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Sustainable Utilization Of Wetlands Resources In Selected Areas Of Nyamira County, Kenya

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ABSTRACT

Researches on wetland utilization in Kenya focus more on wetlands located in the ASALs and Lowland areas giving less emphasis to those in high agricultural potential highland areas. This paper examined the utilization of Sironga and Nyabomite wetlands resources in the high potential agricultural areas of Nyamira County. The specific objective established the resources and their uses. Purposive sampling was used in selecting study areas and key informants. Simple random sampling was used in selecting household heads. Data was obtained through the administration of 126 questionnaires of which 115 was used for analysis. Quantitative data was analyzed using descriptive statistics. Data was presented using statistical tables, percentages and photographs. The common wetland resources utilization practices in the area are brick making activities and crop production. Traditionally, the wetlands provided place for conducting rituals and ceremonies. The following recommendations ought to be prioritized: identification of key stakeholders and assessment of their interests; emphasis on afforestation of the wetlands with trees that are friendly to the environment and adoption of alternative sources of livelihoods. The recommendations of this paper are useful in the sustainable utilization of wetland resources in Nyamira County and other high agricultural potential areas.

Keywords: Biodiversity, conservation, livelihoods, utilization, wetland resources

1. INTRODUCTION

Wetland resources are global assets of enormous value to present and future generations as they are vital to humanity's economic and social development. They are important for their ecological functions which they perform, as well as for their rich flora and fauna (Ramsar, 1997). Many wetlands in the world also have an important socio-cultural value, for instance, in Australia many wetlands have a cultural value to their Aboriginal owners, in which they conduct ceremonies and semi-traditional hunting and gathering (WWF and World Bank, 2003). As observed by Thompson (1996), wetlands in Africa, are important source of water and nutrients necessary for biological productivity and often sheer survival of people. According to Franken and Mharapara (2002), wetland agriculture is important for poverty reduction and food security in many developing countries and they are considered to be important ecosystems, which contribute considerably to the national economy and rural livelihoods of many countries. Kenya has variety of wetlands that stretch from coastal marine wetlands to inland freshwater lakes, rivers, dams and swamps. The wetlands occupy about 3-4 percent, which is approximately 14,000 square kilometres of the land surface but fluctuates up to 6 percent during the rain seasons (Gok, 2002). As Kareri (1992) observes, Kenya's wetlands are among the country's most important resources for social-cultural and economic development. These wetlands are biodiversity hotspots, they are equally important for income generation, livelihoods and wellbeing of riparian communities

(Gok, 2008). According to Riedmiller (1994), the most important provisioning services procured from Kenya's wetlands are food, freshwater, fuel and variety of raw materials for building and construction.

In Africa, common factors that put further increasing pressures on wetlands are poverty in combination with high population growth rates (Matiza and Chabwera, 1992). The Kenya government has recognised the importance of wetlands and their contribution to her Gross Domestic Product and has embarked on comprehensive reforms to address sustainable utilization of her wetland resources. However, sustainable utilization of wetland resources nationally has not been achieved. Most researches in Kenya focus on the utilization and conservation of wetlands in ASALs and Lowland areas. For instance, Janak (2011) focuses on conflicts over utilization of Yala Swamp while Mungai (1992) focuses on wetlands and dry land management in Kenya. Less emphasis has been put on wetlands located in high agricultural potential areas. Due to increasing population pressure and other developmental pressures in this high potential agricultural areas many people depend on the wetland resources for a livelihood.

1.1 OBJECTIVES OF THE STUDY

The broad objective of the study examined the sustainable utilization of Sironga and Nyabomite wetlands resources in the high potential agricultural areas of Nyamira County. The specific objective was to establish Sironga and Nyabomite wetlands resources and their uses.

2. DATA AND METHODS

The study covered Sironga and Nyabomite wetlands in Nyamira division of Nyamira Sub-County within Nyamira County in Kenya. Nyamira division lies between latitude $0^0 30' South$ and $0^0 45' North$ and Longitude $34^0 45' East$ and $35^0 00' East$ (Figure 1).

