very diverse in terms of ethnic groups, power relations, wealth status, economic and livelihood activities, cultural background and religious belief. When the study regards water sources as a social field, competition of claims in terms of values and meaning is inevitable. In addition, there is a possibility of some claims being stronger than others due to differences in power relation, resources and knowledge held by different actors. For example in Ukerewe District, water users of traditional water sources are composed of different ethnic groups, education levels, occupation, duration of using the water sources and religious background. This has contributed to the fact that the younger generation and newcomers ignore customary rules and regulations based on taboos and cultural beliefs related to use and management of traditional water sources (see Chapter 7).

Legal pluralism and forest and tree tenure

The literature provides many examples of the distinction between forest and tree tenure (FAO, 1989 and Fortmann, 1985). Forest tenure determines who can use what resources, when and under what conditions. Forest tenure combines a bundle of rights which include the right to own, manage, use resources, and transfer forest resources and land; and these can be defined legally or customarily (FAO, 2008). Forest tenure can be defined in general terms such as government forest reserves, private forests, community forest and open access. Within these categories, tree tenure can be distinguished from the forest rights. For example, tree tenure can be distinguished between planted trees and wild trees; some species of tree can be subjected to particular rules; rights to use some trees can be determined by the type of use (personal or commercial uses); and the rights to use trees can be granted to individuals according to the provisions of labour and other investments (FAO, 1989). From this perspective, tree tenure consists of a bundle of rights, which may be held by different people at different times. The rights that make the bundle can be categorized as the right to own or inherit, the right to plant, the right to use, and the right of disposal (Fortmann, 1985). For example, the state may regulate or attempt to regulate the use of trees owned by others e.g. declaring certain species as protected no matter where they are located and to be used only with official permission. Furthermore, usufruct

can be granted by the government to local communities who are living close to forest reserves as incentives for their participation in managing the reserves under special arrangements like Participatory Forest Management (PFM). Tree planting in most cases is used as a basis for claiming the rights to land and for that case, planting trees on borrowed land can lead to termination of the agreement (FAO, 1995). Also at kinship or family level, members may also have different rights on trees depending on gender, birth order or intra-family status (Fortmann, 1985).

Religion plays a special role in creating a basis for forest rights. Despite the fact that churches or temples are being places of worship for many religions, places for spiritual veneration are still common in rural settings. For instance in Ethiopia, Church forests are very important in biodiversity conservation for hosting threatened tree species and they are considered by local people as “most holy places” and hence tree cutting is controlled (Alemayehu, 2007). In Thailand, Buddhist “forest monks” are renowned for their environmental activism (Taylor, 1996). Also, in rural areas in Tanzania some trees are traditionally considered sacred or dwelling places of spirits and thus tree cutting is strictly prohibited (Fortmann, 1985) or they may be places for cultural ceremonies such as rain making (Kessy, 1998). In the Ukerewe cases, examples of protected tree species are *Ficus spp*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense*, which are traditionally believed to be good in conserving water sources, and thus it is a taboo to cut them.

2.8 Conceptual framework

The framework is developed to help us understand how new institutions are formed under the situation of external intervention and modernization, and how they positively or negatively influence conditions of water sources and forest vegetation in micro spring forests in Ukerewe main Island. In constructing the framework, the study has used the concepts of interface, institutional bricolage, and legal pluralism in relation to natural resources management, and as elaborated in the previous sections. These three concepts are used because they are key complementary approaches of the structural and practical aspects of integrated resource management. Moreover, the bricolage process occurs at the interface of multiple realities and institutions. The concept of institutional bricolage in this study is not used to test whether or not the concept works, but to assess the manner in which the six cases of micro spring forests in Ukerewe main Island show different forms of bricolage practices in the use and management of these resources.

The conceptual model (Figure 2.1) is based on the notion that users of water sources in micro spring forests are introduced to new rules, new norms, new regulations, new technologies, new actors, new knowledge, new power relations and new financial assistances during external intervention and modernization, which contest, merge, or mix with the existing local institutions. In order to address the challenges, the water users develop strategies to negotiate, transform or adapt the new institutions. Different water sources and forest vegetation may undergo different management

developments, which provide the water users, and the forest owners with different claims over the resource use, create different power relations among users, and reconstruct their values and meaning. Under such conditions, each of the six cases appears to produce different forms of institutional bricolage.

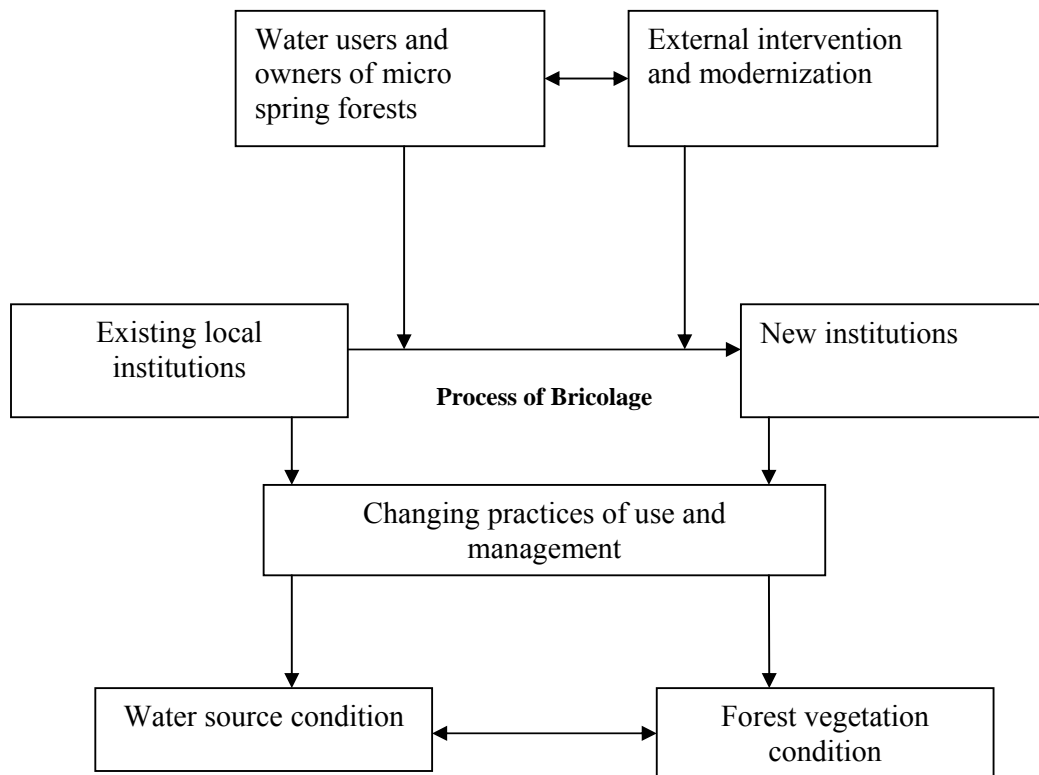


Figure 2.1 Conceptual framework of institutional bricolage in water and forest use and management practices

Chapter 3

METHODOLOGICAL APPROACH OF THE STUDY

3.1 Study area

The study was carried out in Ukerewe main Island where water sources surrounded by micro spring forests are a common feature. The study area is located in Ukerewe district in Mwanza region (Figure 3.1 and 3.2). The district is between latitudes $1^{\circ} 5'S$ to $3^{\circ} 30'S$ and longitude $34^{\circ} 0'E$ to $35^{\circ} 0'E$ and has a total area of 6,400 square kilometers of which 640 square kilometers is land and 5,760 square kilometers is mainly covered by Lake Victoria water body.

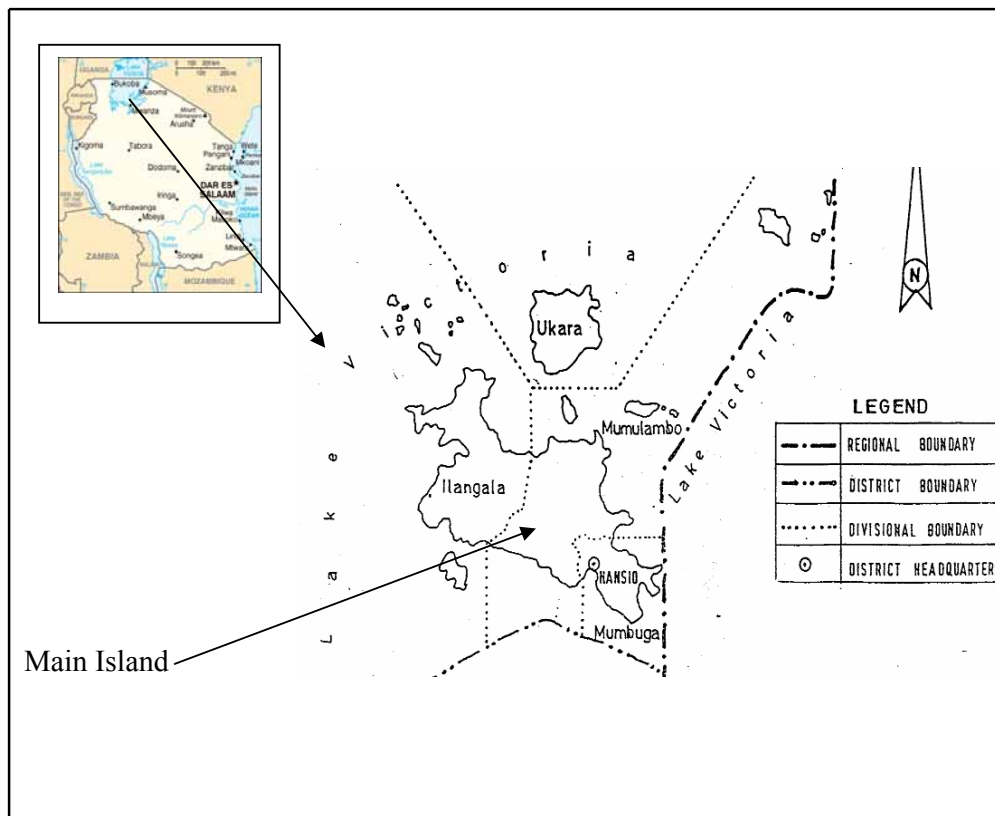


Figure 3.1 Location and map of Ukerewe District

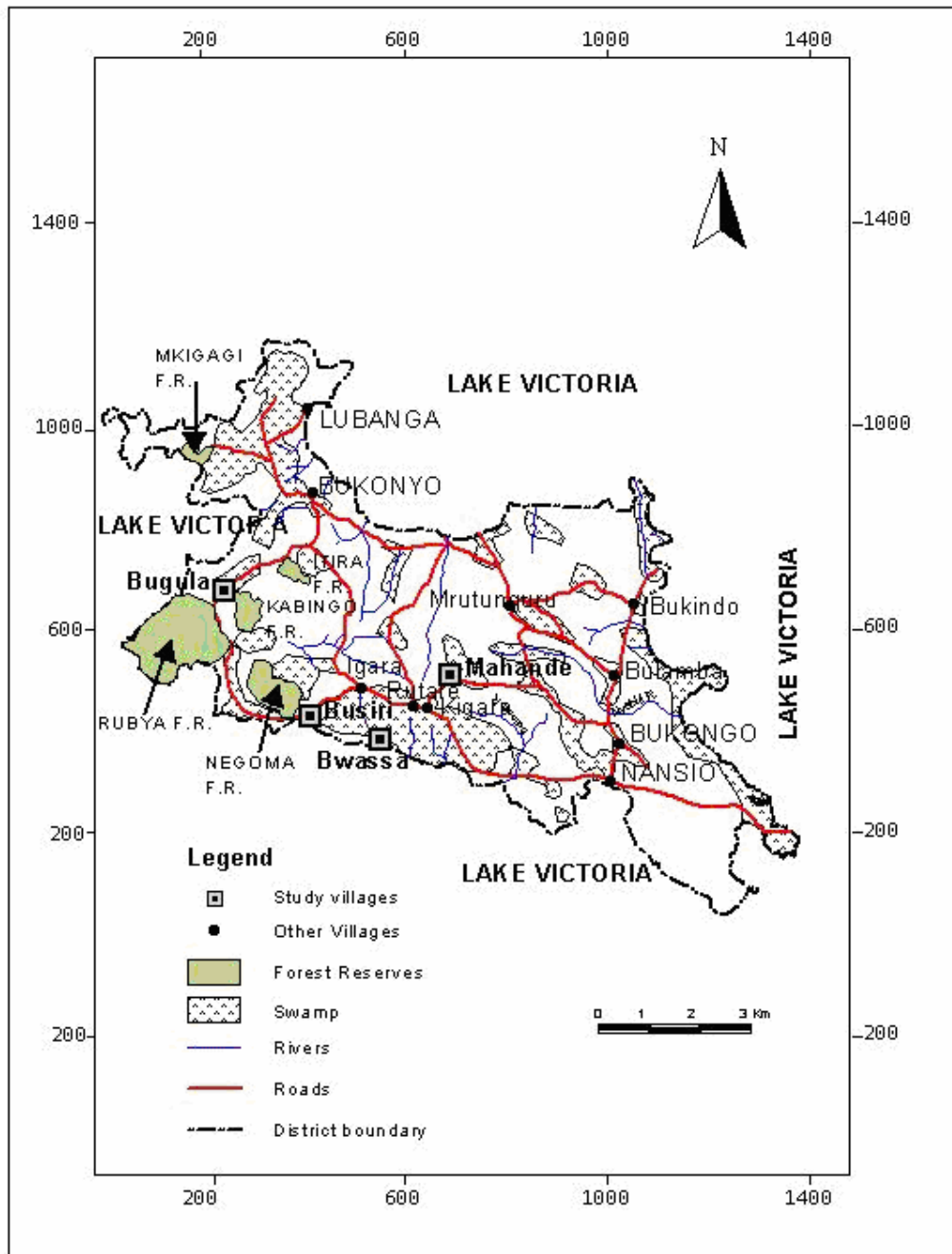


Figure 3.2 Map of Ukerewe main Island and location of study sites

The district is bordered by Kagera Region to the west and north west, Mara Region to the east and north east, Sengerema, Ilemela and Magu Districts are to the south. The district is made up of 27 islands out of which seven are permanently occupied by people, the study area being the largest island. The other islands are temporarily

occupied by fishing camps. Administratively, the district is divided into four divisions namely Ilangala, Mumlambo, Mumbuga and Ukara. The divisions are divided into a total of 24 wards (URT, 2003). According to the last census of 2002 the population of the district was 261,944 persons living in 74 registered villages with a total of 40,729 households; on average each village consists of 550 households. The district is densely populated with a population of 409 persons per square kilometer; and during data collection in 2007 the population density was projected to be 514 persons/km². This population density is well above the average population density of Mwanza region which is 146 persons/km² (2002) and 186 persons/km² (projected for 2007) (NBS, 2003). The next census will be carried out in 2012 and the projected population of Ukerewe District in that year is 362,000 with a population density of 566 persons/km² (URT, 2003)

The people in the district mainly subsistence farmers (69.5%) depending on rain-fed agriculture and livestock keeping, supplemented by fishing. The main staple food in the district is cassava. Other crops grown include sweet potatoes, rice, sorghum, beans, cowpeas, finger millet, maize, bambara nuts and ground nuts. Cotton used to be a cash crop, but now many people have abandoned it, one of the reason being land scarcity. Other cash crops are coffee, orange and mango. However, surplus food crops are also used as source of income.

Another economic activity is business employing about 12% of the population, 7.5% being employed in office work and about 6% being employed in fisheries enterprises. Also about 99% of the people in the district depend on firewood/charcoal as a main source of energy for cooking (URT, 2003). The district has a high rate of poverty about 48% of the population living below the basic needs poverty line of TSh 262 per adult equivalent per day¹(URT, 2005). This figure is above the national rate of poverty of 36% of the population living below the basic needs poverty line.

There are a number of social services in the district including primary and secondary schools, health facilities, and water supply services. The district has 84 public primary schools which is an average of 1 school per village with an average of 664 pupils per school. There are no private primary schools. The district has 20 public secondary school and 2 private secondary schools, making an average of one secondary school in each ward. Health facilities are comprised of: 27 public dispensaries which is an average of 1 dispensary per ward; 3 health centres one in each divisions of Ilangala, Ukara and Mumlambo; there is also a District hospital located in Nansio Township. There are also private dispensaries located in different villages of the district.

In terms of water supply, 36% of the rural population in the district is supplied with safe and clean water (URT, 2003). According to the Acting Ukerewe District Water Engineer, Mr Daniel P. Butati during an interview in July 2007, the water supply systems that are functioning in the district include improved natural water wells (108),

¹ Equivalence: \$ 0.22 per adult equivalent per day.

shallow wells (285) and water taps (3). The data on the district water sources do not include the traditional water sources, which were not improved by the Health through Sanitation and Water (HESAWA) programme.

The climate of the district is characterized by both short and long rains. Short rains start from September to December and the long rains start from February to May. The rainfall ranges between 900 and 1200 mm per annum. The mean annual temperature ranges between 23⁰ C and 27⁰ C. The district has five land uses including bushland, cultivated land, grassland, forest and water features. Bushlands and grasslands include scattered croplands. Cultivated land includes mixed cropping and trees. Water features include permanent swamp/marsh areas. The forest data available in the Ukerewe District Council offices are only for forest reserves and which show that Ukerewe District has a total of 2,990 ha of forest reserves. These reserves include Rubya forest plantation (1,820 ha) owned by the central government; and Negoma natural forest (697 ha), Itira natural forest (107 ha), Kabingo forest plantation (250 ha) and Mkigagi natural forest (116 ha) owned by the local government authority (URT, 2003). Micro spring forests are not included and data on these forests do not exist in Ukerewe District Forest Department Office.

3.2 Research design

The original idea of the study started by identifying traditional water sources as micro forest catchments; a term which refers to small forest patches found around traditional water sources. The term was coined to depict the belief of local people that forest patches catch rain water, conserve water sources and make water available in the form of springs. Later, during thesis write-up in 2009 and during discussions with supervisors, the researcher deemed appropriate to change the term micro forest catchments into micro spring forests because these water sources are not really water catchment nor watersheds. Their sizes are rather small (0.1 to 0.9 ha on average) but they often harbor the main water sources of Ukerewe island people. The motivation behind studying these water sources revolved around the fact that the researcher had lived in Ukerewe district for 15 years; this is a place where he grew up. His father was working as a medical worker at a missionary dispensary in Kazilankanda village. The use of traditional water sources in micro spring forests for domestic purposes by villagers in this district was rather familiar to me. Local norms which included rules, taboos and cultural beliefs to guide the users of these water sources were an interesting phenomenon to me.

Before the villagization programme in 1974, people respected the rules and cultural beliefs related to the management of the water sources. These included fetching water bare footed; the use of dirty utensils in fetching water was strictly prohibited; the killing of the black snake (*Njubi*) and the harvesting of fishes from the sources was a taboo. The researcher left the district in 1985 when his father was transferred to another district. Since then he had not visited the district until the time he decided to undertake research in the district.

The idea of doing PhD study started in 2003 when the researcher was employed by Sokoine University of Agriculture as an Assistant lecturer in the Department of Forest Mensuration and Management. It was at this time that the memories of these water sources sprang to mind. The main research question about these water sources was how do villagers in Ukerewe district manage to maintain their local norms, cultural beliefs and taboos in managing these integrated natural resource systems under the era of modernization? During the development of research proposal the researcher visited Ukerewe District in 2004 to see these water sources so as to have the impression of their status. The micro spring forests showed a lot of changes in terms of the organization of water users and the conditions of micro spring forests due to external interventions and modernization. This prompted the researcher to change the initial idea to incorporate also the effect of intervention.

The topic is scientifically very relevant because it integrates two resources, water sources and forest vegetation and seeks to understand the scientific insight in the nature and functioning of local institutions for multiple resource management and whether the management of these resources should be organised for one sector (forest *or* water) or be integrated (forest *and* water). Within Tanzanian context, the study has developmental relevance because of a relative lack of public services in rural areas of Ukerewe main Island. In the regions which are not well covered by public services, as is the case with this island in lake Victoria, people often depend on local institutions in managing their resources, and it is important to understand how local and external institutions can be integrated for sustainable management of micro spring forests.

Based on this background, in this study, it was thought appropriate to use a comparative case study method to understand the social and physical processes of water use and management in six selected micro spring forests in Ukerewe main Island. A case study refers to “an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between the phenomenon and the context are not clearly evident; and in which multiple sources of evidence are used” (Yin, 1984: 23). A comparative case study method was chosen to allow an in-depth study of variations and differences of the natural conditions and social forms of management of different micro spring forests. A comparative case study is a distinctive form of multiple cases (multiple research sites) and can be used for the purpose of comparison of both qualitative and quantitative data (Yin, 2003; Yin, 1984).

The field research was divided into two phases because of lack of records on ecological, social-historical and water management data of micro spring forests. The first phase started from January 2007 to April 2008 with a qualitative data collection and analysis of ecological and social-cultural conditions of cases to contextualize the in-depth studies. The second phase started from May 2008 to December 2008 for quantitative survey of selected households. The combination of qualitative and quantitative research in this study generally aimed at enhancing the validity of findings through the logic of triangulation. The findings from one type of study were

checked against the findings derived from the other type. Also many issues needed both qualitative as well as a quantitative investigation. While quantitative research readily allows the researcher to establish relationships among variables, a qualitative study helps to explain the factors underlying the broad relationships that were established (Punch, 2005).

3.3 Selection of study location and respondents

A preliminary survey was done in eleven villages of Ukerewe District in November 2006 and it covered all four divisions and 8 wards out of 24 wards (see Appendix 1). The visited villages were purposively selected based on two criteria: (1) the presence of traditional water sources in the micro spring forests or water sources used to be surrounded by forest patches 5 years ago and, (2) villages whose uses of these water sources are being governed by multiple rules. A period of five years was arrived upon basing on the fact that people can easily remember what was happening when the water source was forested. Also if the area was left to regenerate naturally, the time is enough to see some changes. Identification of the villages basing on these criteria was made possible by the help of Mr. Mangamanga, the technician of the Department of Community Development of Ukerewe District Council. The water sources that met most of the criteria were visited and the explorative data were collected on forest patch size, water source size, and the surrounding land uses. The data also focused on whether or not the well was cemented, distance to nearest house and ownership of forest and water source. From the visited 22 micro spring forests, six were selected for detailed study from two divisions and four wards. These micro spring forests include Nzuitaka, Tumbu, Kilombero, Chemichemi, Anselm and Migombani. Six micro spring forests located in four different villages were purposively selected to represent different types of ownership, different stages of maintenance or degradation of forest cover and different surrounding land uses. The selected micro spring forests include those relatively in good condition and bad condition; those owned by individuals, groups or communal forests; and those relatively close (distance less than 200 m) to the settlements and far away (distance greater than 200 m) from the settlements. The selected water sources with their respective village, ward and division are given in Table 3.1.

Table 3.1 The selected study cases of micro spring forests and their respective villages, wards and division

| Water source | Village | Ward | Division |
|--------------|---------|-----------|----------|
| Nzuitaka | Mahande | Mukituntu | Mumlambo |
| Tumbu | Mahande | Mukituntu | Mumlambo |
| Kilombero | Bwassa | Igalla | Ilangala |
| Chemichemi | Busiri | Bwiro | Ilangala |
| Anselm | Busiri | Bwiro | Ilangala |
| Migombani | Bugula | Muriti | Ilangala |

The selection of different key informants for each case was done during the first phase of the field research. Key informants were village executive officers (government leaders), ward health officers, clan leaders and village elders. Also district officers from the Departments of Agriculture, Forestry, Health, Water, and Community Development were selected. Key informants like village elders were selected based on their willingness to give information and their knowledge about the issues discussed. Participants for Participatory Rural Appraisal (PRA) in each case were selected in such a way as to provide a good representation of age groups, gender and wealth categories. The size of PRA group usually ranged between 10 and 15 people based on the fact that with such a number, each category would be well represented and the representatives would contribute to the discussion.

The selection of thirty households for quantitative data in each of the six cases was done using a random sampling during the second phase of field research. Bailey (1994) suggests that in social research at least 30 units is a sufficient sample irrespective of the population size. Water users' registers for Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources were used to select the respondents for the surveys. Nzuitaka had no register for water users so the households using this water source were grouped into three zones. Then the researcher requested one village member who was guiding the researcher in the village to mention any 30 names of households in each zone. These names formed a frame for each zone and from it ten households were randomly selected for interviews. Each household was assigned a unique identification number; which enabled the researcher to randomly select the households in all six cases. The respondents whom were selected and interviewed included both men and women heads of households. Men and women in the households have different roles in using and managing water sources and forests. Therefore, although the head of the household was the key person interviewed, other members of the households, in most cases the spouses, as well as children and male or female relatives were involved. The researcher allowed each household member an equal chance to respond to the posed questions. This technique enabled the household members to supplement information given by the head.

3.4 Data collection

The methods used during data collection depended on the research objective to be addressed. This study combined a number of methods for both phases of the field research. The methods enabled the researcher to understand the use and management of micro spring forests (see Table 3.2). The data collection methods for the first phase of field research were: participatory rural appraisal (PRA) which was mainly used to document natural (forestry and water) aspects and ethnographic methods to study socio-cultural aspects.

PRA tools used included:

- Village resource mapping– resource mapping was used for collecting spatial dimension of resources in the study area e.g. water sources, forests, farmlands social services and other land uses.
- Venn diagrams – during focused group discussions, water users identified local institutions, their relationships with one another and their membership. Venn diagrams were circles with different sizes placed on a bigger circle drawn on the ground. Institutions were represented by circles, the bigger the circle the stronger the institution. The circles placed near the centre of the big circle on the ground were considered institutions that are more important.
- Trend lines and time lines – during focused group discussion, trend lines helped to collect data on local perspectives about changes of water sources and forest vegetation conditions and institutional arrangements over time. Time lines were used to collect data on the main events which occurred in the study area within a selected range of time and which had an impact on water and forest vegetation management and local institutional arrangements.
- Seasonal calendar – was used to collect data on temporal dimension of water and forest uses. Various activities, problems and opportunities that occurred at different times of the year and which had an effect on the availability of water and forest products to local people were identified.
- Matrix ranking and scoring – was a useful tool for assessing relative importance of different water sources, criteria of water quality, forests, and activities and rules in managing resources
- Activity profiles and daily routine – was used to identify the different kind of activities generally carried out by men and women in one day and to understand the gender based division of labour in relation to use and management of water sources and forest vegetation.

Table 3.2 Methods of data collection with respect to research objectives and phases of field research

| Research objectives | Phase of field research | Data collection methods |
|---|-------------------------|---|
| To examine the tenure systems of land, water, forest and trees, their historical dynamics in the Tanzanian context, and how they affect today's types of management of micro spring forests as integrated resources systems. | Phase one and two | Review of National Policies and Acts of land, water and forest and other Relevant literature |
| To identify local and external institutions with regard to the use and management of water and forest vegetation in micro spring forests, and to assess the dynamic interface of these institutions and how they affect water and forest condition. | Phase one | Unstructured interviews, participant observation, village resource mapping, venn diagrams, activity profiles and daily routine , seasonal calendar, trend lines, time lines, and matrix ranking and scoring |
| | Phase two | Household survey, Forest inventory survey, water source measurement |
| To assess present use and management practices of water and forest resources, and to show how external intervention is embedded in the local institutional practices, and how these practices differ between the cases. | Phase one | Unstructured interviews, focused group discussions, village resource mapping, matrix ranking and scoring, seasonal calendar, activity profiles and daily routine , and participant observation |
| | Phase two | Household survey and Forest inventory survey |
| To propose whether decentralised management of water and forest resources requires an integrated or a sector approach. | Phase one | Unstructured interviews, participant observation and focused group discussions |
| | Phase two | Household survey |

After the appraisal, in-depth interviews were held to deepen the understanding of the issues and contentions that emerged during earlier meetings, especially regarding differences in access and use of the natural resources and cultural practices. Open-ended interviews with different water users gave the researcher the chance to talk with people who were normally not represented in leaders or group meetings. Also sometimes, the real situation especially on cultural issues was not fully exposed

during large public meetings, so visiting a few homes was the best way to make such discoveries. Interviews were also used for cross checking the validity of the information obtained from the group meetings. PRA interviews were carried out with the help of checklists.

Ethnographic techniques including observation and semi-structured interviews and unstructured discussions were used to study the daily practices of the people in relation to use and management of micro spring forests in the study area. To understand behaviour, the researcher needed to learn the meanings of cultural notions and people's interpretations of them (Punch, 2005) especially under conditions of social and cultural change. Ethnographic data were used to provide the context for the interview data. The aim was to understand the meaning of actions and events in relation to the use and management of micro spring forests to different actors in the study area. The technique was based on insider's perspective whereby the researcher became part of the natural setting of the events, actions and context in the eyes of the people involved (ibid). The ability to speak local languages such as Kikerewe, Kijita and Kisukuma helped the researcher to interact and build rapport very easily with villagers who were mostly Kerewe, Jita and Sukuma; and the villagers considered the researcher as part of their community. Also being familiar with the study area and knowing about the culture and traditions of the local people helped the researcher to understand the changes and the causes of the changes of some cultural beliefs. The fact that the researcher had been out of the area for 22 years provided him with the necessary social distance to carry out the study.

Pre-testing to check reliability and validity of the questionnaire items was done at the end of phase one of the field research. As argued by Mettrick (1993) pre-testing is essential before beginning any survey. The pilot testing was conducted in 10 randomly selected households in Nzuitaka water source case. Most of the questions could be answered and therefore very little modifications were done to the original questionnaire. Also, some questions were added to quantify the differences in perceptions on some issues raised during the collection of qualitative data. The respondents whom were approached during the pre-testing were not included during the main survey.

In the second phase of the research, after the researcher had already obtained sufficient insight to understand the qualitative variations between individuals and groups; structured interviews, inventory survey of forest patches and measurement of water sources were conducted to collect quantitative data. Most of the questions in the questionnaire for the survey were closed and a few were semi-structured questions. The questionnaire was administered to 180 respondents, and the researcher alone interviewed all these respondents. The research assistants were not involved during the survey because the researcher wanted to maintain the consistency of asking questions in the same way to reduce the possibility of the same questions being asked in different ways. In addition, sole administering of questionnaire helped the researcher to identify some people among the respondents for a follow-up and more

in-depth interview on issues that appeared to be relevant and which that were not originally accommodated in the questionnaire. During the interviews, all the respondents received the same questions in the same order, delivered in more or less the same manner. The open-ended questions were used to get different opinions from different respondents as Punch (2005) argues that closed questions in structured interviews would give little room for variation in responses.

Global Positioning System (GPS) was used to measure the distances of each household interviewed from the different water sources used. The GPS readings for all possible and distant water sources in the study area were saved and the GO TO option was used to measure the distance from different water sources used by each household. The technique provides more accurate and consistent measurement of distances than the estimates made by individuals who often measure distance in terms of time which is difficult to convert to spatial measurements. For the households which mentioned to use alternative water sources from their neighbouring houses, it was easy for the researcher to measure the distance from the sources as they were visible in the near surroundings.

Each micro spring forest was considered as a single plot during the inventory survey. This is because their sizes were very small ranging from 0.1 ha to 0.9 ha and the establishment of enough sample plots to qualify for statistical analysis was difficult. In order to be able to count the number and take measurements of all trees in the micro spring forests, the minimum size of tree diameter at breast height was chosen. Based on the experience of local people, 4 cm diameter at breast height was chosen as the minimum size to be measured because most uses including building poles and handles start from that size. The diameter at breast height refers to a tree diameter measured at tree height of 1.3 m from the ground. In each micro spring forest, all trees with a diameter at breast height greater than 4 cm were counted and their diameter and local and scientific names recorded. A villager from the study site who was knowledgeable of the local names of the trees helped to identify the local names of the trees found in the forest and which could not be identified by their scientific names. The local names were later used for further identification of the scientific names of the trees based on the existing species checklist of Ukerewe. The names and uses of cut trees were also recorded. GPS was used to take coordinates of micro spring forests, which were later used to determine the sizes of the forests. A distance tape measure was used to measure the sizes of water sources (length, width or diameter and depth) and a stopwatch was used to record the time spent to fill a water container with a known volume. These data were used to describe the physical condition of water sources and forest vegetation in Chapter 5 and 6.

3.5 Characteristics of the respondents

Characterization of the village communities is very important because it enables the researcher to understand if the water users are homogenous or heterogeneous; as this has an implication on the resource use and management. The findings revealed that

the communities in the study cases are composed of different categories of household head, ethnicity, education level, main occupation and duration of stay in the village (Table 3.3).

Table 3.3 Characteristics and distributions of respondents

| Aspect | Categories | Micro spring forests | | | | | |
|---------------------|-----------------------|-----------------------|--------------------|------------------------|-------------------------|---------------------|------------------------|
| | | Nzuitaka N=30 % | Tumbu N=30 % | Kilombero N=30 % | Chemichemi N=30 % | Anselm N=30 % | Migombani N=30 % |
| Sex | Male | 83.3 | 63.3 | 86.7 | 83.3 | 80 | 83.3 |
| | Female | 16.7 | 36.7 | 13.3 | 16.7 | 20.0 | 16.7 |
| | Total | 100 | 100 | 100 | 100 | 100 | 100 |
| Ethnicity | Kerewe | 3.3 | 10.0 | 40.0 | 46.7 | 60.0 | 43.3 |
| | Jita | 60.0 | 60.0 | 36.7 | 30.0 | 16.7 | 20.0 |
| | Sukuma | 26.7 | 13.3 | 16.7 | 16.7 | 13.3 | |
| | Luli | 6.7 | | | 6.7 | 6.7 | 6.7 |
| | Zinza | | | | | 3.3 | |
| | Kara | 3.3 | 13.3 | | | | 30.0 |
| | Nyakyusa | | 3.3 | 3.3 | | | |
| | Haya | | | 3.3 | | | |
| | Total | 100 | 100 | 100 | 100 | 100 | 100 |
| Born in the village | Yes | 66.7 | 50.0 | 73.3 | 60.0 | 60.0 | 86.7 |
| | No | 33.3 | 50.0 | 26.7 | 40.0 | 40.0 | 13.3 |
| | Total | 100 | 100 | 100 | 100 | 100 | 100 |
| Education level | No formal education | 3.3 | | | | 3.3 | 6.7 |
| | Adult education | 3.3 | 6.7 | | 6.7 | 6.7 | 3.3 |
| | Primary school | 80.0 | 86.7 | 96.7 | 86.7 | 76.7 | 83.3 |
| | Middle school | 3.3 | | | 3.3 | 6.7 | |
| | Secondary school | | | | | 3.3 | 3.3 |
| | Post secondary school | 10.0 | 6.7 | 3.3 | 3.3 | 3.3 | 3.3 |
| | Total | 100 | 100 | 100 | 100 | 100 | 100 |
| Main occupation | Farmer | 90.0 | 86.7 | 90.0 | 93.3 | 93.3 | 96.7 |
| | Civil servant | 10.0 | 10.0 | 3.3 | 3.3 | 6.7 | 3.3 |
| | Farmer & businessman | | 3.3 | 6.7 | | | |
| | Farmer & fisherman | | | | 3.3 | | |
| | Total | 100 | 100 | 100 | 100 | 100 | 100 |

Source: Survey data 2007

Most of the households in Nzuitaka (83.3%), Tumbu (63.3%), Kilombero (86.7%), Chemichemi (83.3%), Anselm (80%) and Migombani (83.3%) cases are headed by men. This shows that most of the men are involved in activities that do not require them to out-migrate and spend most of their time without their families. In addition, it implies that men are involved in and are aware of what is happening with the use and

management of micro spring forests, although the actual use of the water is the task of women or wives.

The indigenous ethnic group of the study area is Kerewe, but the study reveals that the communities in all cases are diverse consisting of many different ethnic groups. The most common ethnic groups were Jita, Sukuma, Luli and Kara (see Table 3.3). However, the dominant ethnic groups were Kerewe and Jita and whose distribution in the study area reveals some kind of pattern in relation to the distance from Lake Victoria. Kerewe ethnic group is more predominant in the places along the Lake Victoria shore, which involves Kilombero (40%), Chemichemi (46.7%), Anselm (60%), and Migombani (43%) cases while Jita ethnic group was more predominant in the inland areas of the island, which involve Nzuitaka (60%) and Tumbu (60%) cases (Table 3.3). All the ethnic groups found in the study area are Bantu and they use their own local languages to communicate among themselves and use Kiswahili as a national language to communicate with outsiders. Some scholars emphasize that ethnic or social-cultural homogeneity facilitates collective action due to social cohesion reinforced by strong culture and traditional institutions (Jodha, 1996 and Kideghesho and Mtoni, 2008). The diversity of ethnic groups on one hand can act as a repertoire of experience and knowledge to be drawn upon for successful collective action in resource use and management while on the other hand this diversity of ethnicity can fuel competitions over resources or act as a stage for future conflicts (Natcher *et al.*, 2005; Sneddon *et al.* 2002). Based on the experience from the study area, the heterogeneity of the village communities has had both negative and positive impacts on the use and management of water sources and forest (see Chapters 5, 6 and 7). Some of the local rules, cultural beliefs and taboos regarding using and managing water and forest are disregarded by some water sources users. Yet, at the same time, other water users contributed to proper management of water and forest vegetation based on their cultural-historical knowledge, experience and social networks.

The non-indigenous ethnic groups from Mara, Kagera and Mbeya regions and other districts of Mwanza region have migrated to the district to find a livelihood through farming, fishing or being employed as civil servants. In-migration is high in all cases of Nzuitaka (33.3%), Tumbu (50%), Kilombero (26.7%), Chemichemi (40%) and Anselm (40%) while the same is still low in Migombani (13.3%). However, some people migrated to the study area many years ago and their children have grown up there and have become locals.

Most of the respondents in Nzuitaka (80%), Tumbu (86.7%), Kilombero (96.7%), Chemichemi (86.7%), Anselm (76.7%) and Migombani (83.3%) cases have primary school education and they can write and read Kiswahili language. There are few people who have acquired post secondary school education in Nzuitaka (10%), Tumbu (6.7%), Kilombero (3.3%), Chemichemi (3.3%), Anselm (3.3%) and Migombani (3.3%) and most of these people work as primary school teachers and civil servants. Nzuitaka and Tumbu had a higher percentage of respondents with post-secondary school education due to the presence of one secondary school and two

primary schools in Mahande village, while the other cases have one primary school and no secondary school. There are few or no secondary school leavers in Nzuitaka (0%), Tumbu (0%), Kilombero (0%), Chemichemi (0%), Anselm (3.3%) and Migombani (3.3%). This could be due to two reasons. First, up to the 1970s, there haven't been any secondary school in the district and later in 1980s, there has been only one secondary school (URT, 2003), which contributed to very few students being enrolled. Secondly, those who manage to complete secondary school education within the district or in other schools outside the district have more opportunities to go for further education and hence they secure jobs in towns or in other places outside their district. Formal education is important for creating awareness on sustainable use and management of natural resources.

The majority of the residents in Nzuitaka (90%), Tumbu (86.7%), Kilombero (90%), Chemichemi (93.3%), Anselm (93.3%) and Migombani (96.7%) are peasants who consider farming as their main economic activity. Farming here includes crop cultivation and livestock keeping, although very few people actually do keep livestock. Fishing activities do not feature well as an important economic activity in Kilombero (0%), Chemichemi (3.3%), Anselm (0%) and Migombani (0%) although these sites are close to Lake Victoria. It was noted during focused group discussions that livelihood activities based on fisheries, that require owning nets and boats, were for wealthy people who constitute not more than 5% of villagers in each case. This could be because after the introduction of fish processing industries in Mwanza city and Musoma town in 1990s, the fishing business attracted many big investors and the artisan fishers were quickly marginalised due to their small capital.

3.6 Data analysis

A content analysis of the interviews was done by breaking down the components of recorded dialogue with the respondents into the smallest meaningful units of information or themes. This helped the researcher in ascertaining the types, patterns, sequences and process of issues related to use and management of micro spring forests. The quantitative data collected during the field survey were analysed statistically using SPSS. Both descriptive and inferential analyses were used. Means and frequencies were calculated for some variables and presented in the form of tables and charts. The analysis of variance (ANOVA) was performed for the selected variables.

A linear regression analysis was used to show the relationship between the amount of water fetched by households per day (dependent variable) and the distance from the water source, household size, the presence of alternative water sources and the dependence on water source (independent variables). Forest inventory data were analysed using EXCEL computer programme. The numbers of trees and basal area per hectare, distribution of numbers of trees per ha by diameter at breast height classes, and dominant tree species in terms of basal area per hectare were calculated for each forest. These data helped the researcher to describe the conditions of the

forests. The GPS data were analysed using Geographic Information System (GIS) to determine the sizes of the forests. The measurements of water wells were calculated using EXCEL computer programme to determine the sizes of water tanks and the rate of water flow. These measurements reflected the amount of water stored in the tank and the time used by individuals to fill their water containers. The validity of the quantitative data was cross-checked with the qualitative information through triangulation. The quantitative and qualitative data from both social and the ecological research were used in an integrated way to answer the research questions.

Chapter 4

TENURE SYSTEMS ADMINISTRATION AND DYNAMICS

4.1 Overview

The use and management of land, water sources and forest depend on property rights. Property rights are very important because they define who owns what, who uses what, how and for how long, who is responsible for what and how different actors interact. This chapter gives the historical development of tenure systems in Tanzania and discusses the current tenure systems for land, water, forest land and trees. In addition, it gives an account of how these tenure systems are administered in Tanzania from the national to district and village levels. Then, the historical perspective of the villagization programme in Tanzania is discussed, including its impact on tenure systems for land, water and forest, as well as the consequent implications on the condition of water and forest resources. The discussion in this chapter is based on the fact that the uses of land and trees have major impacts on both the quality and quantity of water resources. Decisions regarding the use and allocation of one resource affect the other resources directly or indirectly. Therefore, this chapter intends to shed light on how tenure of land, water, forest and trees and their administration and dynamics are important aspects for sustainable water and forest management. Finally, the conclusion is drawn on key issues related to tenure systems with respect to water sources and forest management. The arguments drawn in this chapter are used in Chapter 7 to demonstrate how formal rights, customary rights and other rights established through external interventions exist in practice and relate to each other in using and managing land, water and forest resources.

4.2 Tenure systems of land, water, forest and trees

The term ‘land’ is ambiguous because it includes underground water, trees, minerals and petroleum. In order to clarify the kinds of resources being considered in a particular property rights situation, a functional definition is always important. According to the Tanzanian Land Act No. 4 of 1999 and Village Land Act No. 5 of 1999, ‘land’ is defined as: “the surface of the earth and the earth below the surface and all substances other than minerals and petroleum forming part of or below the surface, things naturally growing on the land, buildings and other structures permanently affixed to land”. According to this definition, water and planted trees are parts of the land while naturally growing trees are excluded from the land. However, in daily practices, water sources and both planted and naturally growing trees are sometimes combined or separated from the land. In the micro spring forests, both planted and naturally growing trees are available. For analytical purposes planted and naturally growing trees are discussed separately and, later in Chapter 7 the cases are used to show how sometimes land, water and forest become combined or separated in people’s daily practices of using them. The following sub-sections discuss the tenure systems of land, water, forest land and trees.

Land tenure

The land tenure system of Tanzania has undergone several historical developments. To understand the current tenure system, one needs to know its history. Before colonization, all the land was owned by different tribes, and the chiefs and headmen of the tribes were responsible for granting land to clans and individuals (URT, 1995a). The tribes ranged from bigger to smaller ones and the roles of the chiefs in distributing land depended on the size of these tribes. For big tribes like the Sukuma in Mwanza and Shinyanga regions the role of the chiefs was very important in reducing conflicts between the clans of the tribe, while for small tribes like Pogoro in Morogoro region, the role of the chief was minor and the clans and families were involved in granting land to individuals (Arntzen *et al.*, 1986).

The system of customary law was continued even during German and British colonial eras. The German colonial regime prevailed from 1885 to 1919. In 1895, the German government passed the Imperial Decree on land acquisition and declared all land in Tanganyika as Crown Land vested in the German Empire (Lange, 2008; Kessy, 1998). Because this decree was aimed at alienation of land for establishment of plantations, the customary land laws were interfered with the State powers mostly in fertile highland areas of Usambara, Meru, Livingstone mountains and Kilimanjaro. In the remaining parts of Tanganyika such interference was minimal except for the regulations introduced by the colonial government for agricultural practices including proper planting, weeding and harvesting of some important cash crops.

The British colonial regime started after German was conquered and evicted in 1919. The rule ended in 1961 when Tanzania (Tanganyika by then) got its independence. During the British regime, land tenure ordinance was enacted in 1923, the legislation was very important in controlling land acquisition and use, and several amendments were made to address different challenges (Kessy, 1998; Arntzen *et al.*, 1986). All the land whether occupied or not was declared as public land and the rights were vested in the Governor who had the power to grant right of occupancy and revoke the same when the land was required for other uses. The ordinance recognized the customary laws and it provided for the customary land holdings which accounted for about 95% of all the land to be deemed granted to different tribes (Arntzen *et al.*, 1986). Customary laws were very important in land use and management during the colonial era because the colonial administration was not able to reach all the rural areas except through chiefs who controlled land allocations in their respective areas.

After independence, the land law has been changing to accommodate different political philosophies and economic reforms that have been happening in the country. These reforms include: nationalization and President Nyerere's *ujamaa* socialism after the Arusha declaration of 1967; the villagization programme from 1974 to 1975; and community participation in natural resource management in 1990s. However, independent Tanzania has maintained the colonial policy of making all the land public land and the rights to land are vested in the President, as a trustee on behalf of all the citizens. The different land rights are granted to individuals or corporate ownership

under certain conditions and for a specified period ranging from 33 to 99 years (URT, 1999a; URT, 1995a). The essence of public land during colonial era and that during independence era do not principally differ because only the president has replaced the governor. The land is under the control and management of public administration, for the case of independent Tanzania it is the central state bureaucracy which has the mandate for the control and administration of public land (Shivji, 1999). Also in 1963, the chieftainship, which traditionally had the authority for land allocation and guardian of customary laws, was abolished by Tanganyika African National Union (TANU), which was the ruling party of independent Tanganyika (Lange, 2008; URT, 1995a). The abolishment of chieftainship came after Tanganyika became a Republic on 9 December 1962. The abolishment of chieftainship weakened the customary laws in rural areas, but this also contributed to unsustainable use of land resources in the areas that are rarely reached by formal institutions (Sheridan, 2004).

Vesting the full power in the President over public land denies the people the rights to use and enjoy the control and management of their lands; furthermore centralizing of decisions creates more problems than solving them. If the land is really public then it must be returned to the people and be vested in their own institutions such as village assemblies. The state should provide guidance and technical assistances related to land control and management (Shivji, 1999).

