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Institutional pluralism, access and use of wetland resources in the Nyando Papyrus Wetland, Kenya

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Wetlands support livelihoods of communities living around them as in the Nyando Papyrus Wetland in Kenya. The Nyando Papyrus Wetlands provide multiple resources hence there are multiple uses and users who often overlap spatially and seasonally causing conflicts. More claims are being exerted on these wetland resources from different sides and institutional levels with different actors. The actors involved refer to various legal systems and mechanisms, and frequently create new hybrid law as in the case in the Nyando papyrus wetlands. These institutions, in various degrees of transformation, still have an important role in determining how resources are used. The objective of this study is to find out about the institutions affecting wetland resource use in the past and in the present and to determine the dynamics of specific natural resource-related institutions in four sub-locations in the Nyando Papyrus Wetlands, Kenya. The study shows that there is legal pluralism in the Nyando Wetlands, which requires synergy for sustainable livelihoods in the local communities and for ecosystem management.

Key words: Nyando Papyrus Wetlands, legal pluralism, institutions.

INTRODUCTION

Wetlands comprise of a number of physical, biological and chemical components that yield numerous benefits, which provide both direct and indirect services of value to humans such as wildlife, fisheries and forest resources (Denny, 1997; Carter, 1996; Bergstrom and Brazee, 1991). They also perform important ecological functions such as flood control, shoreline stabilization, water purification and the preservation of biodiversity (Millennium Ecosystem Assessment, 2005). As environmental degradation of farmlands and population pressure in rural areas force more people to seek livelihood strategies other than agricultural ones, the use of wetlands for harvesting of wetland resources has increased all over Africa. As many governments have failed to recognize the significance of local wetland services and indeed the value of wetland functions, they have stimulated rather than mitigated or prevented the intensification of wetland exploitation to improve livelihoods for riparian communities (Wee and Heyzer, 1995; IWMI, 2006; Bikangaga et al., 2007). Increasingly

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therefore, there is evidence that exploitation and transformation is exceeding the potential for the sustainable use of wetlands, resulting in degradation and the loss of livelyhood benefits for all (Millennium Ecosystem Assessment, 2005).

To conserve wetlands properly, it is important to understand the institutions that govern their use and management, and the activities and behaviour of human societies within and around those wetlands, and to devise ways to address processes, activities and behaviour that have a deleterious effect on their survival and sustained use through adapted management and use.

One important question of course is what constitutes the ‘proper use' of wetlands. In the framework of this paper, it is necessary to start from the assumption that the definition of proper management differs per stakeholder or user, over time and from one geographical location to the next. We can only give a very general and flexible definition therefore of what constitutes proper use, and although various frameworks have been proposed, one important description is related to the Ramsar convention (Ostrovskaya et al., 2012). The Ramsar convention refers to ‘wise use', and defines this as 'maintaining their ecological character, achieved through the implementation of ecosystem approaches within the context of sustainable development' (Ramsar handbook 1, 2007). This mainly shifts the problem to the next level, as this ‘ecological character' is also a variable characteristic. However, described systematically, it can thus serve as one particular type of ‘proper use'.

The institutions needed for this ‘proper use' have been for a long time seen to be either informal or formal. Informal institutions are also called traditional ones. They are local, culturally determined and part of the social and historic background of a people and/or area. Formal institutions are often initiated by a national government; they are law-based and often go back to Colonial origins. There are however a number of problems with this dichotomy. The most important one is that these two types of institutions exist together, at the same time and place (Kemerink et al., 2013). The situation is one of legal pluralism rather than either one or the other, with very clear categories of institutions belonging to either formal or informal institutions. According to Quinne et al. (2007) and Ostrom (1990, 2000) institutional design or institutional crafting in this perspective is an impossible goal. There is no clear-cut and rational way of organizing a set of institutions of very different character, depending on how strong the institutions that existed were, and how strong any new institutions that have come in are given that they can be traditional/informal, or formal. In this respect, we arrive at an institutional map, with very many different colours, shades of colours and mixed colours.

This paper departs from the idea that the reality of the institutional landscape on the ground shows a diverse pattern of institutions. Cleaver uses the concept of Institutional Bricolage (Cleaver, 2001) Kemerink and others adopted the concept of legal pluralism (Kemerink et al., 2013; Bavinck et al., 2012; Von Benda Beckman et al., 2009). In this paper we adopt the former, normative institutional, framework as the most relevant. Legal pluralism is the interaction of different normative frameworks within the same space. These spaces can be socio-politically or indeed geographically defined (Kemerink et al., 2013, Von Benda Beckman et al., 2009). These normative frameworks are the result of the interaction of people and their environment thus described as sets of rules and regulations, norms and expectations, in one word, institutions, that regulate this interaction.

Within the present study therefore, we use the concept of institutions as describing sets of norms, rules and systems of values (North, 1990) that control, organize, imprint a pattern on and shape the behaviour of actors during their interaction with each other and the environment to satisfy their requirements of life (Vatn, 2005). As stated above, we can distinguish formal and informal institutions, but we want to make it clear from the start that these are convenient constructions, used to describe normative frameworks in an analytical framework. In reality, as we imply with the use of the legal pluralist concept, these ‘pure' versions of normative frameworks hardly exist. They are in constant flux, change depending on local population dynamics, and changes in the environment, and because of intrusions from other legal frameworks. They are hybrid, a situation described as institutional pluralism.

Therefore having said that, informal institutions are socially shared rules, usually unwritten, created, communicated and socially enforced outside of officially sanctioned channels. Informal institutions are as well-known as are formal rules, but they are not laid down in writing and tend to be more persistent (North, 1997). Although, commonly accepted throughout the community, practices related to informal institutions are not officially established. Defined as openly codified, established formal institutions are communicated through channels that are widely accepted as official, written form, supported by legally recognized actors/ entities rather than socially defined categories (Helmke and Levitsky, 2004).

Turning now to the context of the Nyando Wetland, we establish that formal and informal institutions do exist, but that a plethora of hybrid institutions has developed through the interacting normative frameworks, reacting to changes in the community and environment. Taking the pre-colonial situation as a reference point (as a construct used for this discussion, we do not want to be so presumptuous as to state that we know the informal normative framework prevalent at the time in detail), changes in resource use did lead to a significant transformation in informal institutions present at that time. These institutions, in various degrees of transformation, still have an important role in determining how resources are used. Some of the factors that have caused changes in traditional institutions in the Nyando Papyrus Wetlands

include ecological drivers: droughts and floods, and changing vegetation because of changing climate. Others are more human-driven: human population growth, comercialization of the use of natural resources, changes in religious characteristics and changes in governance situations. In the past, most communities exploited wetlands for consumption rather than for commodities exchange and/or money. This scenario is changing with increasing commercialization of wetland resources. Papyrus wetlands support the livelihoods of millions of people by providing food, construction materials, clean water and other benefits.

One last and important issue that pervades this process is the issue of informal and formal normative frameworks having completely different sets of characteristics. However, for an entirely different context, namely the USA, Arnold and Gunderson (2012) have pointed at the fact that these two normative frameworks have different characteristics. USA laws are not well adapted to the ever-changing ecological and social systems. This formal maladaptive framework is characterized as narrow in its description of goals, monocentric, unimodal and fragmented, inflexible and based on a rational, linear and legal-centralist way of thinking (Arnold and Gunderson, 2012). This may, as a thought experiment, be set against local informal frameworks which may be characterized as more adaptable, inherently flexible, holistic and with multiple goals, and above all: legally pluralistic with negative feedback loops when resource use is threatening sustainability of the socio-ecological system. Even when this is not applicable to all institutions (we will discuss this below), these two sets of frameworks have indeed many of the prescribed characteristics. This juxtaposition has inspired Scott (1998) to study the impact of bureaucracy and 'high-modernist' ideology, linked with the power of the state, on the necessary role of local knowledge and expertise. Those newly introduced, inflexible normative frameworks can damage and even eliminate the structure on which a socio-ecological system rests. On the other hand, they can assist such a system to adapt to new and strange development for which the local framework was never going to be sufficient.

The point is of course that both systems rest on a power structure in the respective societies in which they developed. Their functional merging may strengthen this power position of old and new (or merged) elites alike, and when the resulting normative framework does not lead to the required flexible set of institutions, it may be both more damaging to the socio-ecological situation in the long run, and more persistent in its characteristics. The challenge in any real practical situation, such as the Nyando Wetland, is to see how flexibility can be maintained, while at the same time emergent institutions can be supported to provide a long-term assurance of sustainable use of wetland resources.