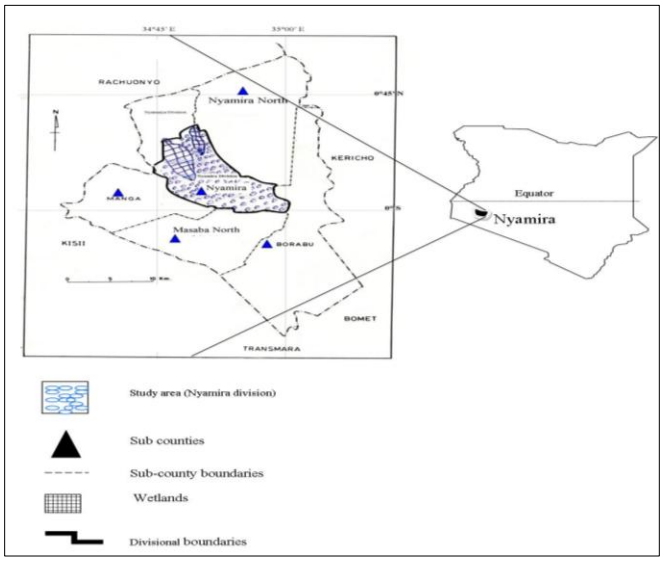

Figure 1: Location of the study area (Source: NDDP, 2008)

The area covers 112.7Km^2. It has equatorial type of climate which enables it to receive high and reliable rainfall that is well distributed throughout the year with an average of over 1500mm of rainfall per year. The area has two rain season, the long rain season occurs in the months of February to June while the short rain season occurs in the months of September to November. December and January are relatively dry months (NEMA, 2009).

The topography of the area is hilly with a series of ridges. Kiabonyoru and Nyabisimba hills are outstanding features. These two topographic zones lie between 1250m and 2100m above the sea level. The major soils found in the area are red volcanic soils (Nitosols), which are deep, fertile and well-drained accounting for 75 percent of the area while the remaining are Vertsols at valley bottoms and Pitsols found at Swampy areas, they are suitable for brick making and they account to 25 percent (NDDP,2002 and NEMA, 2009). The area is divided into two major agro-ecological zones. The high land (LH1 and LH2) covers 82 percent of the area while the upper midland zone (UM1, UM2 and UM3) covers the remaining 18 percent.

There are four main land use types in the sub-county: cash crop and Subsistence farming, Forests, Swamps and other wetlands, urban settlement and Livestock raising (cattle, sheep, goats and donkeys). Swamps and water bodies occupy 6 square kilometres and arable land and large farms occupy 153.1 square kilometres (NDDP, 2008). The lower highland tea-dairy zone (LH1) support growing of tea and rearing dairy cattle and the lower maize/pyrethrum zone (LH2) support growing of maize and pyrethrum. The lower midland sugar zone (LM2) has high potential for growing sugar cane while the upper midland zone (UM1) and upper midland zone 2-3 support the growing of coffee and tea (NDDP, 2008). According to 2009 population census, Nyamira division had a population total of 105,669 persons with a population density of 936 persons per square kilometre and this is about 67 percent of the entire sub-county's population (KNBS, 2009). The high population is due to the fact that the division falls in a high agricultural potential area and it is headquarter of Nyamira County. The high population increase in the area has led to fragmentation of land into small uneconomical plots essentially used for subsistence farming and has exerted pressure on natural resources, social amenities and fragile areas including wetlands.

The study used descriptive survey design to examine the sustainable utilization of Sironga and Nyabomite wetlands resources. The descriptive design was adopted because of its appropriateness in describing the current situation of phenomenon (Kothari, 2009). The main sampling procedures used included; Purposive sampling and Random sampling. Purposive sampling procedure was used in selecting study areas and key informants, who included; Forest service officers, Lake Basin Development Authority officers, NEMA officers, County Executive Environment officers, agricultural extension officers, government administration officers and Self Help Group Leaders. Simple random sampling technique was used to select a sample size of 126 respondents comprising of 90 and 36 respondents from Sironga and Nyabomite wetland areas

respectively. The primary data collection instruments included interview, this technique enabled probing information on communal usage of wetlands, historical background of the wetlands and data on wetland uses and their users. Structured questionnaires were administered to individual household head/representatives. However, due to financial constraints and difficulty in reaching some respondents, a target of 126 questionnaires could not be realized. A total of 115 questionnaires from both wetland areas were used for data analysis. The questionnaires were complimented with photographs. Data was analysed quantitatively using descriptive statistics.