The land rights in Tanzania are both statutory and customary granted. The statutory rights are granted in the name of the President to individuals or corporate by offering a certificate of occupancy. Customary land tenure, which is based on rules of inheritance, is common in rural areas and is recognized by the Village Land Act No. 5 of 1999. Customary land rights are deemed rights to citizens and therefore they should be according to the customs of a tribe, and such rights have no time limit. Inheritance can be through matrilineal or patrilineal systems depending on the tribe in question. The Village Land Act No. 5 of 1999 translates the customary land ownership into written documents called *Hati miliki ya kimila* (Certificate of customary right of occupancy). This document is intended to improve the security of customary rights of land ownership by individuals, family units, clans or groups recognized as such under customary law.

According to URT (1999a) and URT (1999b), the public land has been categorized as: (a) General land referring to all public land, which is not reserved land or village land and includes unoccupied or unused village land. Sometimes the term public land is misused to mean general land. It should be clearly understood that all land in Tanzania is public and the general land is non-demarcated public land and because of lack of administration by the government, general land is considered as open access land. (b) Village land referring to land which is within the boundaries and jurisdiction of a registered village (c) Reserved land referring to land put under special uses including forest reserves, national parks, marine parks, wildlife conservation, road reserves, etc. This categorization does not refer to the types of tenure but it has been made for the purpose of management only (Shivji, 1999). Therefore, general land can

be found within or outside the village land and reserved land can be owned by the village council, central government or local government.

The village land is further divided into: (a) communal village land when it is occupied and used on community and public bases and cannot be made available for individual occupation and use; (b) individual, family or clan land when it is occupied and used under customary law; and (c) land reserve which is unoccupied or unused land that may be made available for communal or individual purposes through allocation by the village council. This categorization is very important for the land under micro spring forests as discussed in Chapters 5, 6 and 7.

The two Acts do address land issues but at different levels and in different contexts as follows: While the Land Act No. 4 of 1999 addresses land issues in general, Village Land Act No. 5 of 1999 addresses issues related to village land and takes into consideration customary rules. In order for the two Acts to complement each other instead of contradicting each other, the definitions of the same terms in the two acts should ideally be consistent. However, this is not the case and it is not clear whether or not this is done intentionally. For example, both Land Acts have defined the term 'general land' in almost the same way except that the Land Act has added: "*includes unoccupied or unused village land*" which is not appearing in the Village Land Act. As Shivji (1999) argues adding or omitting some words in the definition could be in a way used by the land planners in the Ministry of Lands, Housing and Settlement Development to expropriate village land by claiming that it is unused or unoccupied land. However, this has not been the case for the land under traditional water sources in the study area.

Also, the notion of unoccupied or unused land is confusing and misleading. The Village Land Act No. 5 of 1999 considers the land held under customary right of occupancy as being abandoned when it lies unoccupied or unused for not less than five years (URT, 1999b; 225). This Act does not consider the different land uses and local practices used by local communities in managing land. Local communities visit these lands at different times for different purposes and in practice it is not possible in rural areas to find a land that is not used at all. As Sendalo (2009) asserts, because of the climate-driven mode of land and resource use by livestock keepers who move back and forth between different grazing lands in different seasons to make optimal use of foliage, those lands can be dubbed as uninhabited, barren or under-utilized. The use of a minimum of five years to judge whether the land is unused or unoccupied can have three implications on land use and management: (a) it may discourage people in rural areas to leave their land to undergo natural regeneration and hence leading to land degradation due to continuous use; (b) it may encourage deforestation in general lands when people clear forests to show that the areas are occupied and under use; or (c) it contradicts the statement in the Land Act that land has 'value' which implies that only economic value is considered and not its value as nature. In other words, land is regarded to be only productive when it undergoes capital investment. The

Village Land Act does not consider opportunity cost by an individual who puts his/her land under fallow because he/she wants to promote natural regeneration.

Formalization of customary rights by itself does not ensure land tenure security to local people, unless its implementation is based on political will and intended to empower local people to utilize their land for long term investment. This can be reflected in the Village Land Act No. 5 of 1999 which states: “*customary right of occupancy is in every respect of equal status and effect to a granted right of occupancy*”, but still the state and other actors have not fully recognized these rights. Local communities have been displaced from their ancestral land without payment or compensations (Lange, 2008; Mniwasa and Shauri, 2001). Local people are evicted from their areas to allow investments like mining, creation of reserves and other activities, which are considered to be of national interests. The displaced local people need to get compensations that meet their expectations of the value of land, otherwise, they may feel that customary land is unsecured and they may become reluctant to invest in their land.

Moreover, the process of entitlement and granting certificates for customary right of occupancy is stipulated in the Village Land Act No. 5 of 1999, but it is cumbersome and the costs involved in surveying are supposed to be covered by the future title holders. This reduces its implementation because, in practice, very few rural people can manage to pay the high costs involved in the surveying (Lange, 2008; Shivji, 1999). As a result, most resource users in Ukerewe main Island have no certificate of customary right of occupancy.

Declaring all land as public property and all rights vested in the state has contributed to a large portion of the land being classified as general land; hence it is lacking proper control and monitoring systems. The general land is supposed to be administered and managed by government, but because of low capacity in terms of finance and human resources, the land has become *de facto* open access and subject to over-exploitation. Clear ownership needs to be defined in order to rescue this land from degradation. Since the 1980s – 90s, many authors and international conservation agencies have proposed to have community based natural resource management as a solution (Mniwasa and Shauri, 2001; Kessy, 1998; Kajembe, 1994). The land management of micro spring forests by local people in Ukerewe main Island is a case in point (see Chapter 7).

Water rights

Water rights, like those of land, have undergone several developments. During pre-colonial era, water sources were conserved using customary laws and the practices for conserving water sources differed from one ethnic group to another. The chiefs and clan heads were very important in controlling different rights to water sources (Van Koppen, *et al.*, 2004; Ylhäisi, 2003). Formal water rights were introduced in Tanzania during German colonial period in 1900s (Van Koppen, *et al.*, 2004) and during British colonial period, registration to obtain water right was stipulated in the Water

Ordinance of 1923 (Rajabu and Mahoo, 2008). These rights were vested to German and British colonial settlers localized in the areas of intensified irrigated agriculture, for example in Kilimanjaro region (Van Koppen, *et al.*, 2004). Then in 1948, the Water Ordinance was issued and the water rights started to be used country wide. The control of all water rights was vested in the authority of the Governor of Tanganyika. All water users were required to register for water rights to divert, dam, store, abstract and use water for economic activities. Customary authority under the tribal chiefs was recognized by the colonial rulers and given the mandate of controlling small scale rural water uses and retaining secondary legal status. However, after some years and when the water rights were revised by colonial rulers, the customary law was eroded, because the Water Ordinance of 1959 required even native users to register for water rights.

After independence in 1961, the new government of Tanganyika inherited the colonial Water Ordinance of 1959. In 1974 the government issued the Water Utilization (Control and Regulation) Act which retained the concept of all water being vested in the President from the colonial states (Van Koppen, *et al.*, 2004). This Act and its amendments of 1981, 1989, 1997 and 1999 is the main instrument which is currently applied to guide the use and management of water. The Act stipulates that any person can be granted the right to use water from any source, in a specified quantity and period, whether definite or indefinite, and for any purpose as specified in the water right. Also it provides right to the owner or occupier of any land to use it to sink or enlarge any well or borehole and abstract water from it, not exceeding 22,700 litres in any one day. The provision gives the opportunity for people in the rural areas to have private water wells, which reduces the pressure on communal water sources and hence reducing conflicts among water users.

Tanzania has seen several policy changes from policies that emphasize the role of the central government as the sole investor, implementer and manager of water projects and responsible for water protection to the current policy that emphasizes the privatization of water services and conservation of water sources by users (Mascarenhas, 2005). The implementation of this last policy might be challenging in rural areas where in most cases water is a shared resource of the villagers.

The current National Water Policy which was issued in 2002, identifies three sub-sectors including water resource management, rural water supply, and urban water supply and sewerage (URT, 2002a). The reason for the establishment of three sub-sectors is to ensure that water is managed sustainably and equitably by taking into consideration the concerns of all water users. However, it is challenging to strike a balance between these sectors because some tend to be given more priority than others. For example, water for irrigation and urban supply tends to be given more attention than rural water supply because investment in the former is expected to give more returns (Boelens *et al.*, 2007).

The current National Water Policy recognizes the importance of the participation of village communities and the institutionalization of customary laws. The policy intends to empower people to sustainably maintain and operate water supply systems. However, according to Juma and Maganga (2005) the mainstream policies and laws do not seem to provide the real attention which the customary laws deserve. The authors argue further that since the new statutory water provision is not able to reach all rural areas, customary laws are expected to be very important in addressing water problems. In fact this is what we see happening in Ukerewe main Island for the water sources management (see Chapters 5 and 7).

Forest land tenure

Like land tenure and water right, forest land tenure has undergone several changes. The historical development of forest land tenure can be traced back to five different periods, which include the pre-colonial period; the German colonial period; the British colonial period; independence and the Ujamaa period; and the current period (Ylhäisi, 2003). During pre-colonial times the tenure of forest land was based on customary laws. Different ethnic groups had different rules for owning, accessing and managing forests. Some forest areas and tree species were sacred for different purposes such as conservation of water sources, top hills conservation, ritual forests and forests for fodder production. The rights over forest products under customary law vary at kinship or household level; members may also have different rights depending on gender, birth order or intra-family status (Fortmann, 1985).

The German colonial period was from 1885 to 1919. The Colonial Government considered local people surrounding forests as being dangerous to the environment. This caused the Colonial Government to legitimate itself in controlling all the important resources. In 1897, all land whether occupied or not was transformed to 'Crown land' and those who managed to provide documents as evidence of private ownership of land were recognized as owners of that particular land. In 1904, the Forest Conservation Ordinance was issued to create forest reserves from the Crown Land and it excluded local people from using the forest for farming, grazing and other uses (Ylhäisi, 2003). The authority of traditional institutions that used to control natural resources started to erode.

The British colonial period was from 1919 to 1961. The British colonial government had the same interest as the Germans in forest protection and more forest lands were converted into reserves. Also large tracts of forest were cleared to establish large-scale export crop plantations of tea, coffee, rubber, sisal, cotton and tobacco; local communities were displaced from these areas (Mbonile, 2005; Ylhäisi, 2003). The British used the concept of 'divide and rule' and for that purpose they encouraged ethnic differentiation by creating "clean tribal boundaries" (Ylhäisi, 2003). Customary laws were maintained by each ethnic group and these laws were the main instruments in controlling forest land and local people.

After independence in 1961, the government adopted the reserved area policy and more lands were converted to forest reserves. The policy continued to change in order to address different land reforms undertaken by the government. Despite the role played by customary laws in managing forest vegetation, the government neither formally recognized nor gave much attention to these regulatory institutions. The formal abolishment of chieftainship by the independent Government of Tanganyika in 1963 threatened to weaken the role of customary laws even more (Ylhäisi, 2003).

Since the 1990s major changes have taken place in forest tenure systems and the current National forest policy and the Forest Act now formally recognizes customary laws and community participation in forest use and management. The Forest Act has assigned the forests into different types to allow easy monitoring and management of forest resources. According to URT (2002b) there are four types of forest lands in Tanzania; the first is national forests which consist of forest reserves and forest on general lands. Forest reserves can be natural forests or industrial plantations. The natural forest reserves are for protection on steep slopes, water catchments areas and diverse biological ecosystems or for the production of forest products including timber, fuel wood, gums, resins and bark. Industrial plantations are primarily for timber production. Forests under this category are owned and managed by the central government and some use rights can be granted to neighbouring villages through joint forest management or to individuals or companies through permits and licensing. Secondly, forests under local authority, these consist of forest reserves and forest on general lands. Forest reserves in this category are mainly natural forests for productions and protections. These forests are owned and managed by local authorities including city councils, municipal councils, town councils and district councils. Thirdly, village forests which consist of village land forest reserves; community forest reserves created out of village forests; and forests, which are not reserved but are on village land and their management, are vested in the village council. Finally, the category of private forests consists of forests on village land held by one or more individuals under customary rule and forests on general or village land of which the rights of occupancy or lease have been granted to individuals, groups, corporate bodies or any other organization.

Tanzania is estimated to have about 35.2 million ha of forests and woodlands and out of this total area, almost two third is woodland on general lands (FAO, 2006). The central government which is also responsible for managing forest on general lands does not have the capacity of managing this land, and this has led to the resources being *de facto* open access, putting these forests under the pressure of unsustainable uses.

The implementation of formal property rights depends on the clarity of terms used in defining these rights. Ambiguous terms contribute to multiple interpretations by different actors and this has implication on the resource use and management. The Tanzanian Forest Act No. 14 of 2002 defines 'forest' as: "an area of land with at least 10 % tree crown cover, naturally grown or planted and or 50 % or more shrub and tree

regeneration cover” (URT, 2002b: 8). On the other hand, the Tanzanian National Forest Policy of 1998 defines ‘forest’ as: “all land bearing a vegetative association dominated by trees of any size, exploitable or not, and capable of producing wood or other products of exerting influence on the climate or water regime or providing shelter to livestock and wildlife” (URT, 1998: viii). The two definitions are used side by side; these are important documents in providing guidance to the different actors in forest related activities, but neither of them defines the minimum size of the land required to make it a forest.

According to the definition by FAO (2000), forest is a land with trees crown cover of more than 10% and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 meters at maturity in situ. May consist either of closed (<40%) forest formation where trees of various storeys and undergrowth cover a high proportion of the ground, or of open forest formations with a continuous vegetation cover in which tree crown exceed 10%. Young natural stands and all plantations established for forestry purposes, and which have yet to reach a crown density of 10% or tree height of 5 meters are included under forest, as are areas normally forming part of the forest area and which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest. At least this definition gives more options and it provides a definition of the minimum area. However, some of the community owned forests have smaller areas than the ones mentioned in the definition.

Because of the vagueness and ambiguity of forest definitions in the Tanzanian context, small forest patches like the micro spring forests – which are the subject of this study - are not given due attention by the policy makers and other actors in development programmes. As a result, these small forest patches might be seen as useless in terms of their contribution to biological biodiversity, harbouring threatened indigenous tree species, gene pool source, watershed protection, products for sale and subsistence, and social and cultural benefits (Alemayehu, 2007; Schelhas and Greenberg, 1996). However, these are vital functions and the lack of formal recognition might make them unnoticed and finally getting lost.

Tree tenure

Tree tenure sometimes is different from forest land tenure because some tree species are a non-renewable resource that is threatened to become extinct due to over-exploitation. Therefore, the Tanzanian Forest Act No. of 2002 continued to provide for the relevant authorities including district councils and the Division of Forestry and Beekeeping of the Ministry of Natural Resources and Tourism in prohibiting the use of certain trees by declaring them as reserved trees regardless where they are located. For example, *Pterocarpus angolensis*, *Milicia excelsa*, *Khaya nyasica*, *Azelia quanzensis* and *Dalbergia melanoxylon* have been declared as reserved trees regardless of being planted or being wild tree on private or on any type of land ownership (see URT, 1995b). These trees are harvested once one has gotten permits and after having paid royalty fee to the government. The list of reserved tree species is

composed of many tree species with a higher timber value than the tree species related to water source conservation. The licensing and payment of royalty fee to harvest these trees are meant to control their demand, but this might limit people to domesticating and growing such trees on their own land. Also, the fact that less attention is paid to declare the reserved trees such as *Ficus spp*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense* and which are commonly known to be good for water source conservation lead to the danger of over-exploitation, especially in densely populated areas with fewer such forest resources, like Ukerewe main Island.

Furthermore, the government through collaborative forest management can grant the use right for some tree products to certain villages neighbouring forests, denying or restricting access to villages further away (URT, 1998). The granting of use right is an incentive to local people for participating in conserving forest resources in their vicinity. The success of this incentive for the local people to conserve the forests in their vicinity depends on how the local people interpret this government initiative. The use rights as incentives should base on products, which have not been available to local people before collaborative forest management. In fact, the local people adjacent to forest reserves often visit these forests for purposes such as collecting firewood, gathering medicinal plants, hunting for game meat of small wild animals and collecting wild vegetables even without being involved in managing these forest reserves.

4.3 Public administration and management of tenure systems

Before discussing the manner in which how tenure systems for land, water, forest and trees are administered in Tanzania, it is important to describe the structure of government administration. The government administration in Tanzania has two tiers. The first tier is that of regional administration whereby the central government is represented at three different levels including region, district and division. The higher level is the Region headed by the Regional Commissioner followed by the District headed by the District Commissioner and the lowest level is the Division headed by the Divisional Secretary. The role of the heads of the three levels of regional administration is to represent the president and to supervise development activities in their respective areas. The second tier is that of local government, which has three levels including a district, followed by a Ward and finally a village, which is the lowest level. The authority at district level is the district council with an elected chairperson. In theory, the district council is an autonomous entity with its own expenditure budget, revenue sources, ability to borrow funds, and the ability to hire personnel. The district council has the mandate to make by-laws and approve by-laws made by village councils within its jurisdiction and it is allowed to interact directly with the government ministries. The district council is responsible for providing public services such as health, primary and secondary education, water, extension services and local roads maintenance. However, these district councils' budget of up to about 85% is dependent on allocations from the central government to meet their

expenditure on core development activities (Fjelstad *et al.*, 2004). The authority at the village level is the village council, which is elected by the village general assembly which is comprised of all villagers of 18 years and above. The village council has the role of planning and coordinating development activities in the village. In addition, it has the power to propose by-laws and submit the same to the district council for approval.

In Tanzania the tenure of land, water, forests and trees are administered by different ministries, including the Ministry of Lands, Housing and Settlement Development (MLHSD); the Ministry of Water and Irrigation (MWI); and the Ministry of Natural Resources and Tourism (MNRT). However, while these ministries are more oriented to policy formulation and technical advice, the Regional Administration and Local Government (PMO - RALG) of the Prime Minister's office is responsible for the implementation of their policies at local level and for the coordination of activities between ministries and local governments. The following sub-sections give the details of the administration of land, water and forest land.

Land

Land administration is done by the Ministry of Lands, Housing and Settlement Development (MLHSD). The Ministry is responsible for the formulation, coordination and implementation of policies on land development, human settlement development, surveys, valuation, land registration of documents and property transfer (URT, 1995a). The commissioner for lands is the sole authority responsible for land administration and at different government levels he/she can appoint officers who have the authority to administer land other than village land. District and urban authorities, which are under the Prime Minister's Office – Regional Administration and Local Government (PMO - RALG) have the responsibility of implementing land policy at local levels. However, the village council is responsible for administering, managing village land and granting *Hati miliki ya kimila* (certificate of customary right of occupancy) to the applicants. The village council is accountable to the village assembly, which consists of all village members of 18 years of age and above.

Also, due to the specialized nature of land matters, the settlement of land disputes is done by land courts from the village level by the *Baraza la ardhi la kijiji* (Village land council) upward to the ward tribunal, district land and housing tribunal and to the high court (Land Division) at the national level. The village council has been given full powers of dealing with all issues pertaining to village land and is accountable to the villagers. However, in Ukerewe main Island the role of village council in the management of micro spring forests is being considered as a final resort in cases where the socially embedded institutions like clan headmen and the well committee fail to resolve complex land use problems.

The granting of *Hati miliki ya kimila* (certificate of customary right of occupancy) to farmers requires the area to be surveyed and demarcated first. Such an undertaking requires a substantial amount of money that cannot be raised by local people alone

without external support. The granting of these certificates started after the enactment of Village land Act No. 5 of 1999 and seven districts including Mbozi, Iringa, Handeni, Bagamoyo, Kilindi, Kisarawe and Monduli have been partly covered so far (Chiligati, 2009). The exercise in these districts was based on villagers showing interest for their farms to be surveyed and having certificates issued for them. The exercise covered only few villages and households per district.

Early 2009, another programme for surveying and issuing *Hati miliki ya kimila* was launched in Bariadi and Babati districts covering all villages and households. The involved districts are for trials before having the programme implemented to all villages in the country. The two districts were selected because they have similar proportion of farmers and pastoralists (Chiligati, 2009). In Tanzania, farmers and livestock keepers are often in conflict over land uses due to location, unclear tenure rights and scarcity of land. The implementation of this formal tenure regime is important; however it is necessary to involve all the actors in order to avoid conflict that might arise because of overriding the customary laws over different land uses. This new programme of issuing *Hati miliki ya kimila* has not covered Ukerewe main Island.

Water

The administration of water resources is under the Ministry of Water and Irrigation. The Ministry is responsible for addressing water resources management; rural water supply; and urban water supply and sewerage (URT, 2002b). The Ministry provides policy orientation, development and regular revisions of policies and legislation, and it is supposed to create conducive environment for sectoral coordination and integration.

Tanzania has been divided into nine hydrological zones or river basins and but these are not based on administrative boundaries like region and district (URT, 2002b). These include: (i) Pangani, (ii) Wami/Ruvu, (iii) Rufiji, (iv) Ruvuma and Southern Coast (v) Lake Nyasa, (vi) Lake Rukwa, (vii) Lake Tanganyika, (viii) Lake Victoria, and (ix) Internal drainage basins of Lake Eyasi, Manyara and Bubu depression. In each zone or river basin there is a Basin Water Board and Basin Water Office located at the headquarters of each zone or river basin. Basin water boards comprise representatives from district councils and these boards are responsible for planning and coordinating water resource management at basin levels. These boards are coordinated by the Central Water Board, which is at the national level under the Ministry of Water and Irrigation.

The Basin Water Office has seven responsibilities, monitoring the abstraction of water whether legalized through water rights or not; monitoring the water resources in the basin; facilitating water resources research; monitoring the quality of water and advises the ministry, the boards and water users on measures of minimizing pollution and improving the quality of water. They issue, suspend or vary water rights; take legal actions against all defaulters; and assist water users to use water properly and

practice water conservation measures. Ukerewe main Island is under Lake Victoria Basin and the headquarters of the basin is located in Mwanza city. However, the basin water board and the basin water office are mainly dealing with big water sources like Lake Victoria and big rivers like Mara River but not with water sources in micro spring forests. Therefore in practice, the Basin office and Basin Water Board have no direct activities on water sources in micro spring forests.

Water User Associations (WUAs) or Water User Groups (WUGs) are responsible for owning, managing, operating and maintaining the water supply systems at the village level. These associations need to be established by water users themselves and be registered with the district council in order to be legally recognized by the government. The establishment of these associations emanates from projects of water supply systems supported or constructed by the government or non-governmental organizations; as a result, not all water users in rural areas of Tanzania have established these associations. When Water User Associations (WUAs) or Water User Groups (WUGs) are not yet established, the responsibility for water supply rests with the district councils through the Department of Water.

The intention of the government to have Water User Associations as a legal administrative unit is to empower local communities to own and manage their own water supply systems. However, to have such associations working properly, they need to have capacity in terms of human and financial resources and be articulate in dealing with the local people's situation. When the processes of establishing the associations are very bureaucratic, local people might not be able to establish them. Also even if the associations are established, they may not be flexible in accommodating any changes happening at the local level. As Giné and Pérez-Foguet (2008) argue, the process of registering a Water Users' Association is complex and challenging; more flexibility and simplicity should be advocated at district levels to prevent procedures from being excessively bureaucratic and ineffective. The current study in Ukerewe main Island shows that there are no registered Water User Associations or Water User Groups (see Chapter 7 on the organization of water use).

By-laws need to be enacted in order to facilitate local communities in managing water sources. The Village council has the mandate of establishing by-laws, which have to be approved by the district council, and the process has to start from the village assembly but it takes time before being approved. To amend a by-law it needs to pass through the same process and for that reason it becomes very complicated and time consuming for the local people, especially when they need to address a problem that needs immediate action. As Mniwasa and Shauri (2001) argue, the by-laws' formulation process is slow and inefficient because of the long route taken during the whole process. This is the case in Ukerewe main Island (see Chapter 5).

Forest land and Trees

The administration of forest land and trees is done under the Ministry of Natural Resources and Tourism. The Forestry and Beekeeping Division (FBD) is one of the

five divisions within the Ministry dealing specifically with forestry issues. The division has the overall responsibility for the development of forestry and beekeeping sectors through the formulation of policies, provision of technical guidance and supervision of policy implementation. However, forest reserves of national strategic importance, such as critical watershed areas, forest areas with high biodiversity or endemism and industrial plantations are directly managed by the central government through FBD (URT, 1998). Regional secretariats, local authorities and district councils that are under the Prime Minister's Office - Regional Administration and Local Government (PMO – RALG) have the responsibility of implementing policy at local levels since it has the mandate to coordinate and oversee the functions performed by regional secretariats, local authorities and district councils and link them with FBD.

District Forest Officers (DFOs) are in charge of all forest activities in the district. These activities include enforcing forestry laws, providing extension services to farmers, supervising tree planting activities and issuing permits and licenses for harvesting and trading forest products. The DFOs are assisted by forest assistants located in the wards. However, local governments have no enough capacity in terms of finance and human resources to implement the policies related to the management of natural resources. This is the case in Ukerewe main Island because there are only forest officers at the district office and not at the ward level, and this has implications on the effectiveness of the implementation of the forest policies at the village level.

4.4 Villagization and decentralization

Villagization and its impact on tenure systems and management of natural resources
After independence in 1961, Tanzania developed several policies meant to transform the rural economy through the resettlement of its population in the villages. The two resettlement campaigns, which both took place between 1961 and 1965 ended in a failure. This is because of the reliance on externally imposed development ideas that ignored local people's economic and environment concerns (Lawi, 2007). The selected new sites for villages were not close enough to water sources for domestic uses, and this required the women to walk over long distances looking for water. Also the villagers were forced out of their carefully tested and crafted ecological and social settings to the untested and new environments. The labour sharing which was developed under the clan settlement was disrupted, and this negatively affected the production systems. The abrupt relocation of people to new areas meant that they had to start developing new values and meanings in the course of interacting with their immediate environment and to develop new livelihoods and social networks to cope with this new environment. These institutional processes took time and needed a lot of experimentation before they were accepted, and since there was little time given people resisted the campaigns.

In 1967, the Government of Tanzania after the Arusha declaration by the late President Julius Kambarage Nyerere adopted the 'Ujamaa' socialism. This was an

official rural development policy aimed at creating an egalitarian society where there would be no exploitation and no inequality (Coldham, 1995; Kashuliza, 1993). To achieve this, rural people were encouraged to move voluntarily into collective villages. Despite the hopes of President Julius Nyerere that this move could organize rural Tanzanians into coherent and effective social units, the attempt failed as the majority of rural dwellers did not want to move to the newly established villages (Lawi, 2007; Scott, 1998). In 1974, a country wide programme involving compulsory relocation of rural dwellers to new government designated areas, which is popularly known as Operation *Vijiji* (Villagization), was launched. The people were forcefully moved to new villages, which were required to consist of at least 250 households.

The villagization programme in Tanzania has been reported to have had a profound effect on tenure systems and management of natural resources (Scott, 1998). A Report of the Presidential Commission of Inquiry into Land Matters (URT, 1994) identifies three types of villagization. First, villages that were registered based on their age-old boundaries remained largely unaffected by the operation; second, the relocation of families who lived scattered within old settlements to clustered houses of new villages; and third, villagization in the sense of a programme of distribution whereby lands were pooled and then re-distributed equally between villagers, and this was operationalized in areas where there was some concentration of land holding.

Each type of villagization had a different impact on the land tenure system. The second and third types led to some people losing ownership and control of their ancestral land and water sources. Villagization weakened the socially embedded institutions developed over a long time; villagization also disrupted some of the cultural beliefs, leading to the degradation of water and forest resources (Lawi, 2007; Sheridan, 2004). The decline of authority and influence of local elders and ritual leaders resulted into a shift of power from the community to government bureaucrats (Mbeyale, 2009; Lawi, 2007). Also it is acknowledged in the National Land Policy of 1995 that: “the creation, relocation and expansion of villages under the 1971 to 1976 villagization programme (Operation *Vijiji*) affected customary land tenure in many rural areas sometimes making it difficult to determine with certainty the kind of land tenure system now operational in these areas” (URT, 1995a: 2).

The clustering of households during villagization created more pressure on natural resources like forests, water springs and wetlands as opposed to the more scattered pattern of the pre-villagization period (Lawi, 2007; Katani, 1999; Scott, 1998; Kajembe, 1994). The villagization programme was accompanied by several national campaigns, which included *Siasa ni Kilimo-1972* (politics is agriculture) and *Kilimo cha kufa na kupona* (agriculture is a matter of life and death) which focused on the increase of agricultural crop production during a nationwide drought in 19974 - 1975. The campaigns led to having local conservation laws forgotten and people starting farming even near or at water sources to get more produce (Sheridan, 2004). Effects like these can be seen in Ukerewe main Island (see Chapters 5, 6 and 7).

Decentralization

In 1982 decentralization was thought to be the best option in managing natural resources. As a result, the Local Government (District) Authorities Act of 1982 gave power to the village councils to propose by-laws related to natural resources management while the district councils were given the power to approve these by-laws. This process of decentralization also contributed to the development of the National Land Policy of 1995, the National Forest Policy of 1998 and the National Water Policy of 2002 to recognize and emphasize the active participation of local communities and local government in the management of land, forest and water respectively.

The Tanzanian government started the initial effort of consolidating local people's control over their land by framing title deeds in the National Agricultural Policy of 1983 (Iddi, 2002). The government wanted to achieve effective use of land and encouraging local people and foreigners to invest in agriculture; this was because agricultural production in 1980s was low and environment degradation was high (Lerise, 2000). The Ministry of Lands started surveying and granting title deeds to village land. About 10% of all villages in the country were covered and the project ended after facing many challenges including poor implementation by the ministerial officials; this led to conflicts over boundaries and shortage of funds to cover all villages. The Land Commission recommended the project to be stopped (Shivji, 1999).

Later when the new Village Land Act of 1999 was enacted, it stated that in order to control and protect the village land from alienation from foreign investors, the villages should get a 'certificate of village land', which is a document indicating the village boundaries with the double purpose of securing land rights through title deeds as well as allowing individuals to have title deeds for their customary land (URT, 1999b:49) and having the communal property to be titled in the name of the village council (URT, 1995a:19). This Village Land Act of 1999 implied important modifications to the previous initiative of 1983, because village land titling by that time restricted the options for individuals to process a certificate of customary right of occupancy as it could mean double allocations or would have required a revocation of the title deed for the village before allowing the individuals to have a title for their customary land.. Unfortunately, the provision of the certificates of the customary right of occupancy to individuals and the provision of the certificate of village land to villages have been very slow and only few villages have been covered.

The National Forest Policy of 1998 has given the district and village councils the mandate to manage forest reserves in their jurisdictions. However, these local authorities have not managed their forests well because they lack the capacity in terms of trained staff and funds and also because they have become bureaucratic instruments for the central government (Mniwasa and Shauri, 2001). This study suggest that the central government should be more serious in devolving powers and building the

capacity of these local authorities in order to be able to appropriately manage their natural resources.

Since the 1990s local communities in Tanzania started to participate in forest management through Community Based Forest Management (CBFM) and Joint Forest Management (JFM) under the support of the Government and international organizations including DANIDA, FINIDA, NORAD, GTZ and the World Bank (Blomley and Ramadhani, 2004). CBFM allows local communities to become both owners and duty bearers, while in JFM the government is the owner and shares the benefits and duties with the community. When appropriate institutions and incentive structures are in place, the local communities may become effective managers (Kajembe *et al.*, 2003; Shahbaz *et al.*, 2008). However, the model of CBFM has been driven largely by externally funded and facilitated projects and the staff of the district council do not consider CBFM as part and parcel of their routine activities (Blomley and Ramadhani, 2004). This scenario poses a threat of making local communities become dependent of external supports, and this would undermine their capacities to proper management of natural resources.

The Water Policies of 1971 and 1991 emphasized that the central government is the sole investor, implementer and manager of the water projects, in both rural and urban areas with the responsibility of protecting water sources. But the current Water Policy of 2002 has changed the role of the Government from service provision to that of coordination, policy and guidelines formulation, and regulation. Also the policy has given more attention to the role of the water users in rural areas to own, manage and mediate disputes related to water resources. This has led to the formation of Water User Association or Water User Groups.

4.5 Summary

The tenure systems for natural resources are important for a sustainable use and management of natural resources. The current tenure systems for land, water, forest and trees have a long history of changes and development from the pre-colonial period through colonial period, country's independence and, finally, to the current tenure system. The main feature of the formal tenure system which has been consistent through all periods is that land is a public property vested in the colonial ruler (Governor) or the President of the independent Tanzania. Land has been an important means of production and a determinant of rights of other resources. Also, formal tenure has been important in acknowledging the position of customary tenure rights. Although customary laws were disregarded during some historical periods, they have remained very important for the use and management of the resources, especially in the rural areas where the administration of formal rights has been difficult. However, the abolishment of chieftaincy and the implementation of the villagization programme have contributed to the weakening of customary rules and regulations. These state interventions have disrupted the social institutions including clan-based settlement and the authority of local elders, which were well embedded

through history and well suited to address local conflict. Formal tenure systems are well elaborated but they rarely apply in the real life conditions of rural areas. The formal systems primarily focus on economic gain of the users, rather than providing incentives for resources conservation. The implementation of current formal tenure systems and the formalization of customary tenure in land, water and forest use and management depend very much on the bricolage of village communities of these external institutional arrangements and their local practices and uses. Moreover, formalization of customary laws should not be treated as a fit for all that works in all cases; rather as one of the options to sustainable use and management of natural resources. Chapter five, six and seven show the variability in practices of use and management of water and forest in the six cases of micro spring forests in Ukerewe main Island.

Chapter 5

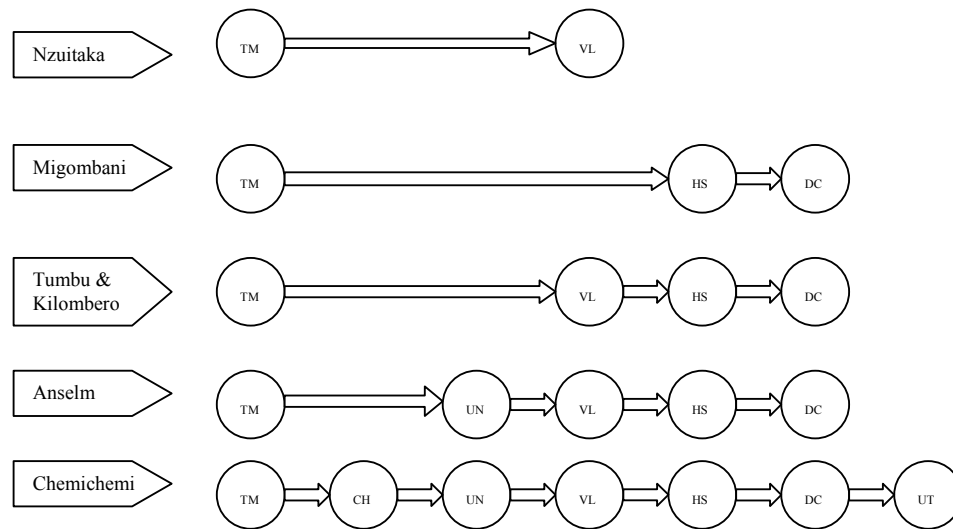
DYNAMICS IN WATER SOURCES MANAGEMENT AND THE PRESENT PHYSICAL CHARACTERISTICS OF WATER SOURCES IN MICRO SPRING FORESTS

5.1 Overview

This chapter gives the history of the water management in micro spring forests by identifying the types of external intervention and the actors involved. The history starts from traditional management to the current management, which is the combination of technological innovation and traditional systems. In each intervention, the key issues discussed relate to who initiated the management change; the technical and organizational features that were introduced; and what legitimacy those changes had. Then the description of the physical characteristics of today's water sources and their status is given and their implications on traditional water source use and management are presented. The knowledge of the historical account of the water source management and their physical characteristics are important because they provide insight in how different actors are involved in and perceive the use and management of water sources. The chapter ends with giving a summary of how the external and local institutions relate to each other and what this implies on water source management.

5.2 The History of water sources management in micro spring forests

External actors like Water and Health Departments always consider rural people as backward when they manage water sources using local norms like cultural beliefs and taboos. The external actors consider traditional water sources as lacking the required standards of water quality and requiring external interventions to correct the situation. Such external organizational or institutional intervention does not follow a singular developmental path. This study revealed that the six water sources have undergone different trajectories of management development (Figure 5.1). Nzuitaka water source has taken the shortest trajectory with only one external intervention while Chemichemi water source has taken the longest trajectory with six types of external interventions. The variations are due to both internal arrangements of water source users and initiatives of external actors interested in the intervention. The next sub-sections provide the details of how each intervention came into being. These different interventions have implications on the resource use and management because they can lead to changes in institutions that guide the uses and the management of these resources.



KEY: TM = Traditional institutions
 CH= Church intervention
 UN = United Nations Children's Fund (UNICEF) intervention
 VL = Villagization intervention
 HS = Health through Sanitation and Water (HESAWA) intervention
 DC = District Council administrative formalization intervention
 UT = Uhuru Torch intervention

Figure 5.1 Trajectories of management development of different water sources

Interventions in natural resource use and management tend to focus on changing human behaviour and practices by introducing some physical features, regulations and rules in order to guide the users of the resource. All the actors involved in the interventions of water sources management aimed at either improving water quality or quantity or both, but the approach to achieve these objectives differed among the interventions. At different times of the interventions, new rules and physical features of water sources were introduced and which in one way or another changed the way people used their water sources. In addition, the water users themselves actively modified these rules and physical features to suit their local situations. From these interventions, seven types of institutions can be distinguished (Table 5.1). The first type is traditional management while the other six types are external development intervention institutions. The next sub-sections present the descriptions and different outcomes of the institutional interfaces that have been seen as different processes of bricolage (Clever, 2002).

Table 5.1 Different institutions involved in water source management

| Type of institution | Initiative | Technical features | Organizational feature | Focus | Water source involved |
|--|-------------------------------------|---|--|--|------------------------------------|
| Traditional Management (year vary for each water source) | Villagers | Natural spring | Community elders or clan leaders | Cultural significance on water quality and quantity | All water sources |
| Church (1960) | Missionary | Water tank | Community elders or clan leaders | Technological significance on water quality and quantity | Chemichemi |
| UNICEF (1965) | One person in the village community | Water tank, tap, bathroom, clothes washing shade, animal trough | Community elders and clan leaders | Technological significance on water quality and quantity | Chemichemi & Anselm |
| Villagization (1974 – 1975) | Central government | No technical feature introduced | Villages and hamlets | Resettlement of people into planned villages | All water sources except Migombani |
| HESAWA (1985 – 2002) | Central government | Water tanks, pipes and taps | Water User Groups and water committees | Technological significance on water quality, water quantity and membership | All cases except Nzuitaka |
| Ukerewe District Council administrative formalization (2002 – to date) | HESAWA | Maintenance & scale up of technology | By-laws, Water User Association | Legal ownership of water source | All cases except Nzuitaka |
| Uhuru Torch (2008) | Ukerewe District Council | Maintenance and fencing | Used the existing Water User Group and water committee and introduced well guard | Emphasis on community participation in water source conservation | Chemichemi |

Traditional management of water sources

Traditional management of water sources in rural areas has been inevitable in Ukerewe main Island because both colonial and independent Tanzanian governments have not been able to supply all the areas with water for domestic uses. The villagers dug water wells or discovered springs as sources of water for domestic purposes and they used local norms to manage them. Community elders or clan leaders have been important in enforcing these local practices and have been transferring them from one generation to another. Traditional management practices include the use of rules, taboos and cultural beliefs to guide who should do what, when, how and where in using and managing water sources. For example, the cultural significance of springs surrounded by forests that denote the places of ancestral spirits (*Jiba lye byalo*) has been common in Ukerewe main Island. Traditional management of water sources does not value water sources only as places to meet the water requirements for domestic and irrigation purposes, but also as places for spiritual purposes like rain making and praying for forgiveness, when someone has violated a cultural belief. The

valuation of these traditional water sources has changed profoundly in the past few years. As one interviewee narrated:

‘Before the 1970s, Mr. Mwizarubi who established and owned this water source was conducting ritual activities in the forest surrounding this water source especially when the source produced little water. When some people violated the taboos and cultural beliefs like harvesting fishes and cutting trees, less water was available in the source. In those days, the rules, taboos and cultural beliefs were very strong and respected by the people using the water source because there were clans owning and managing the sources. But nowadays the taboos and cultural beliefs are no longer strong due to the presence of different clans and tribes using the same water source’ (Lweganwa Luhusi 60s yrs: May 2007)

There are several reasons for people in rural areas to establish water sources due to social, health and economic purposes. The pioneers of the six water sources have shown different motivations for discovering these water sources (see Table 5.2). The establishment of new settlements is the main reason for discovering these water sources as mentioned in most cases, including Nzuitaka, Tumbu, Kilombero and Anselm water sources. The years of discovery of these water sources do not differ very much between the cases except Migombani. This implies that from the 1930s to the 1940s there was a massive settlement in the study area.

Table 5.2 The names of people and clans that discovered the water sources with respect to year and motivation for discovery

| Name of water source | Pioneer | Year of discovery | Motivation for discovery |
|----------------------|---|-------------------|--|
| Nzuitaka | Bahira clan (Mr. Wanjura) | 1930s | New settlement |
| Tumbu | Mr. Tumbu | 1930s | New settlement |
| Kilombero | Basingo clan (Mr Mwizarubi) | 1930s | New settlement |
| Chemichemi | Balinda clan (Mr. Mageta, Matulage, Namguna and Mganga) | 1940s | Increased water users to the previous source |
| Anselm | Mr. Petro (Father of Anselm) | 1930s | New settlement |
| Migombani | Residents nearby | 1990 | Rotten fish polluted the Lake Victoria shore |

Source: Field data, 2007

The Balinda clan discovered Chemichemi water source because their old water source was not able to meet the demand of an increased population. This implies that more people were still migrating into this area and even the number of individuals within the families using the water source was increasing due to new births. Before 1990, the users of Migombani water source used to fetch water for domestic purposes from the Lake Victoria. During interviews, water users reported to have stopped using Lake Victoria water for domestic purposes in 1990 because the rotten *Sangara* fishes (*Lates niloticus*) polluted the water when they were washed ashore from the Lake. The *Sangara* fishes were introduced in Lake Victoria during the late 1950s and early 1960s (Arunga 1981; Welcomme 1988). The population of *Sangara* fishes exploded in the 1980s and increased the economic value of fishery but at the same time decreased

the population of other fish species due to predation (Pringle, 2005). The massive death of *Sangara* fishes in Lake Victoria in 1990s was due to heavy rains associated with strong currents, which caused upwelling of deep anaerobic waters and abrupt mixing of the water that cause the fishes to die due to lack of oxygen (Mkumbo and Mlaponi, 2007). The motivations for discovering Chemichemi and Migombani water sources show that people in the rural areas have their own standards of water quality and the quantity they needed in their daily water uses. The next sub-sections of this chapter discuss these standards of water quality.

The names of the traditional water sources are very informative. Water sources are named after the person who first discovered the water source or water sources bear the name that depicts the nature of the water source. For example, according to Kerewe people '*Nzuitaka*' refers to a place with trees or bushes; '*Kilombero*' has literally no meaning but refers to a place with big flat rocks used to dry pounded cassava; '*Chemichemi*' is a Kiswahili word referring to a water spring; '*Migombani*' is a Kiswahili word referring to a place planted with many banana plants; and Tumbu and Anselm are names of the persons who pioneered and inherited the water sources respectively.

The names of the water sources are very dynamic and changing depending on the circumstances taking place at a particular time. In addition, when the water source loses some of the attributes that constituted the name, the users give it a new name. For example until 1970s, Kilombero water source was called Nambozu, which is the Kerewe word referring to catfish. The villagers used this name because the water source had many of these fishes which it was a taboo to eat. But, when these fishes disappeared and the big flat stones near the water source became very popular for drying pounded cassava by women, hence the name changed to Kilombero. This shows that villagers change the names of the resources to depict the dynamics of the resource. Thus the naming of resources gives important information about the condition of the resources and its ownership history.

The way people in the rural areas implement and control rules, taboos and cultural beliefs for natural resource management depends very much on the context. Table 5.3 shows the rules, taboos and cultural beliefs guiding the use and management of water sources under traditional management system.

Table 5.3 Rules, taboos and cultural beliefs in traditional management and use of water sources

| Aspect | SN | Item | Objective of implementation |
|------------------|----|---|--|
| Rules | 1 | Smoked metal pots (<i>sufuria</i>) not used for fetching water | Control of water quality by reducing contamination |
| | 2 | Cleaning of water source done by all users | Creating sense of collective responsibilities |
| | 3 | Washing clothes, cleaning utensils and bathing near water source prohibited | Control of water quality by reducing contamination |
| | 4 | Brushing teeth near a water source prohibited | Control of water quality by reducing contamination |
| | 5 | Watering cattle in the water source prohibited | Control of water quality by reducing contamination |
| | 6 | Water fetching done bare footed | Control of water quality by reducing contamination |
| | 7 | Water drawing from well only done by traditional container called <i>Mtaho</i> | Control of water quality by reducing contamination |
| | 8 | Children less than 10 years of age not allowed to fetch water | Control of water quality by reducing contamination |
| Taboos | 9 | Tree cutting around a water source prohibited | Conservation of a water source and protection of the dwelling of spirits |
| | 10 | Postpartum women within 3 weeks are not allowed to fetch water | Paying respect to holy place because they are “not clean” |
| | 11 | Women in menstrual period are not allowed to fetch water | Paying respect to holy place because they are “not clean” |
| | 12 | Harvesting of well fish prohibited | Fish protect the water source from drying |
| | 13 | Women who have given birth to twins are not allowed to clean water source | Paying respect to holy place because they are “not clean” |
| | 14 | Modification of traditional water well (<i>Jiba lye byalo</i>) prohibited | Protection of the natural dwelling of the spirits |
| | 15 | Women who have given birth to twins are not allowed to fetch water | Paying respect to holy place because they are “not clean” |
| | 16 | Killing of <i>njubi</i> (black water snake) is a taboo | Njubi is part of the spirits and gods |
| Cultural beliefs | 17 | Killing of <i>njubi</i> leads to drying up of water sources and brings bad luck to the person involved and household members e.g. falling sick or dying | Punishment from the spirits and gods |
| | 18 | Tree cutting around water sources leads to drying up of water sources | Punishment from the spirits and gods |
| | 19 | Harvesting of fishes from water sources leads to drying up of water in the sources and the fishes will never get cooked no matter how long you cook it | Punishment from the spirits and gods |
| | 20 | Water becomes reddish in colour when postpartum woman or a woman in menstrual period fetches water from the source | Punishment from the spirits and gods |
| | 21 | The well dries up if a woman after giving birth to twins fetches water or cleans the water well | Punishment from the spirits and gods |
| | 22 | The traditional water well dries up when modified | Punishment from the spirits and gods |

The ancestors who established the rules, taboos and cultural beliefs linked the sustainability of water sources in terms of water quality and quantity with the presence of some living creatures. The identified rules, taboos and cultural beliefs in all cases are similar. This could be because during chieftainship period, the Kerewe ethnic group was under the control of one chief; the last chief being Michael Lukumbuzya (1938-1962). The chieftainship was abolished in 1963 after Tanganyika became a republic on 9th December 1962.