The objective of this study therefore was to examine the institutions that govern wetland resource use in Nyando wetland. Specific objectives were: (1) to describe the use of wetland resources in Nyando wetland by local communities; (2) to describe the current institutions controlling wetland resource use; (3) to link the two issues to come to an understanding of the causal linkages between these institutions and use practices. All these are discussed in the context of sustainability of resource use, and from there derive recommendations for management policy.

The study area

The Nyando Papyrus Wetland near the city of Kisumu on the shores of Lake Victoria in western Kenya is a typical example of exploited papyrus wetlands that are very common in the Lake Victoria Basin and in other parts of central, eastern and southern Africa (van Dam et al., 2011). The Nyando Wetland is a swamp situated at the mouth of the Nyando River between Nyakach Bay and the Kano Plains (0°11'- 0 °19'S/34°47'-34°57'E). The Nyando River is the major source of water of this wetland but additional waters come from the seasonal Asawo, Nyatini, Ombeyi and Awach-Kano River. Three ecological zones found in the wetland are permanent swamps, seasonal swamps and floodplains (Wakwabi et al., 2006).

The permanent swamp has hydric soils dominated by papyrus throughout the year. They are valuable ecosystems and are of significance particularly to the biota and water quality of the lake where they are situated. In the past, these wetlands supplied sand, clay, papyrus, fuel wood, herbs, and water. Wetlands were infused with a cultural significance and were also used for livestock grazing, hunting, fishing and the provision of grass for thatching houses. Traditional uses were sustainable under low population densities and had self-regulatory systems (Hongo and Masking, 2001; Dixon and Wood, 2003; Kipkemboi, 2006; Adede, 2008). However, use patterns have changed over the years.

The vast majority of the population in this area belongs to the Luo ethnic group, the only Nilotic group in Kenya (Adamson, 1967). They speak the Dholuo language, which belongs to the Western Nilotic branch of the Nilo-Saharan language family. Amongst the Luo, the family is part of a larger group of families called *Dhoot* or clan, which combines to form a Luo sub-group or *ogendni*. Several *ogendni* (plural for *oganda*) form *piny* (meaning a country or nation). According to the Luo, the *Dhoot* (clan) is a group of people united by kinship relationships even if this kinship-based bond is only symbolic in nature. The present day Kenya Luo consist of about 25 *ogendni* (the opinion of the members as to the definition of an *ogendni* differs and so does the number identified), each composed of various clans and sub-clans. Two Luo *ogendni*, the Nyakach and the Kano, are the predominant occupants of the study area.

The Luo were predominantly polygamous and the number of wives and children was a sign of wealth and prestige. They also practiced levirate marriage, in which

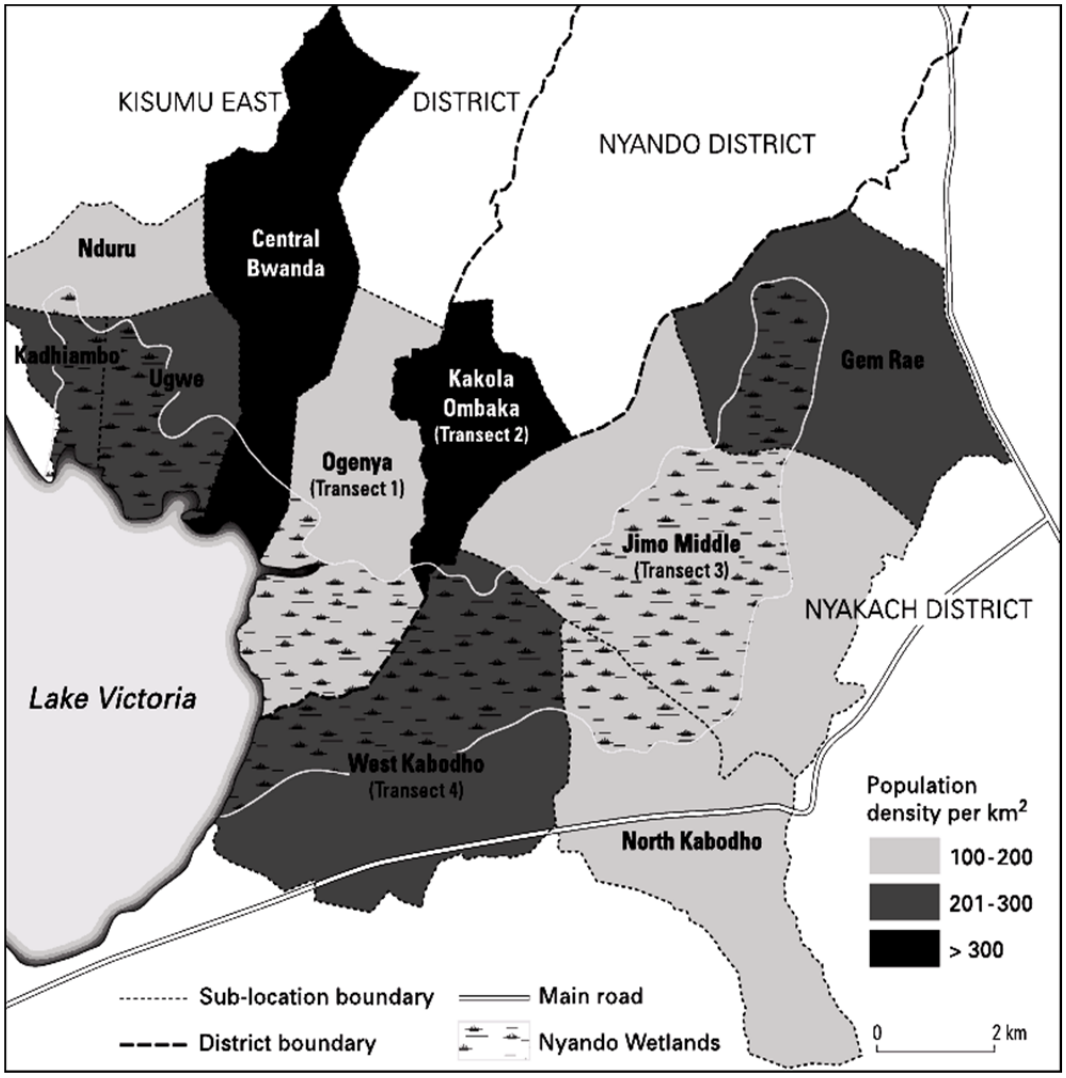

Figure 1. Map showing the study area.

a distant cousin or younger brother might enter into a union with the widow(s) of the deceased cousin or brother to help socialize children and continue child bearing on behalf of the deceased (Potash, 1986). The Luo live in family compounds, with strict dwelling arrangements that delineate seniority amongst wives and their children. There is also a strict seniority as far as brothers' domestic career is concerned; a younger brother could not marry unless his elder brothers were married first.

The above social arrangements and institutions, briefly described, already suggest that very inflexible arrangements and institutions (around seniority in marriage and the location of the house in particular) were combined with very flexible institutions of the levirate and woman-woman marriage, to absorb incidental and unfavorable crises situations that would threaten the local and regional socio-economic fabric if arranged too stringently.

METHODOLOGYS

The study carried out between October 2009 and May 2011 was in four sub-locations in Nyando wetland: Ogenya, Kakola Ombaka, Jimo Middle and West Kabodho, Kenya (Figure 1), with a population density of 153, 704, 131, and 225 persons per km^2, respectively.

To be able to meet the objectives of the study, data were both qualitative (on community institutions) and quantitative data (on personal normative frameworks and on resource use). Collection of qualitative data was through key informant interviews and focus group discussions. Quantitative data were collected using a household survey with 411 respondents in four transects in the area (Figure 1).