3. RESULTS AND DISCUSSION

3.1 SOCIAL CHARACTERISTICS OF THE RESPONDENTS

The study found out that majority of the respondents owned less than 1 acre of land with those from Sironga representing 59.4 percent while those from Nyabomite representing 52.8 percent. Those with 1-3 acres of land were 24.1 percent and 27.8 percent respectively and those with more than 10 acres were 6.3 percent and 2.7 percent from Sironga and Nyabomite areas respectively **(**Table 1**)**.

Table 1: Land owned by the respondents in acres

Land (Acres)	SIRONGA	NYABOMITE
	Percentage (%)	Percentage (%)
Less than 1	59.4	52.8
1-3	24.1	27.8
4-6	5.1	11.1
7-9	5.1	5.6
More than 10	6.3	2.7

Source: Field Survey, 2014

As revealed in the study, the high percentage of respondents with less than 1 acre of land one owned coupled with high rate of population growth rate in the study areas shows the existent of land subdivision into small uneconomical units in the area. In general, the study revealed that the number of acres one owned was not enough to provide the household with diverse livelihood requirements.

The studies revealed that majority of the respondents were between 40-49 years of age representing 34.2 percent and 38.9 percent from Sironga and Nyabomite areas respectively. In average 21.9 percent of the respondents from both wetland areas were between 30-39 years, 19 percent and 13.9 percent from Sironga and Nyabomite were between 20-29 years and those above 50 years were 25.3 and 25 percent from Sironga and Nyabomite areas respectively (Table 2).

Table 2: Distribution of the respondents by age

Age (years)	SIRONGA	NYABOMITE
	Percentage (%)	Percentage (%)
20-29	19.0	13.9

30-39	21.5	22.2
40-49	34.2	38.9
Above 50	25.3	25.0

Source: Field Survey, 2014

3.2 WETLAND RESOURCES AND THEIR USES

The wetland resources common in Sironga and Nyabomite areas included; water, land, clay soil, Papyrus reeds, fibers, trees, grasses, fish and Ibis birds.

3.2.1 WATER

The common sources of water in the study area included; rivers, boreholes, protected springs, pan and roof catchments. The permanent rivers in Sironga area include Eaka and River Kuja while the major permanent rivers in Nyabomite are Charachani and Nyabomite. The study revealed that 90 percent of the respondents from Sironga and 86 percent from Nyabomite indicated that water was the most utilized wetland resource (Table 3).

Table 3: Wetland resources utilized by the local community

Wetland resource(s)	**SIRONGA**	**NYABOMITE**
	Percentage (%)	**Percentage (%)**
Water	90	86
Clay soil	86	50
Papyrus reeds	66	33
Fibres	27	22
Trees/wood	84	83
Grasses/sedges	29	39
Fish	19	69
Land	89	83

Source: Field Survey, 2014

The high percentage was attributed to variety of uses for water, which included domestic use and use in tea factories such as Tombe, Kebirigo, Sang'anyi and Gianchore that are found in the surrounding areas. Water is used as a raw material for brick making activities and it is mixed with clay soil in smearing traditional houses/huts. In addition, water is an important habitat for various biodiversity in the area. The study revealed that people living adjacent to the wetlands rely 100% on water obtained from the wetlands for both domestic and for building and construction.

This study finding agrees with that of Ramsar (1971), that wetlands ecosystem provides water and primary productivity upon which countless species of plants and animal depend. The study findings is also consistent with that of Goudswaard et al (2002) who found out that the most provisioning services procured from Kenya's wetlands are food and fresh water.

3.2.2 LAND

The results from the study indicated that 89 percent and 83 percent of the respondents from Sironga and Nyabomite areas respectively as observed in Table 3, drained wetlands for both settlement and crop production. Animals raised by the inhabitants included exotic and indigenous cows, sheep, goats and donkeys. The most common cattle breed is zebu animals and some mixed breeds. An interesting observation made during the study was the free range grazing of cattle in the wetlands (Plate 1). Overgrazing by livestock on wetland land usually has a negative impact on the environment as the animals overgraze and deplete the vegetation cover. Some animals such as donkeys are used as a mode of transporting roasted bricks to the road sides for easy transportation by Lorries and tractors to places of high demand. The increasing numbers of marginalized people were moving and settling in fragile wetland areas in search of new sources of livelihoods.