The rules, taboos and cultural beliefs focused on controlling water quantity; paying respect to the spirits and gods of the water sources; conserving water source; protecting the dwelling places of spirits and gods; and punishing those who violate the taboos and cultural beliefs. The water users believed that spirits live in clean and

undisturbed places; dirt and disturbance make the spirits become angry which can lead to the drying up of water sources and bad luck to the violators. In addition, the rules, taboos and cultural beliefs focus on women because women are traditionally responsible for fetching water. The elders or entrusted members of the community - who were in most cases men - enforced these rules and taboos. The enforcement includes posing fines like a payment of a goat or a cow depending on the rule or the taboo that was violated or the exclusion of the wrong-doers especially when they fail to pay the fines.

Some of the cultural beliefs and taboos like harvesting of fishes and killing of snakes might have no connection to water source conservation, but they were used as mechanisms to deter water users from violations of the local norms. Many scientists and rural development actors today see traditional management systems as not being important from the perspective of current technological development and the modernization of people, but in the past they were very relevant and they served the purpose of conserving the resources. The persistence of some resources including water sources and forest patches are the result of these systems. According to Dungumaro and Madulu (2003), experiences and knowledge of people in rural areas though lack scientific explanations, are a strong weapon in solving local problems.

Scientists and modern people, including Africans, commonly consider the ancestors who established the rules, taboos and cultural beliefs for managing natural resources as being irrational and find their claims lacking scientific proofs. However, in practice, these old people were very conscious with what constituted the rules, taboos and cultural beliefs and they were very secretive in exposing the reality behind the rules, taboos and cultural beliefs. By so doing, it helped to shape the behaviour of the people using the resource, which subsequently helped to conserve the resources. In addition, it needs to be understood that people make meaning of their resources depending on their context. One of the interviewees in Nzuitaka said:

“The ancestors were very clever in creating these rules, taboos and cultural beliefs and they understood that prohibiting people to cut trees around water sources was not easy since they had no external mechanisms like courts and prisons by that time to jail wrongdoers. They decided to use cultural beliefs because they created fear among the resource users. This seemed to be very effective for self control and deterring people from misusing the resources due to the perceived punishments from the spirit of dead ancestors”(Mayemba Manyama, 82yrs; April 2007).

The knowledge of the various practices of management and use of water sources in micro spring forests is passed on from one generation to another. The modes of transferring this knowledge vary between ethnicity and even within the ethnic group, and vary between age group, gender and roles played by individuals. The water users reported to have inherited the rules, taboos and cultural beliefs used in managing water sources from their grandfathers and grandmothers through storytelling. For the young boys, storytelling is during the fire warming gathering in the evening outside

their houses, while for young girls the storytelling is during water fetching or in the kitchen when cooking evening meals. However, it does not mean that the next generation respected all the rules, taboos and cultural beliefs passed to them. In every generation, the recipients consider some rules, taboos and cultural beliefs as outdated, people let them disappear, and those considered relevant are promoted. From this perspective, it follows that the list produced during this study might be quite different from what could have been produced 50 years ago and for that reason the list will keep on changing over time. The selective disregard and promotion of some rules, taboos and cultural beliefs depend very much on factors such as external interventions, the level of modernization, heterogeneity of the resource users and the power of indigenous leaders. Chapter 7 gives the details of the current practices and local norms related to the management of water sources in micro spring forests.

Types of development interventions

Development intervention in Ukerewe is a well-known phenomenon, and has been taking place throughout history.

The church

The church as an institution and specific churches as its representatives are very important in rural development in Tanzania. This is because pastors and priests of different denominations are not only responsible for preaching and teaching the word of God, but they are also involved in development activities in different sectors. These sectors include water, health, agriculture, education and environment. For example, one missionary from the African Inland Church, which is a protestant church, modified Chemichemi water source in 1960 (Photo 5.1). The missionary used to fetch drinking water from this water source but he was living in another village called Kazilankanda. This village is about 7 km away from the Chemichemi water source. The missionary modified the water source because he wanted to improve the water quality and quantity. He constructed a water tank that served the purpose of storing water and at the same time reducing water contamination through rainwater runoff. The water tank was not covered; hence it allowed the fishes to continue living there which was very important for the villagers because it did not interfere with their cultural beliefs on well fishes.

The missionary covered all the costs for the construction of the water tank. The intervention was locally arranged through collective action of the missionary and water users and did not involve government institutions like village government and district council. The modification of the water source in micro spring forests was very simple. It did not involve fixing of facilities like water taps and fence; hence, there was no need of replacing broken down facilities. The users did not need to pay frequent contributions of money to solve technical problems. The water users maintained the traditional practices of using and managing the water well because the missionary did not introduce any new rules regarding the water source. It was noted that during this period people living in one location were mostly from one clan and they respected and adhered to their cultural beliefs and taboos and any intervention

intending to change their way of living was hardly accepted. People in rural areas, especially the older people, generally claim that modern religions are responsible for the weakening of cultural beliefs and taboos related to water source management. The intervention by the missionary is important in this respect because he integrated technical innovation with cultural beliefs while he maintained the fishes to protect the water quality. The key point is that not every intervention needs to change people's culture. In other words, the purpose of improving water quality and quantity can be achieved without necessarily changing people's culture.

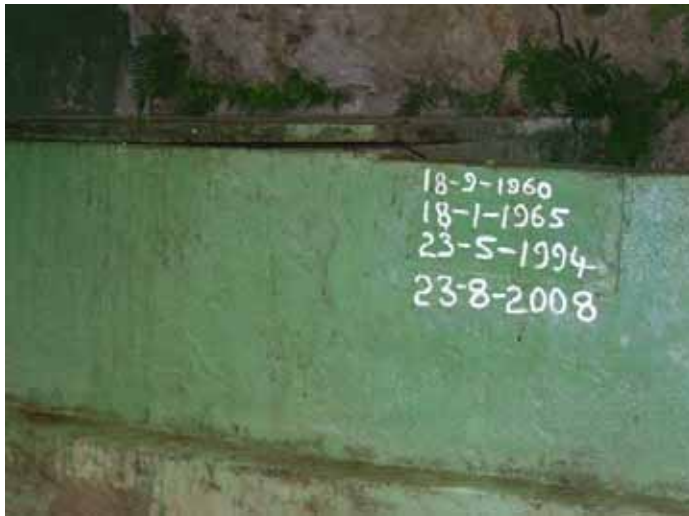


Photo 5.1 Modified Chemichemi water source, photo taken in 2008

Although in the Chemichemi case the church's intervention did not change the traditional practices of using water sources, local people generally consider religion to have an effect on traditional water management. The preaching and teachings by religious leaders play a significant role in changing peoples' culture and traditional practices, including beliefs and taboos related to the use and management of traditional water sources in micro spring forests. World religions as opposed to cultural beliefs and taboos promote the belief in one God. Christianity and Islam are very predominant in the study area and water users are the believers of either of the two. During my interviews with Reverend Bwire and Imam Abdallah, they both emphasized that cultural beliefs and taboos used in conserving water sources are against God's will, since they require water users to worship gods. The Christian (protestant) leader showed scriptures in the Bible including the Ten Commandments which strongly discourage people from worshiping other gods including animals, forests and stones (see Box 5.1). Likewise, the Imam showed several surahs, which strongly discourage people from worshiping other gods (see Box 5.2). We juxtapose them here:

Box 5.1 Bible scriptures cited by Reverend Bwire of African Inland Church, interviewed at the headquarter of Nansio Pastorate, Ukerewe (May 2007)

Exodus 20: Verses 1-6: The Ten Commandments

¹ “And God spoke all these words: ² I am the LORD your God, who brought you out of Egypt, out of the land of slavery. ³ You shall have no other gods before me. ⁴ You shall not make for yourself an idol in the form of anything in heaven above or on the earth beneath or in the waters below. ⁵ You shall not bow down to them or worship them; for I, the LORD your God, am a jealous God, punishing the children for the sin of the fathers to the third and fourth generation of those who hate me, ⁶ but showing love to a thousand (generations) of those who love me and keep my commandments”.

Roman 1: Verses 22-23: God's Wrath Against Mankind

²² “Although they claimed to be wise, they became fools ²³ and exchanged the glory of the immortal God for images made to look like mortal man and birds and animals and reptiles”.

Act 17: Verses 29-31

²⁹ “Therefore since we are God's offspring, we should not think that the divine being is like gold or silver or stone—an image made by man's design and skill. ³⁰ In the past God overlooked such ignorance, but now he commands all people everywhere to repent. ³¹ For he has set a day when he will judge the world with justice by the man he has appointed. He has given proof of this to all men by raising him from the dead”.

Box 5.2 Translations of Quran surah cited by Imam Abdallah Kazungu, interviewed at Mahande Village (May 2007)

Surah 112. Verses 1-4: The Unity, Sincerity, Oneness Of Allah

1. “Say: He is Allah, the One and Only; 2. Allah, the Eternal, Absolute; 3. He begetteth not, nor is He begotten; 4. And there is none like unto Him”.

Surah 72. Verses 1, 2 and 20: The Jinn, Sprites

1. “Say: It has been revealed to me that a company of Jinns listened (to the Quran). They said, ‘We have really heard a wonderful Recital’!”

2. “It gives guidance to the Right, and we have believed therein: we shall not join (in worship) any (gods) with our Lord”.

20. “Say: I do no more than invoke my Lord, and I join not with Him any (false god)”.

Surah 17. Verses 22-23: Isra', The Night Journey, Children of Israel

22. “Take not with Allah another object of worship; or thou (O man!) wilt sit in disgrace and destitution. 23. Thy Lord hath decreed that ye worship none but Him”.

During the interviews and group discussions, also ordinary villagers cited Christianity as one of the factors that contributed to some people questioning and disregarding the taboos and cultural beliefs guiding the use and management of water sources. In addition, villagers noted that traditional religions are recently disappearing due to the

mushrooming of many churches in rural areas, and which search for new believers. The village resource maps drawn by villagers showed the different churches and mosques found in their villages (see Appendix 3). The religious teaching and preaching against cultural beliefs are not only attracting younger generations, but also some older people who believe in different religions have started questioning and challenging these cultural beliefs as one of the interviewees explained:

“When I became a Christian and was baptized, I changed from believing in the cultural beliefs and became saved. One time I even killed a python, which according to Kerewe culture is a taboo, but nothing bad happened to me. You know, it is not true that the snake causes bad luck or bad things to you, but the people themselves who believe in these cultural beliefs find ways of causing bad things. When they have done bad things to you they start speculating in the village that bad things happening to you are because of the killing of the snake” (Mayemba Manyama, 82yrs; April 2007).

This study does not condemn the introduction of modern religions in the study area, but the interest is to see how religion causes changes of traditional management and how these changes impacts on the practices of using and managing water sources whether positively or negatively. The observations from the interviewees above showed that traditional managements of these water sources are facing a lot of challenges as the knowledge bases of the users are becoming more culturally heterogeneous. Some practices of using and managing these water sources have started changing, and this has implications on the existing institutions and the resources. However, the process of generating new practices of using and managing water sources depends on the role of individuals in the community who are actively involved in changing the rules of the game. Chapter 7 gives the current practices of villagers in using and managing water sources and how these practices have come into being.

The United Nations Children’s Fund (UNICEF) organization

External intervention on resource use and management in rural areas is not always initiated by external actors themselves. Sometimes community members play a great role in initiating or attracting external interventions regarding the use and management of natural resources, especially because the village communities are composed of people with different roles, knowledge, power and social networks. The case of Mr. Anselm, who influenced the modification of Anselm and Chemichemi water sources, is used here to elaborate the role of individuals in the community in attracting and initiating external intervention. Mr Anselm was a retired medical worker and a politician living in Busiri village where Anselm and Chemichemi water sources are found. He held different political positions at different periods and he managed to hold high positions as a member of national executive committee of Tanganyika National Union (TANU) political party and as a Vice Chairman of Murutunguru Ginnery Cooperative Union. His involvements in politics made him popular in the village and district as a whole. In 1965, Mr. Anselm requested the United Nations Children’s Fund (UNICEF) to modify Anselm and Chemichemi water

sources for improving water quality. UNICEF was involved in the construction of water wells in Ukerewe district, but Anselm and Chemichemi were not in their plan. Mr. Anselm was able to attract the attention of UNICEF in improving these water sources – which was the first improvement on the Anselm water source (Photo 5.2), while the Chemichemi water source underwent a second improvement after the one done by the missionary. The modification of the two water sources included the construction of water tanks and the fixing of water taps. Since Anselm himself owned the Anselm water source, UNICEF constructed more facilities at this water source, which included a trough for watering animals, bathrooms for men and women, and a shaded place to wash clothes.



Photo 5.2 Modified Anselm water source, photo taken in 2007

The intervention in both water sources changed some of the water use practices as well as introducing some new rules. Instead of water users drawing water from the well using a traditional gourd as a container, called *mtaho* (Photo 5.3), they started tapping the water directly from the water taps. Also, the users contributed some money to fix the broken-down taps. During his lifetime, Mr. Anselm used to strictly enforce the rules and regulations related to the use and management of the water source and he sustained the maintenance of water source facilities. When Mr. Anselm died in 1992, the supervision was gone and the water source started lacking proper maintenance, thus most of the introduced facilities collapsed. This implies that the facilities were working well because there was a committed and motivated person to enforce the rules and regulations. The introduced technical facilities for the Chemichemi water source continued to function for sometime only, and by the late 1970s the water tap and the tank were allegedly not working anymore because the water source users did not sustain their financial contributions for the repair and maintenance of the water tank and the water tap. People again started fetching water directly from the well using the *mtaho*. The two cases show that people in rural areas have developed their traditional management of water sources over a long time based on knowledge and values that are deeply embedded. These systems are often devised in a way that they can easily implement and control. These cases also show that

institutions are important for resource use, but their effective implementation and people's compliance depend on the social and symbolic capital of the owner or guardian of the water source. The introduction of new technologies that need to be monitored and controlled by rural people need to be well planned and tested over long time under local conditions prevailing in the villages in order to be easily adopted into the people's norms and daily practices.



Photo 5.3 *Mtaho*

The villagization programme

The interventions in the previous sections were implemented directly on water sources, which is not the case for villagization programme. The villagization programme was a nation wide programme which was carried out in Tanzania from 1974 to 1975 to resettle people into planned villages (see Chapter 4). The government envisaged that villagization could lead to more efficient and effective provision of social services in the planned villages than in scattered settlements. The services included schools, health care, water supply systems and communication networks. The programme did not implement any activities to improve or modify traditional water sources. Nevertheless, the resettlement of people had a negative impact on the use and management of water sources in terms of tenure rights of water sources and the number of water users. Mahande, Bwasa, Busiri and Bugula are villages where the six water sources surveyed by this study are located. These villages, like other villages in Ukerewe District, were also involved in the villagization programme. The four villages were registered as formal villages based on their old boundaries due to the fact that Ukerewe District by that time was already overpopulated. Unlike other districts of the country where population was low and settlements were very scattered, resettlements in the study area did not involve long distance replacement beyond 5km.

The villagization programme changed the ownership of traditional water sources. Before villagization, clan and family members mainly owned and used Nzuitaka, Tumbu, Kilombero, Chemichemi and Anselm water sources. But after villagization, these water sources became communal property. The reason behind this change is that villagization programme disrupted the clan settlements and different clans were mixed to form new village communities. Furthermore, the new settlements had very limited

sources of water to suffice the demands of the households now clustered together in the planned villages. The owner and users of the Migombani water source did not perceive any impact of the villagization programme because this water source was established after the villagization programme of the 1970s.

The villagization programme caused new water users to join traditional water sources and these differed among the cases. The resettlements during villagization programme caused some water source users to move away from their settlements close to the traditional water sources, while others remained in the same place. The new villages consisted of about 240 households concentrated in one area, which in most cases lacked enough water sources to support these households, and this caused people to move long distance to get to their old water sources to fetch water.

People who were using Nzuitaka and Tumbu water sources moved away from these water sources to the places where the planned settlements were located, while those who were using Kilombero, Chemichemi and Anselm water sources remained in their old settlements. The findings from the household survey also show that some households in Anselm (40%), Kilombero (40%), Chemichemi (33%), Tumbu (33%) and Nzuitaka (20%) water sources started using these water sources only during villagization programme. By comparing the cases, Anselm and Kilombero water sources had relatively more households that joined during villagization than other cases. This could be because people in these cases did not move away from their old settlements, but it does not mean that the people who moved away from their water sources abandoned their sources.

The Health through Sanitation and Water (HESAWA) Programme

The government and development agencies sometimes design and implement interventions targeting very big geographical areas and covering different sectors. In 1985, the Government of Tanzania, with the financial support from the Swedish International Development Agency (SIDA) set up a very big intervention programme called Health through Sanitation and Water (HESAWA). This programme covered the Mwanza, Kagera and Mara regions which border Lake Victoria. The overall aim of the programme was to improve the welfare of the rural people through improved health education, environmental sanitation, drinking water supply, community participation and capability and capacity building at village, ward, and district levels. To achieve this aim, HESAWA implemented its activities as a multi-sectoral programme in collaboration with four different ministries: the Ministry of Community Development, Women's Affairs and Children (MCDWC), the Ministry of Regional Administration and Local Government (MORALG), the Ministry of Health (MOH), and the Ministry of Water and Livestock Development (MOWLD).

The Ministry of Community Development, Women's Affairs and Children was the leading ministry for the administration and coordination of the HESAWA programme. However, the Government of Tanzania changed the leading ministry a few times during the programme's life from the Ministry of Water to the Prime

Minister's Office and eventually to MCDWC. The Central Government of Tanzania selected the ministries that took part in the implementation of HESAWA programme activities. The selected ministries were those directly related to the programme activities i.e. MOH and MOWLD. When the government introduced a more integrated approach of the programme, it selected the Ministry of Community Development, Women Affairs and Children to participate in the programme (Tufvesson, *et al.* 2005). MORALG was included because it coordinates and implements all developmental activities at local level and links the sectoral ministries with local governments. The involvement of the Departments of health, water and community development at the district level automatically align with the selected ministries. However, the District Education Department also participated in the programme because the programme involved the construction of primary schools latrines and rainwater harvesting tanks.

The programme involved the construction of latrines and rain water harvesting tanks at institutions like primary schools and dispensaries, as well as rain water harvesting tanks, shallow wells, and improvement of traditional water sources for the households. This study focuses only on the improvement of the traditional water sources as one of the activities of HESAWA.

The HESAWA programme strongly advocated and promoted the principles of community participation, gender awareness, self-reliance, credibility, sustainability, affordability, cost effectiveness and replicability as a means to bring about sustainability and success of programme activities (Mute, 1995). Community participation was envisaged in the sense that planning and decision making processes were bottom-up. Gender awareness was envisaged to promote the participation of women, youth and men in all the activities in order to mobilize all the available human resource for development activities. Self-reliance and ownership were emphasized so that the community would own the facilities and eventually take a full responsibility for their management, financing, operation and maintenance after the programme is phased out. Credibility was based on the idea that the beneficiaries would have to believe in the technology and become fully aware of their immediate and long term commitments before they choose to phase in. The programme required the community to discuss their ability and willingness to pay for the services over a longer period to realize sustainable development. The concept of affordability of the programme was important because the means of acquiring clean water and improving environmental sanitation must be financially affordable by the individual households or communities. Cost effectiveness focused on the choice of appropriate technology, methods to be used as well as operations and financial management. Finally, HESAWA as a concept should be replicable in other areas not reached by the programme. HESAWA assumed that the principles by themselves would lead to sustainable water use and success of the intervention, but it ignored - or was not interested in - the active role of the beneficiaries themselves in negotiating and transforming some of the project activities during the course of implementation. The

present research fills this gap, and shows the relationships of the improved traditional water sources in Ukerewe main Island (see Chapter 7).

The HESAWA programme operated in 62 villages, but for water supply activities it specifically covered 52 villages out of the 74 villages found in Ukerewe District. The programme modified 103 traditional water sources in Ukerewe main Island. External actors including workers from the District Council knew that villagers managed their traditional water sources based on local norms that prohibited external interventions. Therefore, before HESAWA modified the traditional water sources, the HESAWA promotion team consulted the villagers through meetings and explained the reasons for improving water sources. The team consisted of officers from the Departments of Water, Health, Education and Community Development of the Ukerewe District Council. During an interview, one of the members of HESAWA promotion team at the time reported that users of some water sources raised the concern of the effects associated with the modification of sacred water sources; one of it being drying up of the water. However, the reporter noted that the promotion team used some existing example of modified sources or scientific arguments to counter the cultural concerns of the villagers and to convince them to accept the programme. He emphasized that the meetings worked in the case of some water sources where the users could not defend their beliefs, but in some other cases, the meetings failed because there were some influential villagers who defended their beliefs regarding the taboo on touching the water source. This study at some of the sites corroborates his observation.

The HESAWA programme modified Tumbu, Kilombero, Chemichemi, Anselm and Migombani traditional water sources because the water users reached this consensus during the consultation meetings. The programme did not modify Nzuitaka water source because the water users and members of Bahira clan did not agree with the technical intervention on the basis that it was a violation of cultural beliefs and taboos, which could result into the drying up of their water source. The clan members, especially Mr. Zacharia Wanjura who is the guardian of this water source still feels that modification of traditional water source is going against the spirit of their ancestors.

In each village where the HESAWA programme operated, the villagers selected village ‘animators’ from among themselves by voting. The animators were responsible for the planning, promotion and maintenance at the user level; and every village selected one animator. The villagers selected influential people in the village or retired officials to be animator. This is because such people were usually rich, wise, respected and socially accepted by most villagers. During the interviews of this study, water users noted that HESAWA workers advised the villagers to select people of that type. Although this strategy can be a good one in creating legitimacy for changes introduced through external intervention, it can sometimes lead to elite capture (Platteau, 2004) and promote the adverse effect of more inequality in resource access and use.

At the site of each water source, for example at Tumbu, Kilombero, Chemichemi, Anselm and Migombani HESAWA established a well committee. These committees consisted of 12 members. The water users selected these members from among themselves by voting. The committee has a chairperson, a secretary and a treasurer. In addition, the committee members organized themselves into three sub-committees namely: finance and planning; security; and technical matters. Nzuitaka doesn't have a well committee because it was not involved in the intervention. In general, the process of decision making on modifying these water sources and selecting the leaders sounds rather formal because it involved meetings organized by the village government, but it was participatory in the sense that it involved water users during the planning phase. However, it did not always guarantee the success of the intervention. Villagers can participate very well during the planning process because external actors put much emphasis on the need to do so and even supervise their presence, but during the implementation people tend to negotiate and modify the activities planned earlier to suit their local situations. The practices described in Chapter 7 demonstrate this clearly.

The committee is responsible for organizing cleanliness, repair and safety of the water source facilities. The committee through the chairperson and secretary is required to organize meetings, make deliberations regarding the use and management of their water sources and supervise the implementation of different activities related to the management of the water sources. In addition, the committee is responsible for enforcing the rules guiding the use and management of these water sources. It carries out these activities by mobilizing water users to provide their labour and contribute money in case of buying industrial materials like cement and water tap or paying for the cost of hiring a technician. Members of the committee of each water source are supposed to serve for three years, after which the water users are supposed to select new members. The committee members work on voluntary basis; they do not get a salary or any payments from the water users or the district council for the time they spend on the organization. Therefore, whether or not a committee is active depends on the commitment and motivation of the leaders, especially the chairperson and the secretary. Moreover, the motivation to become a member of such a committee is not primarily financial, but lies more in the frequent technical support from the district council or the administrative support from the village government for private affairs.

It is now five years since the HESAWA programme was phased out. The current practices of committee members in organizing the water users to properly use and manage the water source depend on the incentives and motivation they get from both the water source users and the district council. During the interviews, water users told me that the well committees were indeed very active in organizing and supervising the implementation of water source use and management during the HESAWA implementation as the project leaders motivated the committee members by organizing trainings and frequently visiting them.

The implementation of HESAWA programme was based on four different phases. These phases based on the levels of the involvement of the district council and the number of villages involved in the programme (Salumu, 2002). The phases included:

- Phase I (financial years 1985/86 to 1989/90): an experimental phase with heavy inputs from external consultants;
- Phase II (financial years 1990/91 to 1993/94): more involvement of district authorities in the programme management and implementation, while expatriate and local consultants played a more advisory role;
- Phase III (financial years 1994/95 to 1997/98): aimed at full decentralization and expansion of the programme activities to all districts;
- Phase IV (financial years 1998/99 to 2001/2002): the last phase focusing on consolidation and sustainability of the services and facilities established by the HESAWA programme.

The aim of these four phases was to build the capacity of both district council and water users by learning from the experiences of the past phases and which could help in changing people's behaviour and attitudes of their traditional practices in the use and management of water sources. The five water sources included in this study have featured in different phases of programme implementation (Table 5.4).

Table 5.4 The year of intervention by HESAWA programme in study cases

| Name of water source | Year of intervention | Implementation phase of HESAWA programme |
|----------------------|----------------------|---|
| Nzuitaka | Not involved | |
| Tumbu | 1990 | Phase I – Experimental |
| Kilombero | 1994 | Phase II - More involvement of district authorities |
| Chemichemi | 1994 | Phase II - More involvement of district authorities |
| Anselm | 1994 | Phase II - More involvement of district authorities |
| Migombani | 2000 | Phase IV - Consolidation and sustainability |

Source: Field data 2007

Tumbu, Kilombero, Chemichemi and Anselm received more attention and enjoyed closer supervision from the programme because the phases involved experimentation and more involvement of the Ukerewe District Council. Migombani became part of the programme only during the last phase, so it might have received less attention from the programme and the District Council because HESAWA was preparing to phase out and hand over the programme activities to the district council. On the other hand, Migombani probably enjoyed less interference from the programme workers and district council officials, and got better opportunity to learn from previous phases.

The HESAWA programme modified the traditional water sources to improve water quality and quantity. This involved covering water sources with construction of water storage tanks and fixing water taps (Photo 5.4). The intervention promoted membership of water users for each of the water sources and initiated fencing of water sources to control the time of water fetching and exclude non-members (Photo 5.4). The modifications of water sources were based on cost sharing between the programme and water source users. The programme covered the costs related to purchases and transportation of industrial materials like cements, iron bars, wire mesh, water pipes and water taps. Water users contributed labour and construction materials, which were locally available like sand and gravel.



Cemented Kilombero water source, photo taken in 2006



Chemichemi water tank, photo taken in 2006



Migombani water tap, photo taken in 2006



Fenced Migombani water source, photo taken in 2006

Photo 5.4 Traditional water sources modified during HESAWA programme

Rural development agents consider privatization of common pool resources as the best option to ensure sustainability of the resource. HESAWA programme introduced the idea of Water User Groups based on membership to ensure that a group of people collectively owning the water source would reduce the problem of free riders.

Therefore, the status of Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources was changed from communal property to the property of formal Water User Groups. The users groups had the responsibility of maintaining and controlling the use of the water sources. The water users acquired membership of a particular water source after participating in the improvement of that water source by contributing labour and materials. The water users who did not participate or those who came to the village after the improvement of these water sources had to contribute a membership fee, which ranged from TSh 200 to 2,000². The membership fee varied among water sources because it depended on the real costs involved in that particular water source, the year of intervention and the year someone became a member. During interviews water users noted that not all people in the village managed to meet the requirements of becoming a member. The villagers who failed to contribute the fee shifted to other water sources which had not been involved in the HESAWA programme, and whose use was not based on membership. Some failed to become members because they had no money to contribute, but others were not interested in using their time and labour in collective action. The decision taken by individuals to participate or not to participate depends very much on the availability of alternative water sources. An interesting phenomenon is the fencing structures found around the water sources. As a physical barrier they are not always very strong but Water User Groups see them primarily as symbolic fences to exclude non-members.

Often, external intervention to formalize traditional management of natural resources involves documentation of rules and regulations. The HESAWA programme formalized the rules and regulations guiding the use and management of water sources by putting them on paper, and the secretary of the well committee keeps them for references. The Water User Groups formulated the rules with the supported from the HESAWA programme workers (Table 5.5). The groups adopted most of the rules from traditional management and the group added new rules, which focused on fines and financial contributions. However, issues related to taboos and cultural beliefs, and potential conflicts were not included in these formal rules. The same implementer of the HESAWA programme facilitated the process of formulating these rules in different places of Ukerewe main Island, hence the documented rules are similar in all five cases of Tumbu, Kilombero, Chemichemi, Anselm and Migombani. In addition, since the idea was to formalize these water sources to make them easy to monitor administratively by Ukerewe District Council through enacted by-laws, it was convenient to have a simplified and homogenized set of rules (Scott, 1998).

² Equivalence: \$ 0.20 to 1.70

Table 5.5 The HESAWA rules to guide the use and management of water sources

| SN | Rules | Objective of implementation |
|----|---|--|
| 1 | Teeth brushing near a water source prohibited | To control water quality by reducing contamination |
| 2 | To fetch water bare footed | To control water quality by reducing contamination |
| 3 | Cleaning utensils at water source prohibited | To control water quality by reducing contamination |
| 4 | Washing clothes near a water source prohibited | To control water quality by reducing contamination |
| 5 | Bathing near a water source prohibited | To control water quality by reducing contamination |
| 6 | Animal grazing near a water source prohibited | To control water quality by reducing contamination |
| 7 | Children under 10 year not allowed to enter the water source | To control water quality by reducing contamination and reduce destruction of water taps |
| 8 | Tree cutting in micro spring forest prohibited | To control water source by reducing soil erosion and water evaporation |
| 9 | Membership by fee contribution | To create sense of ownership and get money to cover for maintenance of broken down water taps, tank and other facilities |
| 10 | Water fetching allowed only during the scheduled time | To control free riders |
| 11 | The water source guard to be paid through monthly contributions from water users | To control free riders, destruction and theft of water source facilities |
| 12 | Cleaning of water well to be done by all users | To create sense of collective responsibilities |
| 13 | Water users to contribute money for replacing old facility e.g. water tap | To ensure proper functioning of the water source facilities |
| 14 | Water fetching by queuing | To control conflict among water users |
| 15 | Individuals destroying any facility are required to pay money or fix a new facility | To ensure proper use of water source facilities |
| 16 | Violators of the rules to pay fines within a specified period | To punish violators of the water source rules |
| 17 | Non compliant member to be suspended or terminated from membership | To punish non compliant and control free riders |

Knowledge and the transfer of knowledge about rules related to natural resource management vary between villagers and between the external actors who are involved in the projects and programmes for development. People in the rural areas often memorise their knowledge and transfer knowledge through storytelling to a specified audience. Scientists and professionals acquire public knowledge, and this knowledge is transferred primarily through documentation on paper and storage in computer databases. Among the five cases of HESAWA programme intervention, the secretary of Chemichemi is the only person who reproduced the rules of using and managing the water source written on paper, while the secretaries of Tumbu, Kilombero, Anselm and Migombani did not produce the written rules, but they memorised them nevertheless. This implies that formally written records of the rules guiding the use and management of water sources are in many cases not practical for people in the rural areas.

The rules for managing water sources focus on controlling water quality, emphasizing on ownership and responsibilities among water users, maintaining water source facilities, resolving conflict, punishing the violators and controlling free riders. The achievements of these rules depend on how the well committees enforce these rules and sanctions. Specifications of fines for different violation of rules vary between water sources and within the water sources, depending of course on the nature of violation. The fines were not introduced only to punish violators, but they were also

meant to build up the financial capacities of the users groups so that the money could be used to repair and replace the broken down water taps. In practice, the implementation of fines to violators of the rules is a challenging task because there are no full time water source guards or strong fences to prevent free riders in Tumbu, Kilombero, Anselm and Migombani. Currently it is possible only for Chemichemi to administer the fines and other sanctions because this is the only site which has a water source guard and a strong fence which help in controlling the access and monitoring of time for people to fetch water. However, enforcement of the rules and payments of fines still depends on the commitment of the well committee and the water source guard (see Chapter 7).

Each Water User Group was supposed to open a bank account for the well committee to deposit the money collected from fines and membership fees. However, the process of opening and managing bank accounts for Water User Groups in rural areas is difficult because it needs frequent travelling to the capital of the district where the banks are located. This needs money to cover the costs for transport and trust on well committee members involved in banking transactions. Also, sometimes it is difficult to collect the money through contributions and fines from the users, and certainly money collected does not cover the costs of opening and using a bank account in town. When there is too much formalization of resource management, the village community may fail to implement it, not because of a lack of will, but because the traditional ways of organising people's adherence to rules does not involve many transaction costs.

Traditional management of natural resources is often organized around the natural setting of the resource and any modification of the settings may lead to changes in the practices of resource users. The water source users in the study area attribute the sustainability of water sources to the presence of the black snake (*Njubi*) as well as fishes and trees found in or around the water sources. When HESAWA modified Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources their actions led to the disruption of some of the traditional practices and beliefs. For example, water users stopped using *mtaho* (traditional containers) to draw some water from the well due to the presence of the water tap. In addition, the water users especially the young generation of both men and women started questioning the validity of the belief that the removal of *ngugu* (well fishes) could lead to the drying up of the water source. Because during the construction of the water tank around the water source, the technician removed the fishes from the well and covered the water source with cemented concrete and nothing happened afterwards. Often in rural areas, people tend to believe and are scared of mysterious things around the water source and the micro-spring forest; both of these aspects have indeed been a strategic weapon for the conservation of the threatened resources. However, during interviews older people still argued that violations of such cultural beliefs have led to the current water shortages in these water sources.

The cultural beliefs and taboos function when there are mechanisms to reinforcing them. The community elders have been very important in enforcing rules, taboos and cultural beliefs. Nevertheless, after the well committee replaced these elders during the implementation of the HESAWA intervention, the role of community elders in the water source management had become redundant. The enforcement of rules by community elders did not require any payment as a reward or salary, as long as they were paid due respect by the community. Any person in rural areas who is recognized by the village community as a community elder feels honoured and high respect these elders received was by itself enough motivation. This performance contrasts with the formal structures of the well committee, whose members nowadays demand tangible incentives to participate in the implementation of village or communal activities.

Furthermore, the comparison of the rules, cultural beliefs and taboos under traditional management in Table 5.3 and rules under formal group management in Table 5.5 clearly shows that cultural beliefs and taboos are not anymore included in the latter. The HESAWA intervention in fact reduced and made redundant the role of community elders and traditional management. The question is whether the Water User Group as a replacement can acquire the necessary symbolic capital. This issue of trust or legitimacy has implications even on the sustainability of the HESAWA intervention itself because the programme has established institutional structures that take a long time before they are embedded in local situations. In addition, the local autonomy and control of the resource users is no longer a given one and more external monitoring and institutional enforcement of rules is now becoming inevitable. Chapter 7 discusses some of these challenges.

Ukerewe District Council' administrative formalization of HESAWA programme activities

The sustainability of development intervention activities after the programme or project phased out has been a concern of many national and international sponsors. Development interventions work within a specified period of time and phase out when that planned period is completed. To challenge this format the HESAWA programme was designed in a way that when it phases out, its activities would be handed over to the Ukerewe District Council. When the period of the programme was coming to an end, the district council formally committed itself to providing financial and technical support to the programme activities after phasing out. In June 2002 the HESAWA programme phased out. After the transfer, the District Council distributed the programme activities to different departments according to their specialization.

The Department of Water was given the mandate of monitoring the progress of all the constructed shallow wells in the rural areas and to construct new wells. The Department of Health was given the mandate of creating awareness among the rural people on sanitation and hygiene related to water use. The Department of Community Development was given the responsibility of continuing to coordinate and supervise the modification and maintenance of traditional water sources. From this allocation of duties to different departments it becomes apparent that the traditional water sources

were given special attention by removing their management from the Department of Water to the Department of Community Development. In other words, rural development gained priority over a sectoral approach to fresh water sources in a micro forest environment.

Furthermore, it was observed that while all the other departments were allocated with funds from the central government to implement field activities including those of HESAWA, the Department of Community Development had no such allocation of funds although it is responsible for mobilizing people at community level to participate in development activities supervised by other departments like water, health and education. These departments should in fact cover the costs for the staff of the Department of Community Development to mobilize people in rural areas. Lack of autonomous funds has constrained the Department of Community Development in supporting and monitoring HESAWA activities. This in fact is the danger of formalizing traditional management of water by creating Water User Groups and well committees and nesting them to district council which has formal hierarchical structures. Formal institutions often need frequent support and monitoring from the higher structure and short of which it may result into inefficiency of these institutions.

The HESAWA programme strongly emphasized the establishment of Water User Groups as operators of the water source facilities. WUGs were also envisaged to shoulder the responsibility of sufficient cost recovery to ensure adequate maintenance of the facilities in the future. The functions of WUGs to be legally recognized need to be backed legislatively. In that respect in 2005 Ukerewe District Council embarked on a process of enacting by-laws for conserving water sources and environmental sanitation. The district council prepared the bill which underwent all the processes beginning from the community who made their recommendations which were sent to the councillors' assembly for approval. The bill now sits at the office of the Minister for Regional Administration and Local Government (PMO - RALG) in the Prime Minister's office awaiting signature. The by-laws have not been effected until 2010 because the bill had not been signed. However, the bill does not recognize the role of cultural beliefs and taboos in managing water sources. Because this process is about formalizing the rights and practices to make the bill become legally binding, ignoring the values and meaning attached by villagers to these beliefs and taboos will make the outcomes of the interventions more uncertain (Gelcich *et. al.* 2006). Village communities and their local knowledge are very effective in solving local problems in resource use and management among themselves. However, external planners often ignore this during the process of developing and managing land and water resources plans (Kauzeni and Madulu, 2001). In other words, co-management fails not because of a lack of organization of village communities, but because of a lack of government recognition of the communities' capacity and capability and a lack of funds at local government level. Community based management of natural resources should be based on local people's knowledge; and the external interventions should not replace the rights of local people in making decisions that affect local people's culture and livelihoods (Yaofeng *et al.*, 2009).

Uhuru Torch Race

Unlike the HESAWA intervention that covered the five cases of water sources, the Uhuru Torch Race intervention only included Chemichemi. The Uhuru Torch is one of the national symbols of Tanzania for independence; it is a kerosene torch that symbolizes freedom and light. Lieutenant Alexander Nyirenda of Tanzania People's Defence Force Army first lighted the torch on the top of Mount Kilimanjaro in December 9, 1961. Symbolically to enlighten the country and across the borders to bring hope where there is despair, love where there is enmity and respect where there is hatred. The Uhuru Torch Race takes place every year and reaches different places of the country with a special message. The idea of the Uhuru Torch is to create awareness among the citizens about key issues related to development, peace, unity and the role of individuals in addressing these key issues. The race also challenges the district councils all over the country to identify and implement different development projects, which the leader of the race then launches or inaugurates.

In 2008, the Uhuru Torch Race carried a message on participation of village communities in conserving water sources. To mark the race in August 2008 in Ukerewe District, the District Council supported the rehabilitation of Chemichemi water source facilities. The intervention involved the rehabilitation of the leaking water tank, broken down water taps and fencing the water well (Photo 5.5). The support from the District Council included the provision of industrial materials such as cement, water taps and fencing wire mesh. The water users contributed labour by bringing sand, gravel and assisting the technician during the construction. The reason why Chemichemi was selected for this intervention could be due to the fact that it is strategically located close to the main road, and it produces enough water throughout the year. The Uhuru Torch introduced no new rules but it revived the ones introduced during the HESAWA programme. A good example, was the reintroduction of the water source guard to control the time for opening and closing of the gate of the water source and the users' monthly financial contribution to pay the guard and maintain the water source. The water source users selected the guard among themselves by voting and the guard is supposed to serve for one year before another person is selected.



Photo 5.5 Rehabilitated Chemichemi water source by Uhuru Torch Race, photo taken in 2008

5.3 Physical characteristics of today's water sources

A description of the physical characteristics of the water sources are very important because they give the real picture of how they were modified by external intervention. Today's physical characteristics of each water source have been a result of the number and quality of interventions on that particular water source and how the water source users have organized themselves to maintain it. The physical characteristics discussed in this section include the configuration of water sources, water quality, and water quantity and seasonality. The next sub-sections present the details of these characteristics of water sources.

Configuration and features of water sources

The configuration of the water source determines the amount and quality of water produced, including the terrain, types of rocks found around the water source, sacred organisms in the water, and the physical or material structures of water sources. All six cases discussed here are natural springs that are part of an underground watershed. They are created when ground water naturally flows to the surface. Nzuitaka, Chemichemi and Migombani are located on a steep terrain while Tumbu, Kilombero and Anselm are located on a gentle terrain. This can have implications on the amount of water produced by the spring and water pollution through water runoff. All the water sources except Anselm and Migombani have seasonal water streams that are used for irrigation. The largely extended and protruding chalk rocks in the uplands of the Nzuitaka and Chemichemi water source provide special features that protect these water sources from soil siltation and water contamination through rain water runoff (Photo 5.5). Also, the chalk rocks act as water filter and reservoir, regulating the amount of water supplied to the well. *Ngugu* (small well fishes) and bees were found in Nzuitaka water source while *njubi* (big black water snake) was seen in the Migombani well when the researcher opened the water tank. These living creatures are considered sacred by the villagers and they are very important in protecting the water sources.



Photo 5.6 Protruding chalk rock at Nzuitaka water source, photo taken in 207

Tumbu, Kilombero, Chemichemi, Anselm and Migombani have storage water tanks and water taps that were constructed during the technological interventions. Water tanks and taps help to control water loss, especially during water shortages in the dry season. Tumbu, Kilombero, Anselm and Migombani wells are completely cemented on all sides and covered with a lid on top while the Chemichemi well is only cemented on the side where there are no spring water channels. If the cementing of the water source is not properly done this may interfere with the water channels leading to a less production of water by the spring. Table 5.6 shows examples of the present conditions of water tanks, water taps and water pipes of water sources that were observe during the field research.

Table 5.6 Status of water tap, tank and pipe in different water sources

| Name of water source | Water tap | Tank | Status of water pipe |
|----------------------|------------------------------|--|--|
| Tumbu | Total block due to siltation | Working | Total block due to siltation |
| Kilombero | Not working | Not working | Working |
| Chemichemi | Working | Working | Working |
| Anselm | Working | Working but with some leakage of water | Working but with some leakage of water |
| Migombani | Working | Working | Working |

All the facilities in Chemichemi are working properly because they were well maintained in 2008 during the Uhuru Torch Race, as already discussed in the previous section. Migombani water source has all its facilities working properly. Tumbu, Kilombero and Anselm have some facilities not working due to a lack of maintenance by water users. Nzuitaka has no water tank nor a tap because it was not involved in any technological intervention.

Water quality according to local knowledge and institutional qualification

Water quality is an important factor used by households to make choices on water sources for different domestic uses. To determine this quality requires someone to have some knowledge or predetermined standards. The formal standards may differ from those identified by the water source users who have their own ways of judging whether or not the water source produces good quality water. The water users identify several criteria for judging the water quality including: colour, taste, smell; water flow; cleanliness of the water source surroundings; presence of worms and larvae in the water; underground water source; and covered water source.

The results of judgements of the water quality in the cases studied here show that the most important criteria in determining water quality in all the cases are smell, flow, taste, and colour of the water (Table 5.7).

Table 5.7 Ranking of water quality criteria

| Name of water source | Ranking of the criteria | | | | | | | |
|----------------------|-------------------------|-------------|--|------------|-------------|------------------------------|-------------------|----------------|
| | Water colour | Water taste | Cleaniness of water source surrounding | Water flow | Water smell | Presence of worms and larvae | Underground water | Covered source |
| Nzuitaka | 3 | 3 | | 2 | 1 | | | |
| Tumbu | 4 | 3 | | 1 | 2 | | | |
| Kilombero | 5 | 4 | 1 | 2 | 3 | | | |
| Chemichemi | 4 | 3 | | 2 | 1 | | 3 | 4 |
| Anselm | 3 | 3 | | 2 | 1 | 2 | | |
| Migombani | 4 | 3 | | 2 | 1 | 5 | | |

Note: 1=Highest; 5=Lowest

Source: Field data 2007.

In terms of their importance smell, flow and taste of the water were ranked either first or second or third by the water users in the six cases of water sources. Thus, these criteria are very important and are given high priority as compared to other criteria. Water smell is considered to be very important because the drinking water needs to be stored in *ensuha* (clay pot container for storing drinking water) for cooling before it is drunk and it takes two to three days before all the water in an *ensuha* has been used. Therefore, a good water source is one that produces water which can be stored for a long time without smelling. Also, the water users considered the underground water flow safe because the tank or well always refills itself with good quality (that is, not brackish) water. Brackish water is considered to be bad because it makes ones' teeth brown, it consumes a lot of soap during washing of clothes, and it tastes bad, especially in sweet food or drinks like tea. Water users claim that their traditional water sources in micro spring forests provide water that meets most of the criteria in comparison to the alternative water sources like Lake Victoria, shallow wells constructed by the HESAWA programme or shallow wells constructed by households.

The different departments of Ukerewe district dealing with water supply and hygiene address the issue of water quality differently. The Water Department is charged with the responsibility of supplying water to the people for domestic use. They mainly deal with pipe water and shallow wells. According to the District Water Engineer, before supplying water to the people from a new water supply system, they conduct a chemical analysis of water to determine its quality. The essential characteristics analysed include colour, odour, turbidity, pH, total hardness, iron and chlorides. The Health Department is charged with the responsibility among others, of coordinating all issues related to health education and the cleanliness of the general environment of public water sources. This department deals with the treatment of the water source for domestic uses especially those not under the department of water. According to the District Health Officer, the department is involved in testing water quality by conducting bacteriological analysis of water sources for public use. The analysis is not done regularly in all water sources due to financial constraints, but it is done when there is a crisis, like an outbreak of water borne diseases. This analysis focuses on pathogens, non-pathogens or thermophylic micro-organisms. In addition, the Department of Health was involved in testing water quality during the construction of

shallow wells and improvement of traditional water sources during HESAWA programme.

The accounts given by water source users, and by the water engineer and the health officer indicate that they define water quality differently based on different criteria. Domestic water users are primarily concerned with colour, taste, smell and safety to family health. These water users apply their experience and indigenous knowledge in determining water quality. Health people are concerned with the purity of water as it relates to bacteria and other organisms related to disease outbreak and they use laboratories to test water purity. Water engineers are concerned with the purity of water as it relates to cost of soap, detergents, corrosion, softening, or other treatments required for improving the water quality. These engineers also use laboratories to assert these qualities. External interventionists need to understand this differentiation in knowledge and perceptions in determining water quality between water users and professionals before implementing any development intervention on traditional water sources in order to design a project that can be accepted and sustained by the water users in rural areas.

