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THE ROLE OF WETLANDS IN ENHANCING HOUSEHOLD INCOME IN OKANA IN THE LOWER NYANDO RIVER BASIN, KISUMU COUNTY, KENYA

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ABSTRACT

Wetland ecosystems have rich biodiversity ranging from various communities of flora and fauna to particular species. They provide numerous goods and services to the riparian communities. This is through their socio-cultural, economic and ecological values and functions which communities have depended on for their livelihood. However, despite the importance of the ecosystems, wetlands have been perceived as "wastelands". The wrong perception is due to lack of comprehensive valuation of wetland resources that can be compared to other developments or sources of income and/or revenues. Until this is done, the ecosystems will continue to suffer wanton destruction and degradation. The study attempts to establish economic value of wetlands with reference to Okana wetlands in the lower Nyando River Basin. The study used direct observation, photography, surveys and Participatory Rural Appraisal (PRA) tool in collecting data. The findings revealed that wetland resources provide significant economic values which sustain livelihoods of the residents of Okana area. The wetlands should therefore be utilized sustainably if they are to be used to enhance the livelihoods of the residents. This can be achieved through selective harvesting of wetland resources, rehabilitation of degraded sites and diversification of livelihoods through provision of alternative sources of economic activities. The results of this study will form basis for decision-making with regard to planning and management of such ecosystems.

Keywords: *wetland, wastelands, ecosystem, ecology, rehabilitation.*

1.0 INTRODUCTION

Wetlands have been broadly defined as areas of marsh, fen, peat land or water whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water, depth of which at low tide does not exceed six metres (Mitsch & Gosselink, 2000; Kasoma, 2003; Mwanuzi, 2003). A simplified definition of wetlands has been given by Awange & Ong'ang'a (2006) as areas where the land is saturated with water long enough to support and that do support poorly drained soils, plants and animals, which have been adapted to such environment, and biological processes suited to wet areas. In the East African context, wetlands are defined as areas of land that are permanently or occasionally waterlogged with fresh, saline, brackish or marine waters at a depth not exceeding six metres, including both natural and man-made areas that support characteristic biota (McClanahan & Young, 1996; GOK, 2005; GOK, 2007).

Kenya's wetlands are diverse in type and distribution. They cover a total surface area of about 2,737,790 ha, which is approximately 2-3% of the country's surface area (Crafter *et al*., 1992). They include shallow lakes, swamps, valley bottoms, deltas, estuaries, sandy beaches, sea grass beds and coral reefs. Okana is a riverine wetland and comprises swamps, flood plains, ponds and streams.

Wetlands are one of the most productive ecosystems in the world supporting high biological diversity (Mitsch & Gosselink, 2000; Crafter *et al*., 1992). They support high biodiversity of fish, birds, macro-invertebrates and micro-organisms, which maintain and support life systems on the planet earth. Wetlands have provided great socio-cultural and economic values to the riparian communities living around these ecosystems since time immemorial. Both rural and urban populace has drawn food, water, handicrafts, fuel wood, medicinal products and building materials from the wetland habitats.

Despite the socio-cultural, economic and ecological importance, wetlands have been and/or are being modified mainly because their resources are overexploited and their lands converted to other uses. This is attributed to the fact that the economic values of wetland goods and services are poorly understood (Emerton *et al.*, 1999; Crafter *et al*., 1992; Kamukala & Crafter, 1993). Both freshwater and marine wetlands, their resources and hydrological functions have been modified, degraded and interfered with because they are considered less valuable compared to other 'developments', which yield immediate and obvious profits (Emerton *et al*., 1999). Wetlands have also suffered from other factors apart from conversion to other uses. Climate change has impacted negatively on the ecosystems. For instance, rainfall variability due to climate change on one hand, has led to the drying up of seasonal streams, ponds and wetlands in the Lake Victoria Basin (LVB), study area included (EASWN, 2013). On the other hand, climate change phenomenon may also cause excessive rainfall, which in turn can lead to flooding and subsequent inundation of low elevation wetland areas. For instance, in the Ganges-Brahmaputra and Zambezi deltas, multiple risks of storm surges and inland river flooding severely affect the cities and settlements within the deltas (Reckien, *et al*., 2017).

The study aimed at assessing the role of the wetland resources in enhancing household income in Okana in the lower Nyando River Basin. An understanding of these will not only reverse the wrong perception on the wetlands but also help in designing a framework for planning and management of the ecosystems in the basin and in other regions.