Key informants were people with particular knowledge and understanding of the wetland, its resource users and their problems. The total number of interviews held were 30 and included men and women engaged in fishing and fish trade, harvesting and sale of papyrus mats and sand, officers from government departments, parastatals, and civil society organizations working in the area. The key informant interviews included children who were heads of homes. Topics discussed covered old informal institutions

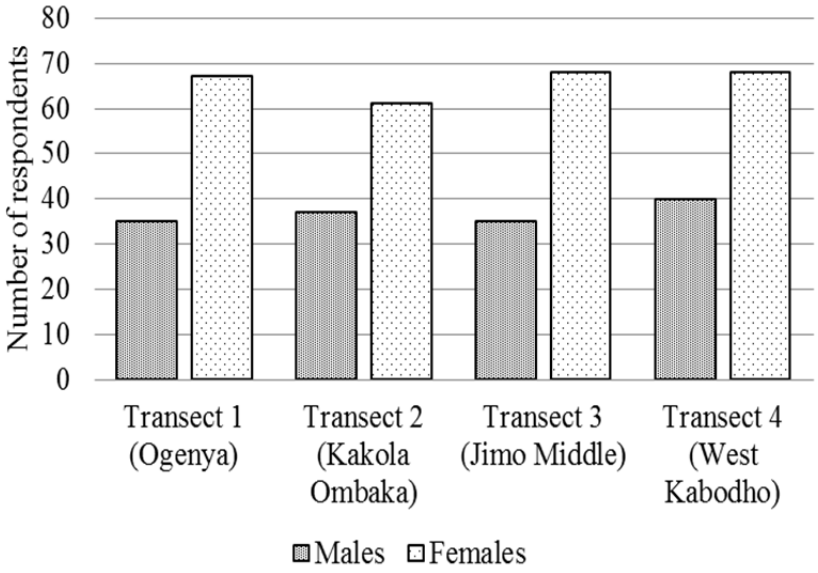

Figure 2. Sex of respondents by transect.

that guided wetland resource use, new formal and current hybrid institutions, and the reasons for 'institutional pluralization' taking place. Discussions included trends and changes in resource use within the Nyando wetlands, Kenya. The results from the key-informant interviews (KII) shows that respondents from government departments, parastatals and civil society organizations did not have knowledge of traditional and hybrid institutions since most of them are employed and may not be originally from the area.

The focus group discussions conducted were 13 and these contributed to a better understanding of data from the quantitative survey, triangulating these findings, and to obtain insights into perceptions, needs, problems, beliefs, practices and institutions related to them. The participants interviewed in the focus group discussions comprised both males and females as mixed groups who use a particular resource and drawn from different age groups. Coded verbatim transcripts of information from the focus group discussions and key informants interviews was analyzed using Atlas.ti (Scientific Software Development GmbH, Berlin) to obtain insight in similarities and develop trends.

The data from the survey used to obtain information on the personal belief systems of the respondents and on their reasons for conforming or not conforming to informal institutions that guided wetland resource use, and on the wetland use was analyzed using Statistical Package for Social Sciences (SPSS, IBM Corporation, New York) to generate frequencies and cross tabulations.

Household composition: The key to institutions for access

There were a total of 411 respondents with transects 1, 2, 3, and 4 having 102, 98, 103 and 108 respondents, respectively. Figure 2 shows the sexes of the respondents by transect. As suggested above, household composition and in particular whether a household is male headed, female headed or actually child headed (a recent phenomenon), is crucial for the understanding of household access to resources, and the degree in which a household is dependent on these (common property) wetland resources. Linking informal, formal and hybrid institutions to resource access and the impact of these institutions on access explains why certain resources are likely to be overused. For example, certain resources are only accessible to men, or women may have access to them only when not on their menstrual cycle. Children hardly ever have access to any resources until they have fulfilled certain obligations or reached a certain legal age. The age of respondents is shown in Figure 3. However, things are changing: women now have access to fisheries resources and land when they are single mothers, a consequence of formal regulations, based on the new constitution.

Figure 4 shows that 70% of the households in transect 1 were headed by males, 72% in transect 2, 71% in transect 3 and 69% in transect 4 respectively, while 25% were headed by females in transect 1, 24% in transects 2 and 4, and 26% in transect 3 respectively. In households where the husbands worked away from home or were incapacitated, females were responsible for running affairs at home and taking decisions (male headed, female managed households). In transect 1, the respondents in male headed- female run households was 4% while transect 2 had 2%, Transect 3 had 3 and transect 4 had 6%, respectively. Child-headed homes are a minority at only 1%. However, this is a telling increase, as they did not exist before. Their prevalence is a result of the decline in the strength of traditional institutions, the weakening of kinship networks and in the duty to absorb remnants of households when crises have struck. These crises relate to the increase in deaths associated with HIV/AIDS and the impossibility to absorb remnants of surviving household members due to over-burdened livelihood options. The last dimension: being a monogamous or polygamous household, is still very important: 44% of male-headed households and slightly more than 13 percent of female-headed households were polygamous. Only 0.2% of the female-headed homes were in a levirate union (Figure 5).

The increase in deaths resulting from HIV/AIDS-related diseases has profoundly affected nearly all forms of household capital, livelihood social networks, and household access to community assets. This is leading to increased household vulnerability, particularly if the deceased was a productive adult household member (Haddad and Gillespie, 2001; Yamano and Jayne, 2004), and the remainder of the household does not have the level of access the former head of the household had. Death or illness caused by HIV-AIDS affects almost 90% of the households in the Nyando wetlands as reported by the key informant interviews.

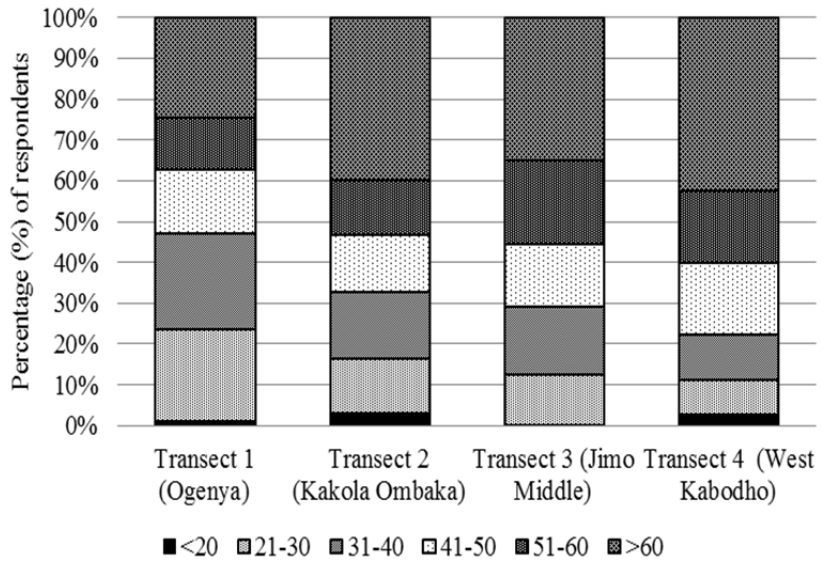

Figure 3. Age of respondents in the Nyando wetlands, Kenya.

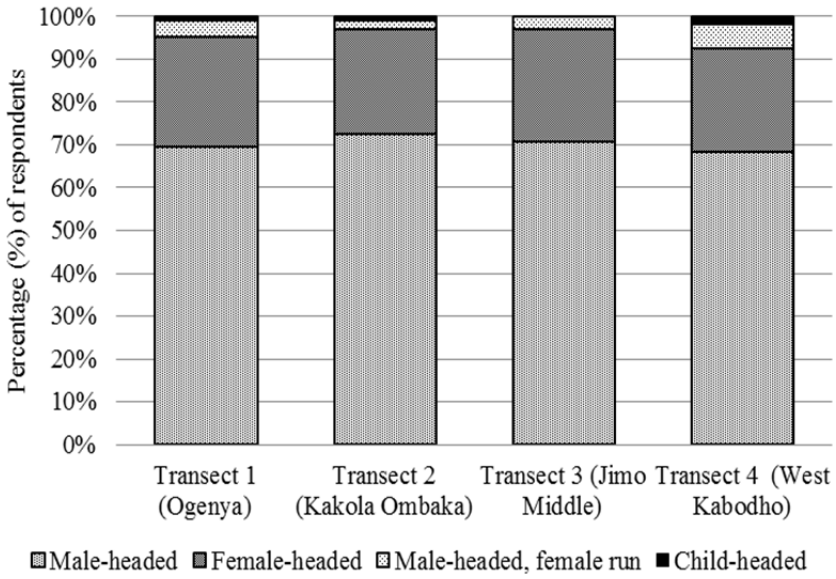

Figure 4. Types of household head of respondents by transect in the Nyando wetlands, Kenya.

Ecological conditions

According to 60% of the key informants interviewed, the main factors associated with the historical decline of some fish populations in the Nyando Papyrus Wetlands are interference of spawning and rearing habitat and blockage of adult passage to suitable spawning and rearing areas. Other factors that may affect population abundance include diversion of juveniles off the primary migration path, fishing of juveniles in diversions, toxic discharge to the rivers, and uncontrolled fishing in the lake. Temperature is a primary factor influencing the breeding and survival of *Protopterus aethiopicus* (Kamongo) which breeds in shallow pools of water in the wetlands.