Water quantity and seasonality

Discussion on water quantity and seasonality in traditional water sources gives an insight on the capacity of water sources and the possibility for water shortage. The amount of water produced by water sources in the micro spring forests depends on the storage capacity of the water tank and the rate of water flow. The water sources in micro spring forests are part of the underground watersheds that are located either very far away or close to the water source. Therefore, the amount of water stored in the water tank or the rate of water flow depends on the nature and capacity of the underground watersheds. As this study focuses on the water source and not on the whole system of the underground water, this aspect was not examined any further.

The size of the water tanks reflects the maximum amount of water that can be stored by a certain water source. Table 5.8 gives the carrying capacities of water tanks and the rates of flow for the different water sources during the seasons. The water tank of Tumbu water source has the highest carrying capacity of 1,142 litres while that of Migombani has the lowest carrying capacity of 301 litres. The sizes of the water tanks constructed in different water sources were determined by the condition of the terrain around the water sources. The water source located on a steep slope provides a big height difference between the water tank and the water source or the tapping point, which determines the depth of the water tank and the size of the tank.

Table 5.8 Water quantity in the tanks and the rates of water flow during the rain and dry seasons

| Name of micro spring forest | Capacity of water tanks (Litres) | Amount of water in the storage tank (Litres) | | Rate of water flow (Litre/second) | |
|-----------------------------|----------------------------------|--|-------------------------------|-------------------------------------|-------------------------------|
| | | Peak long rains season (April 2007) | Peak dry season (August 2007) | Peak long rains season (April 2007) | Peak dry season (August 2007) |
| Nzuitaka | NIL | NIL | NIL | 2 | 1 |
| Tumbu | 1,142 | 1,142 | 400 | No water tap | No water tap |
| Kilombero | 1,130 | 0 | 0 | No water tap | No water tap |
| Chemichemi | 402 | 402 | 100 | 1.25 | 0.5 |
| Anselm | 471 | 230 | 30 | 0.2 | 0.03 |
| Migombani | 301 | 260 | 50 | 0.3 | 0.03 |

Source: Field data, 2007; See the method of measuring the amount and rate in Chapter 2.

In addition, the amount of water stored in the tank or produced by the spring depends on the season of the year and the functioning of the installed facilities. This amount of water can be measured in terms of either the capacities of the water tanks or the rates of water flow. The water sources produce more water during rainy season, which is from September to December (short rains), and from February to May (long rains) but during the dry season, especially in August there is always a water shortage. However, the data collected in April 2007 during the rainy season show that only the storage water tanks for Tumbu (1,142 litres) and Chemichemi (402 litres) water source were filled to their full capacity and were even overflowing, while water tanks for Migombani and Anselm did not reach full capacity (Table 5.8). Migombani recorded 260 litres, which is less than its full capacity (301 litres) during long rains because the water tap was stolen and there was no control of the water flow. Anselm recorded 230 litres, which is also less than its full capacity (471 litres) during long rains because it lacked the proper maintenance of the spring and which caused the blocking of the spring water channels by tree roots and mud. The data collected in August 2007 during the dry season show that Tumbu recorded 400 litres, which is more than one third of its water tank capacity; Chemichemi recorded 100 litres, which is quarter of its water tank capacity; Anselm recorded 30 litres and Migombani recorded 50 litres, which is less than a quarter of their water tank capacities in both cases. The data are consistent with villagers' experience that there is a serious water shortage during the dry season.

By using the rate of water flow as the proxy to estimate water quantity produced by water sources, the findings show that during rainy season Nzuitaka produces 2 litres per second which is higher than the other water sources including Chemichemi (1.25litres/second), Migombani (0.3litres/second) and Anselm (0.2 litres/second) (Table 5.8). Comparing the amount of water available in the water source during dry and rainy seasons, the cases show big differences. The data show that during the dry season the amount of water produced by Nzuitaka drops to half (1 litres/second) as compared to the rainy season, while for Chemichemi it is reduced by more than a half (0.5 litres/second) and for Anselm and Migombani their flows are reduced even by

more than 85% that is 0.03 litres/second and 0.03 litres/second respectively. Kilombero water tank does not store any water because the tank is leaking due to lack of maintenance and the water users have made no any efforts to repair it. Water users have to fetch water from a small pond beside the tank; thus estimating the rate of water flow in this water source was not possible (Photo 5.6).



Photo 5.7 People fetching water at Kilombero water source, photo taken in 2007

The results in Table 5.8 show that there is water shortage during dry season in all cases and it is more serious in Anselm and Migombani. If the storage water tanks would be better maintained, the waste of water through leakage could be reduced because water would be allowed to accumulate during the time of low demand of water like in the night and in the middle of the day, and the saved water could be available in the subsequent time of high demand of water such as in the morning and evening. Also, the differences in water levels or the rates of flow in the six cases indicate the manner in which the underground watersheds for these water sources vary in terms of the amount of water captured, infiltrated and released to springs and how the different management practices can contribute to improvement of water availability. Nzuitaka and Chemichemi water sources have shown to have more water in both seasons as compared to Anselm, Migombani and Tumbu water sources. This could be due to their location on steep slopes, the presence of chalk rock and the lack or minimum interference of spring water channels during technological intervention (see the previous section). Although it was not easy to estimate the rate of flow or the amount of water for Kilombero, the water users during the interviews reported that their water source produces water throughout the year. However, they acknowledged of there being the decline of water availability during the dry season.

Despite the differences in water availability during rainy and dry seasons, the water users acknowledge that their water sources are producing less water as compared to the 1970s. The water sources produced a lot of water with permanent water flow downstream. Because of the changes in the rainfall pattern and frequent severe

droughts experienced nowadays, water shortage has become common. The villagers have different perceptions about these changes. Some associate it with the violation of taboos and cultural beliefs while others associate it with climate changes. Nevertheless, the issue of climate change is becoming more pertinent to most of the villagers due to the current awareness created among the local people about climate change, deforestation and the need for communities to participate in conserving the environment and sustainable use of the natural resources.

The amount of water in the storage tank and the rate of flow for both seasons determine how much water is available for human consumption at a particular time, and the time somebody has to spend to fill the container. When water is not enough they spend more time filling in their buckets or jerrycans, creating the potential for conflict among them. This scenario requires a mechanism to deal with the anticipated conflicts. The implication of this situation on the amount of water produced by these water sources and the everyday practices of water use are further discussed in Chapter 7.

5.4 Summary

The six water sources have undergone different trajectories of management development. Chemichemi and Anselm water sources have received much attention from external actors as compared to Nzuitaka, Tumbu, Kilombero and Migombani water sources. Nevertheless, this attention from external actors has not helped Chemichemi and Anselm water users to achieve more sustainable management of their water sources than did the other sources. All external interventions except villagization addressed water quality and controlled the wastage of water through free flow, but they did not focus on forest management. The villagization programme, HESAWA programmes and Ukerewe District Council are the only interventions changed tenure rights and introduced new rules and organization structures for managing water sources. Despite that the villagers accepted the modification of their water sources in Tumbu, Kilombero, Chemichemi, Anselm and Migombani cases, the water users still have mixed feelings about cultural beliefs on traditional water sources management. Old people unlike the young generation still believe that the modifications made by HESAWA on traditional water sources have caused a decline in water availability because of the violation of cultural beliefs. Therefore, retaining traditional status of water source against external interventions as was the case for Nzuitaka depends very much on who defends these interests and under what legitimacy. The external interventions tend to assume that by having well defined Water User Groups, water committee nested to the District Council institutions and monitoring of water users behaviour through documented rules could lead to effective management of the modified water wells. But this has not been the case. The interventions have changed the physical characteristics of water sources and social institutions in the management of traditional water sources. These changes have had an influence on the practices of water users in managing these water sources (see

Chapter 7). However, the practices between the cases can vary depending on the manner in which individuals adapt or transform these external interventions.

Chapter 6

DYNAMICS IN VEGETATION MANAGEMENT AND THE PRESENT CONDITION OF MICRO SPRING FORESTS

6.1 Overview

This chapter consists of four sections. The first section describes the historical changes in forest ownership and forest vegetation condition. The historical changes in forest ownership are described in relation to different external interventions that caused the changes. The changes in forest vegetation condition concern the local people's perceptions of these dynamics and the major drivers of change. The second section discusses the dynamics in forest management in respect to the regulations and practices of using and managing micro spring forests. This analysis also focuses on the question, of whether similar or different institutions were involved in the management of forest and water sources. The third section analyses the present forest condition with a special attention on tree species composition and stand characteristics. The fourth section presents a further discussion on the various findings. It focuses on the question of how the different types of interventions in the management of micro spring forests relate to those of water source management, how they affect each other, and what the implication is for resource sustainability.

6.2 Changes in micro spring forest ownership and forest vegetation condition

Changes in micro spring forest ownership

Forest ownership determines who uses what forest products, when, under what condition and who is responsible for managing the resource. Inevitably, differences and changes in forest ownership often have an important impact on the resource use and conditions.

In traditional management, either the clan or individual who owned the land or discovered the water source also owned the forest growing on the lands surrounding the water source (Table 6.1).

Table 6.1 Ownership of forests during traditional management

| Name of micro spring forests | The owners of water sources | The owners of forests |
|------------------------------|--|--|
| Nzuitaka | Bahira clan (Mr. Wanjura) and Wasilanga clan (Mr. Msaku) | Bahira clan (Mr. Wanjura) and Wasilanga clan (Mr. Msaku) |
| Tumbu | Mr. Tumbu family | Mr. Tumbu family |
| Kilombero | Basingo clan (Mr. Mwizarubi) | Basingo clan (Mr. Mwizarubi) |
| Chemichemi | Balinda clan (Mr. Mageta) | Balinda clan (Mr. Mageta) |
| Anselm | Mr. Petro family (Petro is father of Mr. Anselm) | Mr. Petro family (Petro is father of Mr. Anselm) |
| Migombani | Community | Mr. Chingulu Chibi family |

The six cases of micro spring forests have shown three categories of forest ownership including family, clan and communal. The management practices of forest varied between the ownership categories because decision making processes in the family, the clan or communal resources also do vary. The transfer of forest lands under family and clan ownership based on the traditional inheritance systems. In the case of individually owned lands, the Kerewe people follow a patriarchal system whereby the first son has the right to inherit the family forest land. For example, the Anselm water source is named after Mr. Anselm, who as the elder son inherited the forest land and the water source in 1948 from his father Mr. Petro. But in the other cases, the water sources were a clan property. To ensure security of land and forest under clan ownership, the clan members gave the headman of the clan the mandate to control the forest land on their behalf. For example, Nzuitaka, Kilombero and Chemichemi were owned by individuals who represented their clans. In such cases, the enforcement of the rules and taboos for using and maintaining the forest lands depended on the personality of that particular person and the support he/she gets from clan members. In the case of the Nzuitaka water source, the forest land is owned by two clans, because the water source is located on the boundary of the two lands owned by these clans. Formally, only the Bahira clan owned Nzuitaka water source. Consequently, the labour that this clan invested in the maintenance of the water source was an important claim to legitimize the ownership of the forest land.

The traditional system of forest ownership has gradually changed due to a variety of external interventions in respect to the management of the water sources. As described in Chapter 5, these external interventions concerned development programmes of the church, the United Nations Children's Fund (UNICEF), the Health through Sanitation and Water (HESAWA) programme, and the Uhuru Torch Race, as well as the impacts of the villagization programme and District Council administrative formalization programme.

The interventions by the church, UNICEF, HESAWA, Ukerewe District Council and UHURU Torch Race worked directly on water source rather than on forests due to the fact that water management were their priority. The villagization programme was a nation wide intervention to resettle people in the planned villages and it focused neither on water sources nor on forests, but it had effect on forest ownership. Despite all these interventions, only villagization and HESAWA programmes had an effect on the changes of forest ownership.

The resettlements of villagers during villagization programme from 1974 to 1975 had different impact on the ownership of forests surrounding water sources. The change in forest ownership did not necessarily match with the changes in water source ownership. The ownership of Tumbu, Kilombero and Chemichemi forests changed from clan/family to communal property while the ownership of Nzuitaka and Anselm forests did not change and remained as clan and family properties respectively. During the villagization programme, Migombani water source was not yet discovered and at that time Mr. Chingulu Chibi owned the forest land (see Table 6.2).

Table 6.2 Ownership of forest with respect to ownership of water sources during the villagization period

| Name of micro spring forest | The owners of forests | The owners of water sources |
|-----------------------------|--|-------------------------------------|
| Nzuitaka | Bahira clan (Mr Wanjura) and Wasilanga clan (Mr. Msaku) | Village community |
| Tumbu | Village community | Village community |
| Kilombero | Village community | Village community |
| Chemichemi | Village community | Village community |
| Anselm | Mr. Anselm family | Village community |
| Migombani | Mr. Chingulu Chibi family | Water source was not yet discovered |

Retaining the ownership of forests by individuals who owned these resources during villagization programme was complex and dynamic. The role of individual local people and their interactions for resource use and management in the planned villages was redefined. Some of the individuals gained more power while others lost their power. For example, both the owner of Nzuitaka and Tumbu micro spring forests moved away from their original settlements during the villagization programme. Only the owner of Nzuitaka retained the ownership of the micro spring forest while the owner of Tumbu lost the ownership. On the other hand, the owners of Kilombero, Chemichemi and Anselm micro spring forests did not move from their original settlements during villagization. However, the owner of Anselm micro spring forest retained the ownership while the other owners lost their ownership rights. This implies that retaining ownership of forest depended on social and personal factors. The individuals owning these forests differed in terms of power, personality, social-political status, pressure they got from the village community and how they perceived the value of the resources. This also implies that the individuals owning these forests are unpredictable in the decisions they may take on these resources.

Furthermore, HESAWA programme changed the ownership of Tumbu, Kilombero and Chemichemi micro spring forests from communal property to formalized group property. The HESAWA programme introduced the idea of water source ownership and the owners were responsible for taking care of the water source maintenance. Therefore, the ownership of forest was determined by those who owned the water source. When HESAWA programme phased out, it handed over its activities to Ukerewe District Council. One of the responsibilities of the district council was to transform the Water User Group into a legal entity. The district council was supposed to enact by-laws to guide these Water User Groups. The Ukerewe District Council process of enacting by-laws and legally recognizing Water User Groups (see Chapter 5) can have implications on tenure rights of private forests. Section 9 of the proposed by-laws protects all spring forests within one hundred meters from the water source improved by HESAWA programme. This protection includes prohibition of tree cutting, bush clearing, and fodder or grass cutting except when such uses are allowed

by the constitution of Water User Groups and after the permit has been granted by the District Council.

The size of micro spring forest in the study area is not more than 1 ha and the proposed area to be protected under the by-laws is about 3ha. This implies that all land under micro spring forest together with some parts of the land under crop cultivations surrounding these water sources will be protected. Therefore, if the Minister for Regional Administration and Local Government in Prime Minister's Office signs the bill of conserving the water sources that HESAWA programme improved and the by-laws become enforced, then the Anselm and Migombani micro spring forests would no longer be a private property. Nevertheless, when no proper compensations are made to the owners of these forests, conflicts between Water User Groups and the owners would be inevitable. These conflicts can subsequently lead to the destruction of these resources especially when there are no strong mechanisms to enforce the sanctions and monitor these forests. This type of tension already exists as discussed in Chapter 7.

Changes in forest vegetation condition

In addition to the changes in forest ownership, also the forest conditions have gradually changed. A major change was the gradual decrease in forest size as a result of the increase in human population. As already discussed in Chapter 3, the population density of Ukerewe Island has been steadily increasing; this high population density (see Table 6.3) has impacted significantly on resource use. The local history as told by old people shows that when people started settling in their respective areas in 1930s and 1940s the forests around Nzuitaka, Tumbu, Kilombero, Chemichemi and Anselm water sources covered extensive areas and contained large trees. But gradually, these forests decreased in size and now they only remain as small forest patches around water sources.

Table 6.3 Population trends of Ukerewe District for seven periods

| Year of census | 1967 | 1978 | 1988 | 1998 (projected) | 2002 | 2007 (projected) | 2012 (projected) |
|---|---------|---------|---------|---------------------|---------|---------------------|---------------------|
| Population | 109,277 | 138,729 | 172,893 | 215,455 | 261,944 | 329,000 | 362,000 |
| Population Density (pers./km ²) | 171 | 217 | 270 | 337 | 409 | 514 | 566 |

Source: Extracted from URT, 2003 and NBS, 2003

During the various group discussions, local people identified four historic periods impacting on the forest vegetation conditions, namely: the colonial period; the independence period; the villagization period; and the current period. During each of these periods specific changes in the local settings and organizations in resource use and management took place.

The colonial period represents the time from 1930s to 1961, when Tanzania mainland got independence. During this period, the population density was still low and the

water sources were located in extensive forest areas. The people lived in scattered clan territories, and respected the traditional and cultural-inspired practices for forest conservation around the water sources.

The independence period which started after the Tanzanian (by then still called Tanganyika) independence in 1961 was characterised by an increase in population and the abolishment of chieftainships in 1963. People felt not only free from colonial rules, but also started to become alienated from their ancestors' clan lands. These developments started to weaken the traditional management of the water sources (see Chapter 5) as well as the surrounding forests. The establishment of new settlements and opening up of new agricultural fields led to massive clear felling of forests, leaving only forest patches around water sources.

The following period was characterized by the villagization programme in 1974. As described in Chapter 5.2, this period involved the disruption of the traditional clan settlements, establishments of new settlements and clearing of more lands for agriculture. However, as indicated by the survey data for this study, in all the six study areas most lands were already deforested before the villagization programme. The data show that only 34% of the respondents were not born in the study area, whereas more than 50% of them have been living in the villages for more than 30 years. This implies that immigration to the study areas started much early than the villagization programme.

The current period which started in the early 1990s is characterized by a further population increase (see Table 6.3), coupled with modernization and technological development. This has increased pressure on traditional management by challenging the taboos and cultural beliefs on forest conservation and exerting an increased pressure on the use of these forests.

6.3 Dynamics in forest management

The different forces causing changes in forest ownership and forest vegetation condition discussed above also caused important changes in respect to forest management. This section first describes the traditional management practices followed by a discussion on the dynamics in these practices.

Traditional management of micro spring forest

Traditionally several practices were common for conserving the forests surrounding the water sources. The main purposes of maintaining the forests were to protect and conserve the water sources and maintain their cultural significance. Local people considered water source and forest vegetation as integrated resource systems, which required integrated management practices. The value and meaning attached to micro spring forests by the local people go beyond that of ecology to include cultural practices.

The traditional management practices mainly comprised practices of controlling the use of the forest vegetation and/or conserving particular tree species. The use and maintenance of the resources were guided by local norms in terms of rules, taboos and cultural beliefs. The different norms and regulations were developed and maintained at different social levels, ranging from household, to clan, group, sub village, village or combination of several villages.

In the discussion with older people in the study area, the traditional regulations for forest management were categorized in different categories regarding ownership status, restrictions on use, restrictions on users, needs for maintenance, and controls on enforcement of the different rules. These regulations do not only concern the forest vegetation, but also have something to do with the animals found in forest and water (Table 6.4). The regulations on use define the types of uses and how and when people should use the resource. The regulations on users specify who may use what resources for which purposes. The regulations on maintenance define how the users of a resource can sustain it. The regulations on control define how the different regulations can be enforced and defended against violations. Even though not all norms and regulations are always strictly enforced, the various principles clearly illustrate how the forest vegetation traditionally had an important meaning for the local communities and how they had developed an array of cultural practices to conserve the forest vegetation by regulating their use and maintenance.

Table 6.4 Ideal types of regulations concerning traditional use and management of forest patches

| Category of regulation | | Vegetation | Animals |
|---|----|---|--|
| Regulation on ownership | on | Family, clan or village community owns the forest based on customary laws | Ritual animals are owned by universe/gods |
| Regulation controlled use | on | Rules and taboos strictly prohibiting the use of tree species and linking some tree species to cultural rituals and beliefs (e.g. rain making, plea of forgiveness and sacrificial offerings) | Rules and taboos prohibiting the killing of some animals e.g. <i>Njubi</i> (black snake), bees, <i>Ngugu</i> (well fishes) |
| Regulation users | on | Only clan headmen may perform ritual activities in the forest. Entrance to the forest prohibited for women especially those with a newly born child or twins or in menstrual period | Clan headmen address rituals to these animals and spirit of the ancestors |
| Regulation maintenance | on | Rules and taboos supporting natural regeneration of trees and prohibiting human intervention like tree planting | No external intervention on improvement of water source to maintain natural conditions for <i>Ngugu</i> and <i>njubi</i> |
| Regulation controlling enforcement of local regulations | on | Owner of forest and community elders or head of clan enforce sanctions; cultural beliefs create self-discipline of individuals in the village community | Elders or head of clan enforces sanctions; cultural beliefs create self-discipline of individuals in the village community |

The traditional management of micro spring forests involved diverse management practices. These practices were guided by various categories of norms and regulations related to forest vegetation and animal protection. As such, the local people in rural areas did not only consider these forests as important for water source protection, but also as living places for *Mizimu* (spirits of their dead ancestors) and places for traditional rituals. Different generations have inherited this traditional knowledge from their grandfathers and grandmothers. Also the local people in the study area have not considered all the trees as being good in protecting water sources, but only some tree species such as *Ficus spp*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense*. However, this does not mean that the local people considered other trees as being least important or that they did not protect these trees. This local classification of tree species is relevant in this study because it shows how the local people put different meanings and values on different trees.

The local people in the study area conserved their micro spring forests using traditional management systems, which involved the use of local norms including taboos and cultural beliefs (see Table 5.3). These forests were considered as part of the water sources and that is why the rules and cultural beliefs for using water sources incorporate those of protecting forests. The various categories of norms and regulations in Table 6.4 show that the traditional management of these forests was strictly for the protection of all tree species found around water sources and any type of use of the material for either firewood, poles and timber was prohibited. However, the study cases show that the forest owners or clan headmen tolerated the uses of leaves, roots and barks for medicinal purposes because these uses do not involve the destruction of the whole tree. Also, the list of rules, taboos and cultural beliefs guiding the traditional management of water sources in the micro spring forest (see Table 5.3) show that regulations on forest are only in the form of taboos and cultural beliefs, and not in the form of rules. This is in contrast with the regulation of use and management of water sources, which involves rules, taboos, and cultural beliefs. The local people tended to believe in mysterious things embodied in taboos and cultural beliefs and respected them with the worry that gods could punish them. Therefore, local people use taboos and cultural beliefs to put more emphasis on forest protection for water source conservation. In addition, it can be argued that local people considered water sources and forests as an integrated ecosystem rather than two independent systems. However, it is commonly understood that water is very important for the life of a human being and the idea of these local people putting water as a central point of focus during its management is relevant.

In the traditional management, the functions of micro spring forests around water sources go beyond that of water source conservation. Through group discussion, it was observed that because of the presence of the trees around water sources, the local people enjoy cool drinking water from the water sources. The main arguments local people made were that the trees provide shade and prevent the water in the spring well from getting warm through direct sunlight. Moreover, women reported that trees are useful because they provide shade for them during the shortage of water when they

spend long time in the queue waiting for their turn. The other functions of trees around water sources reported by individuals include: the control of soil erosion and reduction of siltation in the water sources; acting as a barrier against encroachment by those owning crop fields around water sources; and increasing water infiltration in the soil and the same water is subsequently released in the form of spring in other places. Furthermore, the local people in study area reported that micro spring forests are not only important for water source conservation, but also harbour different fauna species. In all cases, small animals like monkeys, birds, insects and reptiles were observed. These animals use trees for habitat and as source of food and nectar. By analyzing the perceptions of local people about the functions of trees around water sources, it is apparent that micro spring forests are taken by local people as integrated resources with multiple uses. However, traditional management of micro spring forest is dynamic and has been changing over time due to several factors, which are discussed in the next sub-section.

Changes in the management of micro spring forests

Despite the fact that micro spring forests have been under traditional management systems since pre-colonial era, their traditional management practices have gradually been undergoing some changes. These changes are attributed to several factors including those of external and internal origin. The management of micro spring forests have changed from total protection during traditional management to a combination of protection and production forests during different external interventions. The main external interventions that have led to the changes in the management of micro spring forests include villagization, Health through Sanitation and Water (HESAWA) programme and the conservation programme of the Ukerewe District Council. In addition, other factors like modernization, population increase and a change in ownership due to inheritance have also contributed to these changes.

Although the villagization programme did not directly focus on forest management, it had important repercussions as a result of changes in the forest ownership and disruption of the traditional clan regulations. It disrupted the clan settlements and introduced planned villages with village government and hamlet leaders. As discussed earlier, in several cases of traditional clan control over forests, such as in Tumbu, Kilombero and Chemichemi, the management responsibility changed from clan to village community organisations. Moreover, the heterogeneity of the village community increased due to different background of people in terms of clans, religion, education level and economic status. Even in cases where the micro spring forests remained under clan or family management such as Nzuitaka and Anselm, new challenges arose on how this clan or family should manage these forests to meet their own forest-related interests as well as those of the people using the communal water sources located within these forests. The decisions that the clan or family made on the use of the forest, depended on the social-cultural and power relations of the clan or family with the village community. Another change during the villagization period concerned the increased rates of forest clearing for agriculture and settlements. This caused the forests surrounding water sources to be detached from the main forest

and became patches, and increased the use pressure on the remaining forests. As in the villagization programme, no specific attention was given to the need for forest conservation; the villagers had to rely on their own local norms to manage the forest resources. However, the village government and hamlet leaders helped to solve forest conservation problems that could not be solved by community elders and clan leaders.

As discussed in Chapter 5.2, the HESAWA programme was primarily a development programme focused on improved water management. This programme did not focus specifically on the maintenance of the forest vegetation, although it specified the need for protecting the water sources by a protective vegetation belt up to 100 m from the water source. Nonetheless, the programme had important repercussions on the forest management, notably as a result of the identification and organisation of Water User Groups being responsible for the management of the water sources. The study cases were affected differently by this programme in the management of forest vegetation. For example, Tumbu, Kilombero and Chemichemi micro spring forests which were managed by village community started to be managed by formal groups while Anselm and Migombani micro spring forests remained under private management. These changes have resulted into different management systems for forest and water resources in the same micro spring forests. This was observed in Anselm and Migombani micro spring forests where the water sources are managed by Water User Groups while the forests are managed by private owners. As a result the management of forests under Water User Groups created forest land insecurity to private owners in Anselm and Migombani. This has caused management malpractices such as massive tree harvesting in these forests. For example, in 2005, Mr. Chingulu Chibi who owned the Migombani micro spring forest clear felled the forest and he later sold the land to Mr. Tumaini Keya.

After taking over the HESAWA programme activities by the Ukerewe District Council, the management of these forests became nested under this district council. In 2005 the Ukerewe District Council embarked on the process of enacting by-laws for conserving water sources and environmental sanitation, which include the protection of forest around water sources. The by-laws have not been effected until 2010 because the Minister has not signed the bill (see Chapter 5). However, the bill has not even recognized the role of cultural beliefs and taboos in managing water sources and forests. This transition from traditional management by the community to legally recognized management of water sources together with its forests by Water User Group has created insecurity of forest tenure rights especially on private forests.

Apart from external interventions, modernization and population increase have also contributed to the changes of management in micro spring forests. Some of the local people in the study area are increasingly becoming modernized due to formal education, modern religions, exposure to foreign culture and ways of living through watching western biased programmes on television, reading newspapers and listening to the radio programmes. This modernization has given some people the audacity of questioning the validity of traditional management in micro spring forests such as the

use of cultural beliefs and taboos. This has contributed to management practices such as tree harvesting in all cases of micro spring forests; this wouldn't have been possible during traditional management. In addition, population increase in Ukerewe main Island as discussed in the previous sections, has contributed to changes in management practices. This includes the encroachment of the traditionally protected micro spring forests.

Furthermore, the management practices in the privately owned micro spring forests depend on the person who owns the forests. Individual owners have different expectations and interests on the resource use and management. These expectations and interests dictate the management practices to be undertaken by the owner and can have either positive or negative influence on the forest condition. For example, Mr Zacharia who inherited the Nzuitaka forest from his father in 1980s, he changed the management practices by planting exotic trees in this forest for timber and fruits production. This was not the case during the traditional management before 1970s. In addition, Mr. Anselm who owned the Anselm micro spring forest used to plant trees in this forest to fill the gaps, but when he died in 1992, the family never carried out any further trees planting. This shows that a change in ownership has influenced the management practices of these forests.

6.4 The present forest condition

This section gives descriptions on the present conditions of micro spring forests in terms of sizes, tree species composition and stand parameters.

Land sizes of micro spring forests

The various cases of micro spring forests show relative minor differences in their sizes. The current sizes of micro spring forests results from the historical management practices discussed in the previous section of this chapter. Table 6.5 presents the sizes of six cases of micro spring forests. The results show that Kilombero has the biggest size (0.9ha) while Anselm (0.1ha) and Migombani (0.1ha) have the least coverage. By comparing the types of ownership, the communally owned micro spring forests of Kilombero, Tumbu and Chemichemi generally have bigger sizes than the privately owned forests of Anselm and Migombani. Nzuitaka has bigger land size than the sizes of land of other privately owned forests because the owner of Nzuitaka forest planted exotic trees on the open land of the micro spring forest. The data suggest that the social control in communally owned micro spring forests prevent the encroachment of these forests better than in privately owned forests.

Table 6.5 Land sizes of micro spring forests

| S/N | Name of micro spring forest | Area (ha) |
|-----|-----------------------------|-----------|
| 1 | Nzuitaka | 0.4 |
| 2 | Tumbu | 0.2 |
| 3 | Kilombero | 0.9 |
| 4 | Chemichemi | 0.4 |
| 5 | Anselm | 0.1 |
| 6 | Migombani | 0.1 |

Source: Survey data 2007

Tree species composition

Between the various cases there are relatively minor differences of species composition. Table 6.6 and Appendix 2 show the recorded total number and names of woody tree species respectively with a diameter at breast height (dbh) of ≥ 5 cm in each micro spring forest. The dbh refers to a tree diameter measured at tree height of 1.3 m from the ground. Nzuitaka micro spring forest recorded the highest number of tree species (15) while Migombani micro spring forest recorded the lowest (5). The minor differences observed between Nzuitaka, Tumbu, Kilombero, Chemichemi and Anselm micro spring forests implies that there is some consistency of species richness between the cases. Migombani micro spring forest recorded few species compared to the other micro spring forests because it is regenerating. In 2005, Mr. Chibi who owned this forest of Migombani clear felled the forest before he had sold the land. Although the difference is not so big, the results in Table 6.6 show that communally owned micro spring forests of Tumbu, Kilombero and Chemichemi have relatively more indigenous tree species than the rest and that the privately owned micro spring forests of Nzuitaka and Anselm have relatively more exotic tree species than the rest of the forests. The data suggest that the social control in communally owned micro spring forest prevents tree cutting of indigenous trees better than in cases of privately owned. On the other hand, the data suggest that the owner of a private forest can more easily make decisions and take initiatives to plant exotic tree species on private forest land than is the case in making collective decisions by village community to plant trees on communal forest land.

Table 6.6 Number of tree species found in micro springs

| S/N | Name of micro spring forest | Number of tree species | | Total number of tree species |
|-----|-----------------------------|------------------------|--------|------------------------------|
| | | Indigenous | Exotic | |
| 1 | Nzuitaka | 10 | 5 | 15 |
| 2 | Tumbu | 11 | 1 | 12 |
| 3 | Kilombero | 11 | 1 | 12 |
| 4 | Chemichemi | 14 | 0 | 14 |
| 5 | Anselm | 9 | 2 | 11 |
| 6 | Migombani | 4 | 1 | 5 |

Source: Survey data 2007

From local people's perspective, different tree species have different functions and values. Local people believe that *Ficus thonningii*, *Ficus sycomorus*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense* are good tree species for conserving underground water sources like springs. In addition, they believe that these trees raise the water table and as a result, form water springs, which are available for human use. Due to this belief, it is a taboo to cut these tree species and violation of this taboo leads to a decrease in water quantity or drying up of the water sources. To reflect the reality of how local people value these tree species, this study shows that at least each case has these tree species except Migombani case, which is regenerating (Table 6.7 and see Appendix 2). The communal micro spring forests of Tumbu, Kilombero and Chemichemi generally have recorded more different species of these trees than the species observed in the trees of micro spring forests under private ownership. The data suggest that social control in communally owned spring forests prevents tree cutting of these species better than in cases privately owned.

Table 6.7 Tree species found in micro spring forests that are traditionally recognized to be good for water sources conservation

| Tree species | Micro spring forests | | | | | |
|----------------------------------|----------------------|-------|-----------|------------|--------|-----------|
| | Nzuitaka | Tumbu | Kilombero | Chemichemi | Anselm | Migombani |
| <i>Macaranga monandra</i> | √ | | √ | √ | | |
| <i>Pseudospondias microcarpa</i> | | √ | √ | √ | √ | |
| <i>Syzygium guineense</i> | | √ | | √ | √ | |
| <i>Ficus sycomorus</i> | | √ | | | √ | |
| <i>Ficus thonningii</i> | | | √ | √ | | |

Key: √ = Present

The presence of newly introduced tree species either naturally or through planting in the micro spring forests can have a negative effect on the regeneration of the indigenous tree species. The invasive species of *Lantana camara* dominate the open spaces of Chemichemi and Tumbu micro spring forests and no indigenous tree species are regenerating in these dominated areas. Human disturbances like cutting trees for firewood and building materials that leave the canopy open have made *Lantana camara* to dominate some parts of these micro spring forests. The formed dense thicket of *Lantana camara* and its ability to grow very fast hinder the regeneration of the indigenous tree species found around water sources. This is due to space competition and shading effect especially for non-resistant tree species. *Lantana camara* is a shrub invasive species originating from West Indies or South America.

Stand parameters

Stand parameters in terms of number of trees per hectare (N) and basal area per hectare (G) determine the regeneration potentials, dominant tree species and structure of micro spring forests. Table 6.8 presents the trees and basal area per hectare for the different forests.

Table 6.8 Number of trees per hectare (N) and basal area per hectare (G) for the study cases

| S/N | Name of micro spring forests | N (trees/ha) | G(m ² /ha) |
|-----|------------------------------|--------------|-----------------------|
| 1 | Nzuitaka | 700 | 29.75 |
| 2 | Tumbu | 175 | 15.12 |
| 3 | Kilombero | 392 | 28.97 |
| 4 | Chemichemi | 95 | 17.28 |
| 5 | Anselm | 190 | 52.31 |
| 6 | Migombani | 80 | 1.70 |

Source: Survey data 2007

The various cases of micro spring forests have shown major differences in stand parameters. Nzuitaka micro spring forest has had the highest number of trees per hectare (700), which could be due to the initiatives of Mr. Zacharia of planting trees for timber and fruits. Mr. Zacharia owns part of the land of this micro spring forest. Migombani micro spring forest has had the least number of trees per hectare (80) because it is regenerating. Chemichemi micro spring forest has also recorded a small number of trees per hectare (95) due to the presence of *Macaranga monandra* and *Lantana camara* dense thicket occupying a big area that might have suppressed the regeneration of other tree species. Furthermore, the forest inventory in micro spring forests was done in May 2008. Nevertheless, when the researcher visited the forest in September 2008 observed that the family of late Anselm cleared the trees with dbh below 12 cm to scare monkeys, which were destroying crops in the fields near the forest. Therefore, the number of trees per hectare presented in Table 6.8 for Anselm micro spring forest is higher than what is in the forest now. These findings show that the stand parameters in these forests especially clan or family forests are very dynamic.

The study cases have shown major differences in basal area per hectare (see Table 6.8). Despite that Anselm micro spring forest has had small number of trees per hectare compared to Nzuitaka and Kilombero, it has exhibited the highest basal area per hectare (52.3 m²/ha). The presence of many big trees with dbh equal or greater than 60 cm in Anselm micro spring forest has led to this situation (Figure 6.1). The basal area of Anselm micro spring forest is higher than what is currently found in the forest because of harvesting trees to scare monkeys. However, generally all the micro spring forests except Migombani have shown a big basal area per hectare regardless of their small number of trees per hectare. This is because the micro spring forests have considerable number of trees in higher diameter classes i.e. 60-70cm and above 70cm.

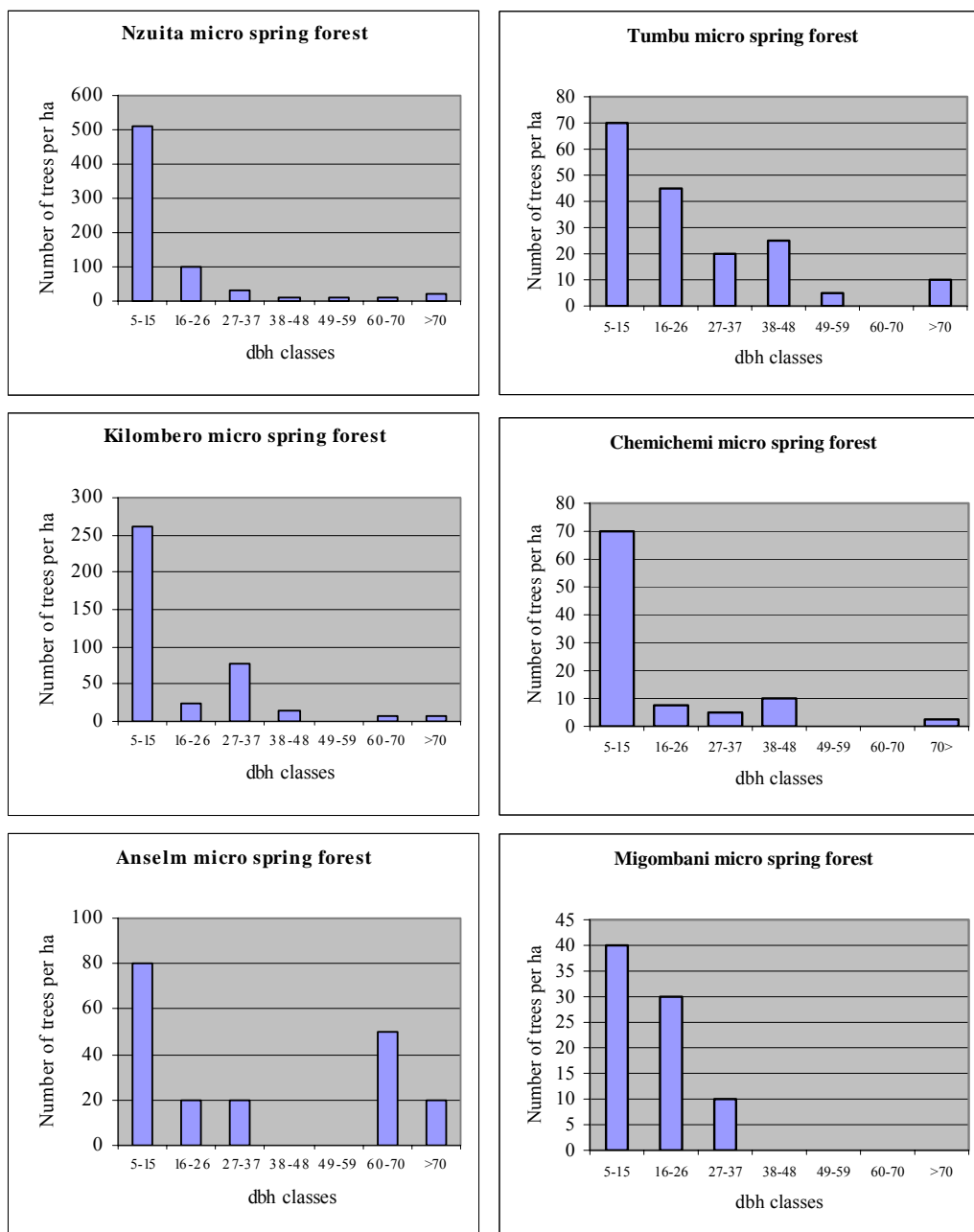


Figure 6.1 Distribution of number of trees per hectare by dbh classes

In addition, the distribution of trees per hectare in all micro spring forests except Anselm and Migombani follow the usual expected reversed J-shaped trend (Figure 6.1). This is an indication of a good forest regeneration and recruitment trend in a naturally growing forest. Migombani has not depicted the usual expected reversed J-shaped trend because it is now regenerating. It seems the tendency of harvesting trees

in Anselm micro spring forest has been there for several years now and it could be the reason for the Anselm micro spring forest not to depict the expected reversed J-shaped trend. However, it is interesting to note that even with the frequent harvesting of the Anselm micro spring forest, the regeneration of the forest maintained its indigenous tree species (Table 6.6 and Appendix 2).

A sharp decrease of the number of trees per hectare has been observed between dbh class 5-15 and 16-26 for Nzuitaka, Kilombero, Chemichemi and Anselm micro spring forests. This suggests that the local people in the village commonly harvest trees with dbh between 16 and 26. Also, the results show that lacking of trees in some diameter classes is common in all micro spring forests except in Nzuitaka and this is an indication of serious disturbance incidences in the past. Moreover, the number of trees per hectare for dbh class 5 – 15 presented here for Anselm micro spring forest is higher than what is in the forest now because of tree harvesting done in 2008 to scare the monkeys.

The study cases have shown a high level of similarities in terms of dominant tree species. The basal area was used to determine dominant tree species. Figure 6.2 shows the dominant tree species in the micro spring forests. The most three dominant tree species depicted by Tumbu, Kilombero, Chemichemi and Anselm micro spring forests include species, which are traditionally recognized by the local people to be good for water source conservations. These tree species include *Ficus sycomorus*, *Ficus thonningii*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense*. These findings indicate that village communities value these tree species for water source conservation. The Nzuitaka micro spring forest has depicted a different pattern of dominant tree species of *Albizia gummifera* and *Grewia bicolor*, which are indigenous tree species good for timber and handles respectively, but local people have left them for water source conservation. Migombani micro spring forest has depicted yet a different pattern of dominant tree species because it is regenerating after clear felling and the fast growing tree species of *Maesopsis eminii* and *Cedrella odorata* are dominant.

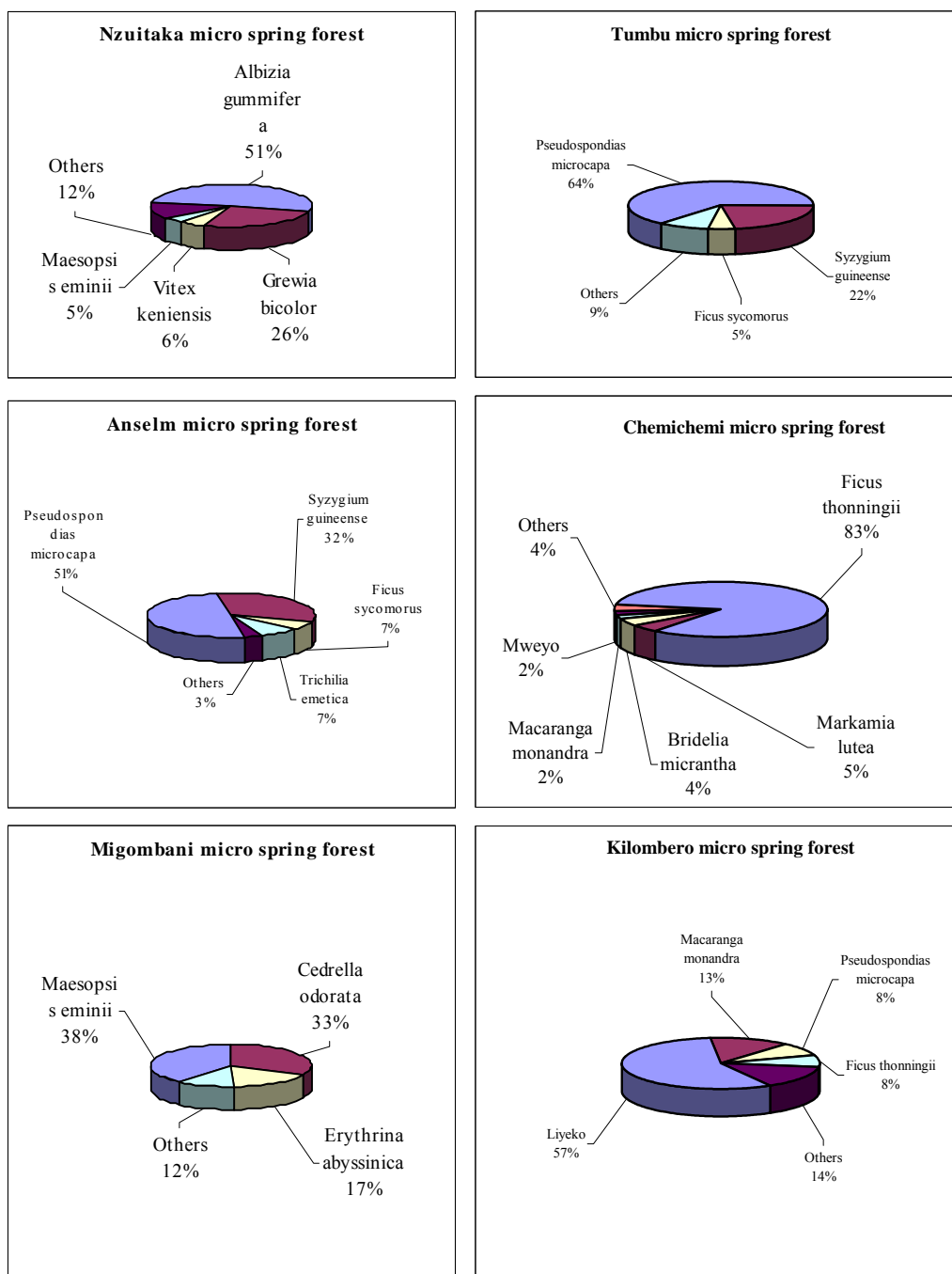


Figure 6.2 Dominant tree species in terms of basal area per hectare for each forest

Some tree species are threatened to disappear while other species might have been newly introduced in the micro spring forest. Appendix 2 shows the distribution of the number of trees and basal area per hectare by species and diameter classes of standing

trees in micro spring forests. The results indicate that *Liyeko*, *Ficus thonningii* and *syzygium guineense* tree species in Nzuitaka, Kilombero and Anselm micro spring forests are only found in the upper diameter class VI and VII, which is an indication of the absence of regeneration for these tree species. This suggests that the species can disappear from the forests if no initiatives are taken to regenerate these species artificially. The disappearance of these tree species has an implication on the composition and diversity of tree species in the micro spring forests. Furthermore, there are some tree species both indigenous and exotic in all micro spring forests except Migombani which are being distributed only in diameter class I (see Appendix 2) and this suggest that the tree species are newly introduced in these micro spring forests. The dispersion of their seeds might have been done through human and natural agencies.