2.0 OBJECTIVES OF THE STUDY

The purpose of the study was to assess the role of wetlands in sustaining livelihoods of the residents of Okana in the lower Nyando River Basin.

Justification of the study

Research has shown that wetlands have the potential to sustain livelihoods of the riparian communities (Kareri, 1992). This is through the socio-cultural and economic values that local communities have drawn from them since time immemorial. Wetlands have been utilized as sources of food, water, building materials, handicrafts and medicinal herbs as well as grazing fields for both wild and domesticated animals especially during dry seasons. However, a comprehensive economic valuation of wetland products in Okana is very necessary in order to understand the role of wetlands in enhancing household income. This will also help to increase the community appreciation of the wetland resources hence their zeal or commitment to participate in the protection and management of the ecosystems if given chance through corporate management.

3.0 STUDY AREA

The study is based on a research survey conducted in Okana wetlands in the lower Nyando River basin. It has an estimated area of about 40 km^2 (GOK, 2009b). The Okana wetland system lies in West Kano in Nyando Sub-County, Kisumu County. The wetland system is in the western part of Kano Plains where the soils are gleysols type, commonly associated with swamps (LVEMP, 2000a & b). It is located at the confluence of rivers Ombeyi-Oroba, Luanda, Nyangeta, Lielango and Miriu (Fig 1).

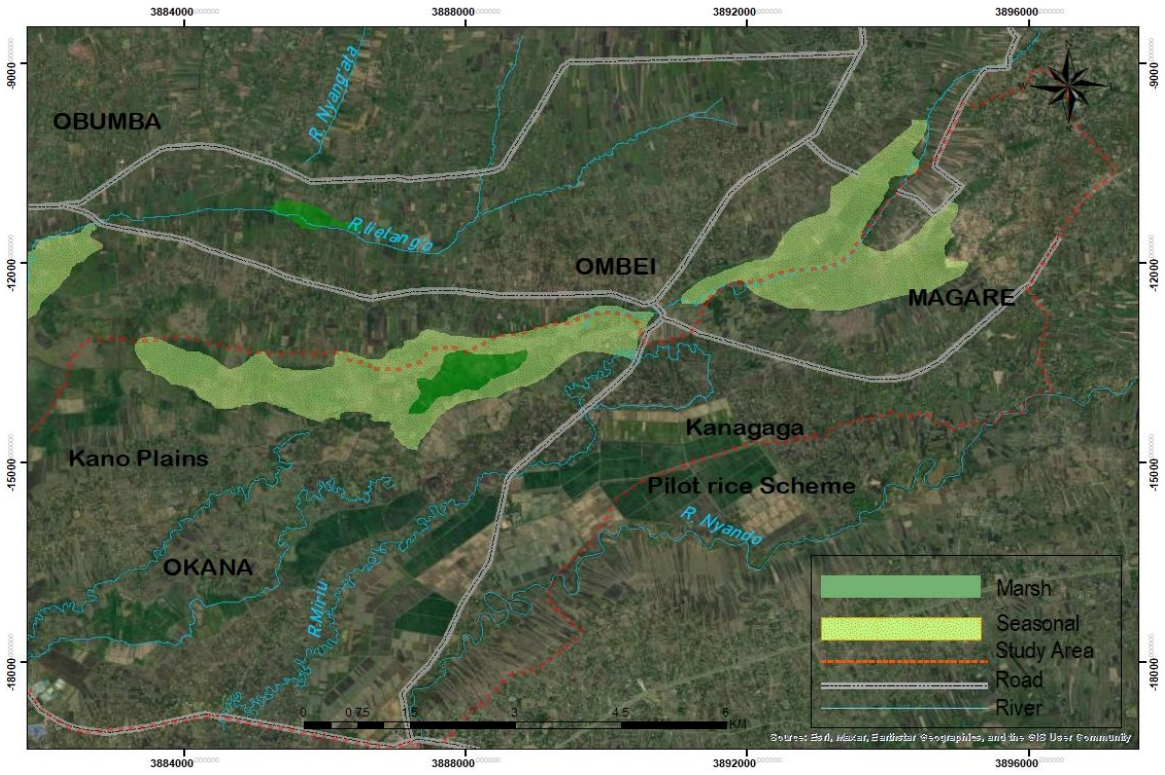

Fig: 1 Okana Wetlands. Source: Kisumu East Topographical Map 1: 50,000.