Plate 1: Free range cattle grazing in Sironga wetland

Maize is the most preferred subsistence crop in the area and has high carbohydrates content and most people prefer food (*Ugali*) from maize flour. About 100% of the respondents are engaged in maize crop production. Due to scarcity of enough good soils for farming, rapid population pressures and land subdivision into small uneconomical units, drainage of swampy areas is becoming an important aspect in trying to increase the crop production so as to address the problem of food insecurity in the region. The result confirms with that of Franken and Mharapara (2002), who observes that, wetland agriculture, is important for poverty reduction and food security in many developing countries with grazing in swamps with livestock including cattle, sheep and goats increasingly becoming important over the past few decades. According to Scherr and Mc Neely (2008), 45 percent of the more than 17,000 major sites globally devoted to biodiversity conservation have been drained for agriculture.

3.2.3 TREES/WOOD

The dominant tree species in the area are blue gums (*eucalyptus spp*) which are highly planted in both wetland areas. Most of the people plant gum trees in ditches left after extraction of clay for brick making activities. It was established that in both wetland areas about 20% of the people lumbered mature gum trees

for timber production to earn income, about 35% used gum trees for building and construction while about 5% engaged in the supply of electric posts and about 23% used gum trees in brick making related activities such as roasting bricks, making brick sheds and brick boxes of standardized sizes. Some of the indigenous trees in the area are useful as their roots, leaves or barks are harvested to supply medicinal herbs to cure various diseases such as malaria, typhoid, bloat, cough and sexually transmitted infections (STIS) and used for firewood and charcoal production as shown in table 4.

Table 4: Some Exotic and Indigenous tree species in the study area and their uses

No.	Biotic Name	Common Name	Indigenous/Exotic	Uses
1	*Eucalyptus saligna*	Blue gum	Exotic	Timber, firewood &herbal
2	*Gravellier robusta*	Gravellier	Exotic	Timber, firewood
3	*Erypotra japonica*	Loquats	Exotic	Food, firewood and animal feed
4	*Persia Americana*	Avocado	Exotic	Fuel, human food, animal feed & timber
5	*Leucena leucocephale*	Leueera	Exotic	Firewood and herbal
6	*Aberia caffra*	Kei-apple	Exotic	Firewood& herbal
7	*Psidium guajava*	Guava	Exotic	Firewood, human, animal feed & timber
8	*Erythrina tomentosa*	*Omotembe*	Indigenous	Herbal& firewood
9	*Acrucarpus fraxinifolia*	*Omokina bwango*	Indigenous	Herbal& firewood

Source: Field Survey, 2014

The findings of this study concurs with that of Odaro (2004) who found out that wetland plants, especially macrophtes, provide a wide variety of medicinal resources to the riparian communities. The wetland trees plus the planted vegetation binds the soil together preventing further soil erosion, this is one of the most important aspect of trees in the study area. The roots of wetland vegetation bind the soil and deposit silt to the wetland floor, this prevents soil from being washed downstream, which reduces the erosive power of water. Biodiversity below ground included moles, rats, mouse, ants, mollusks, lizards, hares and snakes which are very rare to date due to human encroachment into wetland areas for settlement, crop production and brick making activities.

3.2.4 PAPYRUS REEDS AND FIBER

The type of reeds in the study areas is common reed (*Phragmites communis*). It has numerous uses, such as, used to cover fresh unroasted bricks from direct sunlight, thatch traditional houses and brick sheds and as a source of fuel by the local people. Due to small land sizes in the area that fetches little returns, the local communities was turning to alternative source of income such as making papyrus-based products that include mats and baskets made from papyrus reeds. A major consumptive practice in the area leading to the diminishing of papyrus was due to its multiple usage in building traditional houses and rampant brick making activities largely in Sironga area. The study revealed that from both wetland areas about 35% of the people engaged in other sources of livelihood such as mat making, basketry and beekeeping which are done in small