6.5 Discussion and summary

Discussion

Micro spring forests have undergone long history of management development from traditional management institutions to a combination of traditional and external intervention institutions. These external interventions have caused changes in the forest ownership and management types. These changes, which operate under human population increase, have affected the condition of micro spring forests. The study assessed the condition of micro spring forests in terms of land sizes, tree species composition and stand parameters.

The results of this study are comparable with similar studies conducted in Tanzania. Having micro spring forests showing small land sizes ranging from 0.1 to 0.9 ha is comparable to similar studies by Mgumia and Oba (2003) for the sacred forests of Wanyamwezi ethnic and another by Mwihomeke *et al.*, (1998) for traditionally protected forests of the Zigua and Gweno ethnic group in Tanzania (see Table 6.9). However, the sizes of these forest patches depend on the purpose of management; as Mwihomeke *et al.*, (1998) report forests for worshipping are bigger than forests for burial grove. In addition, the sizes depend on how the local norms are resilient to external interventions and remain relevant in protecting these resources under the changes of management forms, tenure rights and population increase.

Table 6.9 The comparison of forest sizes, species composition and stand parameters of this study with other similar studies.

| Aspect | This study | Mgumia and Oba (2003) | Mwihomeke <i>et al.</i> , (1998) |
|--|---------------------------|---------------------------|----------------------------------|
| Sizes of forests (ha) | Ranged from 0.1 to 0.9 ha | Ranged from 0.1 to 0.3 ha | 0.125 ha |
| Number of tree species | Ranged from 5 to 15 | Ranged from 20 to 40 | |
| Number of trees per hectare | Ranged from 80 to 7000 | Ranged from 362 to 1172 | |
| Basal area per hectare (m ² /ha) | Ranged from 1.70 to 52.31 | Ranged from 0.7 to 14.2 | |

The six micro spring forests in this study show sizes of less than one hectare and according to the definition of forest by FAO (2000), and which gives a minimum size of above 0.5 ha, only the Kilombero micro spring forest qualifies to be called forest while Nzuitaka, Tumbu, Chemichemi, Anselm and Migombani micro spring forests do not qualify. Interestingly, although the Tanzanian definition of forest in the National Forest Policy of 1998 and Forest Act of 2002 does not mention the minimum size of forest land, there has been no involvement of the Department of Forest in providing extension services and support to the local people to manage these forests. Forest department often focuses on big forests, which generate revenues or which are important in terms of biodiversity and big water catchment conservation.

Most of the studies on forest patches in Tanzania focus on the uses and management of these forests (Msuya and Kideghesho, 2009; Ylhäisi, 2004; Mwihomeke *et. al*, 1998), but there are limited studies which focus on the quantification of species richness and stand parameters like the number of trees and basal area per hectare. The study by Mgumia and Oba (2003) in Miombo woodland of Tabora (Tanzania) reports of there being a higher number of species in the area than that found in the micro spring forests in Ukerewe District, which range from 5 to 15 species (see Table 6.8). Although the study by Mgumia and Oba recorded bigger tree species with dbh ≥ 10 cm than the size recorded in this study with dbh ≥ 5 cm, still the number of species in the miombo woodland is higher. The reason for this difference of species richness may be that Tabora has more forests compared to Ukerewe District, which is overpopulated and has very few remaining forests. This implies that micro spring forests in Ukerewe District have experienced more pressure from the local community compared to the sacred forests in Tabora.

The number of trees per hectare for Nzuitaka (700) and Kilombero (392) micro spring forests are comparable with those of sacred forest patches of Wanyamwezi ethnic group, which range from 362 to 1172 trees per hectare (see Table 6.8). On the other hand the numbers of trees per hectare for Tumbu, Chemichemi, Anselm and Migombani micro spring forests are lower than those reported by Mgumia and Oba (2003). In addition, all micro spring forests except Migombani and Anselm have shown the signs of good forest regeneration and recruitment trend because they depicted many small size trees and fewer large size trees in the distribution of diameter classes (see Figure. 6.1). This distribution is a common feature in naturally growing forests (Zahabu, 2008). Anselm and Migombani forests have not depicted good forest regeneration and recruitment because of the human disturbances in these forests. As Alemayehu (2007) argues human interference is the most important factor determining the diameter class distribution of the forest.

Furthermore, the basal area per hectare which ranges from 15.1 to 52.3 m²/ha for all cases of micro spring forests in Ukerewe except Migombani are higher than those reported by Mgumia and Oba (2003) in Tabora (see Table 6.8). These micro spring forests have bigger trees in the higher diameter class. This is the typical characteristics of traditional management of micro spring forests whereby very big trees especially

those traditionally known to be good for water source conservation are protected by taboos.

The introduction of exotic tree species whether through planting or natural regeneration around water sources can have implications on the regeneration of indigenous tree species. As we have observed, some micro spring forests of Chemichemi and Tumbu have *Lantana camara*, which is suppressing the regeneration of other tree species due to its fast growth rate. As Edward (2007) reports *Lantana camara* is a noxious weed to other vegetation and colonizes fire-stricken areas of forests and forms extensive impenetrable thickets in disturbed areas. Furthermore, the species grow in the understorey of open forests. This observation suggests that the owners of the forest should be careful in selecting tree species for planting on these lands or should be knowledgeable about invasive tree species and their management because they have implications on the biodiversity of indigenous tree species.

The local people in the villages consider the micro spring forests as long time remnants of natural forests conserving water sources. However, these forests are declining in size, and this has an implication on the sustainability of the indigenous tree species found in these forests. These forest patches may be too small to maintain viable breeding population of certain species and excessive fragmentation may result into loss of plant species that require big patches. According to Fischer and Lindenmayer (2002) it is important to recognize the complementary value of small forest patches for biodiversity conservation. Traditionally protected forest patches are ideal for in situ and ex situ conservation as they act as biodiversity banks and new habitat areas when the populations of some species need to be increased (Ylhäisi, 2004; Mgumia and Oba, 2003). Therefore, despite the micro spring forests being very small, they still need to be given due attention by both local people and external actors. These forests might be very important for biodiversity conservation of indigenous tree species especially trees species that the local people consider good for water source conservation.

Summary

The traditional management focuses on micro spring forests as integrated resources of water and forests. The local people in the village considered the sustenance of water sources in micro spring forests as the result of good protection of forest cover. This is why the rules, taboos and cultural beliefs on forest management are typically for protection and not for uses. The changes in management of micro spring forests do not only depend on the external interventions directed on these resources, but even the national wide programmes like villagization that focused on resettlement of people had a big influence on forest ownership. The external interventions that focus on water sources alone and change the ownership of water sources have influence on the management of forests and leading to insecurity on forest ownership. The insecurity of forest ownership has compelled the management of the forests to change from protection to utilization.

Furthermore, the combination of ownership of forest and water sources in different cases determines the sustainability and the condition of forest vegetation. Sustainable management of integrated resources including water and forest vegetation requires secured tenure rights for both resources. In this study, three combinations of forest and water source ownership and their implications on resource condition have been identified. The first combination of ownership is clan forest and communal water source. This combination includes Nzuitaka micro spring forest, which the owner considered his forest land being secured. Nzuitaka water source was not intervened by HESAWA programme and the management of this water source remained traditional. Since there have been no changes in ownership of water source, there has been a good condition of forest vegetation because the owner has been planting trees in open spaces and there has been no massive harvesting of trees.

The second combination of ownership is family forest and formal group water source. This combination includes Anselm and Migombani micro spring forests. The owners of these forests showed insecurity of forest tenure rights, which contributed to bad forest condition due to massive harvest of trees. The third combination is that of forest and water source being owned by user groups. This combination includes Tumbu, Kilombero and Chemichemi micro spring forests. The Water User Groups considered their forest tenure rights as being secured and this has resulted into good forest condition because there has been no massive harvest of trees as a reaction to insecure tenure rights. Land security is relevant for the management and sustainability of micro spring forests. The three combinations of forest and water source ownership show that private forests are very prone to degradation especially when external interventions try to redefine the ownership of water sources. Therefore, the external intervention on micro spring forest should be integrated because the management of one resource has an impact on the other. If the management of these resources is to focus on one resource and having a different ownership of forest and water source, then the intervention should ensure the tenure security of each resource.

Moreover, the characteristics of micro spring forests in Ukerewe District are similar with other traditionally protected forest patches in other parts of Tanzania. However, the trend of forest condition change in the study area indicates that if the situation is not reversed, there will be a danger of some micro spring forests and tree species disappearing in the near future.

Chapter 7

RESOURCE USE AND MANAGEMENT PRACTICES IN MICRO SPRING FORESTS

7.1 Overview

After our discussion in the previous Chapters 4, 5 and 6 about the technical aspects of land, water, and forest, it is equally important to understand the use and management practices of water sources and forests in Ukerewe main Island. This chapter presents the empirical data on the present practices of using and managing micro spring forests and their water sources. The chapter contains four sections, which include the organization of water sources and forests management; the use practices of water sources and forest vegetation; the management practices of these resources; and the summary. In this chapter, there is also a discussion on how the everyday practices of villagers in using and managing land, water and forest resources relate to the external interventions described earlier, the history of management development, and the present condition of the resources. This contextualization helps us to reflect on how local people negotiate and integrate external intervention institutions in their daily practices. In the summary, the differences and similarities of the six micro spring forest cases are reviewed, and their implications on the differential use and management of these resources are discussed.

7.2 Organization of water and forest management

The organization of resources management influences the ways in which water and forest vegetation are accessed and used. This section describes the ownership of water and forests, access to the use of these resources and the organizational practices of the selection of the individuals who enforce the rules, including taboos and cultural beliefs.

Ownership of water sources and micro spring forests

The identification of the types of ownership and how they are organized, to a large extent determine how the resource is used and managed. When we speak about the water sources in terms of ownership and use, the water source becomes a resource. The organization of ownership of the water sources depends on water rights and the historical background of its use and management. Table 7.1 shows the present ownership of water sources in the study area. The formal user group refers to a group of people with clearly defined objectives, membership, rules and organization structure being established by external interventions. These formal groups at village level are not necessarily legal entity, but they can be legally recognized when they are guided by by-laws or agreements enacted by recognized authorities including district councils (see Chapter 4). These groups are currently not legally recognized because they are not registered by the district council and the proposed by-laws to guide the activities of these groups are not yet approved by relevant authorities.

Table 7.1 Ownership of water sources

| Name of water source | Type of ownership |
|----------------------|-----------------------------|
| Nzuitaka | Communal property |
| Tumbu | Formal users group property |
| Kilombero | Formal users group property |
| Chemichemi | Formal users group property |
| Anselm | Formal users group property |
| Migombani | Formal users group property |

The findings indicate that the type of ownership of the six cases have remained the same over the last decades since major changes took place. The last changes in Tumbu, Kilombero, Chemichemi, Anselm and Migombani occurred as a result of the HESAWA intervention in the 1990s, while for Nzuitaka the villagization programme in 1974 was crucial (see Chapter 5). The organization of ownership for Nzuitaka is based on customary laws while the ownership for Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources is pluralistic in the sense of being in transition from customary laws to following the Ukerewe District Council by-laws (see Chapter 5). In other words, ownership of the Nzuitaka water source has remained the same for the last 35 years, while the ownership rules of the other water sources of Tumbu, Kilombero, Chemichemi, Anselm and Migombani has remained constant for about 10 years. This shows that ownership for Nzuitaka has been more stable than has been the case in the other cases due to the fact that the water users and the Bahira clan have been resisting any external interventions on their water source.

In the eyes of the resource users, the micro spring forest is not separated from the water source it contains. The ownership of the water source determines the ownership of the forest, which means that those who own water source also own the forest. Table 7.2 shows the forest ownership for the different cases. The ownership of Tumbu, Kilombero and Chemichemi micro spring forests has remained unchanged since the HESAWA intervention. On the other hand Nzuitaka and Anselm micro spring forests ownership have changed based on inheritance. The organization of ownership of Nzuitaka, Anselm, and part of Migombani micro spring forests is still under customary laws whereas the ownership of Tumbu, Kilombero, Chemichemi, and the other part of Migombani is currently more pluralistic, as it is in transition from being under customary law to being under the Ukerewe district council by-laws.

Table 7.2 The present ownership of micro spring forests

| Name of micro spring forest | Ownership of forests |
|-----------------------------|---|
| Nzuitaka | Bahira clan (Mr. Zacharia Wanjura) and Wasilanga clan (Mr. Somba) |
| Tumbu | Formal Water User Group |
| Kilombero | Formal Water User Group |
| Chemichemi | Formal Water User Group |
| Anselm | Anselm family (Mrs. Anselm - widow) |
| Migombani | Formal Water User Group |

The customary laws are based on the principle of patrilineal inheritance. The change in ownership under this system depends on the demise of the owner of the forest or the owner willingly distributing the forest among his children during his life time. Usually the transfer of rights takes place when the owner dies. The Nzuitaka and Anselm cases show a transfer of ownership rights through inheritance after the death of the owners. Mr. Zacharia owns part of Nzuitaka forest after inheriting it from his father Mr. Wanjura while Mr. Somba owns the other half of Nzuitaka after inheriting it from his father Msaku. Mrs. Anselm owns Anselm forest after inheriting it from her husband Mr Anselm who died in 1992, because their oldest son, who should have inherited the forest, is living outside the Ukerewe district.

However, apart from inheritance, the owner of the land under customary laws can change the ownership by selling the land and the trees together, or by first harvesting the trees and then selling the land. The decision taken by the owner to either sell the land with the trees or selling the land after cutting the trees depends on the value of the trees or the location of the land and the willingness of the buyer to pay for the value of the land with trees. For example, the case of Migombani forest shows the complexities of transferring the forested land through selling. At present, the formal Water User Group of Migombani owns a small plot of land surrounding the water source, which is re-generating naturally. In 2005, Mr. Chingulu Chibi clear-felled the forest and he later sold the land to Mr. Tumaini Keya. The reason for cutting the trees first might be that the buyer was not interested in the trees or the cost was so high. Also, it could mean that since the land was surrounding the water source, the seller harvested the trees to show the buyer that the land was not anymore a “forest” belonging to the water source. Currently, Mr. Keya indeed uses a big portion of that land for crop cultivation and the Water User Group claims the remaining small plot of the land surrounding water place as belonging to the water source. Mr. Keya was unable to include that small portion because he had bought the land and not inherited the land; the latter would have given him a stronger claim. In addition, it might be that he sacrificed the land to avoid the Water User Group to speak up against his cultivating the land within 100 m from the water source, which was discouraged by the HESAWA programme at the time. The Migombani case underscores the relevance of identifying the types of access to the resources because these tell us who uses what, and under what condition and time frame. In addition, the type of access determines the sustainability of the resources. The following examples show us the details of the access to the water sources, and how they relate to the access to micro spring forests.

Access to water sources can be open or restricted depending on the strategies developed by the surrounding community or the Water User Group. People in Ukerewe main Island have access to water sources depending on three types of ownership of the water sources which include full membership of the group of owners, tolerated access, and self-exclusion. This study shows that the Nzuitaka water source is a clear example of a common property resource, while access to the Tumbu, Kilombero, Chemichemi, and Anselm water sources is determined by the rules of the Water User Group, and its flexibility depends on the season and water availability.

Finally, access to Migombani is bound by the ownership rules of the Water User group.

People who access the Nzuitaka water source exercise a kind of self-exclusion, because they acknowledge that they must abide by the rules guiding this water source. Whether they live near or come from away, especially when there is a water shortage in the other sources, they choose to use Nzuitaka. Thus, this which is in principle an open access resource becomes a water source with restricted access by the self-exclusion of those who do not wish to follow the common property rules - and be punished for it - as long as there are alternative water sources, especially during the rainy season. The sanctions for not following the rules include seizing containers used to carry water, cleaning the surroundings of water source and suspension from using the water source. The sanctions are enforced by the water source guardian. However, during the dry season, self-exclusion in Nzuitaka water source does not work since people have no options because Nzuitaka is the only water source that supplies enough water and that the people have to abide by the common property rules. Access to the water sources of Tumbu, Kilombero, Chemichemi, Anselm, and Migombani is regulated and restricted by membership of the formal Water User Groups in terms of their financial contribution and through physical barriers like fencing. In addition to this formal group membership, during periods of plenty water access to the sources of non-members is commonly tolerated in all these sites except Migombani, which exclude non-members even during period of plenty water.

The numbers of households using the six water sources depend on how the access is organized and controlled. Table 7.3 presents the numbers of households using the water sources. Nzuitaka water source has the highest number of households (250) because it is a common property resource especially during dry season. Migombani on the other hand, has the lowest number of households (44) because the access is more restrictive.

Table 7.3 Number of households using water sources

| Name of water source | Number of households |
|----------------------|------------------------------------|
| Nzuitaka | 250 (estimated – no list of users) |
| Tumbu | 65 |
| Kilombero | 170 |
| Chemichemi | 83 |
| Anselm | 60 |
| Migombani | 44 |

Source: Field data, 2007

After the HESAWA programme was phased out in 2002, the members of the Migombani Water User Group decided to raise the membership fee from TSH 200 to 20,000³. The members wanted to restrict the number of users because more people

³ Equivalence: \$ 0.70 to 16.70

were interested in access the water source, which would have affected both quality and quantity of the water. The Kilombero water source has a relatively big number of water users as compared to other sources which were developed with the help of HESAWA because people registered for membership at Kilombero after the break down of the water pumps of the two shallow wells constructed by the HESAWA programme.

Evidently, the numbers of households using the water sources vary depending on the period of the year. During the dry season, the number of households using Nzuitaka water source rises well above the average number of households presented in Table 7.2 because Nzuitaka is the only water source in the village that keeps providing more water during the dry season as compared to other sources, and that access is free to whoever follows the rules of using the source. With regard to Tumbu, Kilombero, Chemichemi and Anselm, the situation is again different. In these water sources, both members and non-members of the Water User Group fetch water during rainy season, while during the dry season only Group members are eligible to fetch the water because they pay a membership fee. The non-members are tolerated during rainy season because of the history of management development. Before the HESAWA intervention, these water sources were the communal properties and those who were using the source at that time are the ones tolerated during rainy season. Usually, there are kinship relationships between present day Water User Group members and the users who are tolerated. Again, the fluidity of membership rules mainly counts during the period when the water is plenty, and there is no reason to exclude non-members.

The Migombani water source differs from all the other cases as the number of households using this water source remains constant throughout the year regardless of the season. Access is restricted to user group members alone. The reason for managing to restrict the number of households accessing this water source through raising the membership fee could be linked to the historical management development of Migombani water source (Chapter 5) and the presence of Lake Victoria located near the village. The residents of this area discovered Migombani water source in 1990. The time that has elapsed from the discovery to the time of raising the fee is about 12 years, which is relatively short period of time for community members to have strong social and cultural values attached to the water source and among the users themselves. In addition, the Lake Victoria is not anymore polluted by dead Nile perch fishes (see Chapter 5) and hence the excluded water users meet their water needs from the lake and other sources.

Access to the micro spring forests follows the rules which are different from the one on water sources. It depends on the management objectives of these forests and the types of ownership. In all micro forest cases, the access of local people to using the forest for collecting for the use of firewood, timber and building poles is traditionally restricted regardless of whether the forest is common property or private property. The reason behind this is that the trees around water sources are considered to be protected by cultural taboos. Sometimes the use of the trees is only allowed for such

cases as obtaining bark and leaves that are used for medicinal purposes or collecting dead fallen branches for firewood. These uses have been recognized for a long time and they have no big impact on the condition of the forests. Nevertheless, changes have taken place and today there is harvesting of live trees for firewood, timber, poles, handles and other reasons, depending on the type of land ownership and the kind of trees, as will be exemplified below. Forest owners, especially in clan and family forests like the Nzuitaka and Anselm micro spring forests, have legitimated the use of live trees. While in other cases, individuals from the village access the forest illegally to extract resources by cutting trees during the night or when there are no other people around. Today, there are people who challenge the validity of the taboos and cultural beliefs that traditionally restricted access to live trees in the micro spring forests, particularly where village communities have currently become heterogeneous. The traditional management of forests is stronger in villages where the community shares a similar tradition and culture. Increased ethnic intermarriage, immigration, modernization and technological intervention are presently threatening and transforming or eroding the cultural rules, beliefs and taboos governing the management of forests. One male interviewee in Migombani micro spring forest said:

“Nowadays people cut trees in micro spring forests, which was not the case during our teenage days, our parents and other old people in the village could punish us when we violated the taboos. The micro spring forest rules and taboos are no longer respected because of the intermarriages between different cultures and the claims made by contemporary young girls and boys being educated and modernized” (Katanga, 51yrs; May 2007).

The changes we see in Ukerewe main Island regarding traditional management of micro spring forests is similar to those witnessed in other parts of the country. Other scholars have reported the change of culture due to the influence of colonization and the introduction of modern education in Tanzania. According to Mlacha (1988) traditional life has changed whereby contemporary people look down on their parents and consider their ideas on cultural beliefs and taboos outdated. In earlier times the children grew up and were strongly embedded in the codes and institutions of their society; they belonged to the society rather than to their own parents. Any older person in that society could discipline them once they act against the codes of the society. At present, young people are free to do anything without being bothered by the presence of other people in a society, and the responsibility of disciplining the young is now vested with the parents alone, who often are unable to do so. This modern lack of discipline and regard for the natural environment also impacts on the control of access and use of water sources in micro spring forests.

Control of access and use of water sources and micro spring forests

The control of access and use of water sources and micro spring forests is of course crucial for the sustainability of the resources. The well committee, well guard and clan water source guardian are the different institutional actors presently active in controlling the access and use of water sources in micro spring forests of Ukerewe

main Island. Five years have now passed since the Ukerewe District Council embarked on the process of enacting the by-laws in 2005 to guide the registered Water User Groups (WUGs) and these by-laws have not been into effect because the Minister for Regional Administration and Local Government in Prime Minister's Office has not signed the by-law bill (see Chapter 5). The registered Water User Groups are the legal institutions which control rural water sources and supplies at village or users group level. They are the owners, managers, and operators who are responsible for the maintenance of the water supply systems in rural areas. The water users of Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources have not registered their Water User Groups with the Ukerewe District Council and hence they are not yet legally recognized.

Water User Groups have a well committee. The well committees of Tumbu, Kilombero, Chemichemi, Anselm, and Migombani control the use of these water sources on behalf of the Water User Groups. During the field research in 2007 and 2008 for this study, it was observed that the well committees of Chemichemi and Migombani were active while those of Tumbu, Kilombero, and Anselm were not active. The tasks of well committee include the organization of activities related to keeping the water source clean and repairing the facilities, like the water tap. The committee members at these sites were often involved in these tasks, and they were also readily available and would contribute to the discussion during interviews and group discussions. Unfortunately, the well committee members suffer from the lack of support from the Ukerewe District Council and they consider this as the main reason for their inefficiencies.

The water users among themselves select the members of the well committee by voting. Their ability to organize water users to participate in maintaining water sources depends on their personality in terms of power, social-cultural status and social-political status. In other words, there is a lot of political-economy involved in the composition and functioning of a well committee. For example, the chairperson of Chemichemi well committee, Mr. Tilusubya, is particularly active. He is the son of Mr. Mageta who is one of the persons who pioneered the establishment of this water source (Chapter 5). He also owns the forested hill near the water source, so he has a personal interest in the social and physical sustainability of the water source. Furthermore, for the past five years Mr. Tilusubya has been a member of Village Council and he is currently the Chairperson of the ruling political party of CCM at the Busiri branch. He has the power and the trust from the users group to organize them and to make an active committee. The two positions of Mr. Tilusubya are both acquired through the votes and support of the villagers. The political and personal networks of Mr. Tilusubya thus motivate him to act on behalf of the villagers, and to be active in the well committee. This example shows that the institution (the Water User Group) might be in place, but whether or not they are active and effective depends on individual members as political and economic actors.

On the other hand, the case of the Kilombero well committee shows that monitoring and control of the water source is not necessarily done by member(s) of the Water User Group as an embedded institution. The Kilombero well committee was not active, but every water user pointed out that it was Mr. Masalu who controlled the use and conservation of this water source. There are several factors that contribute to his involvement with the control of the water source and forest conservation. He sometimes supervises the water fetching during water shortage and he visits the water source to see if there are any users violating the rules guiding the uses of the water source (see Chapter 5). Yet, Mr. Masalu is not a member of the well committee, but his wife is. He is the head of the Hakona sub-village, and his house is only about 200 m from the water source, where he has a vegetable garden downstream. Voting for committee members by water users does not necessarily provide a good committee. Water users can vote for someone who is not capable of organizing people to get involved in the maintenance of the water source, especially when they want to avoid financial contributions for maintenance. In addition, someone can campaign for the position with the expectation benefiting from the committee membership, but when the person fails to realize the expected benefits he/she becomes frustrated and inactive. Moreover, sometimes villagers select a committee member even if he/she is not capable, but because the persons who are known to be capable by the water users are not interested in the membership of the well committee since it involves spending a lot of time without any remuneration.

The tenure period for the well committee members varies between the cases. During the HESAWA programme membership was for three years, but in practice the water users have been electing new members within that period depending on circumstances. For example, when a member dies or moves away from the village they vote to replace the vacant post. Some of the committee members have spent more than three years while others have spent less than three years. During the election meeting the Water User Group would recommend the committee to either continue for another period or be discontinued, so that a new committee can be elected. When the water users are satisfied with the committee's performance they would allow them to stay on; likewise, when a committee is inefficient they vote it out. However, voting out the inefficient committee members has not been the cases in all the five cases of Tumbu, Kilombero, Chemichemi, Anselm and Migombani cases. This implies that the inefficiency of well committee members in the five cases has not been of great concern in constraining the water users in their daily practices of using and managing water sources.

During focus group discussions, committee members reported to have found it difficult to be active in organizing water users to repair and maintain the water sources facilities because the district council was not motivating them, as it used to be the case during the HESAWA period. At that time (see Chapter 5) the committee members would attend seminars organized by the HESAWA programme and which they considered very useful and a good motivation. The programme covered the costs for meals and transportation. In addition, because it was an international intervention,

programme implementers frequently visited water sources for control and the committee members were held responsible and accountable for the user group. In other words, the well committee members consider themselves equal to other community workers of the Ukerewe District Council, and they deserve to be motivated like the others who are employed by the district council.

The institution of a well guard was introduced by the Uhuru Torch Race (see Chapter 5) and it is only operational at the Chemichemi water source. The water users select the well guard among themselves by voting. The well guard serves for one year only, and the water users have to select another person to replace the one who has finished his term. The well guard gets a salary of TSh 11,000 per month⁴. The water users contribute TSh 100 per month per household⁵. In Chemichemi, there are 83 households (see Table 7.3) who contributed a membership fee for the water source. Evidently, the amount of money contributed by the members of the Chemichemi Water User Group does not amount to the salary of the well guard of TSh 11,000. This implies that extra money is required to cover for the difference. During the interview with the chairperson of the well committee, it was reported that when non-members contribute this amount of TSh 100 per month to fetch water during dry season, the committee allows them to fetch water without being required to contribute to the membership fee of TSh 200⁶ (see Chapter 5). This implies that access to the Chemichemi water source is rather variable. The previous section showed that people have access to Chemichemi by paying a membership fee, but that they allow access of non-members during the rainy season when water is plenty. But when Chemichemi water source was fenced during Uhuru Torch Race in 2008, non-members were not allowed to fetch water even during rainy season without paying monthly financial contributions. This arrangement has compelled Water User Group members to pay extra money during rainy season, especially when non-members decides to fetch water from other sources. Therefore, the monthly contributions of non-members supplements and supports the Chemichemi members for hiring water guard.

The organization of water users in the Nzuitaka water source again differs from that of the other water sources. Instead of a well committee, Mr. Zacharia is the one who organizes the water users. He is in charge of the forest around the water source on behalf of Bahira clan. Although, the water source is a communal property, Mr. Zacharia feels responsible for overseeing the use and management of this water source. As he said during the interview:

“Although, some water users do not appreciate the volunteering work I do in taking care of this water source of Nzuitaka, I still feel obliged to control the use of this water source because we are the founder and other people are just newcomers”.

⁴ Equivalence: \$ 9.20 per month

⁵ Equivalence: \$ 0.08 per month per household

⁶ Equivalence: \$ 0.2

His statement reveals the difference between the well committee members and clan elders as the traditional land owners in organizing and controlling the use and management of water sources. Unlike well committees, which expect motivation and support from the district council, local leaders and clan elders feel morally and historically obliged to work for the community. Their main motivation is the recognition and appreciation they get from the community. The replacement of local leaders and clan elders with well committees has contributed to lack of accountability in maintaining the water sources that became embedded with external institutions, like the district council or national political programmes like the Uhuru Torch Race.. Consequently, Water User Groups and village communities lack people who can volunteer to take care of the water sources on behalf of the communities. Only in Nzuitaka case where the water source is still clearly under clan ownership, the guardian feels accountable to his community. However, not all clan leaders feel committed to take care of the communal water source. For example, the son who will inherit the ownership of Nzuitaka forest might react differently from his father regarding water source and forest management, and it also depends on the social, cultural, and political-administrative context in which he will be operating. Issues like ownership of the water sources and micro spring forests; the increasing heterogeneity of the villages and the consequent changes of social and cultural cohesion because of modernization in the everyday life of the water users, external NGO intervention and the degree of government institutional support, all contribute to the sustainability of the water sources in micro spring forests.

The organizational rules, cultural taboos and beliefs guiding the use and conservation of water sources and forests vegetation are constantly challenged. Both traditional institutions and external technological interventions are having an impact on the use and management of water sources and forests. Some of the rules, taboos and cultural beliefs are respected by all users, while others are respected by only a few individuals, and again others are not respected at all. The dynamic changes in the cultural meaning and social adherence to rules, taboos and cultural beliefs are due to external intervention, modern religion, modernization and formal education (see Chapters 5 and 6). Table 7.4 shows the present social adherence of rules, taboos and beliefs in the management and use of water sources and forests.

Table 7.4 The present social adherence of rules, taboos and beliefs in the management and use of water sources and forests

| Aspect | SN | Item | Social adherence of the rules, taboos and beliefs |
|------------------|----|--|---|
| Rules | 1 | Smoked metal pots (<i>sufuria</i>) should not be used for fetching water | Followed by water users in all cases |
| | 2 | Cleaning of water source done by all users | Depends on the organization of users at each water source |
| | 3 | Washing clothes, cleaning utensils and bathing near the water source are prohibited | Followed by water users in all cases |
| | 4 | Brushing teeth near the water source is prohibited | Followed by water users in all cases |
| | 5 | Watering cattle in the water source is prohibited | Followed by water users in all cases |
| | 6 | Water fetching should be done bare footed | Some users follow this but others do not |
| | 7 | Water drawing from the well should be done only by traditional container called <i>Mtaho</i> | Water users do not follow this |
| | 8 | Children under 10 years of age are not allowed to fetch water | Depends on the organization of users in each water source |
| | 9 | Membership by fee contribution | Works during water shortage |
| | 10 | Water fetching allowed only during the scheduled time | Works in Chemichemi and Migombani water sources only |
| | 11 | The water source guard should be paid through monthly contributions from water users | Works in Chemichemi water source only |
| | 13 | Water users to contribute money for replacing old facilities e.g. water tap | Depends on the organization of users in each water source |
| | 14 | Water fetching by queuing | Works during water shortage |
| | 15 | Individuals destroying any facility are required to pay money or replace the new facility | Depends on the organization of users in each water source |
| | 16 | Violators of the rules pay fines within a specified period | Not followed in all cases |
| | 17 | Non-compliant members should be suspended or membership terminated | Not common in all cases |
| Taboos | 18 | Postpartum women are not allowed to fetch water within 3 weeks | Not followed in all cases |
| | 19 | Women in menstrual period are not allowed to fetch water | Not followed in all cases |
| | 20 | Harvesting of well fish is prohibited | Not applicable in all cases except Nzuitaka |
| | 21 | Modification of traditional water wells (<i>Jiba lye byalo</i>) is prohibited | Not followed except Nzuitaka |
| | 22 | Women having given birth to twins not allowed to fetch water | Not followed in all cases |
| | 23 | Killing of <i>njubi</i> (black water snake) is a taboo | Followed in all cases |
| Cultural beliefs | 24 | Killing of <i>njubi</i> leads to drying up of water source and brings bad luck to the person involved and household members e.g. falling sick or dying | Differs among water users in all cases |
| | 26 | Tree cutting around water sources leads to drying up of water source | Differs among water users in all cases |
| | 27 | Harvesting of fish from water source leads to drying up of water in the source and the fish will never get cooked no matter how long you cook it | Differs among water users in Nzuitaka case |
| | 28 | The well dries up or water becomes reddish if a postpartum woman or a woman given birth to twins fetches water or cleans the water well | Not applicable in all cases |
| | 29 | The traditional water well dries up when modified | Differs among water users |

Regarding the control of access to the water sources, the well committee members registered their disappointment with the lack of support and motivation from the Ukerewe District Council, after the HESAWA programme had been terminated (see above). It appears that the district council has indeed assigned the Department of Community Development to assist the well committee and Water User Groups on technical issues related to the functioning of the water taps and tanks. Moreover, the Ward Health Offices are responsible to treat the water sources with chlorine to control water-borne diseases. However, due to financial constraints, the community development technician and the ward health officers have rarely been visiting Tumbu, Kilombero, Chemichemi, Anselm, and Migombani water sources. In fact we can consider this institutional weakness as a danger of formalizing local institutions for the management of natural resources by nesting them in formal structures that need frequent support and monitoring from the higher levels of government organs. The examples from Ukerewe main Island prove that one should not be naive about bricolage or the embedding of local institutions within wider governmental structures (Cleaver, 2002). The replacement of local leadership with a formal institutional set up is not always the solution to increasing efficiency, but can also lead to serious inefficiency. In Ukerewe for example, the introduced facilities like water taps and water tanks are not working properly in some water sources (see Chapter 5), and the well committees have failed to mobilize the users to contribute money to fix the problems. The well committees are regarded as external institutions that lack the social and symbolic capital in terms of networks of trust that would provide them with the status and power to persuade the water users to participate in contributing money, and make them see the collective benefit of using water taps in the first place. These examples also indicate the relevance for resources management of in-depth knowledge of people's everyday use practices as they vary according to physical, social, and cultural conditions in any of the six cases described in this thesis.

7.3 Use practices

This section discusses the use practices of water sources and micro spring forests, starting from the different uses of the water sources, how villagers use alternative water sources, and their contributions to the sustainable management of water sources in the micro spring forests.

The uses of water sources in the micro spring forests by the local people are similar in all cases with only minor differences. The villagers in Ukerewe main Island use the water sources in the micro spring forests for domestic and irrigation purposes. The domestic water use is the main use in all six water sources, while crop irrigation was observed only in Nzuitaka and Kilombero. Domestic water use includes using the water for cooking; drinking; washing utensils and clothes; bathing; and watering animals. This section describes different aspects, like who fetches water, time and means of fetching water, the amount of water fetched, water shortage, conflict management and the factors affecting the use of these sources.

Fetching water is traditionally based on a gendered division of labour, and it also depends on the ethnic group. This study supports the general picture of rural Africa that fetching water for domestic uses is a women's job, involving both young girls and adult women in all six cases. While adult women fetch water in the mornings, young girls especially those who are in day-schools fetch the water in the evenings just after coming home from school. When schools are closed and pupils are on leave, both women and young girls fetch the water in the mornings and evenings. Sometimes, due to shortages of household labour, young boys are also involved in this task. Young girls of less than ten years were observed fetching water alone in Nzuitaka, Tumbu, Kilombero, Chemichemi and Anselm while in Migombani they are allowed only when accompanied with adult women. The well committee of Migombani water source does not allow young girls to fetch water alone because they think that when many girls meet together they end up playing. This could cause destruction of the water source facilities like the water tap. However, the restriction of young girls is not the case in other water sources. In the past, young girls were not allowed to fetch water in these water sources (see Table 7.4), but because of household labour shortage and the dwindling of local norms guiding the use of these water sources, it is now common for young girls to fetch water alone from these sources.

Men usually fetch water for watering animals when the animals are grazing close to the water source. Alternatively, men water the animals directly at the downstream water or the rivers. However, men can fetch water for domestic uses under special circumstances. These include separation from their wives, being widowers, living singles, or in case their wives are sick or have just been giving birth, or are away for safaris and when there are no young girls or boys in the household.

It is important to understand the timing of water users when they fetch water because of the peak times and the potential conflict among water users. The timing differs between water sources depending on whether or not access is controlled. In Chemichemi and Migombani the fetching of water is controlled by the rules of opening and closing times, while in Nzuitaka, Tumbu, Kilombero and Anselm there is no such restriction. The opening time for Migombani water sources is from 8.00 am to 06.00 pm during the rainy season and from 08.00 am to 10.00 am and from 04.00 pm to 06.00 pm during the dry season. The opening time for Chemichemi is from 7.00 am to 10.00 am and from 2.00 pm to 06.00 pm regardless of the season. The fetching time for Nzuitaka, Tumbu, Kilombero, and Anselm is unrestricted during day time, but the peak is in the morning from 6.00 to 8.00 and in the evening from 4.00 to 6.00. The restrictions in Chemichemi and Migombani are physical, in the sense of having fences built around the water source, or social, in the form of having the guards. If these are absent, people are again free to fetch the water at any time, like in the other four cases. This daily routine allows women to combine water fetching with other activities like bathing, washing clothes and household utensils. Also, we should not underestimate the social control mechanism for a proper use of the water source by the practice that most water users are concentrating around the same time for fetching

water. However, the absence of guards or fences can contribute to conflicts among users when many people are competing for water during water scarcity in the dry period. Some measures have been taken by some water users in the study area to avoid conflicts related to overcrowding at water sources during water scarcity in dry seasons by fetching water during the night. This strategy has been acknowledged by other scholars that shifting time to off-peak periods is one of the components of water demand management (Mohapatra and Mitchell, 2009).

The way people draw water from the source depends on the available facilities and the nature of the water source. This study has identified different means of fetching water in the six cases (see Photo 7.1). Technological intervention, modernization and structural design of each water source have caused differences in the means of fetching the water. Before external interventions and massive introduction of plastic containers, villagers commonly used the *mtaho* for drawing water from the well; it was a specific traditional container that was only used for that purpose, so as to control the water quality by reducing the risk of contamination of the water source. The use of other containers like aluminium or plastic bowls was not allowed because sometimes the same containers could be used for serving foods and for other uses, which could pollute the water. However, plastic containers have become popular partly due to their availability and durability; but also because local people want to be modern, and they think that the use of traditional containers in the era of technology is the sign of being backward. The following comparison of the cases shows that there are different ways of fetching the water in these cases with the exception of Nzuitaka where there was no external intervention.



Water tap - Migombani, 2007

Water trapping - Nzuitaka, 2007

Dipping a container - Chemichemi, 2007

Photo 7.1 Different means of fetching water from water sources

Today, fetching water is through water taps in the sites like Anselm, Migombani and Chemichemi, where external interventions have prevailed. The water users in Kilombero and Tumbu fetch water with a *mtaho*, a bowl or a jug because the water taps are not working. In Nzuitaka they fetch water by trapping it with a container. The functioning of water taps and tanks in these water sources differs quite a lot; sometimes the taps and tanks are working and sometimes they do not function due to lack of maintenance from the water users. When there is a breakdown of the water tap

and the water flow is not controlled, the water users plug the tap with a wooden plug which can be removed to allow water fetching. The water users use this plug until a new water tap is bought and fixed. In addition, when the water tank is not storing water because of the water leakage caused by lack of maintenance, like in the Kilombero case, water users create a pond beside the tank and fetch the water from that pond until the water users repair the tank. This implies that it is difficult to predict whether or not the facilities work properly.

The amount of water fetched by households from water sources in the micro spring forests depends on several factors. Table 7.5 shows the average amount of water fetched per day by households with regard to distance of the water source and household size. The household survey was done in May 2008, which was the end of rainy season and the villagers estimated the amount of water they fetch during this period when water was plenty in the water sources. The Anselm water users estimated the highest amount (98.7 litres) of water fetched per day while Migombani water users estimated the lowest amount (64.7 litres). There are significant differences for water fetched by households per day in the six water sources ($F_{5, 175}=4.45$, $P<0.05$). A Tuckey's post hoc test further shows that the most significant differences are between Anselm and Tumbu; Anselm and Kilombero; and Anselm and Migombani water sources.

Table 7.5 The average amount of water fetched by household with respect to distance from water source and household size

| Name of water source | Average amount of water per day (litres) | Distance (km) | Household size (persons) |
|----------------------|--|---------------|--------------------------|
| Nzuitaka | 92.5 | 1.1 | 9 |
| Tumbu | 64.8 | 0.6 | 6 |
| Kilombero | 65.3 | 0.6 | 7 |
| Chemichemi | 84.3 | 0.5 | 7 |
| Anselm | 98.7 | 0.2 | 8 |
| Migombani | 64.7 | 0.3 | 8 |

Source: Survey data, 2008

The differences of the amount of water fetched by households per day in the six water sources in this study is considered to relate to factors like: the distance from the water source, household size, the presence of alternative water sources nearby, and the dependence on the water source. Using a linear regression analysis for the relationship between the amount of water fetched by the households per day and the independent factors mentioned above, only household size, dependence on water source and presence of alternative water sources were found to be significant (Table 7.6).

Table 7.6 Factors affecting the use of the water sources

| Independent variables | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|--|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | B | Std. Error | Beta | | | Tolerance | VIF |
| (Constant) | 51.204 | 12.296 | | 4.164 | .000 | | |
| Household size | 6.152 | .850 | .463 | 7.240 | .000 | .952 | 1.051 |
| Distance to micro forest | -8.785 | 7.445 | -.074 | -1.180 | .240 | .985 | 1.015 |
| Dependence on water source for domestic water uses | 25.560 | 5.826 | .285 | 4.387 | .000 | .926 | 1.080 |
| Presence of alternative water sources | -33.858 | 8.492 | -.255 | -3.987 | .000 | .955 | 1.048 |

Dependent Variable: Amount of water fetched per day; Significance at $p < 0.05$

The relationship of household size is positive implying that an increase in the household size leads to an increase of the water needed from the water source. The dependence on the water source is positive implying that the households which are highly dependent on water sources in the micro spring forests fetch more water from these sources than households that are partially depending on alternative sources. The relationship of having alternative sources of water is negative implying that households with alternative water sources fetch less water from the sources in the micro spring forests than those without the alternative water sources. Despite the fact that distance is not significant, the correlation is negative implying that any increase of distance from the residence to the water source leads to a decrease of the amount of water fetched by a household.

In addition, the comparison of the standardized coefficients suggest that household size has the biggest effect on the amount of water fetched from water sources in the micro spring forests (coefficient = 0.463) compared with dependence on water source (0.285), the presence of alternative water sources (-0.255) and the distance from the water source (-0.074). Furthermore, the adjusted R^2 is 0.30 implying that the independent variables explain only 30% of the variations in the dependent variable. In other words, there are more variables that are not included in the model, which can explain these variations. For example, household income (allowing for the possibility to dig a well near the house), life style, types of domestic water use, age structure, social-cultural values and the numbers of people accessing the water source could influence the amount of fetched water especially during the dry season.

As already discussed in Chapter 5, water shortage is a common phenomenon in all cases during the dry season. Conflicts during peak times for water fetching during the dry season are not uncommon and water users in all the cases have developed strategies of managing these conflicts. For the water sources improved by HESAWA, there are well committees; a male person from the well committee or from the users group is selected to ensure that people fetch water in a queue and everyone waits for

her turn. Men were preferred over women in supervising the water fetching during water scarcity because those who are involved in water fetching are women. Women perceived that they could not maintain the queue by themselves because some women tend to look down upon other women. Therefore, women consider men as the best option to control such situation because women listen to men more in a patrilineal society or because of “male chauvinism” (the common Swahili word is *mfumo dume*) or male dominance, which is common in many ethnic groups in Tanzania. In Nzuitaka, Mr. Zacharia supervises the water fetching during water shortage and he ensures that the water users fetch water in a queue. During the period of water scarcity, every household fetches a fixed amount of water. The water users or well committee collectively decide on a fixed amount of water for all water users depending on the severity of the water shortage at the site; the maximum amount of water ranges from 20 liters to 40 liters. This allows every household to get some water. In Migombani water source, rules have become stricter and people fetch water only for drinking. When water scarcity is very intense at the Nzuitaka, Tumbu, Kilombero and Anselm water sources that have no opening and closing time, people also fetch water during the night or very early in the morning. Some people use this especially when they find that they do not have a drop of water for drinking.

Apart from the villagers using water sources in the micro spring forest for domestic uses, they also use water sources for irrigation. However, only water users for Nzuitaka and Kilombero water sources use irrigation in their fields located near the water streams. Chemichemi and Tumbu water sources have water streams, but no water users of these sources use the stream for irrigation. This is because the bank of the Chemichemi stream is too deep to allow irrigation for the fields near it. The water ends in rice fields located very far away; and the people owning these rice fields are not members of the group owning Chemichemi. The Tumbu water stream also enters the large wetland near the water source and people from Kazilankanda and Harwego villages use that wetland for rice cultivation.

The irrigation of crops in Nzuitaka and Kilombero water source is done downstream and many households in Kilombero water sources are involved in crop irrigation because the water source has extensive wetlands running along the water stream. The irrigation farming involves crops such as rice, potatoes, tomatoes, spinach and cabbage. Since the villagers use the same piece of land for cultivation of different crops, they alternate the cultivation of different crops basing on the water demands of the crops during the seasons to maximize land use. Villagers do cultivate rice during rainy season when the fields are flooded; planting starts from February and harvesting ends in July. They do vegetable gardening and potatoes cultivation during dry season from July just after harvesting rice to November. During the dry season, the water sources do not produce enough water in the stream but they make the soil moist enough to favour the growth of these crops. Crop production during the dry season complements the wet seasonal harvests, while yields from this season’s crops earn a high price on the market due to the food shortage that is commonly experienced during the dry season.

In general villagers give higher priority to the water sources found in the micro spring forests for domestic water use. But they do have alternative water sources for domestic use. The villagers use water source in the micro spring forests mainly for drinking and cooking and consider these water sources as being more reliable in terms of quality and quantity (see Chapter 5). The water quality is considered to be high because of the good taste of the water. Therefore, villagers use alternative water sources not to replace the traditional water sources in the micro spring forests, but to complement them.

Alternative water sources mainly serve for washing utensils and clothes; bathing; and watering animals. The villagers use alternative water sources because a single water source might not meet the high water demands in Ukerewe main Island. In addition, other water uses do not require high water quality and some of the alternative sources are conveniently located in the courtyard or very near to the houses which very much reduces the distance and time to fetch the water for these purposes.