Okana area comprises several villages with a total population of about thirteen thousand, four hundred and sixty seven (13,467) with a total number of households of nine hundred and thirty eight (938) (GOK, 2019b). The major villages in the area include Kowuor, Kabina-Kodeyo, Kagaya, Kaluga, Kosimbo, Kawuor, Kodhiambo, Kokal, Kanyang'anyi, Kanyaoma, Kadeya and Kathina (Fig. 2). In terms of economic activities, the residents basically engage in subsistence agriculture, with rice being the staple crop.

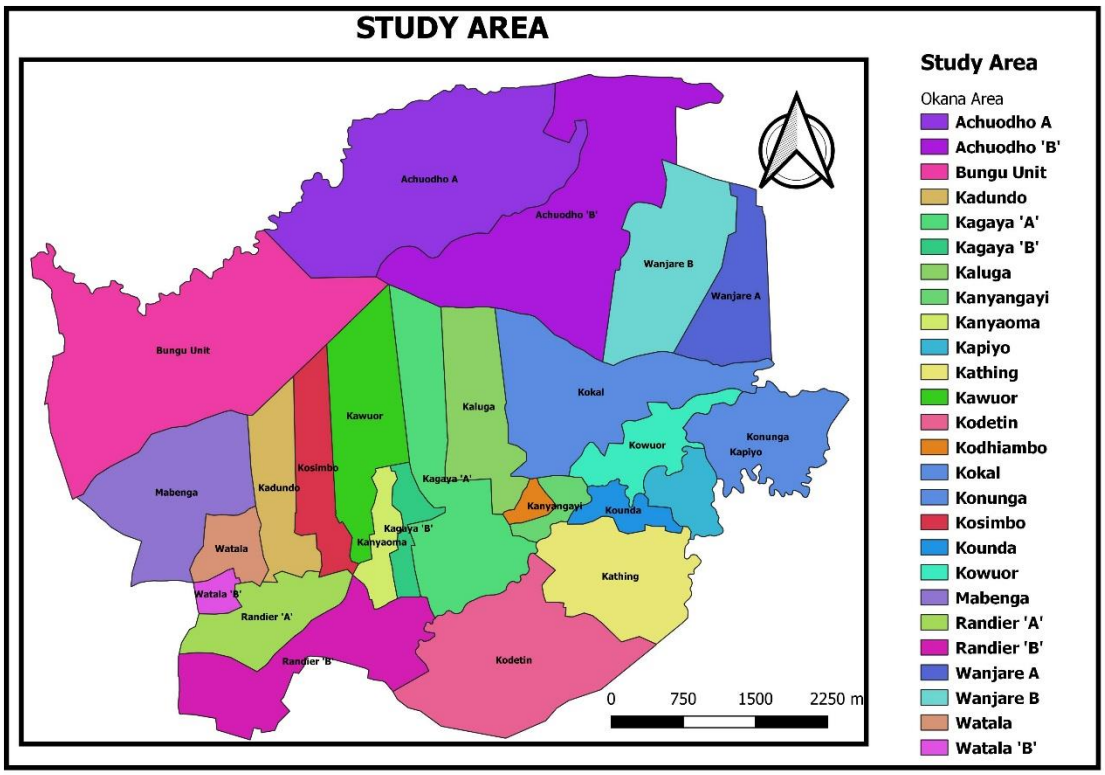

Fig: 2 Okana Area (Villages).

4.0 METHODOLOGY

The study used various techniques in data acquisition and analysis. These include field surveys, photography, Participatory Rural Appraisal (PRA) and Barbier's tool for total economic value of resources. According to Barbier (1994), total economic value refers to the value derived from a resource to a society and comprises use, non-use and optional values. Thus:

Total Economic Value (TEV) = Use Value + Non-Use Value + Option Value

Where: *Use Value* = Direct (Consumptive uses) and Indirect (Non- consumptive/Ecological uses).

Non-use Value = Value gained or attained from the knowledge of protection of a resource.
Option Value = Value placed on the ability to use the resource in future.

PRA was instrumental in verifying the respondents' information during field surveys.