scale. This study findings concurs with that of WWF and the World Bank (2003) which found out that wetlands provide populations with numerous goods and services that have a significant economic value, not only to the local population living in its periphery but also to the communities living outside the wetland areas. Although fiber resource is not wide spread in the study area due to clearance of forested wetland areas for human settlement, the remaining fibers have been put to various uses. According to Abagusii customs, leaves from fibers were used to cover food (*Ugali*) prepared from wimbi during payment of dowry and leaves from fiber could be used as sieves in preparation of traditional alcohol (*ebusa*). The study further revealed that fibers was used as important raw material for making traditional houses; the fibers are used to fasten vittos and rafters during making mud houses and used to fasten thatching grass (reeds) to prevent it from being blown away by strong wind, hence preventing water leakages from roofs of houses when it rains. Another important use of fibers was making brick sheds, ropes, baskets and mats for sale to earn a household a livelihood. This study finding agrees with that of Acreman and Hollis (1996) who observes that, many components of wetland ecosystems also provide resources for direct human consumption including fibers and reeds for thatching houses and handcraft industry.

It was revealed that 19 percent and 69 percent of the respondents from Sironga and Nyabomite areas respectively practiced fish farming as shown in Table 3. Fish farming was highly practiced in Nyabomite area with 69 percent of the respondents attributing this to high consumptive rate of fish to supplement food diet, as fish is known to be rich in proteins. It was further established that there were about 25 fish ponds in Nyabomite area as compared to 8 fish ponds in Sironga area. Further it was revealed that about 60% of the fish ponds from both wetland areas were owned by self help groups while 40% were owned by individual households. The fish species raised in fish ponds included Tilapia, mud fish and Alestes. The fishing gears used includes; mosquito nets, gill nets, use of herbs, baskets and hook and line. The study agrees with that of Bugenyi (1993) and Vanden and Bernacsek (1990) who concluded that wetland fishery contribute about 50 percent of the fishery landing in Africa. Commercial fishing activities are important source of proteins and livelihood for many African communities.

3.3 CULTURAL VALUES OF THE WETLANDS TO THE LOCAL COMMUNITY

Traditionally, the wetlands used to be places for harvesting mushrooms and firewood collection points. They also supplied the local community with clay for smearing traditional houses. They were further used as playing and swimming fields and as places for offering traditional rites of passage for both boys and girls. They also acted as places for offering traditional sacrifices. The study finding confirms with Ramsar (1997) assertion that many wetlands in the world have an important social-cultural value to the local communities. For example in Australia many wetlands have a cultural value to their Aboriginal owners, in which they conduct ceremonies and semi-traditional hunting and gathering, they are also used as places of conducting initiation rites.

4. SUMMARY AND CONCLUSIONS

The various wetland resources in the study area are utilized in various ways and provide the local community with building and construction materials, agricultural production, provision of medicinal herbs, pasture for livestock, aesthetic values and water for both domestic and industrial use. In both wetland areas the major economic activities practiced are brick making and small-scale agricultural production of maize, beans, vegetables, tomatoes and bananas for home consumption while the major cash crops are tea bushes, sugarcane and coffee. Apart from small scale agricultural production the other economic activity practiced is aquaculture and this supplemented income for the households. Traditionally, the wetland sites provided places for conducting rituals and ceremonies.

For sustainable utilization of wetland resources in the study area and other wetlands in high potential agricultural areas, this paper recommends the following strategies: Identification of key stakeholders and assessment of their interests and the way in which these interests affect the wetland conservation in the area should be done so as to embrace integrated wetland resources utilization. The stakeholders should include; peasant farmers living adjacent to the wetlands, Nyamira county agricultural office, natural resource office, and conservationist groups such as NEMA, LBDA, forest service and fisheries departments, brick makers, youth groups and the local administration. Taking into account indigenous knowledge in the utilization of consumptive wetland resource practices such as crop production, harvesting of wood for fuel and other wetland resources such as papyrus reeds and fiber for building and construction, extraction of clay for brick making, livestock grazing which should involve reduction of livestock herds, seasonal grazing of livestock in the wetlands and construction of specific livestock watering points so as to avoid livestock polluting the wetland waters. Emphasis on afforestation, people should be provided with tree seedlings which are friendly to the environment such as bamboo seeds with emphasis on planting of indigenous trees. Finally, the people living adjacent to the wetlands should be encouraged to embrace other alternative sources of livelihoods such as poultry and bee keeping.

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