In transect 1 (Ogenya), the ecological gradient is characterized by cropland with settlement, sugarcane, papyrus and a channel (Aguko) which is suffocated by water hyacinth that joins the lake. The socio-economic activities in the site include farming, fishing, harvesting papyrus and making mats. In this transect, the wetland is influenced by the lake. In transect 2 (Kakola Ombaka), the wetland is influenced by western distributary of the Nyando River. The ecological gradient starts from irrigated rice fields, sugarcane and food crops to the wetlands along the river. The major crops grown in this area are maize and sugarcane. Socio-economic activities include livestock grazing, farming, fishing and papyrus harvesting. The ecological gradient in Transect 3 (Jimo Middle)

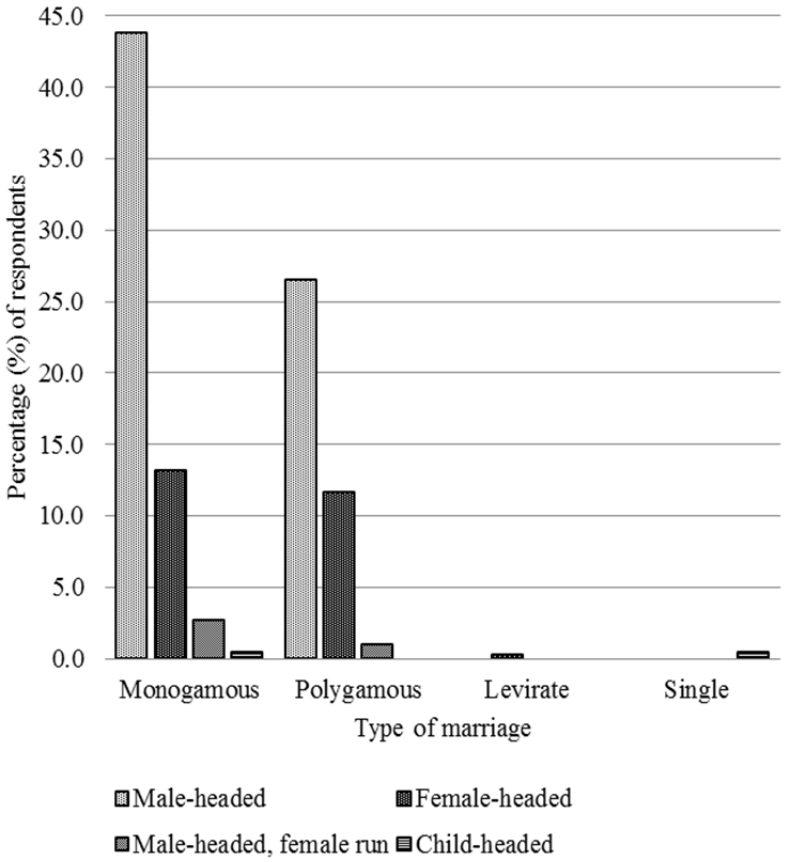

Figure 5. Types of marriages of respondents in the Nyando wetlands, Kenya. Polygamous marriage is the practice or state of being married to more than one person at a time. Levirate marriage is a type of marriage in which the brother of a deceased man is obliged to marry his brother's widow.

starts with the floodplain on the left bank which is colonized by indigenous herbs, invasive plant species and occasional wetland vegetation especially during flooding. The wetland is found on the right bank. The area appears to be rich in avifauna some of which nest, feed and rest along the river and especially where human disturbance is minimal. There is also diverse fish species that are found in the river and numerous hippo pools. The main socio-economic activities on left side of the river are cattle grazing, fishing and on the right side lies the wetlands in which the main socio-economic activities include crop farming, cattle grazing, fishing, harvesting wetland products and brewing of local brew (Chang'aa). Transect 4 (West Kabodho) has mostly sandy soils and the vegetation is characterized by euphorbia, cactus and *Lantana camara*. Some of the socio economic activities include fishing, wetland farming, petty trade along the landing beaches, grazing of livestock and harvesting of wetland products.

Wetland resource use

Products harvested from the Nyando papyrus wetlands include fish, plants, birds, wildlife and insects used for food, medicine, building materials and livestock feed. Figure 6 shows that 88% of the respondents harvest wetland products and 70% use the harvested products for both commercial and subsistence use. Only 4% use the products exclusively for commercial purposes. There are several ways of grouping wetland resources based on use for subsistence or commercial purposes, use for building and making of handicrafts, as fodder, as medicinal plants or as vegetables (Figure 7). These resources are accessible to all types of households but exclusion of groups of people at various times happens due to institutions governing wetland resource use. Outsiders are locked out from accessing certain resources such as land, and in West Kabodho, where harvesting of papyrus is by clans, it is not easy for outsiders to get access.

Both men and women harvest plants for building and making of handicrafts which include *Cynodon prescostalgi, Cyperus papyrus, Phragmites mauritaianus, Pycreus nitidus* and *Sesbania seban*. Women harvest plants such as *Aspilia* sp., *Rhynchosia* sp., *Harmania uhligii*, *Ipomea wrightii*, *Tragia insuavis* and *Tristemma incompletum* used for medicinal purposes and as vegetables. Men harvest plants such as *Echinochloa pyramidalis* and *Vigna luteola* used as feed supplements for livestock. The plants harvested as vegetables include *Amaranthus spinosa, Cleome gynandra, Corchorus tridens, Ipomea aquatic and Solanum nigram. Cyperus papyrus* provides art and craft making materials such as mats, baskets, chairs, tables, beds and building materials. It is the most important natural wetland product harvested in the Nyando wetlands, the percentage of respondents harvesting different parts and stages of papyrus is shown in Figure 8.

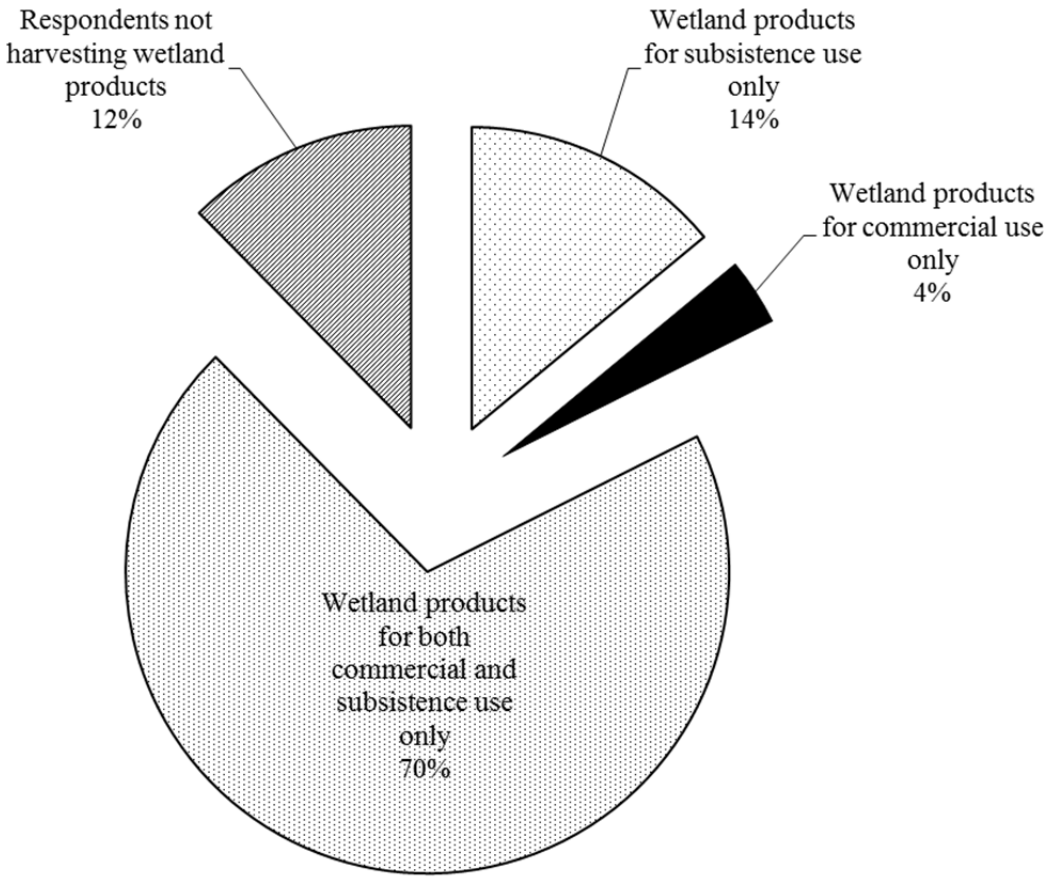

Figure 6. Respondents harvesting wetland products for commercial or subsistence use in the Nyando wetlands, Kenya.