5.0 RESULTS AND DISCUSSIONS

The Okana wetlands include floodplains, riverine swamps, shallow rivers and streams, pans, wells and irrigated rice paddies. These provide significant values and functions to the residents of Okana. The wetland resources include water, numerous flora and fauna (birds, reptiles, mammals, insects, fish and amphibians) as well as clay and land or soil. The riparian communities use these resources to derive their livelihoods. The study revealed that the residents of Okana earn significant income from the sales of wetland resources such as water, fish, dry macrophytes (as woodfuel), reeds, papyruses among others or wetland products (handicrafts) such as mats, baskets, ropes and fishing gears. Besides, some resources are used as building and construction materials thereby reducing the overall household expenditure on such activities. In summary, the estimated income and/or costs from the wetland resources are detailed in the following sections.

5.1 Source of building and construction materials.

The riparian community has always obtained numerous building and construction materials from the wetlands. Materials obtained include thatches from papyruses and sedge grasses, reeds which are used as rails, sand, clay or mud, building poles or posts and ropes made from sisal leaves and papyruses. The materials therefore constitute a major proportion in building and construction of any kind ranging from fencing, building own house, bathroom, pit latrine and

bans. Materials obtained from elsewhere constitute a very small proportion, and these are mainly hardware materials. Table 1 indicates wetland materials which are used for various building and construction activities.

Table 1. Wetland materials used in building and construction in Okana

Wetland materials	Use
Grasses	Thatching.
Papyruses	Thatching and making of ropes which are used to fix rails on building posts.
Reeds	Used as rails in fencing, house/hut, pit latrine, bath room and ban construction
Poles	Used as posts in building and construction activities.
Sand	Plastering of walls and floors of houses/huts.
Clay/Mud	Plastering of walls and floors of houses/huts.

On the average, a household would save a total of about Kenya Shillings (KES) 167,910 on building and construction materials for a one (1) bed roomed, mud and grass thatched house if all the materials were to be bought elsewhere (Table 2). The estimated costs however have not included hardware materials, which are equally required in house/hut building and construction.

Table 2. Estimated cost of constructing a single bed roomed mud walled/grass thatched house

Material	Quantity	Price/Unit (KES)	Total Cost (KES)
Thatches/Grasses	250 Bundles	50	12,500
Rails	200 Bundles	20	4,000
Poles	815	70	57,050
Sand	556 Buckets	10	5,560
Clay/Mud	1,220 Buckets	10	12,200
Papyrus ropes	870 Bundles	20	17,400
Roofing trashes	570	60	34,200
Sisal leaves	1,250 Bundles	20	25,000
Total	**5,731**	**260**	**167,910**

The findings established that 30.8% of the respondents use wetland materials for building and construction purposes. The proportions of respondents representing the sampled population engaging in different economic activities in Okana wetlands are shown in Table 3. In terms of participation, roles usually vary depending on who heads a household, whether a husband, widow or single mother. Generally, men take part in the harvesting of thatches, building poles and rails as well as transportation of the harvested materials. Women on the other hand, excavate clay or mud. However, in the female headed households, women bear the brunt of the entire tasks and occasionally, well-wishers lend hand. On the average, 75.7% of men are involved in primary harvesting of the materials from the wetland while 18.9% and 5.4% of women and others (children, casual labourers, dependents and relatives), respectively, undertake the same as shown in Table 4.

Table 3. Engagement in economic activities in Okana wetland

Activity	Percentage (%)
Agriculture	95.8
Fishing	65
Fuel wood collection	97.5
Extraction of medicinal herbs	9.2
Water supply	100
Construction activities	30.8
Craft-making	80

Table 4. Percentage of household participation in wetland resource utilization in Okana

Activity	Men	Women	Others
Agriculture	28.7	53.9	17.4
Fishing	44.9	37.2	17.9
Fuel wood collection	5.9	57.3	36.8
Extraction of medicinal herbs	36.4	63.6	0
Water supply	2.5	60.8	36.7
Construction activities	75.7	18.9	5.4
Craft-making	24	65.6	10.4

5.2 Fishing

Okana wetlands support diversified fisheries resources. The wetlands provide suitable breeding ground for numerous fish species. However, fishing as an economic activity at Okana is seasonal. It tends to coincide with the onset of both long and short rains, which occur between April and June, and August and October, respectively (Table 5). During the wet seasons, residents usually fish in the rivers, streams, canals and vast flood plains. Fishing activity is at its peak during this time and the proceeds are processed and consumed immediately or and stored for future consumption while the rest are sold at the nearby trading centres and markets such as Okana trading centre, Ahero, Rabuor, Orongo and Korowe. Fishing gears used include fishing traps, hook and line, baskets and pangas.