Table 7.7 presents the percentages of respondents with alternative water sources and the type of these sources. The majority of respondents for Nzuitaka (70%), Tumbu (93%), Kilombero (97%), Chemichemi (83%), Anselm (93%) and Migombani (97%) have alternative water sources. However, in Nzuitaka and Chemichemi 30% and 17% respectively have no alternative water sources. Fortunately, Nzuitaka and Chemichemi water sources are reliable even during the dry season because they produce more water as compared to other water sources (see Chapter 5).

Table 7.7 Percentage of households with alternative water sources

| Name of water source | Household % | Types of alternative water sources |
|----------------------|-------------|--|
| Nzuitaka | 70 | Own shallow well, neighbour's shallow well, HESAWA shallow well |
| Tumbu | 93 | Own shallow well, neighbour's shallow well, spring and Nzuitaka |
| Kilombero | 97 | Own shallow well, neighbour's shallow well, HESAWA shallow well |
| Chemichemi | 83 | Own shallow well, neighbour's shallow well, spring and river |
| Anselm | 93 | Lake, HESAWA well, Chemichemi, spring, own shallow well and neighbour's shallow well |
| Migombani | 97 | Lake, own shallow well, neighbour's shallow well, spring and HESAWA shallow well |

Source: Survey data 2008

In addition, water users in Tumbu and Anselm mention Nzuitaka and Chemichemi water sources as their alternative sources respectively, which adds to the reliability of these water sources (see Table 7.7). Nzuitaka and Tumbu water sources are within the

same village of Mahande while Anselm and Chemichemi water sources are also in the same village of Busiri. This is the reason for the water users in Anselm and Tumbu cases considering Chemichemi and Nzuitaka as being alternative water sources. The users of Anselm who use Chemichemi as alternative water source also contribute a membership fee for the Chemichemi water source. Moreover, the village resource maps drawn by water users in the six cases show that the water users in Anselm, Migombani and Tumbu are surrounded by many alternative water sources as compared to other water users in Nzuitaka, Kilombero and Chemichemi (see Appendix 3).

People's own or their neighbours' shallow wells seem to be good alternative water sources for most of the households in the study area. By comparing the cases, the results indicate that shallow wells constructed by individual households are becoming very important alternative water sources for neighbouring households. The water users of Nzuitaka, Tumbu, Kilombero and Chemichemi water sources attested to this finding (see Figure 7.1). However, these water sources do not replace the water sources in the micro spring forests because the water does not always taste good. These shallow wells located near people's homes are additional rather than alternative sources that reduce the burden on women to walk long distances spending more time fetching water for bathing, washing clothes and utensils from traditional water sources. However, the construction of shallow wells requires the household to have sufficient financial means and a suitable location with a high water table and little brackishness of the water. In addition, the digging of shallow wells is done manually and one well costs up to TSh 30,000⁷. Figure 7.1 shows that few households own shallow well and many households cannot afford to have one, so they depend on their neighbours' shallow wells. Access to these private water sources for domestic water uses by neighbouring households is free. Traditionally, villagers believe that good neighbours assist each other in times of need. In addition, there is a cultural belief that water is a basic human need and cannot be restricted or sold to neighbours. This finding is similar to that reported by Nkonya (2006) who shows that rural people regard water as a common pool resource that should be free for everyone and no one can be denied access to a water source for domestic use regardless of the water source.

⁷ Equivalence: \$ 25

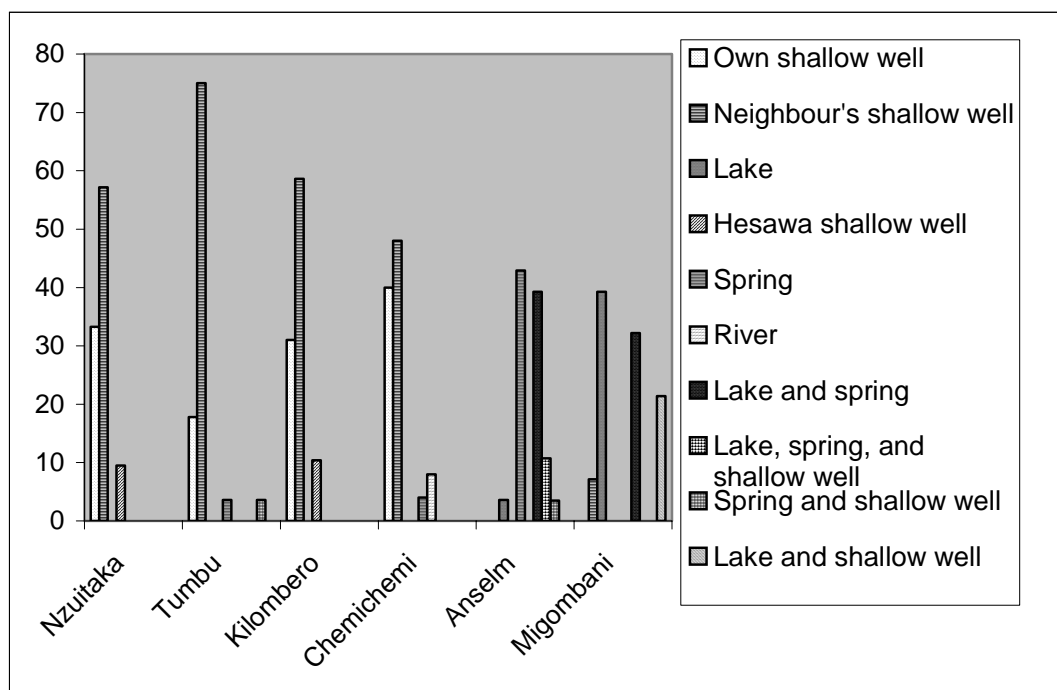


Figure 7.1 Distribution of respondents with respect to different alternative water sources.

Lake Victoria is not equally important as an alternative water source for the users of the six micro spring water sources. The data show that about 90% and 50% of Migombani and Anselm water users respectively use Lake Victoria for domestic uses. The average distance from Lake Victoria for users of the two cases is about 600 m. The longer distance of more than 1.5 km from the lake could be the reason for users from Nzuitaka, Tumbu, Kilombero and Chemichemi of not using Lake Victoria as an alternative water source. The high percentage of people from Migombani case using the water from Lake Victoria is probably because water users use Migombani water source strictly for drinking and cooking only, so the lake becomes an important source to meet other demands like bathing and washing clothes.

The data confirm that villagers consider their traditional water sources as producing good water for domestic uses, especially for drinking, because of its good taste. The perception that the water from traditional water sources has good taste is common in Ukerewe main Island. The villagers for a long time considered other water sources like shallow wells, the river and the lake as producing water that does not taste good, due to the presence of some minerals or pollutants. Currently, however, the perception of water users on traditional water sources a having a good taste is beginning to change. Almost all water users of Kilombero (100%), Chemichemi (100%), Anselm (100%), Migombani (97%), Tumbu (97%) and Nzuitaka (87%) ranked alternative

water sources as second in priority order, while some users in Nzuitaka (13%), Tumbu (3%) and Migombani (3%) ranked the alternative water sources as first in priority order. These findings suggest that some people, like civil servants or richer villagers, are gradually starting to reduce their dependency on these water sources for drinking and cooking, because of the long distances they have to cover in fetching it. For example, during focused group discussions, some people mentioned that they can use water from hand dug shallow wells for drinking and cooking if the top of these shallow wells is covered with a concrete block and the water is boiled. The local people consider water from a shallow well in their yard as being safe in terms of pathogens if they boil. Furthermore, they consider covering the water source could reduce the contamination of water due to the small animals like frogs, lizards and insects entering the shallow well and becoming rotten when these animals die. Apparently people are now not only considering the taste of the water but also the distance from the water source.

Moreover, the description by Mr. Selestine Msiba (Box 1) also shows why some households have stopped using traditional water sources in the micro spring forests for drinking and cooking purposes. Mr. Msiba does not want to use the Tumbu water source anymore because of its water quality and distance. He is a retired primary school teacher, so his education might have contributed to his concern on water quality in terms of water born diseases caused by faecal contamination. Also the retirement benefits might have helped him to cover the costs of constructing a shallow well. In addition, Mr. Msiba has children working in the capital of Dar es Salaam and other towns in the country. These children might have supported their father financially to construct the shallow well or might even have influenced him in changing his perception of the water quality due to their life style in the city and towns.

Box 1. Why Mr. Msiba decided to construct a shallow well at his home

My household used to fetch water for domestic uses from Tumbu water source, but because of the failure of traditional management institutions to ensure good water quality and the long distance to the water source, I decided to construct my own shallow well. The shallow well with a depth of about 30 feet guarantees clean and safe water for my household unlike the Tumbu water source which is easily polluted through rain water runoff and the use of dirty utensils by water users.

As explained earlier, the use practices of micro spring forests in the six cases depend on different factors. Traditionally, micro spring forests are protected for water source conservation and it is a taboo to cut live trees. However, in practice people in all cases harvest not only dead branches for firewood but also live trees for firewood, building materials, wood carving of handles, medicinal plants, and timber. Different tree species are harvested for different uses (Table 7.8).

Table 7.8 Trees harvested by villagers in the micro spring forests with their respective uses

| Name of micro spring forests | Species of cut stumps | |
|------------------------------|--|------------------------|
| | Scientific/Local names | Uses |
| Nzuitaka | <i>Psydrax parviflora</i> | Building poles |
| | <i>Vitex keniensis</i> | Building poles |
| | <i>Trichilia emetica</i> | Handles and firewood |
| | <i>Grewia bicolor</i> | Handles and firewood |
| | <i>Cedrella odorata</i> | Timber |
| | <i>Maesopsis eminii</i> | Timber |
| | <i>Lantana camara</i> | Firewood |
| | <i>Macaranga monandra</i> | Firewood |
| Tumbu | <i>Psydrax parviflora</i> | Building poles |
| | <i>Trichilia emetica</i> | Handles and firewood |
| | <i>Lantana camara</i> | Firewood |
| Kilombero | <i>Lantana camara</i> | Firewood |
| | <i>Macaranga monandra</i> | Firewood |
| | <i>Liyeko</i> | Medicinal plant (bark) |
| Chemichemi | <i>Macaranga monandra</i> | Firewood |
| | <i>Lantana camara</i> | Firewood |
| Anselm | <i>Trichilia emetica</i> , <i>Maesopsis eminii</i> , <i>Vitex keniensis</i> , <i>Melia azedarach</i> , <i>Vernonia amygdalina</i> , <i>Vangueria infausta</i> , <i>Mzyo</i> , <i>Mhuwa</i> , <i>Pseudospondias microcapa</i> , <i>Lantana camara</i> | Firewood and handles |
| Migombani | <i>Maesopsis eminii</i> | Timber |
| | <i>Markamia lutea</i> | Timber |
| | <i>Albizia gummifera</i> | Timber |
| | <i>Milicia excelsa</i> | Timber |
| | <i>Vitex keniensis</i> | Timber |

The harvesting of firewood was the most common in all cases, while harvesting for timber was common in the privately owned micro spring forests of Nzuitaka and Migombani. The collection of dead branches in all cases is done without any permission because it is traditionally accepted. However, not every dry tree or branch is collected for firewood. For example, in Kilombero there is a very big tree that has fallen after it was stricken by lightning in the 1990s, but people do not chop it for firewood because they believe that when they use it for cooking they can be stricken

by lightening too. This tree just lies there rotting without being chopped. Harvesting of live trees for firewood, making handles and building materials in all six sites involves few and only small sized trees. The cutting of branches of big trees is not common. In communal micro spring forests like Tumbu, Kilombero and Chemichemi, people harvest these trees secretly, while in private forests the owners do it openly. Some villagers are not afraid anymore of the cultural beliefs related to the forest conserving water sources; rather they avoid the challenges from other water users who still believe in these taboos and the importance of forest on water source. Before the 1970s, villagers used to be afraid of breaking the taboos related to spring micro forests and they believed in the punishments associated with cultural beliefs. People followed the rules by themselves, rather than been governed by the fear of being seen by others during the violation of the taboos.

The owners of private forests are currently more interested in the economic value of the forest rather than in its conservation value, either because of a lack of alternative sources of income or due to forest land insecurity. This is clearly the case with the privately owned cases of Nzuitaka, Anselm and Migombani. Mr. Zacharia who owns trees in Nzuitaka micro forest harvested the planted trees for timber to obtain the necessary means for school fees for his son who was selected to join secondary school in 2007. In addition, in 2008 the Anselm's family who owns trees in Anselm micro spring forest harvested all the trees with a dbh less than 12 cm to scare away the monkeys that were destroying crops in the farms adjacent to the site. Finally, in 2005 Chingulu Chibi, who owned trees in Migombani case, clear-felled all the trees for timber before he sold the land to Mr. Keya. The interview data for this study show that the intervention by the HESAWA programme contributed to the insecurity of private forest land ownership for Anselm and Migombani. For example, the owners of Anselm and Migombani are worried that all land surrounding water sources within 100 meters from the water source would be seen as belonging to the water sources. The HESAWA people mentioned this distance and it has been included in the bill to enact by-laws for conserving water sources (see Chapters 5 and 6). The practices of using trees in Nzuitaka, Anselm and Migombani cases show that trees on private land run a greater risk of massive harvesting by the owners than those on group-owned forest land. In addition, the owners of private land are legitimizing the cutting of trees around water sources as they do it openly, as opposed to people harvesting trees secretly on communal land. The cultural value of the forest thus definitely changed in comparison to the 1970s when villagers still respected the taboos, hence there was no live tree cutting in either private or communal forests.

Harvesting of trees in micro spring forests by local people is selectively done by considering the importance of indigenous trees species on water source conservation. Interestingly, among the trees considered to be good for water source conservation, *Ficus spp*, *Macaranga monandra*, *Pseudospondias microcarpa* and *Syzygium guineense* are still not cut, and only *Macaranga monandra* is commonly harvested for firewood. This could be due to its capacity to grow fast and form a dense thicket. Also *Lantana camara* that is dominating most of the disturbed parts of micro spring forests

is seen to be harvested for firewood almost in all micro spring forests. This implies that trees, which are traditionally known to be good for water source conservation, are still protected.

7.4 Management practices

This section presents the management practices of water sources and micro spring forests. The first part identifies both local and external groups of people involved in the management and their responsibilities, followed by a discussion of the different management practices regarding water sources and forests. Because sustainability of water sources and micro spring forests does not depend only on the management practices at micro spring forests, this section also discusses the different land use practices around micro spring forests which address the key issues related to water sources and forests management.

The management of water sources and forests involves several actors, both village community or Water User Group members and external people. Table 7.9 presents the actors and their responsibilities in water sources and forests management that will be further elaborated below.

Table 7.9 Actors and their responsibilities in water sources and forests management

| Actors | Responsibilities |
|--------------------------------------|---|
| Water sources management | |
| Water users | To abide to the rules, taboos and cultural beliefs guiding the use of the water source |
| Clan trustee (Mr. Zacharia) | Enforce the rules, taboo and cultural beliefs |
| Community elders | Transfer of taboos and cultural beliefs to young generation |
| Well committee | To oversee the daily uses and management of water sources and enforce the rules, taboos and cultural beliefs |
| Well guard | To control access by opening and closing time for water fetching, cleaning of water source, overseeing the proper use of water source facilities and resolve conflict |
| Ward health officer | To improve the water users hygiene by treating water sources with chlorine |
| Department of community development | To provide technical support to improved traditional water sources |
| | |
| Forest management | |
| Family or clan members owning forest | To control the uses and enhance the growth condition of the forests |
| Community elders | Transfer of indigenous knowledge on trees and taboos and cultural beliefs to young generation |
| Water source users | To abide by the rules, taboos and cultural beliefs |
| Well committee | To oversee the protection of the forest for water source conservation |
| Well guard | To protect tree cutting and other destructive uses |

The management practices of water sources and forest vegetation go beyond physical action/activities, to include social organization, norms and general behaviours of resource users. The management practices regarding water sources focus on the maintenance of the cleanliness of water sources environment and water source facilities while those for forest focus on activities guaranteeing the enhancement of the forest condition.

The maintenance of water sources environments and facilities especially the general cleanliness of the sites and the repairing of taps, tanks and pipes is important in improving the hygiene and proper functioning of the water source facilities,. The water users of Tumbu, Kilombero, Chemichemi, Anselm and Migombani actively clean the surroundings of these water sources. The committee decides on the day for cleaning and then invites the water users to participate at the event. Both men and women are involved in the cleaning. Men slash the grasses and herbs around the water source while women remove the mud and fallen leaves from the well and the water stream. Interestingly, before the HESAWA intervention, only women were doing all these tasks of removing the mud and slashing the grasses. HESAWA emphasized the participation of both men and women in maintaining the water sources. The attendance of water users and regular cleaning of the water sources depends on the manner in which well committees organize their people and the motivations of the people themselves in participating to the event. During fieldwork, water users of Chemichemi and Migombani were observed to be cleaning their water sources more regularly than the users of Tumbu, Kilombero, and Anselm water sources.

Sometimes the paid water source guard does the cleaning if the users have agreed to pay their monthly contribution. Often, the external actors including those from the Department of Community Development at Ukerewe District Council initiate the idea of having someone among the water source users to guard the water quality and clean the water source on behalf of all users; but this idea in most cases is short lived because water users consider the financial contribution of hiring a water guard as an additional burden. Before the Uhuru Torch Race intervention at Chemichemi, the water users were cleaning the water source themselves, and the well committee at Tumbu, Kilombero, Anselm and Migombani water sources used to organize both men and women to do the job. Currently, the Chemichemi water source has a guard who takes care of the water source facilities and cleans the surroundings of the water source by slashing the grasses, removing the mud from the stream and controlling the access of water users. During the Uhuru Torch Race intervention in 2008, the water users under the organization of the well committee agreed with the idea of making financial contribution per month to pay the well guard (see Chapter 5). The sustainability of this arrangement depends on factors such as the length of time water users would be willing to pay the monthly contribution; the strategies should the well committee use in motivating the water users in complying with the practice, and to what extent the water source guard would manage to prevent free riders from using the water source. Many local people depend on agriculture to earn money and there is very little off-farm paid employment in the rural area. The practice of paying one

person to guard a well has led to other people getting more interested in this job. For example, one woman made a joke to a water guard of Chemichemi by saying:

“Because we are paying you a salary to guard this water source, you are now shining and boasting, very soon we are going to stop paying you”.

Apart from cleaning the water sources, its users participate in the replacement and repair of facilities introduced by the programmes. They usually dislike to contribute money to replace water taps, pipes and repair leaking water tanks. Consequently, most of the facilities in these water sources do not working properly (see Chapter 5). During the interviews for this study, water users reported to have failed to maintain and replace the broken down water taps and tanks because they were busy participating in the construction of the wards secondary schools. The villagers contribute labour and money for these constructions and the rates of the contributions are pretty high, so they are left with too little money to bear the extra contribution to repair the water sources. The chairperson of the Chemichemi well committee emphasized that people give a priority in contributing money for secondary school construction because the police arrests the people who fail to contribute. However, water source users and well committees can use the contribution of secondary school as an excuse to offer to the outsiders, like this researcher and others who happened to visit these water sources. Actually, the costs of replacing a water tap if it is shared among all users are very small, which implies that the willingness to contribute money to replace or repair the water source facilities depends on whether or not the users see any added value in the use of a water tap as compared to their traditional ways of fetching water.

The proper functioning of water source facilities depends on both water users and the support from the Ukerewe District Council. The facilities in Chemichemi are currently working properly because the council supported their maintenance during the Uhuru Torch Race in August 2008 (see Chapter 5). The council provided materials such as cement, water taps and fencing wire mesh and supervision of the maintenance in collaboration with the well committee. The water users contributed labour by bringing sand, gravel and assisting the construction technician during the construction. Before the assistance from the district council, the water tap and the water tank of Chemichemi water source had not been functioning for a long time. Neither the water users nor the well committee had been able to replace and repair the broken down water tap and water tank. The well committee had only been able to organize the cleaning around water source. These facts suggest that it is easier for the water users to contribute labour than to contribute money, even if the money needed is very little. Apparently, water users do not see much benefit in having a water tap; they see it as an added cost more than as a means of guaranteeing water quality.

Water treatment to maintain the water quality involves external actors from the Ward's office. The Ward Health Officer is responsible for treating the water. The treatment of water with chlorine in Ukerewe district is usually done for the piped

water systems in urban areas, but not in the traditional water sources located in rural areas. HESAWA intervention initiated the practice of water treatment in the rural areas to control water borne diseases. The treatment of water sources is supposed to be done at least after every three months, especially during the rainy season when diarrhoea outbreaks are common. The Ward Health Officer gets chlorine from the Ukerewe District Health Department. Before treating the water source, the health officer makes announcements through the post (Photo 7.2) or through the sub-village leaders to inform the individual households not to use the water for drinking and cooking within 2 days after the chlorine has been applied to the water.

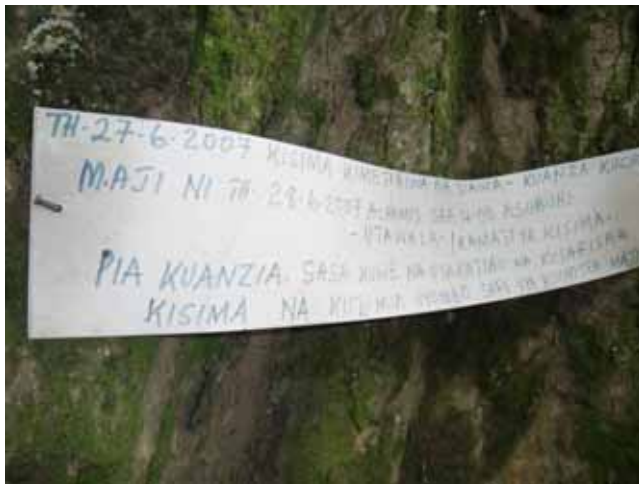


Photo 7.2 Announcement for water source treatment

During fieldwork in 2008, water treatment was observed only in the Tumbu water source; the water users in other sites claimed not to have seen their water source being treated for more than a year. The frequencies of treatment depend on the availability of chlorine from the District Health Department, the presence of the officer and his commitment in making follow-up requests to the district council headquarters to make the chemicals available. Apart from treating the water sources, it is the task of the health officers to create awareness among the local communities about the hygiene of house and water sources. To achieve this, the health officials inspect meat shops, hotels, household toilets, schools and guesthouses. Because there is only one health officer in the ward, and who is supposed to visit several villages composing the ward (see Chapter 5), his/her decision to visit a particular water source depends very much on the distance, the means of communication, funds, and personal interest and priority. For example, only the ward health officer of the Mukituntu ward treated the Tumbu water source with chlorine during the field research period, probably because the water source is in the village where offices for the Ward Health Officers and Ward Executive Officer are located. This implies that the practice of treating water is not sustainable.

During the implementation of the HESAWA programme there was a budget for water treatment activities of the rural water sources and the programme workers made frequent follow-up visits. Today, the district council does not prepare sufficient budget for these activities. The only time one can see concerted action from the district council is when there are disease outbreaks like cholera and diarrhoea.

The management activities at Nzuitaka are different from those of Tumbu, Kilombero, Chemichemi, Anselm and Migombani, because Nzuitaka is the only site where no external intervention specifically on water source took place. All water users of Nzuitaka were cleaning the water source in the 1990s, but nowadays things have changed and Mr. Zacharia Wanjura volunteers to do the cleaning of the water source. This villager still owns the crop fields and forest around the water source (see Chapters 5 and 6). He works in his fields almost every day, which helps him to organize the users of the water source and to monitor the events that happen at the site. However, due to his great involvement in taking care of the water source by warning and punishing those who are abusing the use of water source through improper practices like using dirty utensils, at times he had been insulted and accused of using his power to persuade women to make love with him. These allegations have upset and demoralized him in taking care of the water source as he once said:

“I am not paid for taking care of this water source, but still some users do not appreciate my contribution and they keep blaming me for whatever I am doing to discipline those who are breaking the rules of the water source. It is better to spend my time on economic activities rather than working for people who are not thankful”.

Still, although Mr. Zacharia sometimes feels frustrated he remains committed to take care of the water source in the name of the community and to maintain the identity of Bahira clan.

The management of micro spring forests involve several actors who are directly or indirectly trying to enhance the growth of the forests, for example by planting trees. Tree planting was observed only in Nzuitaka where the planted trees include *Maesopsis eminii*, *Cedrella odorata*, *Mangifera indica*, *Acrocarpus fraxinifolius*, *Melia azedarach* and *Citrus sinensis*. Mr. Zacharia uses wild tree seedlings and he sometimes raises the seedlings at his home. The planted trees species are mainly for timber and fruit production, and less for the purpose of conservation of the water source. He also performs silvicultural practices like pruning and weeding only for the exotic tree species he planted to improve the wood quality for timber production. The presence of exotic trees around the water source could still serve the purpose of water source conservation because they provide shade and reduce soil erosion. Since the trees have been planted on private land and the water source surrounded by this forest is a common property, tree planting can be considered as a strategy of increasing security of land tenure by the fact that the control of trees often contributes to the control and higher value of the land on which they stand (Kajembe, 1994). Although Migombani and Anselm micro spring forests are private land, the owners did not plant

trees. Earlier we have seen that the previous owner clear-felled Migombani micro spring forest before he sold it (see Chapter 6). The current owner is clearly more interested in crop cultivation than in tree planting, and he is also eager to dissociate his land from being associated with the water source. In the case of Anselm, the only planted trees are the ones planted by Mr. Anselm during his lifetime. In Tumbu, Kilombero and Chemichemi micro spring forests- which are owned by Water User Groups – no trees are planted. The six cases imply that individuals who own private forest land are more likely to plant trees, but mainly for economic purposes, whereas collective planting trees for economic purposes is not happening on communal forest land.

The management of micro spring forests is not always done to enhance the growth of the forest, but at times is done to increase security for the water source users. In 2007, there were rumours that *banyigi* (robbers) were waylaying for people at Tumbu micro spring forests, so the water source users decided to cut down all shrubs to destroy potential hiding places for *banyigi*. The management also arranged that people going and coming from the water sources would keep each other in sight. The villagers associated the *banyigi* with witchcraft beliefs that they were searching for human organs like hands, legs and genital organs, which could be used by witchdoctors to make their client rich. Sometimes a rumour may merely start when the villagers see a strange person going around the water sources. The researcher was also a victim of this encounter twice. For example, in 2007 when walking around the Tumbu micro spring forest during the field inventory, two girls who were collecting firewood ran away thinking that the researcher was a *mnyigi* (robber). Furthermore, the same experience of villagers shouting *mnyigi* at the researcher happened when the researcher was taking measurements of the forest near the Chemichemi micro spring forest using Global Positioning System (GPS). When the villagers saw the researcher holding that equipment, walking and stopping regularly, they started shouting at him that he was a *mnyigi*. This implies that, although the researcher was not a real *mnyigi* and that cultural beliefs like these have started to erode, some people still believe there are some witchdoctors who can make some people become very rich. There also some community elders who are instrumental in transferring some of these beliefs.

The enhancement of the quality and quantity of the traditional water sources and the forest condition do not only depend on what happens on the spot at these resources, but it also depends on the different land uses surrounding these resources that can have positive or negative effects. Table 7.10 shows the different land uses surrounding the micro spring forests.

Table 7.10 Different land uses surrounding the micro spring forests

| SN | Name of water source | Types of land use |
|----|----------------------|--|
| 1 | Nzuitaka | Rice, cassava, potatoes, maize, banana and coffee cultivation; tree planting; settlements; and animal grazing (goat and cows). |
| 2 | Tumbu | Rice, cassava, potatoes and maize cultivation; infrastructure (road); settlements; and animal grazing (goat and cows) |
| 3 | Kilombero | Vegetable gardening for tomatoes, spinach and cabbage; rice, cassava, potatoes and maize cultivation; bushed hill tops, settlements, infrastructure (road), and animal grazing (goat and cows) |
| 4 | Chemichemi | Rice, cassava, potatoes, maize, banana; growing orange trees cultivation; forested hills (natural); infrastructure (road); settlements; and animal grazing (goat and cows). |
| 5 | Anselm | Cassava, potatoes, maize, banana, coffee and orange trees cultivation; settlements; bushed hills; and animal grazing (goat and cows). |
| 6 | Migombani | Cassava, potatoes, maize, banana, coffee and orange trees cultivation; settlements; animal grazing (goat and cows), and fishing |

Crop cultivation, animal grazing and settlements are the most common land uses found close to all these sites. The contribution of each land use to water pollution depends very much on the location of the plots in terms of whether it is in the upstream or the downstream of the water source, and the distance of the land use from the water source. The type of land use does not necessarily have a negative effect on the water sources but it depends on the techniques the villagers apply. They often cultivate cassava, maize and potatoes on ridges, and without the application of agricultural chemicals like fertilizers and pesticides. The ridges always run across the slope. If the water source is located down the slope, the ridges can help to reduce water pollution through siltation. The villagers in the cases of Kilombero and Nzuitaka grow vegetables like tomatoes and cabbages downstream and they often use chemicals to control vegetable diseases. However, the possibility of causing water pollution in the Kilombero water source is minimal due to the location of the agricultural land. Human settlements are located at least a 100 meters away from the water sources in all cases which reduce the possibility of water pollution through seepage of toilets and other households' wastes. Water users consider bushed and forested hilltops near Anselm, Kilombero and Chemichemi water sources as positive land covers for the conservation of water sources as they act as water catchment areas. For example, near Chemichemi micro spring forest there are two private forested hills and the owners protect them for environmental conservation purposes. Mr. Tilusubya Mageta owns one forest with an area of about 5 ha and which he inherited from his father who was one of the persons who discovered Chemichemi water source (see Chapter 5). Mr. Tilusubya is looking at the possibility of getting the *Hati Miliki ya Kimila* (certificate of customary rights of occupancy) so that he becomes a legal owner of this forest. However, he complained that those involved in processing the documents are very bothersome and demand a lot of money to accomplish the task. He registered concerns that if he does not get the certificate, the village government might turn the land into a village forest reserve because the Forest Act No. 14 of 2002

empowers village council to create and manage Village land forest reserves. The concerns of Mr. Tilusubya about the security of his forest can force him to change the land use by clearing the forest and grow crops.

Animal grazing near water sources can lead to water pollution due to the cow dung disposal. In all the cases cows were seen grazing near the water sources. During the dry season, most of the grass lands are dry and with no grasses to feed the animals except near the micro spring forests where there are still some green pastures due to the moisture around micro spring forests. In addition, villagers practice post-harvest grazing in the fields located near the water sources. These practices are potential sources of water pollution for Kilombero and Tumbu, especially when done above the water source during the rainy season. The water tank of Tumbu is not covered and its top level is almost the same as the land surface. During the rainy season, the water runoff can easily contaminate the water in the tank. Likewise, for Kilombero, the water tank is not working and people fetch water from the small pond created besides the tank, which could be easily contaminated with water runoff during the rainy season.

The presence of roads near some of the water sources has facilitated the users' access to the water sources by walking, biking, carts and even vehicles. Roads have also contributed to water pollution in Tumbu through the siltation caused by roadside ditches and bridges. The water users in Tumbu complain that the contractors were not in any way concerned about the effects of the construction of side ditches and the bridge on their water source.

The different land uses surrounding the micro spring forests do not only affect the water sources but also the condition of the forest itself. Crop cultivation around micro spring forests in all the cases has an impact on the size of the forests. During interviews water users acknowledged that villagers who cultivate crops on a plot adjacent to a micro spring forest encroach into the forests by a centimetre every season, hence reducing the size of the forest. The boundaries between micro spring forest and crop field do not have clear demarcation by either having live trees or visible boundary signs; and this makes it impossible to tell whether or not one has encroached the forest. Moreover, those who own the fields around the micro spring forests are the same persons who historically already own the water sources and micro spring forests (see Chapter 5 and 6), which makes it difficult for other water users to accuse these people of moving too close to the micro spring forests and the water source.

7.5 Summary

This chapter has shown that the present organization, use and management practices of water sources and forest vegetation vary among the cases due to institutional factors, personalities of actors and characteristics of the resources. Institutional factors include the presence of support from external institutions, an active well committee,

active clan members, and the resilience of traditional management institutions. A combination of traditional management institutions and technological intervention is currently guiding the use and management of water sources and micro spring forests. The personalities of actors refers to the commitment and interest of individual and institutional actors at various levels such as water users, clan elders, well committee members, and ward health officers in managing the water sources and forests, and their power relations and social-cultural factors like the belief in witchcraft. In the discussion of the characteristics of the resources reference is made to the presence of fishes associated with certain taboos, the increased economic value of trees planted in the micro spring forests, governmental health concerns of applying chlorine, and polluting effects of land use in surrounding areas.

We have seen that external intervention and the historical developments of water sources and forests management provide us with three institutional models for the management of micro spring forests as integrated resource systems. The first is the resilient form of traditional management institutions without any external intervention, where the forest is a clan property and the water source is communally owned. The only example is Nzuitaka, where clan ownership and community concern of one elder have ensured better management of both the water and forest resources. The second management model is characterised by technological intervention and common property rights to both water and forest resources. This is the case in Kilombero, Chemichemi and Tumbu, where forest management has been more effective than the management of the water source because the water users have become dependent of external technological support for the maintenance of the water source. Apparently, group membership alone is not enough to guarantee the functioning of facilities like the water tank and the tap.

The third institutional model is that of technological intervention and formal Water User Group membership which provide the management institutions for the water source as group property, while the forest is private property. This model includes Anselm and Migombani, and it has been effective in the management of the Migombani water source, but not in the case of the forests in either of these sites. Lack of security of forest tenure rights has led to degradation of forest condition. It can be concluded therefore that security of forest tenure rights is very important for the sustainability of forests as an integrated resource system of trees and water sources. Also in this institutional structure, the water users have become dependent on the external support that has undermined their capacity to take collective action to maintain the modern facilities at the sites of the water sources. The practices of using and managing water sources and forests in the cases of Tumbu, Kilombero, Chemichemi, Anselm and Migombani may show some sustainability, but they are not predictable. The changes in the condition of the water and forest resources conditions appear strongly related to two kinds of security: security – or, rather, the lack of it – of technological and financial support from the district council in the case of water sources that were reconstructed through programme intervention during the last two decades, and security of land tenure of privately owned forests.

Despite having tree harvesting in the micro spring forests, the presence of tree species traditionally seen as related to water source conservation has not been very much affected. The individual owning private forest of Nzuitaka has used tree planting as a strategy of increasing security of land tenure rights whereas individuals owning Anselm and Migombani have done the opposite, namely the harvesting of trees as a strategy to increase land tenure security. The owner of Nzuitaka sees tree planting as a means of increasing security of land ownership against the village government and, at the same time, allowing him to harvest these planted trees while conserving the naturally grown trees.

The intervention by government institutions, sometimes supported by international donors as was in the case with HESAWA, may threaten local management systems of natural resources. Nesting these local management systems into formal hierarchical structures that need frequent support and monitoring from the district government and higher administrative levels may weaken local institutions and result into inefficiency of the system. Because of financial constraints, the Community Development Technician and the Ward Health Officers rarely visit the Tumbu, Kilombero, Chemichemi, Anselm and Migombani water sources, while these cases also show that the replacement of local leadership with formal institutional dominance does not automatically revert to an increase in institutional efficiency, rather it may revert to the opposite.

Chapter 8

SCIENTIFIC CONCLUSION AND FINAL DISCUSSION

8.1 Overview

The general objective of this research has been to examine the changes in institutional practices for the use and management of water sources and micro spring forests in rural Tanzania, and to assess their role in sustaining these integrated natural resource systems, especially in areas where state provision of water is still minimal. An in-depth empirical study of six cases of micro spring forests and their water sources has been made in order to understand the variability of local institutions, the interventions that have taken place at each site, and the different forms of interaction between local and external institutional arrangements shaping the present day uses and management practices of water sources and forest vegetation.

This chapter presents the main conclusions of the study as presented in the various chapters. In doing so, a reflection has been made on the study objectives and theoretical concepts as well as the literature used in this study. Finally, the chapter discusses the relevance of the research findings for policy making in integrated forest and water management by local communities in Tanzania.

The study on use and management of water sources and micro spring forests in rural Tanzania underscores the importance of detailed knowledge about a number of issues that government officials and foreign non-government organizations usually do not find relevant. The in-depth technical and social science research in the six different sites in Ukerewe main Island show several important findings, particularly the relevance of site-specific institutional histories, variations in resource tenure, and the fact that there is no single model of how external institutions are embedded in local institutions. Below, the scientific conclusions is further substantiated in relation to the literature used, and a comparison is made between the six study sites.

8.2 Main research findings

The main objective was to examine how the changes in institutional practices for use and management of water sources in the micro spring forests relates to the dynamics of these integrated natural resource systems. To find answers to the research questions, the following things have been done: an identification of the external and local institutions with regard to the use and management of water sources and forest vegetation; the assessment of the dynamics of this institutional nesting; and examination of the kinds of changes that have occurred in water sources and forest conditions over time.

The functioning and dynamics of local institutions for the management of water sources and vegetation of micro spring forests in interaction with external

interventions, in the context of modernization of the rural resource users have been the focus of this study. External interventions by government or non-governmental programmes usually apply a monodisciplinary or sector approach to resources management. In this study the main emphasis was on the improvement of water quality and quantity through modern technology and formal organization of water users. External programmes for natural resources management come with their own agenda, which dictates what resource is to be given priority. However, the local communities where the intervention takes place have their own agency to process the introduced technology to suit their local values and priorities. The interface of local people's and external actors' interests creates an arena for negotiations and modifications of outcomes of the planned interventions. The six cases presented in this book show different institutional practices of using and managing water and forest vegetation that are based on different ways of interaction between local and externally introduced institutions.

The process of institutional bricolage and dynamics of tenure systems

In this study, the concept of bricolage as developed by F. Cleaver (2001, 2002) has been used to describe and theoretically explain the process of the interactions between local or traditional resources management institutions and external interventions by government and international institutions and organizations. Cleaver developed the concept of institutional bricolage to understand how local and external institutions are borrowed, adapted and combined in the processes of solving resource management problems by collective action (Cleaver, 2001; 2002). The concept of institutional bricolage is used in this study to conceptualize the different practices of mixing indigenous and externally introduced norms and forms of organization for resource management. This contrasts with an Ostromian approach of identifying design criteria for assessing whether local institutions for use and management of water sources and forest vegetation are robust in view of internal conditions, because the history of external interventions is an essential part of institutionalization.

Moreover, the common-pool resource (CPR) model (Ostrom, 1990) focuses mainly on one natural resource at a time, and it does not address situations of multiple and mutually dependent resources, like in the case of micro spring forests and water sources. The current study has therefore moved beyond this model by giving more attention to the dynamic and variable interface of indigenous and external institutional arrangements in the development of water sources in the micro spring forests.

Bricolage as a concept emphasizes on the critical role of human agency in solving social problems. The interest here has been to understand how in real life processes of institutional bricolage take place, and how actors make it happen. To this purpose the actor-oriented approach of Long and his group at Wageningen (Long, 2001) has been applied. However, as emphasized by the concepts of bricolage and interface, local or traditional institutional arrangements should be conceived as constantly being reproduced and adapted to new conditions. This study has provided insight into how the different social roles of individuals in the village community or external

intervention programmes contribute to the construction of newly embedded institutions for natural resources management. External intervention is not just something that achieves its objectives through a linear process, but as something which is being actively negotiated and transformed by local people who are the subjects having the agency, rather than passive objects of intervention. The different management histories of the six research sites are the cases in point.

Cleaver asserts that during the bricolage process, socially embedded institutions can replace legal and formal sanctions or can be combined with them; without such a process, the externally introduced arrangements are unlikely to be effective. The author does not, however, indicate if the bricolage process takes place only when there is external intervention or whether it can even take place under the initiative of local people when they themselves devise mechanisms to solve resource use problems under conditions of modernization, as this study has shown. Modernization of rural people in Tanzania takes place through formal education and communication media such as TV programmes, radio programmes, or newspapers. It should be considered possible that both situations of institutional change or transformation can take place with external intervention, like in the majority of the sites, and without external intervention, like in the case of Nzuitaka. Considering institutional bricolage as a continuous process without boundaries of space and time as sanctioned by external interventions helps us to understand how the bricolage can be understood as a social process in local communities upon their own initiative and agency, and not necessarily only through external intervention.

Further, Cleaver (2002: 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. The findings in this study support this view: the intervention by HESAWA and the District Council, and the institutionalization of well committees create a new institution that has both local and foreign elements.

Moreover, the process of bricolage implies uncertainties because the newly formed institutions are not necessarily strong in addressing resource use and management problems, instead they can be weak and ineffective (Cleaver, 2000). The change from traditional management of micro spring forests to externally introduced technological management or a combination of traditional and technological management observed in the cases demonstrate the uncertainties involved in institutional bricolage. For example, the introduction of Water User Group and well committee has created tenure rights insecurity in family forests of Anselm and Migombani cases (see Chapters 6 and 7) and which has contributed to the deterioration of forest vegetation in these cases. The impact of management changes on resource condition depends on how

local people have integrated the external institutions in their daily practices and whether these institutions do not affect other interests.

Regarding the institutional scale, admittedly Mehta *et al.* (2001) argument holds water that the institutional embedding approach needs to be extended from the local level by incorporating history and by relating local institutions to policy processes occurring at the national and global levels. In Ukerewe main Island, the examples are the intervention by HESAWA, UNICEF, and national or district programmes for water quality improvement.

The influence of history on institutional change is not strict path dependence; rather it is soft path dependence because not all changes of institutions in the cases are related to history. The Nzuitaka case demonstrates how the history was used to defend the traditional management over external interventions. There was no intervention in the Nzuitaka case because the clan elder Mr. Zacharia who owns the forest and supervises the use of water source rejected the external intervention by the HESAWA programme by claiming that modifying their water source was against the taboos and cultural beliefs, which have been respected over several decades.

This study has been able to confirm the relevance of land, forest, and water tenure rights. Although this is not a study on legal pluralism, it is somehow implied in the process of institutional bricolage. Cleaver's conceptualization of socially embedded institutions may mask other sources of claims on resources that are laid down in patrilineal clan membership or communal forest management systems. Following Meinzen-Dick and Pradhan (2001) it is very important to consider property rights and the implications of externally introduced access rules and management institutions for resources management.

Studying the historical transformation of tenure systems in Tanzania helps to understand how the everyday practices of using and managing land, water, and forests relate to statutory rights, customary rights, or common property rules, and how external intervention has been instrumental in transforming local ownership and use rights. The current tenure systems of land, water, forest and trees have a long history from the pre-colonial era through the colonial period to independence and, finally, to the present forms of tenure. The interest in forest protection of both the colonial government and the government of independent Tanzania has been to convert land into forest reserves, alienating local communities from using these resources. Statutory tenure systems during colonial and post-colonial times recognized the role of customary tenure of land, water and forest, but they never granted full autonomy to those customary systems to work independently and without state interference. However, until today and especially in rural areas where state administration of statutory rights is difficult, customary rights remain important in organizing the access, use and management of natural resources. The abolishment of the chieftaincy and the implementation of the villagization programme in the 1970s contributed to the weakening of customary laws. These state interventions disrupted the social

organization and cohesion of clan settlements and village communities, and the local elders lost their authority and power, which villagers had relied upon over a long time to mediate conflict and find solutions to local problems. These and other historical and institutional changes have affected the use and management of micro spring forests and water sources.

Dynamics in water source and micro spring forest management

The dynamic concept of bricolage has been chosen to understand the process and variable practices of water and forest vegetation management through time and place at six selected micro spring forests in Ukerewe which vary in terms of location and intervention history. The concept of institutional bricolage shows the multiplicity of institutional change and development. It challenges the idea that new institutions are specifically introduced to solve a particular problem; rather the institutions are multi-purpose and are generated by both conscious and unconscious processes (Cleaver, 2002). This is in line with the objective of the current study which aimed at assessing the present use and management practices of water and forest resources, to show how external intervention is embedded in local institutional practices, and how these differ between the cases. The dynamic changes that have taken place in the management of the water sources over time in the six study sites have been presented in Chapter 5. There was a need to understand the institutional and technical developments brought by the various programme interventions and local people's institutional choices because they determine the present physical characteristics of the water sources in the micro spring forests. In all six cases, the history of water management started when clan members and individual households discovered natural wells in spring forests in the places where they settled in the 1930s and 1940s; but from there the management developments have taken different historical trajectories. In the cases of Chemichemi and Anselm, the water sources have received much attention from external institutional and organizational actors. Nevertheless, this attention from external actors has not helped Chemichemi and Anselm water users to achieve a more sustainable form of management of their water sources. On the contrary, external interventions by national and international modernization programmes have created more dependence to the local people on the external support, and have weakened the capacities of the local institutions in managing their water resources. The Nzuitaka case is different because of the successful resistance of its water users and clan members against external intervention, which has resulted into minimal interference from outsiders and institutional independence of the water users in the management of this water source.

Of the various interventions identified in the six cases, mainly the *ujamaa* villagization programme, and the programme implemented by HESAWA and the Ukerewe District Council have changed local tenure rights and introduced new rules and forms of organization for managing the water sources. The present technical conditions of these water sources show that the facilities, like taps and tanks, in the Tumbu, Kilombero, Anselm and Migombani micro spring forests are not functioning well due to the lack of maintenance by the water users. It is often assumed that

having well-defined Water User Groups, water committees nested in district council institutions, and monitoring of water users behaviour through written rules, would lead to effective management of the water sources that are modified by external programme intervention. However, the opposite has proven to be the case, because local people have their own criteria for determining the water quality, and their interactions and networking cannot be fully controlled by the newly institutionalized Water User Groups. The water sources are used also by non-members of these groups, especially during the rainy season when access is less restricted. Also, maintenance by the water users of the newly introduced facilities in water sources is unpredictable and irregular due to lack of external support of a technical expert. In other words, technical improvement dependency on waiting to have a tap or tank repaired does not have an added value for the water users over the loss of autonomy to manage their own water source.

Chapter 6 presents the dynamic changes in vegetation management and the present condition of the micro spring forests. The findings show that changes in forest management and condition are related to changes in water source management. When the settlers discovered these water sources in the 1930s and 1940s, they also protected the forests to conserve these water sources. Their knowledge and practices of integrated natural resources management was embedded in local norms, rules, taboos and cultural beliefs, which are transferred from one generation to another through oral history. Thus, under the traditional management system the management of water and forest were integrated.

The management history of micro spring forests shows that many external interventions focused mainly on improving water quality and quantity, and that there were no interventions introduced specifically for forest management. The external interventions introduced by the HESAWA programme and the Ukerewe District Council to improve water quality and quantity influenced also the management activities of the forests. The harvesting of indigenous tree species in micro spring forests are traditionally prohibited, but because of the external interventions massive tree harvesting has been observed in Anselm and Migombani cases as a reaction to insecure tenure rights of family forests. This has contributed to the deteriorations of these forests (see Table 8.2). The introduced external institutions in water management of Tumbu, Kilombero, Chemichemi and Anselm redefined tenure rights of water from common property to restricted access by group membership, at least during periods of water scarcity.