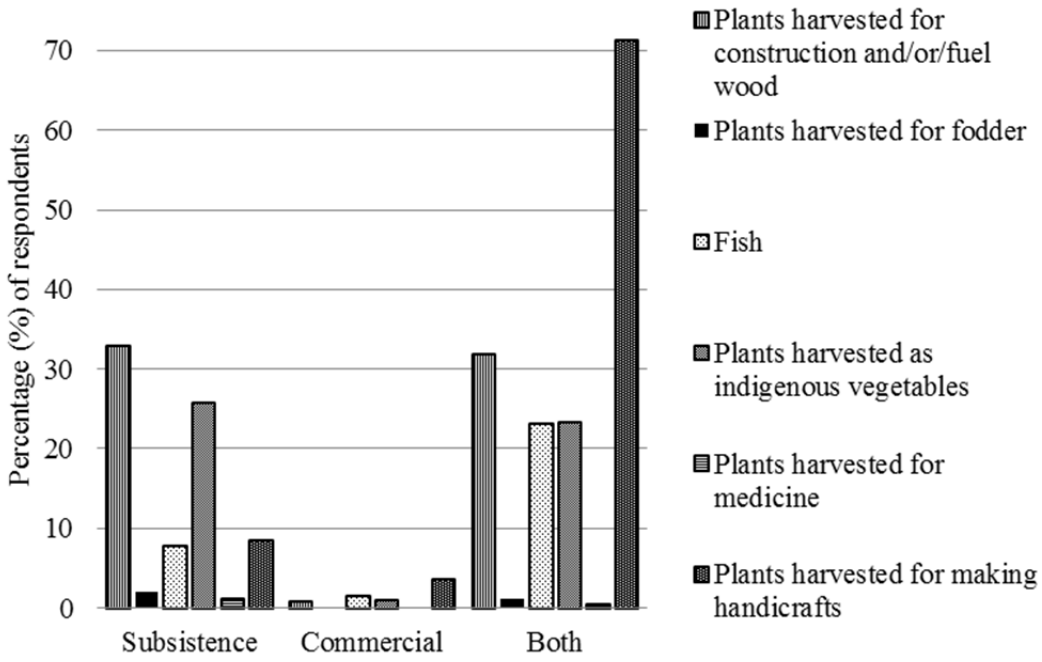

Figure 7. Categories of natural products harvested by respondents in the four transects of the Nyando wetlands, Kenya.

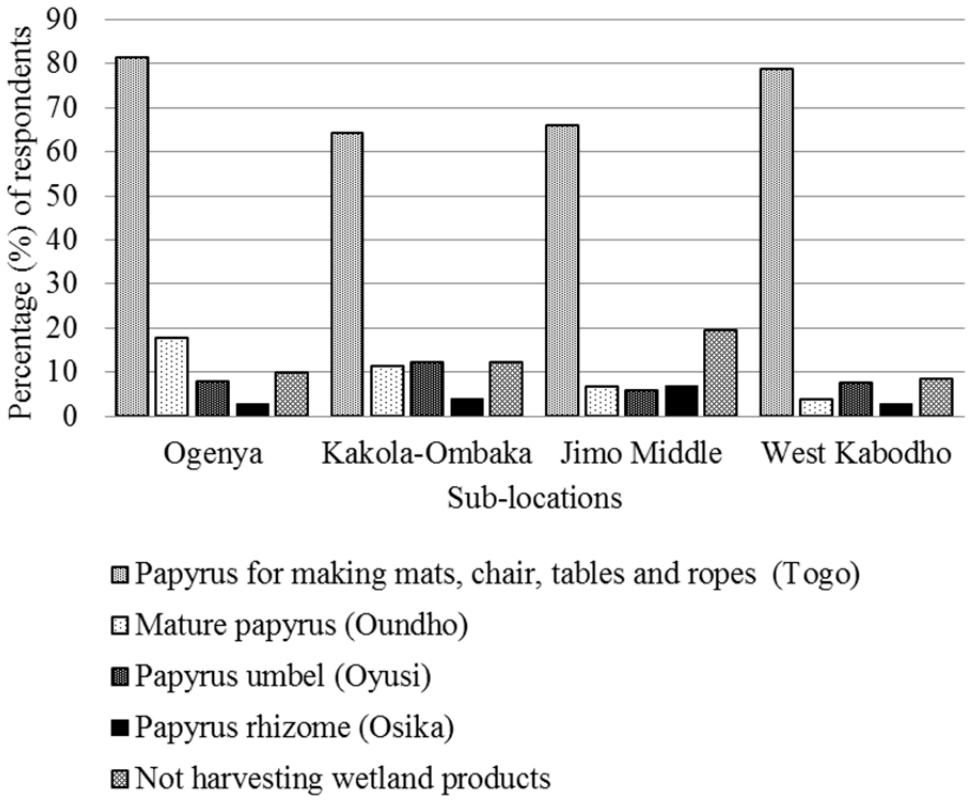

Figure 8. The percentage of respondents harvesting different parts of the papyrus plant in each of the four transects in the Nyando wetlands, Kenya.

The types of fish commonly caught in the Nyando wetland area include *Clarias gariepinus* (locally called mumi, okong' or nyapus depending on size), *Clarias werneri, Labeo* sp., *Lates niloticus*, *Oreochromis niloticus, Protopterus* sp., *Rastrioneobola argentea, Schilbe* sp. and *Synodontis* sp.

Fish such as *C. gariepinus* fingerlings (nyapus) are also used as fish bait for the Nile perch fishery and thus are interesting for commercial purposes hence attracting external players who more often than not engage in bad fishing practices. Furthermore, there are several small fish species such as *Mormyrus* sp. and *Oyuso*, used by the local poor population for food and sales. Figure 9 shows the types of fish species commonly caught by respondents in the Nyando papyrus wetlands, Kenya.

Although not formally protected as Important Bird Areas (IBAs), the wetland is also an important habitat to endangered bird species, and has some habitats crucial for their survival. There are numerous important endemic bird species, many valued by local people and tourists alike.

Wildlife commonly used for food includes hippo (*Hippopotamus amphibius*), hare (*Lepus microtis*) and sitatunga (*Tragecephalus spekeii*). Other species reported to occur are mammals such as otters and mongoose as well as reptiles including snakes (e.g. the African rock python *Python sebae*). Crocodiles (*Crocodylus niloticus*) have declined in numbers over time and now are quite rare in the area. Found in the Nyando papyrus wetlands are numerous insect larvae, earthworms and adult insects used as fish bait.

Land in the wetlands is also an important resource since it is fertile and has high water retention capacity suitable for crop production, especially during the dry season. The local communities grow a variety of crops for subsistence and commercial purposes. Common crops grown are high value fruits and vegetables, maize, rice, pulses and sugarcane.

Institutions and resource use for local livelihoods

Institutions governing the fisheries sector

The artisanal wetland fishery is an important activity. Within the informal normative framework, their exploitation has been largely male dominated, and thus male headed households dominate their access. Traditional dugout fishing boats or papyrus rafts (in Dholuo: *odesso*) and different fishing gears are used including the irreversible fish traps (*osadhi*) (Figure 10) and fish spears (*bidhi*).

Male dominance in fishing is partly rationalized based on the physical strength needed to stay overnight on the open waters, which women are assumed not to have, hence women are not allowed to stay out at night. Another reason for excluding women from open lake fishing is their vulnerability to sexual abuse by men. Other reasons include the fact that men have more resources like money to buy fishing boats and fishing gears whereas women can only afford the less expensive traditional fishing gears. Results from the household survey show that 5% of the women and 2% of the youths own boats and fishing nets and different types of fishing gears with the youth taking to illegal methods of fishing using mosquito nets and also the modified traditional traps. All KII reported that although in the Nyando wetland, women still do not engage in open lake fishing and none of the fishing boat owners employ women as crew members, they now can own boats. In other places, the change in gender-based restrictions to livelihood