The activity is undertaken by all members of the household including young boys and girls who are twelve (12) years and above. Fishing activity gradually declines as rains subside and flood water recedes. However, young boys always fish irrespective of the season by use of fishing lines. Fishing in the wetland is practiced by 65% of the respondents. Gender involvement in the activity is 44.9% and 37.2% adult men and women, and 17.9% children, respectively.

Table 5. Seasonal Calendar of Okana Community

Event	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Rainfall				■	■	■		■	■	■		
Land prep.	■	■					■				■	■
Planting rice				■	■	■	■	■	■	■	■	■
Planting other crops			■	■	■	■	■	■	■	■	■	■
Weeding rice					■	■	■	■				
Weeding other crops				■	■	■		■	■	■		
Harvesting rice							■	■	■	■	■	■
Harvesting other crops	■						■	■				■
Human disease (Cholera/Amoebic dysentry)	■			■	■	■	■	■				■
Fishing				■	■	■		■	■	■		
Animal disease (Foot and mouth)	■			■	■	■	■	■	■	■	■	■
Flooding				■	■	■						
Drought	■										■	■

KEY Occurrence ■ Non-Occurrence □

Fish species caught in Okana wetlands include catfish, mudfish, luambwa barb and a number of species of Tilapia. On the average, income accruing to the community from fishing in the wetlands is estimated at KES. 843,550 per week (Table 6).

Table 6. Estimated Income to the community from fishing at Okana wetlands per week

Fish species	Quantity caught/Day (kg)	Quantity caught/Week (kg)	Price/Unit (KES)	Total Income (KES)
Xenoclarias spp.	505	3535	70	274,450
Clarias mossambicas	317	2,219	100	22,190
Barbus cercops	403	2,821	100	282,100
Labeo victorianus	40	280	100	28,000
Oreochromis leucosticus	20	140	50	7,000
Haplochromis spp.	35	245	20	4,900
Mastacembalus	10	70	10	700

frenatus				
Synodontis afrofeseires	45	315	50	15,750
Barbus altialis	25	175	50	8,750
Total	**1,400**	**9,800**	**550**	**843,550**

5.3 Agricultural Production

Crop farming and animal husbandry are the major economic activities in Okana wetland. In fact, 95.8% of the respondents surveyed engage in primary or subsistence agricultural production (Table 3). However, the involvement in agriculture still remains at a small scale level. This is perhaps partly attributed to the relatively small farm sizes, which would be economically not viable if mechanized and partly explained by the high poverty index rated at 60.5% in the Okana area (GOK, 2009a). On the average, farm sizes generally range from one (1) to three (3) acres of land. The sizes would therefore not permit mechanized farming if meaningful economic returns are expected. The high poverty index implies that modern agronomic practices such as use of agricultural chemicals like herbicides, pesticides and fertilizers as well as certified seeds are quite minimal. Residents of Okana still embrace the conventional farming practices which are characterized by poor harvest. The phenomenon therefore explains the food insecurity in the area which was revealed during PRA exercise. Food insecurity (poor harvest) was ranked fifth in the problem analysis using pair wise ranking method (Table 7).

Table 7. Problem Analysis using pair wise ranking technique

Problem	DR	FL	PI	ITRM	LMG	IH	Score	Rank
Drought		DR	DR	DR	DR	DR	5	1
Floods			FL	FL	FL	FL	4	2
Poor Infrastructure				PI	PI	PI	3	3
Inadequate training on Resource Management					ITRM	ITRM	2	4
Lack of Marketing Group						IH	0	6
Inadequate Harvesting							1	5

KEY

DR	Drought
FL	Floods
PI	Poor Infrastructure
ITRM	Inadequate Training on Resource Management
LMG	Lack of Marketing Group
IH	Inadequate Harvesting

During dry periods, vegetable and other food crops can be planted. Crops grown in Okana wetlands include maize (*Zea mays*), sorghum (*Sorghum vulgare*), bananas (*Musa* spp.), beans (*Phaseolus vulgaris*), vegetables (tomatoes, kales, onions, arrow roots, brinjals and pepper), rice (*Oryza sativa*), sweet potatoes, sugarcane, cotton, cassava, peas, green grams, and fruits (water melons, citrus and mangoes). Of these crops, maize and sorghum are the most predominant crops, with a rating of 85% in terms of crop proportionality in the wetlands. This is perhaps due to ecological requirement of the crops in relation to other crops as well as residents' preference of the crops as staple food to other crops. However, at the time of the survey, rice was the dominant crop in the wetlands (flood plain) (Plates 1a & b). Horticultural crops such as kales, tomatoes, brinjals and legumes like beans and cow peas are valued for their cash income.

a: A mature rice field ready for harvesting

b: Harvesting of rice

Plate 1: Rice fields in Okana. Source: Field Data.