The changes in the management types of water and forest resources do not only result from specific external interventions directed at the study sites, but they can also be the result of indirect influences of nation-wide programmes and policies. Although the villagization programme of relocating people to planned villages did not focus directly on the management of water and forest, it did influence the management types of these resources because it interfered with the existed tenure rights of natural

resources and social organization, which were crucial for the sustainability of local natural resource management.

The effects of villagization, HESAWA and Ukerewe District Council interventions on forest ownership, management practices and forest condition have not been the same between the different cases. The individuals owning the forests in name of the clan determined whether the forest should remain a clan property or become a communal property of all villagers, and their strategy depended on their power relations and historical background. Tenurial changes caused changes in management practices, which in turn influenced the condition of micro spring forests in the sense that increasingly the forest vegetation became to be regarded as separate from the water sources. The focus on water quality by the technical government services to improve the health of local people harmed people's perception of forest and water sources as being integrated. Such a sectoral approach to water redefined the ownership of water sources and access by creating Water User Groups which resulted into insecurity of forest tenure rights and subsequently the management practices of forests changed from protection per se to a combination of protection and production. This insecurity of forest tenure rights was observed in Anselm and Migombani cases.

Resource use and management practices in micro spring forests

Chapter 7 presents the research findings on resource use and management practices of water sources and micro spring forest vegetation. The concept of social interface by Long (2001) was used in this study to shed light on the actual practices of social interaction in resource use and management. The concept focuses on the outcome of planned development programmes as a result of linkages between different actors. The every day practices of water users in the six cases show different ways of using and managing water and forest resources in relation to the local institutions and external interventions built on the histories of management development and the condition of the resources. According to Olivier de Sardan (2005) the interaction between external interveners and those intervened takes place in a particular context, which affects the outcome of the intervention in different ways. For example, the socio-cultural position of Mr Zacharia as a clan leader in Nzuitaka case contributed to the resilience of traditional water source management by rejecting the technological intervention of water source by HESAWA.

8.3 General discussion

The study objective was to propose whether decentralised management of water and forest resources requires an integrated or a sector approach. This general discussion focuses on the relevance of integrated natural resource management, the historical development and place dependency of resource management, and the role of institutions in addressing the final research question on whether decentralised management of water and forest vegetations requires an integrated or a sectorial approach.

From the discussions of the study findings in Chapters 5, 6 and 7, three kinds of dynamic changes in natural resources management are identified. These include changes in local norms and values, transformation of overall bureaucratic organization, and technical changes due to development programme intervention. Each of these changes have affected the management of water and forest resources in different ways. The changes in local norms and values due to the changing religion, formal education and perceptions of local people on traditional management of water and forest resources have differed among the local people. Young generations in the study cases perceive some cultural beliefs and taboos in natural resource management as being a sign of backwardness while older people consider them as important aspects of natural resources management. What is seen happening in the study cases confirms the fact that individuals and groups may perceive modernity in different ways depending on their values, history and perception of the future life. This view is shared by the argument made by Arce and Long (2000) that the assumed practices and ideas of modern society are constantly digested and consumed in the course of everyday life and experiences of individuals and groups in the community. The differences in the perception among the local people on traditional management of natural resources can create conflict of interest among them making the involved groups to redefine their roles in resource use and management. This is what is seen in all the cases whereby traditional management of micro spring forests prohibited the harvesting of live trees but nowadays people harvest live trees for firewood and handle making.

The overall bureaucratic organization of natural resources management has historically changed from monopoly management by central government to decentralized management by district authority. This decentralization has been accompanied by the government devolving power to local people and recognizing their role in the management of natural resources. Equally, the district authorities have been formalizing the organization of local people through creating resource use committees guided by by-laws in using and managing natural resources in their localities. However, the cases have shown that changing traditional management to formal and legal entity like Water User Groups organized by well committee embedded in district council institutions do not necessarily ensure sustainable management of natural resources. Rather, traditional management should be considered as one of the options in managing natural resources and work in parallel with the existing formal organizations including village government.

The dynamics due to technical development intervention of water sources in the micro spring forests show how different actors have different perceptions about resource use and management. The external actors thought that by introducing water tanks and taps in the traditional water sources and establishing well committees could be smoothly welcomed by the local people and the facilities be sustainably maintained without a need of external support. However, the participation of local people in contributing money to repair the broken down facilities has been low and the local people have not organized themselves without the external support. This has led to improper

functioning of the introduced facilities in some cases such as in Tumbu, Kilombero, Anselm and Migombani water sources (see Chapters 5 and 7). The introduced well committees to enforce the rules and regulations related to technological water management in the micro spring forests have not received full support from water users. This could be due to the fact that it takes time for the newly introduced organization structure to be legitimized by the local people. Lack of maintenance of the introduced facilities in the traditional water sources could imply that local people do not see any added advantage in terms of water quality by contributing their labour and materials. In a long term, the weakness of newly introduced organization structure and institutions to organize people in managing the resource can either result into self revitalization of the replaced local institutions or development of new structure and institutions, especially under situation where resource users are experiencing conflict. The tolerated access to water sources by non-members of Water User Group in Tumbu, Kilombero, Anselm, Chemichemi during rain season show how networking of the resource users cannot be defined by only membership in resource use (see chapter 5)

Relevance of integrated natural resource management

The traditional management focused on micro spring forests as integrated resources of water and forests. The local people in the village considered the sustenance of water sources in the micro spring forests as a function of good protection of forest cover. This is why the rules, taboos and cultural beliefs on forest management are typically for protection and not for use. Despite micro spring forests being small in size, their management are complex and their tenure security need to be considered by different actors involved in managing these resources. External interventions in Ukerewe focused on water management as a sector and not as an integrated system of water and forest vegetation. This created tenure insecurity on forest vegetation owned privately and it caused the owners to start using these forests as a source of forest products rather than protecting water sources as was the case in the traditional management. This finding relates to the findings by Van Koppen, *et al.* (2007) who revealed that promoting formal access to water as a single system and replacing the customary rights increases the risk of failure in addressing water problems due to limited options. As for the findings in the current study it can be argued that external interventions on micro spring forest should be integrated because the management of one resource has impact on the other. For example, the forest conditions for Tumbu, Chemichemi and Kilombero cases have been stable because of harmonization of the ownership of water sources and forest vegetation in these cases by both water sources and forests vegetation changing from clan property to Water User Group property (see Chapter 5 and 6). If the management of these resources is to focus on one resource and the ownership of forest and water source is different, then the intervention should ensure the tenure security of each resource, otherwise the forest vegetation condition will be vulnerable to deterioration as it was observed in Anselm and Migombani cases.

In contrast, large-scale forested watersheds are always declared as protective forest reserves managed directly by the Division of Forestry and Beekeeping in the Ministry of Natural Resources and Tourism (URT, 1998). Despite other ministries related to irrigations, hydro-power production and water supply having a stake in large-scale watersheds, they have no direct involvement in the management of these resources. When interventions are needed to address problems related to watersheds management for irrigation, hydro-power production and water supply, the Ministry of Natural Resources and Tourism become responsible for the coordination and supervision of the programmes while other ministries become partners. This approach helps to manage the resource in an integrated manner as opposed to a sectoral manner. Therefore, forestry departments both at local and national levels and other relevant actors must see micro spring forests as important watersheds requiring integrated approach in their management. Integrated management of micro spring forests do not necessarily mean to formalize the traditional management organizations and institutions through enacting by-laws and establishing committees nested to district councils. Formalization creates bureaucracy in decision making and implementation of activities, which is not the case under traditional management. The integration should be two folds. In one hand external actors should recognize the role of local institutions during their planning process and consider local communities as key actors in managing natural resources in their vicinity. On the other hand, local people themselves should take a lead to decide when should external actors intervene and under what arrangement. The resilience of traditional management of water source in Nzuitaka case due to the resistance of clan leader and water users against external intervention by considering it contravening cultural beliefs and taboos confirms the critical role of human agency in defending their interests (Long, 2001).

Variability of process of institutional bricolage

The discussion in this section is based on the variability of process of institutional bricolage. This study has demonstrated in Chapters 5, 6 and 7 how the different cases of micro spring forests have undergone different processes of institutional changes. Table 8.1 presents the institutions involved in the management of water and forest vegetation.

Table 8.1 The identified institutions involved in use and management of water and forests resources

| Origin of institution | Water | Forest vegetation |
|----------------------------|--------------------|--------------------|
| Local institutions | Family | Family |
| | Clan | Clan |
| | Village community | Village community |
| Government institutions | Water User Group | Water User Group |
| | Village council | Village council |
| | Ward | |
| | District Council | District Council |
| | Central Government | Central Government |
| | Uhuru Torch Race | |
| International institutions | HESAWA | |
| | UNICEF | |

The identified local institutions for water and forest management are similar, but differ in terms of their dynamism in different cases. The dynamism of institutions in different cases depends on the role they play. When water sources and forests are owned by individual households, the family becomes an important local institution in managing the resources and controlling the access of users. The family refers to a group of people consisting of a husband and wife and their children living together as a unit. The family in this study is different from household members because while the former includes members who only qualify for inheritance of family resources the latter can consist of members who are not even related by blood and have nothing to do with inheritance. Based on historical background of the water sources, Chapters 5, 6 and 7 have shown that a family is important in the management of these water sources. The head of the family determines how the resources should be used and managed and what direction institutional change should take. If the family owns the resource on behalf of the clan, then the decisions taken by the head of the family will depend on clan members' interests and power relations between the head and the clan. This also applies to the wider context of the village community when the water source is a communal resource and the forest is a family property. The resilience of traditional management in Nzuitaka case due to the resistance of Mr. Zacharia who is the clan leader against the external interventions is a case in point.

This study considered rules, regulations and policies generated by governmental and non-governmental organizations in guiding the use and management of water and forests resources as external institutions. This is because the management of micro spring forests was primarily based on local norms, taboos and cultural beliefs generated by local people themselves. The Water User Group, which was introduced by HESAWA programme and later nested under Ukerewe District Council, defined who should use the water under what conditions. The well committee is an organizational structure enforcing rules related to Water User Group. Some of the rules guiding this group of resource users were consciously formulated by water users while other rules are automatically generated in the course of the resource use and management. For example, access to water in Tumbu, Kilombero, Anselm and

Chemichemi based on membership, but after HESAWA programme was phased out even those who were not members were allowed to fetch the water during rainy season (see Chapter 7).

The village council is the lowest government administration organization at the village level. The village councils influences the way local people use natural resources because it implements national policies at the local level and at the same time proposes by-laws to guide the use and management of natural resources in their vicinity. The village council is not directly involved in the management of water and forest vegetation, but it is the final resort for solving problems that cannot be solved either by the well committee or by local institutions. However in some cases, members of the village council such as chairpersons of sub-villages are also members of the well committee (see Chapter 7). Under such situation, it is very difficult to put a clear line between the mandate of village council members and those of social obligations in solving some of the problems. This strategy of one person having different roles in solving social and resource use problems is referred by Cleaver (2002) as multiple identities of bricoleurs.

The ward as an organization is composed of all government officials at ward level, which include Ward Executive Officer, Councilor, Agricultural Extension Officer, Forest Officer, Health Officer, Education Officer and Community Development Officer. These actors are guided by rules and regulations from both central government and district council. The functioning of these institutions in managing natural resources depends on whether or not these technical actors of different sectors are available at ward level and are involved in the management of the resources. The district council is responsible for recruiting these technical staff in the ward. The presence of these staff in the wards depends on the capacity of the district council itself and the central government in paying their salaries and other costs related to the field activities. Nevertheless, the actors may be available but not involved, especially for development projects and programme. For example, HESAWA programme did not focus on forest; hence, the District Forest Department did not participate in the implementation of the programme activities because they were no activities related to forest management. In addition, the wards in Ukerewe District have no forest officers, which cause the villagers to lack the extension services on forest management.

The central government gives general guidelines in terms of policies, laws, regulations and procedures for managing natural resources. The influence of these institutions in resource use and management depends on how the government has created awareness of people at village level and how local authorities translate these institutions in practices of using and managing resources. In the study cases, tenure rights of land, water and forest have shaped the way people use and manage these resources. The Uhuru Torch Race, which was involved in the modification of Chemichemi water source is not in the organizational structure of government administration but is a national symbol for Tanzania independence. The Uhuru Torch Race creates awareness among the people in the country about key issues related to

development, natural resource management, peace, unity and the role of the individuals in addressing these key issues (see Chapter 5). The Uhuru Torch Race takes place all over the country every year by addressing villagers on a particular message through meetings. When it is a turn to create awareness on natural resource management, the event focuses on national and international policies about sustainable management of natural resources and other related issues including local people participation. The institutional aspect of Uhuru Torch Race could have been effective in long term management of natural resources because it covers many people and exerts a big influence at given times, but this is not the case. Once the race is over there is no regular monitoring of what was disseminated and implemented by district councils during the race and this is what happening in Chemichemi case.

The government organizations deal with natural resource problems in a hierarchical and bureaucratic manner. Therefore, the efficiency of the institutions in terms of rules, regulations and procedures and the actors of these organizations in managing natural resources depend very much on the support they get from both higher and lower actors. For example, the performance of the Ward Health Officer in treating the improved water sources with Chlorine depends on the support from Ukerewe District Council and Village Councils where these water sources are found. The District Council should assure the availability of Chlorine and the Village Council should be ready to support the officer in disseminating the information to water users about the schedule of treating the water sources. Because the actors differ in personalities and commitments, then the effectiveness of the institutions in different cases also differ. The differences in water treatment practices between the cases have shown the different roles of individual actors in making the institution work (see Chapter 7).

Institutional change does not take place in a societal vacuum. The properties, practices and ideas of modernization have been important in the management of micro spring forests. Modernization has caused both positive and negative effects on traditional management. Through modern religion, formal education and media, people have gained new ideas about the management of natural resources and some of these ideas challenge the validity of cultural beliefs and taboos. The study cases have demonstrated the differences in perception between young generations and old people on the validity of cultural beliefs and taboos in the management of water sources and forests.

The policies, rules, regulations and procedures introduced by international organizations during interventions have played a great role in influencing the management of water and forest vegetation. These institutions were often more sectoral oriented than integrated. The international actors introduce these institutions with the idea that the existing institutions are not functioning well in managing the resources. Most of the institutions originating from international organizations address problems related to the global challenges such as climate change, biodiversity conservation, local people participation, water scarcity and poverty. The actors of these international organizations come with their own agenda in the form of a project

proposal, which they want to impose on particular local settings. The actions of individual beneficiaries of external interventions are crucial in shaping the introduced institutions. The study cases have demonstrated that the approaches of international organizations were sectoral and focused on water source improvement for domestic uses and less attention was paid to forest management. This sectoral approach of water management by external intervention created tenure insecurity of private forests, and which contributed to degradation of Migombani and Anselm micro spring forests. The sectoral approach to natural resource management can be effective to certain resources and tenure types, but cannot be fit for all cases.

The six cases of micro spring forests have shown different institutional practices. This is because in each case, there have been different actors with different roles in managing water and forests resources. Table 8.2 shows the analysis of all cases to determine their differences and similarities by focusing on specific institutional practices and resource condition.

Table 8.2 The differences of study cases based on institutional practices

| Criteria | Resources | Cases | | | | | |
|--|---------------|-----------------------------|-----------------------------|---------------------------|---------------------------|----------------------------------|-------------------------------|
| | | Nzuitaka | Tumbu | Kilombero | Chemichemi | Anselm | Migombani |
| External intervention | Water sources | VL | VL, HE, DC | VL, HE, DC | CH, UN, VL, HE, DC, UT | CH, UN, VL, HE, DC | HE, DC |
| | Forest | VL | VL | VL | VL | VL | VL |
| Change of ownership | Water sources | Clan to CM to FG property | Family to CM to FG property | Clan to CM to FG property | Clan to CM to FG property | Family Clan to CM to FG property | CM to FG property |
| | Forest | Inheritance by clan members | Family to CM to FG property | Clan to CM to FG property | Clan to CM to FG property | Inheritance by family members | Family to family through sale |
| Type of organization of use and management | Water sources | Clan elder | Well committee | Well committee | Well committee | Well committee | Well committee |
| | Forest | Clan elder | Well committee | Well committee | Well committee | Family head | Family head |
| Controlled access | Water sources | Yes | Yes | Yes | Yes | Yes | Yes |
| | Forest | Yes | Yes | Yes | Yes | Yes | Yes |
| Compliance to access | Water sources | Yes | No | No | Yes | No | Yes |
| | Forest | Yes | Yes | Yes | Yes | No | No |
| General condition | Water sources | Stable | Deteriorated | Deteriorated | Improved | Deteriorated | Improved |
| | Forest | Stable | Stable | Stable | Stable | Deteriorated | Deteriorated |

KEY: Interventions by CH=Church; UN=UNICEF; VL=Villagization; HE=HESAWA; DC=District Council; UT=Uhuru Torch Race; CM=Communal; FM=Formal group

The six cases have shown different external interventions in water management while intervention in forests has been similar. The external actors have their own agenda and priorities for addressing resource use and management problems in rural areas. The external actors focused on water sources to improve water quality and quantity and paid little attention to forest vegetation. However, the resource users in different cases might have different priorities for managing water sources and forest vegetation. The differences in priorities between the resource users and the external actors have

implications on the sustainability of the introduced technologies. The cases have demonstrated that the sustainability of the introduced water tanks and taps in the traditional water sources vary between the cases and are dependent on the external support (see Chapters 5 and 7). This shows that when external actors try to address a problem which is not perceived by resource users, then there is a big chance of resource users to negotiate, transform or reject the intervention as we have seen in Nzuitaka case.

Despite the six cases of Nzuitaka, Tumbu, Kilombero, Chemichemi, Anselm and Migombani micro spring forests operating under the same context of tenure systems of land, water and forests (see Chapter 4), their responses to external interventions have been different. These variations among the cases and between the resources are due to the history of resource management and motivation of local actors in the management of natural resources. The history of management of water and forests in Chapters 5 and 6 is not only giving the different events happening on these water sources and forests, but also it shows how people in the different cases have negotiated and transformed the imposed technology or ideas due to interventions and modernization. All the six cases have undergone external interventions; however, some of these interventions are similar to all cases while other interventions are specific to some cases. Despite the similarities of some interventions, the practices of people in using and managing the resources have been different among the cases. For example, villagization programme was a nation wide programme to relocate people from clan settlements to planned villages. The five cases of Nzuitaka, Tumbu, Kilombero, Chemichemi and Anselm were involved, but water sources in all these cases became a communal property while forests in Nzuitaka and Anselm remained as a clan and family properties respectively whereas forests in Tumbu, Chemichemi and Kilombero cases became a communal property. This example shows that while all the people can consider water sources as communal resources, in other types of resources such as forests, the users differ in the way they value that resource and how they manage to claim the ownership of that resource.

The analysis in the current study shows that the cases can have the same institutional arrangements, but the way the actors make these institutions work may differ. This is because every individual actor has a different motivation and interest over the resource use and management. HESAWA programme introduced the idea of membership, well committees and well guards. The functioning of these introduced ideas and resource use organizations in the cases has been different (Chapters 5 and 7). For example, the access to water sources in Migombani water source has been strictly on membership basis while access in Tumbu, Kilombero, Anselm and Chemichemi has been flexible depending on the season. This finding is similar to the finding from a study by Meinzen-Dick and Nkonya (2007) who observed that better water availability during the rainy season allows for the toleration of non-members to access the otherwise restricted access water sources. The differences in access to water sources for different cases show how different people use different bases for legitimizing access to resources. The historical background of these water sources

have been one of the reasons for the differences. Meinzen-Dick and Pradhan (2001) argue that individuals make use of different strategies to claim the use of resources. In addition, water source users can consider membership as not favouring the existing social networks and kinship relations; hence, this flexibility in access can be devised to legitimize the rights for non-members to use resources (Bavinck, 2001).

The condition of water sources and forest vegetation depends on the use and management practices of resource users. The institutions guiding the management of these resources need to be effective in order to deter any undesirable practices. However, institutions are not static, but are dynamic due to changes in perceptions, interests and motivations of different actors involved in managing these resources. The study cases have shown that changes in institutions due to external interventions have caused changes in the practices of traditional management of water sources and forest vegetation. While the traditional management encouraged natural setting of the resources like natural wells with fishes and natural forests, the new management forms focus on modern technology. The local people see micro spring forests not only as a source of water for domestic use, but also they consider these resources to have cultural and spiritual functions. The water users might see the modification of the water sources as not having any benefit to their daily life and this has implications for local people's involvement in repairing these facilities. The repairing of broken down water tanks and taps introduced during the external intervention has not been possible without the support from the external actors. This has caused the water source facilities in these cases to function below their anticipated standard by the external actors (see Chapter 5). The external actors thought that by introducing membership, well committees, participatory approach, simple technology for improving water quality and quantity, the water users could easily adopt the technology. This is a typical approach by Ostrom (1990) and Becker and Ostrom (1995) who argue that institutions are robust when have most of the design principles of institutions. The programme used the same approach for all the villages involved in the programme without considering their heterogeneity, expecting that all the villages could achieve the goal in the same way.

The changes of water rights in the micro spring forests due to external intervention have created insecurity on forest land tenure. These changes have caused the private owners of these forest lands to start considering utilizing these forests for more lucrative benefits such as harvesting trees for timber as opposed to protecting them. In addition, planting of exotic trees is used to legitimize the use of micro spring forest land for tree production than for conservation; the alternative is the investing of labour and time to increase tenure security. However, while tree planting is often considered important for securing land rights (Kajembe, 1994), this study has observed that forest clearing and planting crops are equally used to secure land rights in the restricted areas such as those near water sources. The owner of forest land surrounding water sources sometimes clear the trees to separate their land from being part of the water sources. Migombani water source is a case in point whereby the owner of the forest decided to use a big part of the land for crop cultivation and left

the remaining small land, which was claimed by water users to undergo natural regeneration as part of the water source.

During traditional management, the institutions for managing water and forests have been different but not in conflict (Chapters 5 and 6). For example, when the water source was a communal resource and forest was a clan resource, both the actors of a clan and community institutions shared the same idea that forest protects the water source. Cultural beliefs and taboos reinforced the practices of managing water sources and the surrounding forests as integrated systems. The institutions introduced by external interventions replaced the local institutions and the focus of the management started to shift from being an integrated resource to being a specific resource. The shift in resource ownership, resource use organizations, resource use rules and regulations and resource use and management practices have caused the institutions to be in conflict. The actors create these conflicts of interests especially when they try to define their positions in resource use and management. For example, the owners of private forests when cutting trees for timber or scaring monkeys, they show water users that they are the legitimate owners of the forests and have the mandate to make any decision (see Chapter 6). These conflicts do not necessarily amount to physical exchange of blows among the users, but they can be in the form of ideological intimidation such as cutting trees in the micro spring forest, which is contrary to the general understanding of water users.

What makes embedded institutions become effective in managing water and forest?

In the traditional management, local communities in the villages often use self-control mechanism with minimal follow-ups to conserve natural resources and control conflicts among the users. The local norms, cultural beliefs and taboos play a great role in creating this self-control. On the other hand, resource users are not static in terms of ideas, values and perceptions on natural resources, but they change over time depending on external and internal factors. In the study cases, external intervention and modernization have challenged the cultural beliefs and taboos related to use and management of micro spring forests. The resource users relate themselves to a wider world life of modernization in different ways, which make the resource users to become very heterogeneous. In addition, external interventions are increasingly introducing new institutions at the resource user levels, which become nested to the wider institutions like that of ward, district council, ministry and international treaties/conventions. Therefore, drawing a clear line that show a situation under which the embedded institutions work better is challenging. Nevertheless, the external actors should not consider the external institutions are fit for all situations or resources. The cases in Chapters 5, 6 and 7 have demonstrated the argument of external institution as not being fit for all because the cases have responded differently under the same interventions. The developments of new institutions in the six cases of this study under the same influence of external intervention and modernization have not been the same. As Otsuki (2007) puts it, external intervention on sustainable development should be site specific because human agency cannot be separated from historical, social and political contexts. The effectiveness of embedded institutions in the

management of water sources and forests depends very much on how the formed institutions address local problems and fit in the local settings characterized by people with different power, historical and cultural backgrounds. The emphasis here is that external interventions should not be fit for all; rather they should be specific to cases because the process of embedded institution is variable between the cases.

Danger of overlooking relevance of local institutions in modern water and forest management

The external actors are increasingly considering traditional management institutions as weak in addressing water and forest use and management problems. Interventions have been seeking to replace or modify these institutions by either creating other institutions or formalizing them by making them legal entities. This process makes the local institutions to be very formal and bureaucratic, making it difficult for the local people to implement. This process of formalizing local institutions takes a long time to be completed and to become operational. Giné and Pérez-Foguet (2008) and Mniwasa and Shauri (2001) admit of there being complexities in the processes of registering Water User Association and formulating by-laws' at the local level. In addition, the costs of making local institutions formal and legally recognized are high, and this cannot be borne by the government or the resource users. For example, the formalization of land customary law through granting *Hati miliki ya kimila* (certificate of customary right of occupancy) has not been practical in the study area and the land under the micro spring forests have no such certificates. Creating such institutions, which cannot be locally implemented have an implication on the resource sustainability as we have seen in Anselm and Migombani cases.

Shortcomings of institutional approach to water and forest resources as CPRs

The embedding of external institutions to local institutions raises a number of issues related to the sustainability of traditional water sources. The approaches and the concepts used during different interventions of water sources in the micro spring forests, show that the embedding of external institutions in local institutions depend very much on how these institutions fit in the local settings and become capable of addressing local problems. As Cleaver (2002) argues through the processes of bricolage, socially embedded institutions may combine with or replace contracts, legal rights and formal sanctions; without such bricolage and the social embedding of new arrangements, bureaucratic institutions are unlikely to be effective. Even in cases where all stakeholders through participatory processes support the design of future institutions, empirical evidence suggests of there being some gaps between the planning and actual outcomes of the interventions (Fischer *et. al.*, 2007). The evaluation study of HESAWA programme done in 2005, shows that slightly more than half of the sampled water facility functioned fully satisfactorily, with nearly one fifth being completely out of order. The remaining, about one third is operating below their design capacity or is under repair. The most common problems reported being new technology, drought, vandalism, lack of adequate involvement of water users, low contribution for maintenance funds, and environmental degradation (SIDA, 2006). Science and technology have an important role to play in promoting

development and bridging the knowledge divide. But the introduction of 'external technologies' should take into account the local knowledge of the community, because bridging the knowledge divide must be a two-way process, incorporating both local and external knowledge (Wall, 2006). The cases of this study have also shown different achievement of the programme activities and the common feature for all intervened cases is the developed tendency of depending on external support. Thus, the assumption by the external interventions that a single model of development interventions can address all cases has proven to be very challenging.

Use of a sector approach or an integrated approach

The management of multiple resources can be done either as an integrated system or as a sector depending on the goal and priority of the actors involved. The success of each approach depends on how other factors influencing the management of each element in the system have been considered and addressed. The traditional management of micro spring forests in Ukerewe main Island considers water and forest as integrated resources. This approach did help the villagers to manage the resources sustainably even when the two resources were under different ownerships. Because of the introduced institutions by external intervention and the ensued changes in the water sources and forests ownership, the different actors have started to manage the resource in a more sector wise than as integrated resources. Managing these resources as independent resources has been demonstrated to be not sustainable in the current study, because the changes in water source rights have created tenure insecurity of forest land, especially when the forest is privately owned. This observation suggests that to achieve sustainable management of water sources and forests through external intervention depends much on the security of the existing tenure rights of water sources and micro spring forests. The issue of whether the water sources and forests vegetation be managed in sectoral or integrated approach depends on how the tenure system of one resource influences or does not influence the other resource. The cases have demonstrated that an integrated approach is more relevant for resources which are interrelated such as those of water sources and micro spring forests.

8.4 Reflection on scientific, policy and development relevance of the research findings

This section discusses the contribution of this study to the scientific community, policy makers and local community. The scientific relevance of this study is based on two aspects, which include the embeddedness of institutions and variability of the actual practices. This study shows that the management practices of water and forests are embedded in social activities and institutional practices in terms of local norms, cultural beliefs and taboos. The interventions and modernization have created new arena between Water User Group and non-user group and between modern society and traditional society. The two arenas open up new challenges for social organizations in resource use and management. The village communities are not homogeneous because they have people with different gender relations, age,

economic activities, culture, power relations and historical background. Also, the selection of cases in this study was not based on representativeness but on variability of institutional practices and resource condition (see Chapter 3).

The variability of institutional practices in the cases shows how the processes of embedded institutions differ between the cases. Cleaver focused on the institutional bricolage at local level and did not pay much attention on higher levels like district councils and ministries. This study has demonstrated institutional bricolage and embeddedness even at higher levels of central government and district council institutions. The external intervention on water sources by HESAWA focused on improvement of water sources and their sanitation. The overall aim of the programme was to improve the welfare of the rural people through improved health education, environmental sanitation, drinking water supply, community participation and capability and capacity building at village, ward and District levels. Because the programme addressed several issues related to water management, then several ministries were involved in the implementation of the programme and the leading Ministry changed from the Ministry of Water and Livestock Development that based on sector to the Ministry of Community Development, Women Affairs and Children (MCDWC) that focused on integrated approach (see Chapter 5). Changing the leading ministry several times implies how the previous leading ministries could not address the challenges of interventions in integrated resources management.

At the district council level, the selection of the department to take care of the improvement of traditional water sources and to takeover the activities of HESAWA programme after its phasing out was put under the Department of Community Development. The introduced shallow wells were left under the supervision of the Department of water. This separation of responsibilities between the two departments in the district council implies that the two types of water sources required different institutions and attentions. The integrated resource management in HESAWA programme was not based on putting together water and forest management; rather it was putting together different professionals in managing one resource (water). This means that the integration was on knowledge rather than on resources. It could be argued that when external intervention is introduced, actors need to understand whether management problem of that particular resource system is related to lack of integrated knowledge or resources.

Cleaver (2002) emphasizes on the importance of local agency in institutional bricolage and gives little attention on historical background. The cases of this study have shown the variability of the process of institutional bricolage. The variability of the cases is due to differences in power relations and historical background of individuals and institutional development. Therefore, bricolage is not considered to be happening not only because of human agency, but is also partly because of path dependency. However, the path dependency based on historical development of institutions in this study is soft and not strict like that of historical new

institutionalism, which tends to focus on sequences in development, timing of events, and phases of political change.

This study is not only important for its anthropological relevance but also for policy makers. The failure of involvement of foresters in managing small forests like the micro spring forests has been due to lack of capacity of district council and ignorance of foresters on the role of these forests in multiple resource systems. This study showed that in Ukerewe District there are only foresters at district level and not at the ward level. Lack of funds to employ foresters at ward level was observed to be the main reason. But also forestry is not a priority sector at the district council level because of few natural forests and forest plantation found in the district. However, the department like health, which has workers at a ward level, still do not implement most of its field activities due to lack of funds. Apart from lack of funds, the foresters often pay more attention on the commercial forests where they collect revenues and less attention on small forests. This has made villagers to receive little extension services related to their traditional forest management from foresters. Despite that the micro spring forests are small in size, the cases have demonstrated that these micro spring forests need more attention from foresters and other external actors involved in water source management. Moreover, the tendency of external interventions focusing only on water as a sector has contributed to the forest department not to be involved in HESAWA programme activities and the cases have demonstrated that focusing on one resource in multiple system have a negative impact on the other resource.

The relevance of this study to local community can be two folds: First is that the local people consider external interventions as supportive to local initiatives. The cases intervened by HESAWA programme demonstrate that the local people have developed dependency on the external support; and this, in turn undermines their capacities to deal with their local problems. Secondly, the local communities, especially young generations are becoming more modernized and reluctant to adhere to their cultural beliefs. Abandoning the cultural beliefs in resource use and management without replacing them with other effective mechanisms is dangerous to the sustainability of the micro spring forests. Nzuitaka and Chemichemi cases have demonstrated that indigenous and scientific knowledge can be combined to manage the resources in a sustainable way. Therefore modernization is not the solution to all local problems; it can even be destructive to resource use and management.

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Appendices

Appendix 1 A list of divisions, wards and villages in Ukerewe District and the visited villages and micro spring forests during preliminary survey

| DIVISIONS | WARDS | VILLAGES IN EACH WARD | VISITED VILLAGES | VISITED WATER SOURCES |
|-------------|----------------|--|---------------------|---------------------------------------|
| 1. ILANGALA | 1. BWIRO | 1. Busiri 2. Serema 3. Bukundo 4. Busumba (Island) | Busiri | Chemichemi, Anselm, Nanobe and Ndagwa |
| | 2. ILANGALA | 1. Masonga 2. Gallu 3. Murutiliba 4. Kamasi (Island) 5. Kaseni 6. Mibungo | | |
| | 3. IGALLA | 1. Igalla 2. Bwassa 3. Chankamba 4. Buhima | Bwassa | Kilombero and Nambozu B |
| | | | Chankamba | Chankamba |
| | | | Buhima | Kona nne and Nzoga |
| | 4. NDURUMA | 1. Kameya 2. Mukunu 3. Harwego 4. Chamuhunda | | |
| | 5. MURITI | 1. Muriti 2. Bugula 3. Igongo 4. Ihebo 5. Itira | Bugula | Migombani, Mulumoni and Magereza |
| 2. UKARA | 6. NAMILEMBE | 1. Namilembe 2. Bukonyo 3. Busangu 4. Nakamwa 5. Busagami | | |
| | 1. BWISYA | 1. Bwisya 2. Nyang'ombe | | |
| | 2. BUKUNGU | 1. Bukungu 2. Chifule | | |
| | 3. NYAMANGA | 1. Nyamanga 2. Chibasi | | |
| 3. MUMBUGA | 4. BUKIKO | 1. Bukiko 2. Kome | Bukiko | Mwakachumba, Lyamatembe and Karitas |
| | 1. NANSIO | 1. Nansio | | |
| | 2. KAGERA | 1. Kagera | | |
| | 3. NAKATUNGURU | 1. Nakatunguru | | |
| | 4. KAKEREGE | 1. Kakerege | | |
| | 5. BUKONGO | 1. Bukongo | | |
| | 6. NKILIZYA | 1. Nkilizya | Nkilizya (Namalebe) | Mganga |
| | 7. BUKANDA | 1. Muhula 2. Busunda 3. Hamuyebe 4. Namasabo | | |
| | 8. NAMAGONDO | 1. Malegeya 2. Namagondo 3. Mkasika | | |
| | 9. NGOMA | 1. Hamkoko 2. Nantare 3. Muluseni 4. Nebuye | Nebuye | Nswinke |
| | 1. MUKITUNTU | 1. Kazilankanda 2. Mahande | Kazilankanda | Bujura |

| DIVISIONS | WARDS | VILLAGES EACH WARD | IN VISITED VILLAGES | VISITED WATER SOURCES |
|-------------|----------------|--|---------------------------|--------------------------------|
| 4. MUMLAMBO | | 3. Kigara 4. Chabilungo 5. Lutare | Mahande | Tumbu, Nzuitaka and Nyabili |
| | 2. MURUTUNGURU | 1. Murutunguru 2. Bugorola 3. Bugembe 4. Muhande | | |
| | 3. KAGUNGULI | 1. Kagunguli 2. Sizu (Island) 3. Buguza 4. Buzegwe 5. Kweru (Island) | | |
| | 4. BUKINDO | 1. Bukindo 2. Nansole 3. Musozi 4. Bulamba 5. Murutanga | Bulamba | Nyakabale |
| | 5. IRUGWA | 1. Sambi (Island) 2. Nabweko | | |

Appendix 2 Distribution of N and G by species and diameter classes of standing trees in micro spring forests

Nzuitaka micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-------------|----------|-------------|---------------------------------|------------------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-----|-------|-------|-------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 7. | Myenjejenje | <i>Albizia gummifera</i> | 78 | 0.54 | 11 | 0.30 | | | | | | | | | 22 | 14.45 | 111 | 15.28 |
| 2 | 23 | Mkomakoma | <i>Grewia bicolor</i> | 44 | 0.24 | 22 | 0.63 | 22 | 1.33 | | | 11 | 2.18 | 11 | 3.35 | | | 111 | 7.74 |
| 3 | 17 | Liunda | <i>Vitex keniensis</i> | 33 | 0.13 | | | | | 11 | 1.54 | | | | | | | 44 | 1.67 |
| 4 | 15 | Msira | <i>Maesopsis eminii</i> | 22 | 0.26 | 11 | 0.49 | 11 | 0.64 | | | | | | | | | 44 | 1.39 |
| 5 | 22 | Litongo | <i>Macaranga monandra</i> | 78 | 0.58 | 11 | 0.35 | | | | | | | | | | | 89 | 0.93 |
| 6 | 24 | | <i>Acrocarpus fraxinifolius</i> | | | 22 | 0.93 | | | | | | | | | | | 22 | 0.93 |
| 7 | 20 | Msambya | <i>Markamia lutea</i> | 67 | 0.49 | 11 | 0.24 | | | | | | | | | | | 78 | 0.73 |
| 8 | 45 | Mlama | <i>Combretum molle</i> | | | 11 | 0.26 | | | | | | | | | | | 11 | 0.26 |
| 9 | 28 | Lisidireli | <i>Cedrella odorata</i> | 56 | 0.21 | | | | | | | | | | | | | 56 | 0.21 |
| 10 | 8 | Linyembe | <i>Mangifera indica</i> | 44 | 0.18 | | | | | | | | | | | | | 44 | 0.18 |
| 11 | 26 | Lisongoma | <i>Senna siamea</i> | 22 | 0.16 | | | | | | | | | | | | | 22 | 0.16 |
| 12 | 12 | Lisuguti | <i>Trichilia emetica</i> | 22 | 0.12 | | | | | | | | | | | | | 22 | 0.12 |
| 13 | 4 | Muyebe | <i>Psydrax parviflora</i> | 11 | 0.09 | | | | | | | | | | | | | 11 | 0.09 |
| 14 | 27 | Lichungwa | <i>Citrus sinensis</i> | 22 | 0.05 | | | | | | | | | | | | | 22 | 0.05 |
| 15 | 10 | Mlundu | <i>Antiaris toxicaria</i> | 11 | 0.03 | | | | | | | | | | | | | 11 | 0.03 |
| GRAND TOTAL | | | | 511 | 3.06 | 100 | 3.20 | 33 | 1.96 | 11 | 1.54 | 11 | 2.18 | 11 | 3.35 | 22 | 14.45 | 700 | 29.75 |

Tumbu micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-------------|-------------|------------------|---------------------------------|------------------|------|-------|------|-------|------|-------|------|-------|------|-------|---|-----|------|-------|-------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 1 | Lijiro/Mziro | <i>Pseudospondias microcapa</i> | | | 10 | 0.34 | 15 | 1.17 | 15 | 2.12 | 5 | 1.32 | | | 5 | 4.75 | 50 | 9.71 |
| 2 | 6 | Lissassa/Issassa | <i>Syzygium guineense</i> | 35 | 0.30 | 15 | 0.49 | | | 5 | 0.60 | | | | | 5 | 1.95 | 60 | 3.35 |
| 3 | 11 | Mkuyu/Likunu | <i>Ficus sycomorus</i> | | | | | | | 5 | 0.73 | | | | | | | 5 | 0.73 |
| 4 | 10 | Mlundu | <i>Antiaris toxicaria</i> | | | | | 5 | 0.42 | | | | | | | | | 5 | 0.42 |
| 5 | 7 | Myenjeyenje | <i>Albizia gummifera</i> | | | 10 | 0.30 | | | | | | | | | | | 10 | 0.30 |
| 6 | 15 | Msira | <i>Maesopsis eminii</i> | | | 5 | 0.20 | | | | | | | | | | | 5 | 0.20 |
| 7 | 8 | Linyembe | <i>Mangifera indica</i> | 5 | 0.03 | 5 | 0.09 | | | | | | | | | | | 10 | 0.12 |
| 8 | 4 | Muyebe | <i>Psydrax parviflora</i> | 10 | 0.09 | | | | | | | | | | | | | 10 | 0.09 |
| 9 | 5 | Msamiko | <i>Bridelia micrantha</i> | 5 | 0.08 | | | | | | | | | | | | | 5 | 0.08 |
| 10 | 2 | Lisibi | <i>Ekebergia capensis</i> | 5 | 0.06 | | | | | | | | | | | | | 5 | 0.06 |
| 11 | 3 | Gege | <i>Syzygium owariense</i> | 5 | 0.03 | | | | | | | | | | | | | 5 | 0.03 |
| 12 | 9 | Mlimampango | | 5 | 0.03 | | | | | | | | | | | | | 5 | 0.03 |
| GRAND TOTAL | | | | 70 | 0.62 | 45 | 1.42 | 20 | 1.60 | 25 | 3.46 | 5 | 1.32 | | | 10 | 6.70 | 175 | 15.12 |

Kilombero micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-------------|----------|--------------|-------------------------------------|------------------|------|-------|------|-------|------|-------|------|-------|---|-------|------|-----|-------|-------|-------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 31 | Liyeko | | | | | | | | | | | | | | 8 | 16.44 | 8 | 16.44 |
| 2 | 22 | Litongo | <i>Macaranga monandra</i> | 200 | 1.36 | | | 31 | 2.40 | | | | | | | | | 231 | 3.76 |
| 3 | 1. | Lijiro/Mziro | <i>Pseudospondias microcapa</i> | | | | | 15 | 1.50 | 8 | 0.94 | | | | | | | 23 | 2.44 |
| 4 | 19 | Lirumba | <i>Ficus thonningii</i> | | | | | | | | | | | 8 | 2.17 | | | 8 | 2.17 |
| 5 | 8 | Linyembe | <i>Mangifera indica</i> | | | | | 15 | 1.02 | | | | | | | | | 15 | 1.02 |
| 6 | 12 | Lisuguti | <i>Trichilia emetica</i> | 8 | 0.02 | 8 | 0.38 | 8 | 0.54 | | | | | | | | | 23 | 0.94 |
| 7 | 15 | Msira | <i>Maesopsis eminii</i> | | | | | | | 8 | 0.92 | | | | | | | 8 | 0.92 |
| 8 | 5. | Msamiko | <i>Bridelia micrantha</i> | 15 | 0.22 | 15 | 0.38 | | | | | | | | | | | 31 | 0.61 |
| 9 | 32 | Likobekobe | <i>Baikiaea insignis spp. minor</i> | | | | | 8 | 0.58 | | | | | | | | | 8 | 0.58 |
| 10 | 23 | Mkomakoma | <i>Grewia bicolor</i> | 8 | 0.04 | | | | | | | | | | | | | 8 | 0.04 |
| 11 | 7 | Myenjejenje | <i>Albizia gummifera</i> | 15 | 0.03 | | | | | | | | | | | | | 15 | 0.03 |
| 12 | 20 | Msambya | <i>Markamia lutea</i> | 15 | 0.03 | | | | | | | | | | | | | 15 | 0.03 |
| GRAND TOTAL | | | | 262 | 1.70 | 23 | 0.76 | 77 | 6.03 | 15 | 1.86 | | | 8 | 2.17 | 8 | 16.44 | 392 | 28.97 |

Chemichemi micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-------------|----------|------------------|-------------------------------------|------------------|------|-------|------|-------|------|-------|------|-------|---|-------|---|-----|-------|-------|-------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 19 | Lirumba | <i>Ficus thonningii</i> | | | | | | | | | | | | | 3 | 14.31 | 3 | 14.31 |
| 2 | 20 | Msambya | <i>Markamia lutea</i> | 3 | 0.04 | 5 | 0.26 | 3 | 0.15 | 3 | 0.34 | | | | | | | 13 | 0.79 |
| 3 | 30 | Mkarati/Likarati | <i>Bridelia micrantha</i> | | | | | | | 5 | 0.77 | | | | | | | 5 | 0.77 |
| 4 | 22 | Litongo | <i>Macaranga monandra</i> | 25 | 0.38 | | | | | | | | | | | | | 25 | 0.38 |
| 5 | 42 | Mweyo | | | | | | | | 3 | 0.36 | | | | | | | 3 | 0.36 |
| 6 | 1 | Lijiro/Mziro | <i>Pseudospondias microcapa</i> | 5 | 0.06 | | | 3 | 0.15 | | | | | | | | | 8 | 0.21 |
| 7 | 15 | Msira | <i>Maesopsis eminii</i> | 8 | 0.12 | 3 | 0.05 | | | | | | | | | | | 10 | 0.17 |
| 8 | 7 | Myenjejenje | <i>Albizia gummifera</i> | 13 | 0.14 | | | | | | | | | | | | | 13 | 0.14 |
| 9 | 12 | Lisuguti | <i>Trichilia emetica</i> | 3 | 0.04 | | | | | | | | | | | | | 3 | 0.04 |
| 10 | 32 | Likobekobe | <i>Baikiaea insignis spp. minor</i> | 3 | 0.04 | | | | | | | | | | | | | 3 | 0.04 |
| 11 | 10 | Mlundu | <i>Antiaris toxicaria</i> | 3 | 0.03 | | | | | | | | | | | | | 3 | 0.03 |
| 12 | 37 | Mgunga | | 5 | 0.02 | | | | | | | | | | | | | 5 | 0.02 |
| 13 | 43 | Msalazi | | 3 | 0.01 | | | | | | | | | | | | | 3 | 0.01 |
| 14 | 6 | Lissassa/Issassa | <i>Syzygium guineense</i> | 3 | | | | | | | | | | | | | | 3 | 0.00 |
| GRAND TOTAL | | | | 70 | 0.89 | 8 | 0.31 | 5 | 0.31 | 10 | 1.47 | | | | | 3 | 14.31 | 95 | 17.28 |

Anselm micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-----|-------------|------------------|---------------------------------|------------------|------|-------|------|-------|------|-------|---|-------|---|-------|-------|-----|-------|-------|-------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 1. | Lijiro/Mziro | <i>Pseudospondias microcapa</i> | | | 20 | 0.69 | | | | | | | | | 10 | 25.43 | 30 | 26.13 |
| 2 | 6. | Lissassa/Issassa | <i>Syzygium guineense</i> | | | | | | | | | | | 30 | 11.27 | 10 | 5.67 | 40 | 16.94 |
| 3 | 11 | Mkuyu/Likunu | <i>Ficus sycomorus</i> | | | | | | | | | | | 10 | 3.63 | | | 10 | 3.63 |
| 4 | 12. | Lisuguti | <i>Trichilia emetica</i> | 20 | 0.05 | | | | | | | | | 10 | 3.85 | | | 30 | 3.89 |
| 5 | 15 | Msira | <i>Maesopsis eminii</i> | 10 | 0.02 | | | | | | | | | | | | | 10 | 0.02 |
| 6 | 17 | Liunda | <i>Vitex keniensis</i> | 10 | 0.02 | | | | | | | | | | | | | 10 | 0.02 |
| 7 | 20 | Msambya | <i>Markamia lutea</i> | 10 | 0.03 | | | | | | | | | | | | | 10 | 0.03 |
| 8 | 33 | Mpodo | <i>Podocarpus usambarensis</i> | | | | | 10 | 0.59 | | | | | | | | | 10 | 0.59 |
| 9 | 36 | Mbulumatale | <i>Melia azedarach</i> | 20 | 0.18 | | | | | | | | | | | | | 20 | 0.18 |
| 10 | 39 | Lizungute | <i>Kigelia africana</i> | | | | | 10 | 0.85 | | | | | | | | | 10 | 0.85 |
| 11 | 41 | Mpera | <i>Psidium guajava</i> | 10 | 0.02 | | | | | | | | | | | | | 10 | 0.02 |
| | GRAND TOTAL | | | 80 | 0.32 | 20 | 0.69 | 20 | 1.45 | | | | | 50 | 18.75 | 20 | 31.11 | 190 | 52.31 |