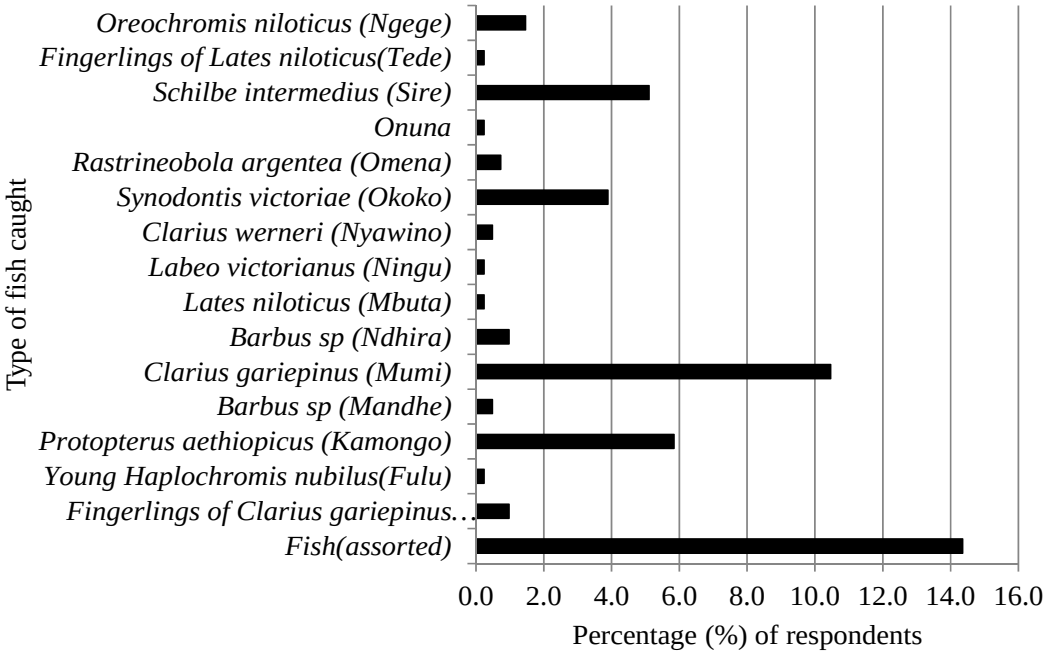

Figure 9. Types of fish harvested by respondents in the Nyando wetland, Kenya.

Figure 10. Traditional fishing traps from left ounga, sienyo and osadhi.

capitals, is mostly caused by poverty as a consequence of increasing numbers of male-less households, women are increasingly employed as crew members in fishing vessels that go out on the open lake.

Notwithstanding, some form of fisheries is also accessible to women. The most common fishing gears for women are the wide-mouthed one-sided traps *ounga* and *sienyo* (Figure 10). The method of using

these fishing gears is called *teng'o,* usually done in shallow waters after the floods recede. It is likely to be close to home and does not necessitate a stay over at night. However, the fish catch per unit of effort is lower, and hence income from sale of such fish is usually lower.

Some forms of fisheries are accessible to both men and women, especially when there do not seem to be the possibility of competition for scarce fish. Both men and women use *sienyo* to fish in freshly flooded waters which carry with it large numbers of fish, especially *Clarias* sp. (*mumi*). The method of digging out mudfish using a hoe called *kunya* is more popular during the dry season. While men made *ounga* and *sienyo*, women owned and used them. In contrast, men made fishing boats and rafts, spears and the irreversible trap (*osadhi*), and in the past men were the exclusive owners and users of fishing boats. Women were restricted from open lake fishing hence were not allowed to own fishing boats.

Results from KII show that 50% of respondents agree that women are now actively catching and trading in *C. gariepinus* fingerlings, used as bait for Nile perch fishing especially in Transect 4 (West Kabodho). In areas occupied by the water hyacinth, women stand in the water for hours searching for these fingerlings. On the one hand, this has allowed women access to income from fish resources in the wetland, but on the other hand, it has causes stress on their livelihood practices and results, as they do not have any protective gears. Consequently, they suffer from health and occupational risks including snakebites and diseases such as schistosomiasis, malaria, foot rot and other skin diseases. All traditional herbalists been interviewed confirmed that there is an increased number of women seeking their services due to injuries suffered as a result of catching *C. gariepinus* fingerlings. The related costs of treatment should be taken into account if the net benefits in economic terms are calculated.

Furthermore, results from the survey show that 40% of the respondents reported that christianity has changed the belief systems and suppressed related customs that previously restricted the use of certain fishing gears. These groups of people prefer to conduct prayers instead of engaging in traditional practices such as cleansing of new boats before being released into the lake or performing cleansing rites when a corpse is found while fishing. In the past, informal institutions regulated the fisheries sector in a variety of ways. Results from FGDs and KII show that there were prohibitions from catching immature fish of any species and when caught accidently these were put back into the water to enable them to grow to maturity. The traditional fishing gears were to catch only mature fish while allowing the juveniles to pass through the open spaces. Discussions held with key informants further indicate that fishing was traditionally prohibited in known fish breeding and spawning grounds in the wetlands and places like Kusa, Sango, Rachuonyo and Gode Ariyo. Folklore about harmful wildlife and diseases were used to scare people from venturing into these areas to fish. In addition, fishing was traditionally restricted between February and August since this coincided with the main cropping season. This ensured that people put concerted efforts on farming giving time for fish to breed and grow hence safeguarding the fisheries sector. In the current wetland fishery, the situation has changed with the introduction of fishing nets in the 1970s. Fishing is carried out in the traditionally restricted areas with all sites used as landing beaches, a situation brought about by increased demand for fish both locally and internationally (SOFIA, 2010).

Sixty percent of the fishermen interviewed reported that they no longer return juvenile fish into the water since they are selling them as bait or as food in the case of young Nile perch (locally called *tede* or *ondhedhe*). Despite government prohibition and scouting, 75% of the fishermen interviewed reported that they use unauthorized fishing gears such as fishing nets with undersized openings and do not observe the closed seasons due to poor enforcement of laws. Bribery of fisheries officers by some rich boat owners was reported by 30% of the key informants and this is frustrating efforts of beach management units (BMU) to enforce the use of correct fishing gears since the illegal fishing nets have bigger catches since they catch fish indiscriminately. Results from FGDs show that antagonistic relationships within families have also prevented BMU officials from working effectively especially when taking disciplinary action on relatives.

The reasons behind these changes are numerous, but an important driving force of change is the new nation-wide formal institutional arrangement developed by the Ministry of Fisheries Development for the governance of fisheries. This change according to key informants is important since enforcement is by government machinery. These include the Fisheries (Prohibitions) Regulations 2003 and the Fisheries (Beach Management Units) Regulations 2007.

The Fisheries (Prohibitions) Regulations 2003 aims to curb destructive fishing methods, by prohibiting fishing for, landing, processing, moving of and trading in Nile perch (*L. niloticus)* of a total length which is less than 85 cm, from the Kenya waters of Lake Victoria. Also, fishing for, landing, processing, moving of or trading in *Rastrineobola argentea* (*Omena*) fish from the Kenya waters of Lake Victoria during the closed season (1st April to 31st July each year) is prohibited.

In 2007, the Fisheries (Beach Management Units) Regulations brought into operation Beach Management Units (BMUs) for co-management of fisheries resources between the government and fishing communities where communities play a key role in resource management, allocation and decision making in order to enhance compliance and reduce costs. The main aim was to decentralize development and enforcement of fisheries polices. The role of BMUs is law enforcement: registration of boats, enforcement of gear regulations and protection of fishing grounds; beach development: fish bandas and sanitation; collection of fisheries data; conflict resolution and welfare matters and handling emergencies. The government on the other hand is responsible for building capacity of these new institutions through training in fisheries management, environment protection and financial management. Results from KII and FGDs show that in the Nyando wetland, all landing beaches have BMUs with democratically elected officials of which at least one third are women, as stipulated in the regulations. Despite the efforts of the government to empower women in the fisheries sector through the BMUs, their contribution in decision making is very limited and they only serve to meet the requirements for registration of the BMU. Results from all the KIIs interviewed and FGDs conducted showed that no woman has ever held the post of chairperson or secretary in any BMU within the Nyando wetlands. This shows that incorporating women in BMUs does not translate to them having more authority as stated by Mayoux (1995), Cleaver (1999), Nightingale (2011) and Zwarteveen (2012) who suggest that more complex and profound processes of social structures and agency shape gender relations.

Registration of new boats and fishing nets with the BMU is necessary before being licensed. Regulations prohibit persons below the age of 18 years from fishing in the open lake. The regulations include mechanisms for sharing fish proceeds among boat owners and crew members as well as rules for fish trade at the beach. For instance, 30% of the proceeds of gill net (*rimba* or *sarip*) fishing should go to the crew, the boat owner taking 70% of the proceeds. Fish sales at the beach give priority to people buying for home consumption, those with disabilities and women with infants before sale to traders. The arrangement prohibits selling fish at night, on the lake and on beaches other than where the boat is registered. It also prohibits catching undersized fish, stealing of fish and gears, fighting and drunkenness while fishing.

Some formal institutions conflict with the traditional norms and practices. Traditionally, institutions prohibited any form of fishing in the open lake from April to August, whereas The Fisheries (Prohibitions) Regulations 2003 recognizes the closed season between April and July but only for open lake fishing of *omena*.