Migombani micro spring forest

| S/N | Spp code | Local name | Botanical name | DBH classes (cm) | | | | | | | | | | | | | | Total | |
|-------------|----------|-------------|-------------------------------------|------------------|------|-------|------|-------|------|-------|---|-------|---|-------|---|-----|---|-------|------|
| | | | | I | | II | | III | | IV | | V | | VI | | VII | | | |
| | | | | 5-15 | | 16-26 | | 27-37 | | 38-48 | | 49-59 | | 60-70 | | >70 | | | |
| | | | | N | G | N | G | N | G | N | G | N | G | N | G | N | G | N | G |
| 1 | 15. | Msira | <i>Maesopsis eminii</i> | 10 | 0.02 | 20 | 0.64 | | | | | | | | | | | 30 | 0.66 |
| 2 | 28. | Lisidireli | <i>Cedrella odorata</i> | | | | | 10 | 0.55 | | | | | | | | | 10 | 0.55 |
| 3 | 38. | Mlinzi | <i>Erythrina abyssinica</i> | | | 10 | 0.28 | | | | | | | | | | | 10 | 0.28 |
| 4 | 32. | Likobekobe | <i>Baikiaea insignis</i> spp. minor | 20 | 0.18 | | | | | | | | | | | | | 20 | 0.18 |
| 5 | 7. | Myenjeyenje | <i>Albizia gummifera</i> | 10 | 0.02 | | | | | | | | | | | | | 10 | 0.02 |
| GRAND TOTAL | | | | 40 | 0.22 | 30 | 0.92 | 10 | 0.55 | | | | | | | | | 80 | 1.70 |

Appendix 3 Villages resource maps

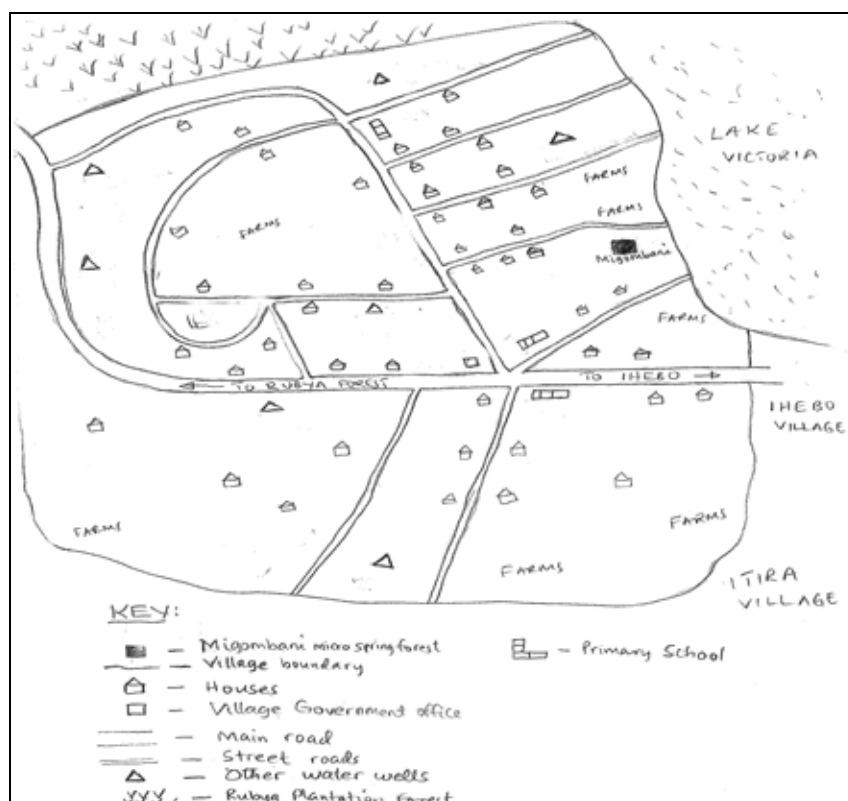


Figure 1 Bugula village resource map in 2007

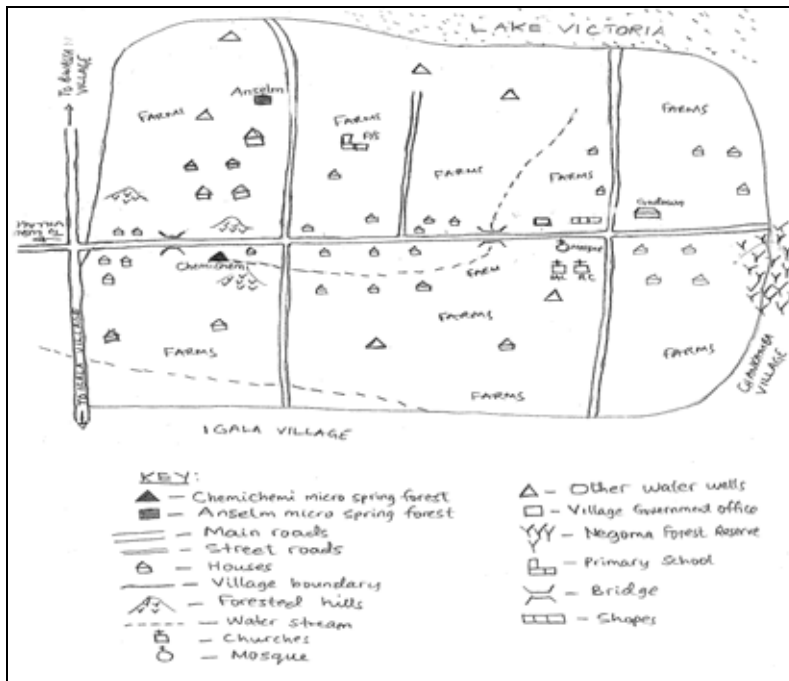


Figure 2 Busisi village resource map in 2007

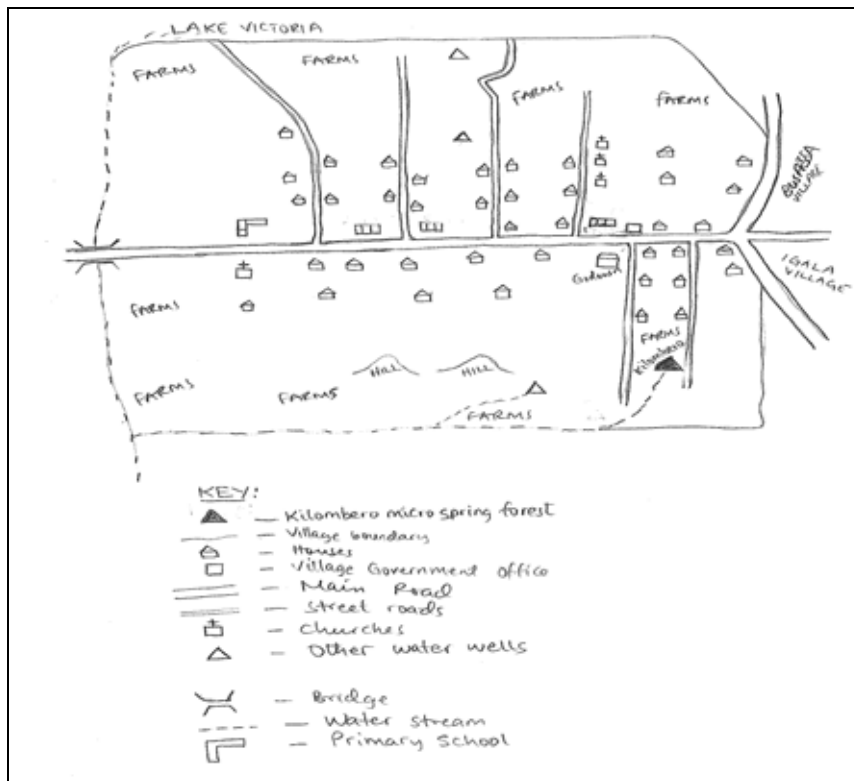


Figure 4 Bwasa village resource map in 2007



Figure 4 Mahande village resource map in 2007

Summary

Water is a basic need for human beings and the access of people to this resource is of great importance. The Tanzanian national water policy of 1971 set the goal of providing clean and safe water for domestic use to the population. It was supposed that by 1991 domestic water resources would be present within 400 metres from the residences and available on a cost-free basis. Although the government has invested in water supply projects in rural areas, up to now only 50% of the population have access to water supply within 400 metres from their residences. This implies that many people still depend on traditional water sources, which include those in the micro spring forests. Micro spring forests refer to forest patches surrounding a natural water source with an average size of about 0.1 to 1 ha. The local people in Ukerewe main Island in Lake Victoria consider micro spring forests as being very important for conserving water sources and the sustainability of these water sources depends on the management of these forests. Hence, local people consider the management of water sources and forest as being integrated.

Micro spring forests have been managed traditionally using local norms such as rules, taboos and cultural beliefs. Several external interventions, revision of national policies and statutory laws related to land, water and forest resources have taken place in the country over the past five decades. Some of these interventions, policies and laws have contributed to the changes in the management forms of micro spring forests. In respect of forest management, several studies in Tanzania have already documented the different characteristics of indigenous forest management. The same applies to the indigenous water management system. Most of these studies have a sectoral approach focusing on one type of natural resource only. However, no specific study has been carried out with regards to the status and management conditions of micro spring forests as an integrated resource system with multiple uses. In addition, there is still little scientific insight about the nature and functioning of local institutions for multiple resource management under the changing management forms and tenure systems. This study has an objective to contribute towards such knowledge by assessing the characteristics and dynamics in the management of the micro spring forests on Ukerewe island.

Chapter 2 discusses the theoretical approach and the basic concepts used in this study. This study uses the concept of institutional bricolage by Cleaver to conceptualize the institution formation process resulting from a mixture of indigenous and externally introduced practices and norms of resource management, rather than assessing whether or not the institutions concerning with the use and management of water sources and forest vegetation are robust in view of internal conditions. The concept of institutional bricolage by Cleaver holds that people draw from both the internal and external knowledge to form new institutions. The concept emphasizes the critical role of human agency in solving social problems. However, the process of forming new institutions is complex and to understand this process other concepts and approaches are used. These include the actor oriented approach, social interface, and legal pluralism. The actor-oriented approach makes the actors a central focus in understanding their everyday life experiences and their multiple realities. The concept of interface sheds light on the actual practices of power, negotiation and conflict involved in institutional bricolage. N. Long argues that interface acts as an arena whereby individuals or groups can define their own worldview against those imposed

by external actors. Legal pluralism focuses on how state laws shape and reconstruct other normative orders and how non-state normative orders negotiate, transform or reject state laws.

Chapter 3 discusses methodological issues involved in this study. In this study, a comparative case study design has been used to assess the extent at which the six cases of micro spring forests show different ways of bricolage practices in using and managing water source and forest.

Chapter 4 discusses the formal tenure systems administration and dynamics in the Tanzanian context. The chapter demonstrates the manner in which tenure systems for land, water, forest and trees have undergone a long historical development from the pre-colonial period to the colonial period, independence and finally, to the current tenure system. The statutory tenure systems during colonial and independent Tanzanian governments recognized the role of customary tenure system in land, water and forest management. However, the statutory systems have not granted full autonomy to the customary system to work independently without the interference and overriding some rights. The abolishment of chieftaincy and the implementation of the villagization programme have contributed to the weakening of customary laws and disrupted the social settings like clan settlements and the authority of local elders, which were suitable in addressing local problems. The statutory tenure systems are well elaborated in the national policies and acts for land, water and forest management, but they rarely apply in the real life in rural areas. Therefore, the customary tenure system has remained to be very important in guiding the use and management of the resources, especially in rural areas where the administration of statutory rights have been difficult. The setting up of tenure systems in the Tanzanian context is very important because it helps to demonstrate - in Chapter 7 - how the daily practices of using and managing land, water and forests relate to statutory rights and customary rights.

Chapter 5 and 6 discuss the empirical data of the dynamics in the management of water sources and micro spring forests and the present physical characteristics of water sources and forests vegetation. Chapter 5 shows that clan members or individuals who established these water sources in their new settlements in 1930s and 1940s used local norms to guide the uses and management of these water sources. However, these water sources have experienced several external interventions. The history of management development due to the external interventions shows that all the six cases of water sources have taken different trajectories of management development. Although several development interventions have taken place, only the villagization, HESAWA programmes and Ukerewe District Council changed the tenure rights and introduced new rules and organizational structures for the management of the water sources in the six cases. The present characteristics of these water sources show that the water source facilities for Tumbu, Anselm and Kilombero are not functioning well due to lack of maintenance by water users.

Chapter 6 shows that during traditional management the management forms of forests and water sources were integrated. The history of the management development of micro spring forests shows that there is no external intervention that was implemented specifically for forest management. However, of all the interventions that focused on improving water quality and quantity, only the HESAWA programme and the

Ukerewe District Council influenced the management of forests, notably as a result of the formation of formal water user groups. The other, mainly technologically focused, interventions did not cause any change of management forms. Although, the villagization programme did not focus directly on the management of water sources and forest, it influenced the management of the forest because it changed the forest ownership. The present characteristics of forest vegetation vary between the cases. However, in general, the characteristics of micro spring forests in Ukerewe District are similar with other traditionally protected forest patches in other parts of Tanzania. Despite the presence of tree harvesting in the six cases of micro spring forests, the traditional tree species for water source conservation have not been very much affected.

Chapter 7 discusses the empirical data of the present practices of using and managing water sources and micro spring forests. The chapter contains three sections, which include present organization of water sources and forests management; the use practices of water sources and forest resources; and the management practices of water sources and forest resources. This chapter shows that the present organization, the uses and management practices of the water sources and forest vegetation vary between the cases. Some of the differences are due to institutional factors, personalities of actors and characteristics of the resources. Due to external intervention and historical management development of water sources and forests, three models of management institutions of micro spring forests as integrated resource systems have been identified.

The first model is the resilient traditional management institution with a communal water source while the forest is a clan property which ensures better management of both water source and forests resources. The second model is a technological and formal group management institution with collective ownership of the water source and forest resources. This model has worked better for forest management and less for water sources because the users have become dependent on the external support for maintaining the water source. The third model is technological and formal group management institution with water sources being a group property and forest as a private property. This model has led to the insecurity of forest rights under private ownership and caused the degradation of the forest vegetation. Also in this case, the water users have become dependent on external support, which undermines their capacity to take collective action in maintaining the introduced facilities. HESAWA intervention has caused the practices of using and managing water sources and forests in the Tumbu, Kilombero, Chemichemi, Anselm and Migombani cases to be very dynamic and not predictable.

Chapter 8 presents the main conclusions of this study from the various Chapters, and reflects on the research objectives and theoretical concepts used in this study, as compared to the literature. Finally, the Chapter discusses the relevance of the research findings for policy making in integrated forest and water management by local communities in the Tanzanian context. The six cases of micro spring forests have shown different institutional practices due to the different roles of individual actors in managing water sources and forests. The cultural beliefs and taboos used to play a great role in managing micro spring forests. However, external interventions and modernization are challenging these cultural beliefs and taboos. The resource users relate themselves to a wider modernized world in different ways, which make the

resource users to become very heterogeneous. The external actors are increasingly considering traditional management institutions as weak in addressing water and forest use and management problems. Their interventions have been seeking to replace or modify these institutions by either creating other institutions or formalizing them into legal entities. This process makes the traditional institutions rather inflexible and bureaucratic, making it difficult for the local people to implement them. But these institutional changes do not proceed everywhere in the same way. The differences of institutional practices between the cases are mainly due to power relations of the local actors and soft path dependency of the institution's development. The bricolage process becomes more active when the external intervention or modernization actively challenges the existing practices. This means that the process of institutional bricolage is not necessarily continuous, but it can be on and off depending on the challenges from the external actors. Therefore, development intervention should not be uniformly applied to the different situations, but instead should be site-specific considering the local social and natural conditions.

Samenvatting (summary in Dutch)

Water vormt een basis behoefte voor mensen en toegang tot water is derhalve cruciaal. Het nationale water beleid van Tanzania uit 1971 heeft als doel om schoon en veilig water voor huishoudelijk gebruik te verschaffen aan de bevolking. In 1991 zou binnen 400 meter van elk huis gratis water beschikbaar moeten zijn. Hoewel de regering veel heeft geïnvesteerd in watervoorzienings projecten op het platteland, heeft echter nog maar 50% van de bevolking toegang tot een waterbron binnen 400 meter van hun huis. Veel mensen zijn nog steeds afhankelijk van traditionele waterbronnen, bijvoorbeeld in de vorm van natuurlijke bronnen. Plaatselijk worden deze beschermd door een omringend bosje met een oppervlakte van 0.1 – 1 hectare. De bevolking van het eiland Ukerewe in het Victoria meer vinden deze bronbosjes erg belangrijk voor water conservering: de duurzaamheid van de watervoorziening is afhankelijk van het beheer van deze bosjes. Lokale mensen beschouwen het beheer van water en bossen derhalve als een geïntegreerd systeem.

De bronbosjes worden traditioneel beheerd op basis van lokale normen die tot uiting kwamen in regels, taboes en culturele gebruiken. Gedurende de afgelopen 50 jaar is het gebruik en beheer van land, water en bossen in Tanzania beïnvloed door diverse ontwikkelingsprojecten en veranderingen in beleid en wetgeving. Verschillende van deze externe interventies hebben geleid tot veranderingen in het lokale beheer van de bronbosjes. Tanzaniaanse studies hebben reeds onderzocht wat de karakteristieken en dynamiek is van inheemse systemen voor bos- en waterbeheer. Deze studies zijn meestal sectoraal gericht en betreffen een specifieke natuurlijke hulpbron. Er zijn nog geen studies uitgevoerd over geïntegreerde vormen van beheer van natuurlijke hulpbronnen, zoals de bronbosjes. Er bestaat ook nog weinig wetenschappelijk inzicht in de aard en werkwijze van lokale instituties voor het geïntegreerde beheer van natuurlijke hulpbronnen en de invloed daarop van veranderingen in gebruik- en eigendomsrechten en beheersystemen. Deze studie beoogt hieraan een bijdrage te leveren in de vorm van een studie naar de kenmerken van en de dynamiek in het beheer van de bronbosjes op Ukerewe eiland.

Hoofdstuk 2 beschrijft de theoretische benadering en wetenschappelijke concepten die de basis vormden voor deze studie. Het door Cleaver geïntroduceerde concept institutionele bricolage is gebruikt om het proces van institutionele vormgeving te doorgronden. Dit begrip maakt het mogelijk om institutionalisering te bestuderen als een empirisch fenomeen op het snijvlak van lokale en externe normen en praktijken op het gebied van het gebruik en beheer van natuurlijke hulpbronnen. In tegenstelling tot sommige andere theorieën gaat deze benadering niet uit van het identificeren van robuuste institutionele arrangementen op lokaal niveau voor het beheer van water en bos. Het concept van institutionele bricolage gaat uit van de gedachte dat de lokale bevolking zowel specifieke lokale normen en kennis als externe normen en kennis begriipt in de geleidelijke ontwikkeling van nieuwe lokale instituties. Het begrip legt de nadruk op het menselijke vermogen om sociale problemen op te lossen. Dit proces is echter complex en er zijn daarom in deze studie diverse wetenschappelijke concepten en benaderingen gebruikt, zoals de actor benadering, sociale interface en legaal pluralisme om de historische veranderingen gedetailleerd te beschrijven. De actor benadering gaat uit van het handelen van individuen en groepen als basis voor het bestuderen van hun alledaagse levenservaringen en diversiteit aan sociale omstandigheden. Het begrip sociale interface biedt de mogelijkheid om de diverse

conflict situaties evenals machts- en onderhandelingspraktijken die optreden tijdens het bricolage proces te bestuderen. Volgens N. Long vormt zo'n sociale interface een arena waarin verschillende individuen of groepen hun eigen wereldbeelden kunnen vormen, die in tegenspraak kunnen zijn met het van buiten opgelegde wereldbeeld. Het legaal pluralisme biedt de mogelijkheid om te begrijpen hoe zowel overheidswetgeving als andere normatieve systemen interacteren in het vormgeven en reconstrueren van bepaalde normatieve kaders via een proces van onderhandeling, aanpassing en afwijzing.

Hoofdstuk 3 beschrijft de onderzoeksmethodologie voor deze studie. Er werd gebruik gemaakt van een vergelijkende case studie om te bepalen of er in zes bronbosjes verschillende processen van institutionele bricolage optraden in het water- en bosbeheer en wat de aard van deze veranderingsprocessen was.

Hoofdstuk 4 beschrijft de aard en dynamiek van de formele rechtssystemen voor eigendom en gebruik van natuurlijke hulpbronnen in Tanzania. Er bestaan verschillende rechtssystemen voor het gebruik van land, water en bos. Deze zijn geleidelijk ontwikkeld tijdens de historische ontwikkeling van pre-koloniale tijd naar koloniale tijd, vroege onafhankelijkheidsperiode en moderne tijd. Zowel de koloniale regering als die van het onafhankelijke Tanzania erkenden de rol van lokale rechtssystemen voor gebruik en beheer van land, water en bos. De constitutie verleende die systemen echter geen autonomie en sommige lokale rechten werden beperkt of vervangen door overheidsregels. De wettelijke afschaffing van het instituut van inheemse stamhoofden en het nationale dorpsontwikkelingsprogramma droegen verder bij aan de verzwakking van de lokale gebruiksrechten. Deze processen resulteerden ook in een ontwrichting van de traditionele sociale en clan systemen voor het oplossen van lokale problemen. Maar hoewel de nieuwe regelingen systematisch werden vastgelegd in de nationale wetgeving, werden zij maar zelden toegepast op lokaal niveau. Het traditionele rechtssysteem bleef derhalve van groot belang bij het gebruik en beheer van de natuurlijke hulpbronnen, met name in de plattelandsgebieden. De nieuwe staats regelingen waren echter wel van invloed. Zoals in hoofdstuk 7 wordt beschreven, ontstonden er geleidelijk lokale mengvormen van de rechtssystemen van de overheid en traditionele lokale rechtssystemen.

Hoofdstuk 5 en 6 geven een gedetailleerde beschrijving van de dynamiek in het beheer van de waterbronnen en het omliggende bos en de huidige fysieke gesteldheid van deze natuurlijke hulpbronnen. Hoofdstuk 5 beschrijft hoe clan leden of individuele personen in de periode 1930-1940 bij de vestiging van de dorpen begonnen om waterbronnen in de buurt te beheren op basis van lokale normen. Geleidelijk aan werd het beheer echter beïnvloed door diverse, elkaar in de tijd opvolgende externe ontwikkelingsprojecten, zoals het dorpsontwikkelingsprogramma, het HESAWA gezondheids, sanitatie en water programma, en het Ukerewe District Council ontwikkelingsprogramma. Elk programma introduceerde nieuwe regels en organisatievormen voor het gebruik en beheer van met name de bronnen. Deze verschillende programma's hadden een verschillende invloed op het beheer van de zes bestudeerde bronnen en omliggende bosjes. In de gevallen van Tumbu, Anselm en Kilombero hadden zij tot resultaat dat de bronnen niet meer goed onderhouden werden door de lokale gebruikers.

Hoofdstuk 6 beschrijft hoe het traditionele beheer van de bronbosjes oorspronkelijk geïntegreerd was en zowel het water als de bosjes betrof. De diverse ontwikkelingsprogramma's richten zich echter hoofdzakelijk op een verbeterd waterbeheer en besteedden meestal geen aandacht aan bosbeheer. Hun activiteiten richten zich met name op technologische maatregelen ter verbetering van de kwaliteit en de hoeveelheid water. Sommige van deze programma's hadden nauwelijks invloed op het bosbeheer. Maar het HESAWA programma en het Ukerewe District Council programma hadden daar wel invloed op, o.a. door het oprichten van formele gebruikersgroepen voor water. Ook het dorpsontwikkelingsprogramma, dat niet specifiek op verbeterd waterbeheer gericht was, beïnvloedde het beheer van de bronbosjes als gevolg van veranderingen in land- en bosbezit. De kwaliteit van de zes bestudeerde bronbosjes varieert enigszins, maar is in het algemeen vergelijkbaar met de kwaliteit van andere bosjes in Tanzania, die nog steeds beheerd worden conform traditionele lokaal gebruik. Hoewel er in alle zes bosjes houtkap plaats vond, worden de traditionele soorten voor water conservering nog steeds gehandhaafd.

Hoofdstuk 7 bespreekt de empirische gegevens over de huidige praktijken ten aanzien van het gebruik en beheer van de waterbronnen en omliggende bosjes verder. Deze discussie betreft drie onderwerpen: de organisatie van het water- en bosbeheer, de praktijken voor het gebruik van het water en bos, en de praktijken ten aanzien van het beheer van water en bos. De diverse praktijken verschillen tussen de zes bestudeerde cases. Sommige van deze verschillen worden veroorzaakt door institutionele verschillen, maar andere door de persoonlijke eigenschappen van lokale actoren of door lokale kenmerken van de natuurlijke hulpbronnen. Als gevolg van de lokaal-specifieke historische ontwikkelingen en invloed van ontwikkelingsprogramma's hebben zich drie verschillende modellen ontwikkeld ten aanzien van de institutionele arrangementen voor het beheer van de bronbosjes als een vorm van geïntegreerd beheer voor natuurlijke hulpbronnen. Het eerste model betreft een veerkrachtig traditioneel beheersysteem met een combinatie van communaal watergebruik en bosbezit door een lokale clan. Dit institutionele arrangement resulteert in een goed beheer van zowel water als bos. Het tweede model betreft een technologisch model voor waterbeheer, waarbij het water beheerd wordt door een formele gebruikersgroep, terwijl deze groep op basis van lokale normen ook het bos beheerd. Dit model is effectiever ten aanzien van bosbeheer dan ten aanzien van waterbeheer, omdat de gebruikersgroep afhankelijk is geworden van externe steun bij het waterbeheer. Het derde model betreft een technologisch model voor waterbeheer, waarbij het water beheerd wordt door een formele gebruikersgroep, terwijl het bos in bezit is van een privé persoon. In dit geval zijn de rechten van de boseigenaar vrij onzeker; wat heeft geleid tot bosdegradatie. Ook in dit geval is de gebruikersgroep afhankelijk geworden van externe steun; dit heeft hun vermogen tot collectieve actie ondermijnd. Het HESAWA ontwikkelingsprogramma heeft ertoe geleid dat in vijf van de zes bestudeerde cases, namelijk Tumbu, Kilombero, Chemichemi, Anselm en Migombani, de praktijken voor gebruik en beheer van de bronnen en bronbosjes erg dynamisch is geworden en dat het moeilijk te voorspellen is hoe deze zich verder zullen ontwikkelen.

Hoofdstuk 8 presenteert de voornaamste wetenschappelijke conclusies en discussie. Het vat de conclusies uit de eerdere hoofdstukken samen en overdenkt die verder in het licht van de theoretische literatuur die de basis vormde voor de studie. Tenslotte wordt aangegeven wat de relevantie van de studie is voor verdere beleidsontwikkeling

in Tanzania op het gebied van geïntegreerd water- en bosbeheer door lokale gemeenschappen. De hoofdconclusie is dat de zes cases over het gebruik en beheer van bronbosjes aangeven dat er een diversiteit in institutionele interactie en praktijken bestaat als gevolg van de verschillende rollen van de individuele actoren. Culturele gewoonten en taboes hadden in het verleden een grote betekenis. Maar als gevolg van ontwikkelingsprogramma's en technologische modernisering spelen deze een steeds kleinere rol. Omdat de gebruikers van de natuurlijke hulpbronnen zich in toenemende mate oriënteren op de bredere moderne wereld, vormen zij een steeds meer heterogene groep. De externe actoren constateren in toenemende mate dat de traditionele instituties voor het gebruik en beheer van water en bos zwak zijn. Ontwikkelingsprogramma's hebben geprobeerd om deze instituties te vervangen door nieuwe instituties of ze aan te passen door een verdere formalisering en legalisering van gebruikersgroepen. De formalisering van de traditionele instituties maakt ze bureaucratisch en inflexibel; hierdoor wordt het moeilijk om ze effectief te gestalten in specifieke lokale situaties. Maar deze formaliseringsprocessen verlopen niet overal hetzelfde. De verschillen in institutionele praktijken worden voornamelijk veroorzaakt door machtsverhoudingen tussen de lokale actoren en de vaak zwakke historische afhankelijkheid van institutionele ontwikkeling. Indien externe ontwikkelingsinterventies of modernisering een uitdaging vormen voor lokale praktijken treedt er een proces op van institutionele bricolage. Zo'n proces is niet continu, maar vindt al of niet plaats afhankelijk van de institutionele uitdaging die gevormd wordt door de maatregelen van de externe actoren. Ontwikkelingsmaatregelen dienen derhalve niet uniform te zijn, maar specifiek geënt op lokale sociale en natuurlijke omstandigheden.

Muhtasari (summary in Kiswahili)

Maji ni hitaji muhimu kwa maisha ya binadamu na kwa sababu hiyo uwezo wa watu kuyapata maji haya ni jambo la kuzingatiwa. Sera ya taifa ya maji ya Tanzania ya mwaka 1971 iliweka lengo la kuwapatia wananchi maji safi na salama kwa matumizi ya nyumbani. Maji haya yalitakiwa kupatikana ndani ya umbali wa mita 400 kutoka kwenye makazi na bila kulipia gharama yoyote ifikapo 1991. Japokuwa serikali ya Tanzania imekuwa ikiwekeza kwenye miradi ya kusambaza maji kwenye maeneo ya vijijini, hadi sasa ni asilimia 50% tu ya watu wanayafikia maji haya ndani ya umbali wa mita 400 kutoka kwenye makazi yao. Hii ina maanisha kuwa watu wengi bado wanategemea vyanzo vya asili vya kijadi vya maji vikiwemo vile vyilivyo kwenye misitu midogo midogo. Misitu hii midogo midogo yenye ukubwa wa eneo la hekta 0.1 hadi 1 ni mabaki ya misitu mikubwa ya zamani kwenye vyanzo vya maji. Watu wa maeneo ya vijijini katika kisiwa cha Ukerewe kwenye Ziwa Victoria wanachukulia misitu midogo midogo ya kwenye vyanzo vya maji kuwa ni muhimu kwa utunzaji wa vyanzo hivi na hivyo uendelevu wake unategemea aina ya usimamizi wake. Mtazamo wa wanavijiji hawa umesababisha utafiti huu kuchukulia usimamizi wa vyanzo vya maji na uoto kwenye misitu hii kuwa ni suala fungamanishi.

Misitu midogo midogo ya kwenye vyanzo vya maji imekuwa ikisimamiwa kwa kutumia kanuni za kijadi kama vile miiko na imani za kimila. Kwa miongo mitano iliyopita kumekuwepo na mabadiliko mengi nchini Tanzania ya sera na sheria za ardhi, maji na misitu. Baadhi ya mabadiliko haya yamechangia kubadilika kwa mfumo wa usimamizi wa misitu hii. Tafiti nyingi juu ya usimamizi wa misitu nchini Tanzania zimeshaandika juu ya sifa mbalimbali za usimamizi wa misitu ya makabila ya asili. Utafiti huu umefanyika pia hata kwenye usimamizi wa mifumo ya maji. Tafiti hizi nyingi zimefanyika kissekta kwa kuangalia aina moja ya mali asili. Hata hivyo, hakuna utafiti maalumu uliofanyika kuangalia hadhi na hali ya usimamizi wa misitu midogo midogo kama mali asili fungamanishi zenye matumizi mengi. Kwa kuongezea, bado kuna uelewa mdogo wa kisayansi juu ya aina na utendaji kazi wa taasisi za kijamii za kusimamia mali asili mchanganyiko katika mazingira yanayobadilika kimfumo wa umilikaji na aina ya usimamizi wa mali asili. Utafiti huu una lengo la kuchangia kutoa uelewa katika jambo hili kwa kuangalia aina za taasis na mabadiliko ya taasisi hizi katika usimamizi wa misitu midogo midogo kwenye vyanzo vya maji kisiwani Ukerewe.

Sura ya 2 imejadili nadharia na dhana zilizotumika katika utafiti huu. Utafiti huu umetumia dhana ya Cleaver ya kuunda taasisi ili kufikiria mchakato wa kutengeneza taasisi kwa kuchanganya kanuni na mazoea ya kiasili na yale ya kutoka nje ya maeneo husika. Dhana hii inaondokana na fikira za kuangalia kama taasisi za kutumia na kusimamia maji na misitu ni imara kwa kuzingatia hali ya ndani tu ya taasisi hizo. Dhana ya Cleaver ya uundwaji wa taasisi inajenga hoja kuwa watu hutumia uelewa wao wenyewe na ule wa kutoka nje ili kutengeneza taasisi mpya. Dhana hii inahimiza umuhimu wa uwezo wa binadamu katika kutatua matatizo yake ya kijamii. Hata hivyo, mchakato wa kuunda taasisi mpya ni mgumu kueleweka na hivyo dhana na mitazamo mingine imetumika ili kuuelewa vizuri mchakato huu. Hii ni pamoja na kumwangalia mlengwa mwenyewe, mwingiliano wa kijamii na mfumo unaotambua kuwepo kwa njia mbalimbali za uhalali. Kwa kumwangalia mlengwa mwenyewe kunafanya wahusika wa jambo fulani wawe kitu cha msingi katika kujua ozoefu wa maisha yao ya kila siku na utofauti wa mitazamo yao. Kuangalia mwingiliano wa

kijamii kunatoa mwanga halisi juu ya nguvu, mwafaka na migongano katika uundaji wa taasisi. N. Long anatoa hoja kuwa mwingiliano unatumika kama uwanja ambapo watu au makundi mbalimbali yanaweza kuonyesha mtazamo wao kuhusu dunia ulivyo tofautiana na ule wa watu kutoka nje. Kutambua mifumo mbalimbali ya uhalali juu ya jambo fulani kunalenga kujua jinsi gani sheria za nchi zimebadili taratibu zingine na jinsi gani taratibu zisizotokana na sheria ya nchi zimebadili au kukataa sheria za nchi.

Sura ya 3 imejadili methodolojia iliyotumika. Utafiti huu umetumia uchunguzi kifani linganifu kujua kama aina sita za misitu midogo midogo zina aina tofauti ya utendaji katika kuunda taasisi za kutumia na kusimamia misitu.

Sura ya 4 imejadili mfumo rasmi wa uendeshaji wa haki za kutumia na kumiliki maliasili na mabadiliko yake nchini Tanzania. Sura hii imeonyesha kwamba mfumo wa umilikaji ardhi, maji, misitu na miti umepitia historia ndefu ya mabadiliko ikianza kipindi kabla ya ukoloni na kufuatiwa kipindi cha ukoloni, uhuru na hatimaye kipindi hiki tulichonacho sasa. Mfumo wa kisheria wa umilikaji wa mali asili wa serikali ya kikoloni na Tanzania huru ulitambua mchango wa mfumo wa kimila wa umilikaji katika usimamizi wa matumizi ya ardhi, maji na misitu. Hata hivyo, mfumo wa kisheria wa serikali haujatoa uhuru wa kutosha kwa mfumo huu wa kimila kusimamia rasilimali hizi bila ya kuingiliwa. Kufutwa kwa mfumo wa utemi nchini Tanzania na utekelezaji mpango wa uanzishaji wa vijiji vimechangia kudhoofisha sheria za kimila na vimeharibu utaratibu wa makazi ya ukoo na uongozi wa kimila ambavyo vimekuwa vikisaidia kutatua matatizo ya kijamii. Mfumo wa kisheria wa umilikaji umeelekezwa vizuri sana kwenye sera na sheria za nchi za kusimamia matumizi ya ardhi, maji na misitu lakini katika hali halisi unatumika mara chache sana kwenye maeneo ya vijijini. Kwa hiyo mfumo wa umilikaji wa kimila bado ni muhimu sana katika kusimamia matumizi ya rasilimali hasa vijijini ambako vyombo vya serikali haviwafikii wananchi kirahisi. Kujadili mfumo wa umilikaji katika mazingira ya Kitanzania kumesaidia kuonyesha kwenye sura ya saba ni kwa jinsi gani utendaji wa kila siku wa utumiaji na usimamizi wa ardhi, maji na misitu unafanana na mifumo hii ya kisheria na kimila.

Sura ya 5 na 6 zimejadili matokeo ya utafiti juu ya mabadiliko ya usimamizi wa maji na misitu midogo midogo na sifa za kimaumbile za maliasili hizi. Sura ya tano inaonyesha kuwa watu waliogundua vyanzo vya maji miaka ya 1930 na 1940 walitumia kanuni za kimila kusimamia matumizi na utunzaji wa maliasili hizi. Hata hivyo utunzaji wa vyanzo hivi vya maji mara kadhaa umepata miingilio kutoka nje. Historia ya mabadiliko ya usimamizi yatokanayo na miingilio ya nje inaonyesha kuwa aina sita za vyanzo vya maji zimepitia hatua tofauti tofauti. Japokuwa aina nyingi za miingilio ya nje zimeanishwa kwenye utafiti huu, miingilio iliyosababisha mabadiliko ya haki za umilikaji ni ile ya kuanzishwa kwa vijiji, mradi wa HESAWA na Halmashauri ya Wilaya ya Ukerewe. Miingilio hii ya watendaji kutoka nje ya jamii imesababisha kuanzishwa kwa taratibu mpya za usimamizi wa vyanzo vya maji na uwekaji wa matanki na vikingia maji kwenye vyanzo hivi. Pamoja na kuwekwa kwa matanki ya maji na vikingia maji, nyenzo hizo katika vyanzo vya maji vya Tumbu, Kilombero na Anselm havifanyi kazi vizuri kutokana na kutokuwepo kwa matengenezo mazuri kutoka kwa watumiaji.

Sura ya 6 inaonyesha kuwa usimamizi wa kimila wa misitu na vyanzo vya maji ulikuwa fungamanishi. Historia ya mabadiliko ya usimamizi wa misitu midogo midogo kwenye vyanzo vya maji inaonyesha kuwa hapakuwepo na miingiliano ya nje iliyolenga moja kwa moja kutunza misitu hii. Hata hivyo, kati ya miingilio iliyolenga moja kwa moja kuboresha vyanzo vya maji ni mradi wa HESAWA na Halmashauri ya Wilaya ya Ukerewe tu ndiyo iliyosababisha mabadiliko ya usimamizi wa misitu hii. Miingilio mengine kama vile kanisa, UNICEF na mbio za mwenge haikubadili mfumo wa usimamizi wa misitu hii. Japokuwa kuanzishwa kwa vijiji hakukulenga moja kwa moja usimamizi wa misitu na vyanzo vya maji lakini kulisababisha mabadiliko ya mfumo wa usimamizi kwa sababu ulibadili umiliki wa misitu. Hali ya kimaumbile ya misitu sita ya utafiti huu imekuwa tofauti tofauti. Hata hivyo, hali ya ujumla ya misitu midogo midogo kwenye vyanzo vya maji katika Wilaya ya Ukerewe inafanana na misitu ya kimila ya sehemu zingine za Tanzania.

Sura ya 7 imejadili matokeo ya utafiti juu ya hali halisi ya sasa ya utumiaji na usimamizi wa vyanzo vya maji na misitu midogo midogo. Sura hii ina sehemu tatu ambazo ni mpangilio wa usimamizi wa vyanzo vya maji na misitu, mazoea ya utumiaji wa vyanzo vya maji na misitu, na mazoea ya usimamizi wa vyanzo vya maji na misitu. Sura hii inaonyesha kuwa hali halisi ya sasa ya mpangilio na mazoea ya utumiaji na usimamizi wa vyanzo vya maji na misitu umetofautiana miongoni mwa aina zilizofanyiwa utafiti. Tofauti hizi zinatokana na sababu za kitaasisi, nafsi ya mtu mwenyewe katika usimamizi na sifa za rasilimali yenyewe. Kutokana na miingilio ya nje na historia ya usimamizi wa maliasili hizi, utafiti huu umebainisha vielelezo vinne vya taasisi za kusimamia misitu midogo midogo kwenye vyanzo vya maji kama rasilimali fungamanishi.

Aina ya kwanza ni taasisi thabiti za kimila ambazo vyanzo vyake vya maji ni mali ya jamii wakati misitu ni mali ya ukoo. Aina hii imesaidia kuwa na usimamizi mzuri wa maji na msitu. Aina ya pili ni ile ya taasisi ya kiteknolojia na kundi rasmi la watumiaji maliasili ambayo vyanzo vya maji na misitu ni mali ya wanakikundi. Aina hii imefanya kazi vizuri kwenye usimamizi wa misitu tu na siyo kwenye vyanzo vya maji. Hii imetokana na wanakikundi kuwa tegemezi kwa misaada ya nje katika kukarabati miundombinu ya vyanzo vya maji. Aina ya tatu ni taasisi ya kiteknolojia na kundi rasmi la watumiaji maliasili ambapo vyanzo vya maji ni mali ya wanakikundi wakati msitu ni mali ya mtu binafsi. Aina hii imesababisha kutokuwepo kwa uhakika wa haki za umilikaji wa msitu binafsi na hivyo kusababisha kuharibika kwa msitu. Pia katika aina hii watumiaji wa vyanzo vya maji wamekuwa tegemezi wa misaada ya nje na hivyo imedhorotesha uwezo wa watumiaji wenyewe kuchukua hatua za pamoja katika kutunza miundombinu iliyoanzishwa kwenye vyanzo vya maji. Mradi wa HESAWA umesababisha utumiaji na usimamizi wa vyanzo vya maji na misitu ya Tumbu, Kilombero, Chemichemi, Anselm na Migombani kuwa wenye kubadilika badilika na usiotabirika. Pamoja na kuwepo kwa uvunaji wa miti kwenye misitu hii midogo midogo hakujaathiri sana miti ile inayosadikiwa kijadi na wanakijiji kuwa inatunza vyanzo vya maji.

Sura ya 8 inatoa hitimisho kuu la utafiti huu kutokana na sura zilizopita na pia ikitafakari malengo ya utafiti na nadharia ya dhana zilizotumika katika utafiti huu kwa kulinganisha na maandiko. Mwisho, sura hii inajadili uhusiano na umuhimu wa matokeo ya utafiti katika kuunda sera za utunzaji fungamanishi wa maji na misitu kupitia wananchi. Aina sita za misitu midogo midogo zimeonyesha utendaji wa

kitaasisi tofauti tofauti kutokana na wajibu mbalimbali wa watendaji katika utunzaji wa maji na misitu. Hata hivyo miingilio kutoka nje na watumiaji rasilimali kuiga tamaduni za kigeni kumeleta changamoto kwenye miiko na imani za kimila. Watumiaji wa maliasili wanajihusisha na maisha ya ulimwengu wa kisasa kwa njia tofauti tofauti na hivyo kuwafanya watu wa jamii moja watofautiane kimtazamo katika maisha yao ya kila siku. Watendaji wa nje wamekuwa wakifikiria kuwa taasisi za kimila ni dhaifu katika kushughulikia matatizo ya utunzaji wa vyanzo vya maji na misitu. Kwa hali hiyo watendaji hawa wamekuwa wakibadili taasisi hizi za kimila kwa kuunda taasisi mpya au zile zilizopo kuzifanya ziwe za kisheria. Hatua hii imesababisha taasisi za kimila kuwa rasmi na zenye urasimu mkubwa, kitendo kilichosababisha wananchi washindwe kuzisimamia. Kwa kuhitimisha, tofauti ya utendaji kazi wa taasisi katika aina sita za misitu midogo midogo inatokana kwa kiwango fulani na historia ya taasisi husika na uwezo wa baadhi ya watu kuathiri watu wengine kwenye jamii kuhusu maamuzi au mitazamo. Uundwaji wa taasisi mpya hautokei kwa sababu tu ya uwezo wa binadamu mwenyewe katika kuatatua matatizo bali ni pale miingiliano ya nje na utamaduni wa kigeni unapotoa changamoto kwa taasisi zilizopo kwenye jamii. Hii inamaanisha kuwa mchakato wa kuundwa kwa taasisi siyo lazima uwe wa mwendelezo bali unaweza kutokea tu pale mabadiliko ni lazima kutegemeana na changamoto zilizopo. Kwa hiyo aina moja ya mradi wa maendeleo isitumike kutatatua matatizo kwenye mazingira tofauti, bali kila sehemu inatakiwa kuwa na mradi wake kwa kuzingatia hali halisi ya kijamii na ya kimazingira

Curriculum Vitae

Josiah Zephania Katani was born in Mwanza, Tanzania on 21 March 1968. In 1995, he obtained BSc. degree in Forestry from Sokoine University of Agriculture. After his graduation, he worked with CARE International in Ngara, Tanzania as a Field Natural Resource Officer. In 1999, he obtained his MSc. degree in Forestry with specialization in Forest Mensuration and Management from Sokoine University of Agriculture. The same year he was employed by Vi Agroforestry Project in Musoma as a Head of Training and Development Unit. In 2001, he was employed by Prevention of Corruption Bureau as a Researcher in the Department of Research. His research focus in the Bureau was corruptions related to natural resources use and management. In 2003, he was employed by Sokoine University of Agriculture as an Assistant Lecturer in the Department of Forest Mensuration and Management. He started his PhD studies at Wageningen University in February 2006 and focused on local institutions in use and management of water sources and forest as integrated resource systems. This book is the result of his research work. Currently, he teaches Forest Management Planning, and Management of Natural Resources and Sustainable Agriculture for undergraduate students at Sokoine University of Agriculture.



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| Information literacy, including introduction Endnote | WGS | June 2009 | 1 |
| Scientific Writing | WUR- Centa | September- November 2009 | 1.8 |
| Presentation skills | WUR- Centa | October 2009 | 1 |
| <u>IV. Presentations of research results</u> | | | |
| FNP and RDS Advanced Research seminars | WUR | 2007/2009 | 4 |
| Changing management forms of micro spring forests: its impact on tenure rights of land, water and forest resources in Ukerewe main Island, Tanzania | Sadguru Water and Development Foundation, India | October 2009 | 2 |
| Total | | | 37.3 |