Some rules and regulations however do not conflict with traditional norms, but are not effective either. For instance, youth below the age of 18 still go fishing and some of them have lost their lives in the process. The Standard Newspaper reporter Buluma on December 16, 2012 wrote a story on the situation as follows:

> "A fishing adventure turned tragic after six fishermen died when a boat they were in capsized at Bumbe beach in Lake Victoria on Saturday evening. The six were part of a seven-man team that included a 16-year-old boy hired by a local fisherman to help pull fishing nets locally referred as 'Egogo'. … The victims whose aged between 16 and 21 years had been warned against fishing in the lake because they did not have valid permits that allow them to fish".

In the FGDs, 50% of the respondents reported that for fear of arrest, the young fishers are now using modified traditional fishing gears, which have smaller openings hence potentially, as equally destructive as the undersized fishing nets. They argue that such a method helps evade new government enforcement institutions as the law does not clearly address their use and only addresses the use of fishing nets and vessels as was repeated in all four FGDs conducted with fisher folk and fish traders. The BMU rule has shortcomings in its effort to contain corruption too, since fishermen can bribe fisheries scouts to avoid arrests and persist in harmful fishing practices.

The changing institutional landscape introduces new rules and regulations and these have modified the prevalent informal rules, but have not yet given the power to relevant actors to control the enforcement of these hybrid rules and regulations. On the contrary, where previously informally controlled common property resources existed, they have taken away from those relevant actors the capacity to develop new enforcement measures or to implement the old ones, effectively creating open access resources.

Institutions governing harvesting and use of papyrus

Several traditional institutions govern harvesting and use of wetland plants, a key activity for the livelihoods of the local communities. Key informants reported that women and youths were prohibited from going deep into the wetland because of the risks involved in harvesting of papyrus and other wetland vegetation. Moreover, it was also not allowed to harvest wetland plants when the crops were still in the field and during heavy rains or floods. Men are the main custodians of natural wetland vegetation and are responsible for its harvesting and protection. Traditionally, men who built houses and granaries harvested vegetation. They also used papyrus products for making ropes (for fishing and livestock tethering), fish traps and baskets. While working in the wetlands, men harvest and eat papyrus rhizomes (omundo) as a source of energy and they monitor any bad practices that may destroy papyrus in the wetlands. Women use papyrus to make mats, pot-holding rings (tach) and cooking materials.

Although, traditionally done only by adult men, nowadays women and young people are also involved in harvesting of papyrus for home use. Around the wetland, the percentage of women harvesting papyrus was 37 while 19 engaged in harvesting other products. Amongst the women were 8.5% not harvesting any wetland products, whereas 20.7% of the men engaged in papyrus harvesting while 11.2% harvested other wetland products with 3.9% not harvesting any wetland products. The local community considers papyrus as a common property since anybody can find and harvest it without any restrictions. Perceived as abundant, papyrus and other wetland resources are exploited limitlessly. However, the local communities acknowledge a decline in the quantity of the papyrus stocks due to population pressure resulting in burning and clearing for farming, and negative attitudes that do not allow for sustainable use of this important natural resource. Due to increasing pressure and overdependence on papyrus, the riparian communities developed local informal institutions, which have been in place from the mid-1990s.

The emergence of child-headed homes with no sources of income has forced the heads of these poverty-stricken families into papyrus harvesting. Poverty is also driving children and youths into harvesting papyrus especially during the school holidays. Prohibited from harvesting papyrus are expectant and lactating women.

Institutions governing wildlife management

Many folk tales are told to younger generations about wildlife. The hippo respected is culturally amongst the Luo communities who live in wetlands and frequently interact with them. Hippos are believed to be of human spirit and associated with the heritage of some local communities which prohibit their killing. Although the Kenyan law prohibits hunting hippos, their meat remains a delicacy among many local people. The skin is thick and used for making whips. Hunted for meat despite a ban, is the sitatunga also a delicacy among the Luo.

With the introduction of the Wildlife (Conservation and Management) Act CAP 376 in 1985, there are now harsh penalties for those who kill wildlife and this has made people refrain from hunting. Part IV, Section 22 (1 And 2) prohibits unlicensed hunting of wild animals and is meant to protect wildlife. There is however illegal hunting of sitatunga for game meat. This often goes unnoticed since the sitatunga is small and its meat easily sneaked out of the wetland. There is the belief that the hippo is a spirit which is respected and strong; hence, the traditional institutions regarding consumption of hippo meat are still strictly adhered to.

Institutions governing farming

Both subsistence and commercial farming are a major occupation for local residents and for people coming from as far as 20 km inland. The seasonal swamps are cleared and farmed during the dry season when water recedes, while farming in the hinterland commences with the onset of the long rains (this is the main cropping season). During the main cropping season, numerous clan and household institutions exist that govern an orderly sequence of ploughing, planting, weeding and harvesting of the crops. There are also institutions that regulate grazing of livestock during the cropping and dry seasons. All these institutions were set to ensure food security for all throughout the year and to minimize land and wetland degradation. During the main cropping season, people were restricted from going to the lake to allow for concentrated efforts on food production.

Over time, the traditional subsistence farming in wetland areas, which was small-scale and did not destroy the ecosystem, has changed to commercial culture of sugarcane, rice, fruit and vegetables. The high water table and hydric soils have encouraged cultivation even during dry seasons. In the past, sweet potatoes and cassava were the crops planted in the wetlands but this changed with the introduction of new crops such as butternut, kales, tomatoes, sweet pepper and watermelons. Traditional institutions, which controlled farming in the wetlands, have also changed and are hardly obeyed by farmers, some of whom are from other parts of the country and have encroached to make a profit from commercial farming. There are also formal institutions that govern the land and land use, including agricultural, environmental and planning legislation.

DISCUSSION

Access and control of wetland resources is shaped by the

intersection of various institutions and the relationships of power and authority that exist between them (Maconachie, 2008). Institutions are often multi-functional, semi-opaque and contingent. They are shaped by historic factors, by the power relations which prevail in social life and by world views which incorporate the roles of the human, natural resources and the supernatural (Cleaver and Franks, 2005). Institutions can be shaped or crafted by external intervention and, providing due attention is paid to the structures (rules and roles) and norms (relations of trust and co-operation) contained within them, then collectively beneficial outcomes may be achieved (Uphoff and Wijayaratna, 2000). Human adaptation refers to both biological and cultural processes that enable a population to survive and reproduce within a given or changing environment (Joralemon, 2010). There have been ecological, economic, demographic and social changes taking place in the Nyando papyrus wetlands. The existence of several actors, at various organizational levels, managing the same natural resource, results in a redundancy in governance. This is generally criticized in policy analysis, although it has been defended in the management of complex adaptive systems like wetland ecosystems (Low et al., 2003), which require institutional flexibility. In response to these changes taking place, there have been changes in the context of legal arrangements (formal institutions) as well as social norms and conventions (informal institutions. In the Nyando papyrus wetlands, institutions can be broadly categorized as traditional, local informal, government or co-management.

Traditional institutions are those that are embedded in the Luo culture and comprise of norms and taboos based on indigenous belief systems of the Luo people. Customary governance through sanctions, which are punishments for those who disobey, enforces traditional institutions. Traditional institutions in local communities indicate the pattern of power distribution and the amount of influence exerted by each actor in the community in the course of decision making and activities related to wetland resource use. In the Nyando papyrus wetland, categorization of traditional institutions can be based on who has to abide by the respective institution. There are general institutions to be followed by children, men, women and the youth, whereas some have to be followed by specific groups, that is, children, men, women or the youth. The general institutions are those related to death, order, and/or seniority and those based on myths. Myths are passed down through generations by strong oral traditions, and these play a significant role in the psyche of people. Though mythology is seeded in the mysterious realm, helps to adapt human behavior to the demands and offerings of the environment and conservation. As such, mythology still plays a role in rural African communities including the Luo of Kenya. There are institutions based on myths affecting the use of resources such as farmlands, fish, papyrus and wildlife (Cohen, 1969).

Put in place with British Colonization, a centralized system of government is added to traditional systems of governance. Christianity and formal education now regarded as ‘frontline civilization' made African ways of doing things seen as primitive, archaic and regrettably unacceptable in the public domain. The impact of christianity has been the most important single factor in the process of westernization in many parts of Africa. Western education, involving literacy and the mastery of a European language, became the condition for entry into the modern sector. For most of the colonial period, education was in the hands of the christian missionaries, who sought not only to convert Africans but also to inculcate western values. Christianity challenged traditional belief systems and institutions and promoted the diffusion of new ideas and modes of life (Arowolo, 2010).

The local institutions, which are crafted by the community have helped fill the gaps created by the poor performance of public systems of governance and are enforced by local sanctions. Resource use often overlaps spatially and seasonally causing resource use conflicts. The local institutions were crafted to guide the changing scenarios in resource use in the same space, for example, the grazing livestock on harvested papyrus. As Babin and Bertrand (1998) put it: "It is extremely unusual for a single area to have only one use or user, or to be used for only one period of the year, and the opposite is more generally the case: a combined plurality of simultaneous and/or successive uses by different users, each of whom is subject to precise rules regarding access and use, and may or may not have management or decision-making power over the resources of the area in question."

Local institutions are specific to a location and also to a resource and are enforced by community mechanisms. In the West Kabodho sub-location, papyrus is harvested according to clans and therefore it is easier to exclude outsiders than in the other sub-locations. This is also due to the fact that there were more respondents involved in papyrus harvesting in West Kabodho than in any other sub-location. Local institutions are usually rooted in community social capital, rather than depending on external top-down decision-making processes. They are regarded as important ‘buffering’ mechanisms that promote sustainability and resilience at the environment-society interface (Mazzucato and Niemeijer, 2002).

Government institutions comprise of laws, policies, rules and regulations, enforced by government officers.

These formal institutions have not been successful due to inadequate staff on the ground. In Kenya, formal state institutions, dealing with wetlands may be weak and fragile due to the sectorial nature of these institutions and the lack of clear policy guidelines as to who is responsible for wetlands. The main institutional arrangements that are relevant to wetlands in Kenya include but are not limited to The Agriculture (Basic land usage) Rules L.N.26/1965, Environmental Management Act (EMCA 1999); Wildlife (Conservation and Management) Chapter 376; Water Act 2002; Physical planning Act Chapter 286; Forestry Act No

7 of 2005 and Fisheries Act Chapter 378. The sectorial nature of legislature inscribed under various Acts for wetland conservation and management is problematic because responsibility is diffused to several unrelated and uncoordinated departments resulting in jurisdictional overlaps and conflicts.

The government institutions around land have brought about many social changes and increased women's land rights which in the past were insecure since they only had usufructuary rights and did not enjoy the rights of ownership or disposition. Amongst the Luo, land tenure was corporately held through patrilineages and not individually alienable. The family enjoyed security of tenure through membership of the particular lineage of the family's male head. Although women could not inherit land, they held positions of structural significance, serving as the medium through which individual rights passed to their sons (Mackenzie, 1989). This has now changed with land adjudication and after the introduction of title deeds, more women increasingly became land-owners.

Land adjudication has, however, disadvantaged foreigners (Jodak) assimilated into the community. They were normally assigned land by clan elders but with the individualization of title deeds the rights of Jodak to access land are adversely affected (Karanja, 1991). It has also disadvantaged women who raised different crops in small parcels of land, which were scattered over a wide area. This was a form of ensuring food security lest there was pest invasion, storm, localized natural disaster or crop failure (Pala, 1983).

The co-management institutions such as the Beach Management Units (BMU) are largely enforced at local level by the community and have had a good degree of success in institutions and the way the work can be analyzed in terms of output and appropriateness. Thus, the most successful co-management institutions in the Nyando papyrus wetland in terms of output have been the Fisheries (Beach Management Units) Regulations, 2007. Enforced jointly by the community through the BMU officials and by the government through the fisheries officers, the latter play an advisory and supervisory role. However, it should be noted that due to the complex nature of formal institutions, transparency and accountability is undermined therefore, despite formation of BMUs, illegal and destructive methods of fishing are still used. These include using clubs and cutlasses to cut and kill fish; clearing wetland vegetation to catch all stages of fish; scaring off hippos to give way for fishing; using mosquito nets to catch juvenile fish; and the use of poisonous bait. It is difficult to control fishing along the Nyando River and in the wetlands since there are different types of fishing activities taking place there including sport fishing by young men and children and because fishing activities are open for all people within the Nyando papyrus wetland and for those from outside the area.

Demographic changes due to increased commercialization of wetland resources such as papyrus and fish and the demand for food and grazing land during the dry season has seen an influx of people into the Nyando Papyrus Wetland. Over the last century, there has been a rapid increase in population within the Nyando River basin establishment and expansion of urban centers. The small land parcels are an indication of the high rate of land fragmentation that is associated with increased population size and the number of households that need to survive on the wetlands. The increase in the population density within the perimeter of the wetland can also be attributed to the fact that these wetland areas had fertile soils and had lots of moisture especially during the dry season (Maithya et al., 2011). The total catch, the variety of fish caught and the average size of fish has seriously declined because of an increasing number of fishers and fishing boats. The total catch, variety of fish caught and size of fish caught have also declined due to overfishing.

The sub locations in the study Ogenya (Transect 1), Kakola Ombaka (Transect 2) Jimo middle (Transect 3) and West Kabodho (Transect 4) have a population density of 153, 704, 131 and 225 persons per km^2, respectively. Almost two thirds of the respondents in FGDs agreed that the high population has resulted in deterioration of quality of the water in the Nyando papyrus wetlands owing to industrial waste, household waste, sewage and pollution from engine boats which consequently impacts on the ecological functions of the wetland.

The post-election violence experienced in Kenya in 2008 and other forms of political instability have also caused people who were employed in affected parts of the country to migrate back into the Nyando papyrus wetland area, to temporarily or permanently seek income from fisheries and other wetland resources. In areas where farmers had undergone a number of harvest failures, and where availability of and access to land had become scarce, members of farming households are turning to fisheries. Thus, households previously labeled as farming households have become fisher folk and fishing communities with income from fisheries becoming the main source of sustenance (FAO, 1998).

This mobility has also has increased the spread of HIV/AIDS amongst the fishing community leading to an increased number of and female-headed and child headed homes. The HIV/AIDS scourge has caused a decline in literacy levels as a result of school dropout due to poor health, lack of resources, care of the sick, etc. The co-management institutions and by-laws of BMU's have tried to some degree to address the issues of HIV/AIDs and sanitation along beaches. Local community institutions have also relaxed rules on harvesting of papyrus to allow needy children over 14 years of age to engage in papyrus harvesting during school holidays as reported by respondents in the FGDs.

Despite the fact that some of these traditional

institutions cannot keep pace with the ecological, economic, demographic and social changes taking place in the Nyando papyrus wetlands, some persist and are still in use. The local institutions are flexible and also change with the changing situations experienced in the Nyando papyrus wetlands. Local community institutions as tradetional institutions are discriminatory, particularly towards women. This is because of their child bearing role hence they are considered as weak for example men who go fishing eat the most palatable parts of fish while the women and children eat the less palatable parts since fishing is considered as hard work. Women are also prohibited from performing certain tasks in fishing and farming during their menstrual periods when they are considered unclean. The diffuse nature of government legislature on wetlands makes traditional and local informal institutions to persist and retain legitimacy within the Nyando wetlands. Choices for livelihood strategies in the Nyando papyrus wetlands are offered by institutions and by the condition of ecosystem services. Local institutions that are flexible and are enforced by local sanctions therefore protect ecosystem integrity and contribute positively to long-term human well-being. There is a need to develop a fine interplay between formal and informal institutions in order to safeguard wetland based livelihoods in the Nyando Papyrus wetlands.

Conclusions

To get a better grip on management of wetland resources, Cleaver (2001) talks of institutional bricolage which is a process by which people consciously and unconsciously draw on existing social and cultural arrangements to shape institutions in response to changing situations. The institutions that result are a mix of ‘modern' and ‘traditional', ‘formal' and ‘informal'. The bricoleurs are the different resource users in the wetlands, the external factors such as traders, government, etc. who come up with institutions to guide resource use and access. It has been noted that in the Nyando papyrus wetland, hybrid institutions help to enforce natural resource management at the local level and therefore, there should be synergy and co-operation between the formal and informal systems.

In line with the different orientations of the relevant institutions and programmes in the various sectors, the government may adopt a nationwide strategy that envisions diversified approaches to wetland conservation and management. A new, diversified vision for wetland conservation and management is needed- one that nevertheless takes into account the legal pluralism in the Nyando papyrus wetlands. It is recommended that implementation of these solutions should engage participation of the local community based on their socio-cultural beliefs that enhance conservation. Different communities hold beliefs and have different views on the relationship between humans and nature. Therefore, the views and attitudes of the local communities should be taken into account in the formulation of conservation measures and policies

Conflict of interests

The author(s) did not declare any conflict of interest.

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