The crops grown are for both household consumption and sale (Table 8a). The residents mostly sell the farm proceeds to meet their cash needs such as school fees, health care and other basic needs. Poor and inadequate storage facilities also compel them to sell most of the produces soon after harvesting lest they run into huge post-harvest losses.

Table 8a. : Estimated Income from Crop farming at Okana wetlands

Crop	Quantity harvested/Season (Bags)	Price/Unit (KES)	Total Income (KES)
Maize	416	2,500	1,040,000
Sorghum	189	2,500	472,500
Peas	38	6,000	228,000

Beans	123	3,000	369,000
Tomatoes*	186	1,000	186,000
Cassava	51	1,200	37,200
Rice	573	2,500	1,432,500
Kales	87	1,000	87,000
Green grams	3	3,000	15,000
Sweet potatoes	20	1,000	20,000
Pepper	3	2,500	7,500
Arrow roots	11	1,000	11,000
Water melons**	1	60,000	60,000
Brinjals*	1	2,000	2,000
Cotton	4	3,325	13,300
Total	**1,686**	**92,525**	**3,981,000**

KEY

* Unit of measurement is in Crates

** Unit of measurement is in Lorries

Crop propagation in Okana experiences myriad of problems that hinder higher production. These include inadequate farming equipment, pests and diseases, drought, floods, poor infrastructure, inadequate certified seeds, inadequate capital and inadequate market information. These constraints can be addressed in various ways if maximum production is to be realized. Despite the constraints to crop production in Okana, land is fairly fertile. In fact, the residents rarely use fertilizers. This is probably due to the rich silt transported by surface run offs and rivers from the upper catchments and deposited as sediments in the region.

Livestock reared at Okana comprises mostly the indigenous breeds. They include the African zebu cattle, goats, sheep, poultry, bees and donkeys. Others are pigs and rabbits. Like the crops, the animals and their products are for both household consumption and sale (Table 8b). Pests and diseases, drought, limited access to veterinary services, inadequate capital to invest in improved breeds, theft, floods and inadequate grazing pasture are the major constraints to livestock production. Floods are particularly problematic because they drown and carry away livestock and also submerge grazing pastures. Besides, Okana area lacks a cattle dip for regular treatment of external livestock pests or parasites.

Table 8b: Estimated Income from Livestock production at Okana wetland

Livestock	**Product (s)**	**Average no./Household**	**Price/Livestock (KES)**	**Total Income/Household (KES)**
Cattle	Milk, meat and hide	7	10,000	70,000
Goats	Milk, meat and skin	8	1,200	9,600
Sheep	Meat and skin	7	1,000	7,000
Poultry	Meat and eggs	15	300	4,500
Total		**37**	**12,500**	**91,100**

5.4 Source of water supply

The Okana wetlands are important source of water for domestic and agricultural purposes. Residents draw water from ponds, streams, canals and rivers for horticultural production, livestock watering and general domestic uses such as cleaning and washing. It is only drinking water, which is obtained from boreholes constructed by Sustainable Aid in Africa (SANA) International. However, residents who do not have boreholes or whose homesteads are far away from the boreholes entirely depend on the wetland water supply.

Abstraction of water for agricultural use like horticultural production and livestock watering is carried out by men and women as well as young boys and girls when they are not in school. However, for the domestic use, it is the sole responsibility of women and young girls to draw water. Exceptional cases where men engage in the activity are when their spouses are sick or unavailable. Gender role is therefore clearly defined. In summary, 2.5% of men usually abstract water for various uses while 60.8% and 36.7% of women and others (young boys and girls) undertake the activity (Fig. 2). Besides, only 30% of the respondents buy and sell water while 70% abstract water for own use and free of charge. The cost of water in Okana varies from KES. 2.00 per twenty (20) litre container to KES. 5.00 of the same capacity. On the average, the residents of Okana save a total of KES. 192,031 per week if they were to buy water from elsewhere (Table 9). The water supply constraints experienced include breakage of water pumps, inadequate shallow wells, drying up of ponds, seasonal rivers and some wells during dry seasons as well as collapse of well walls.

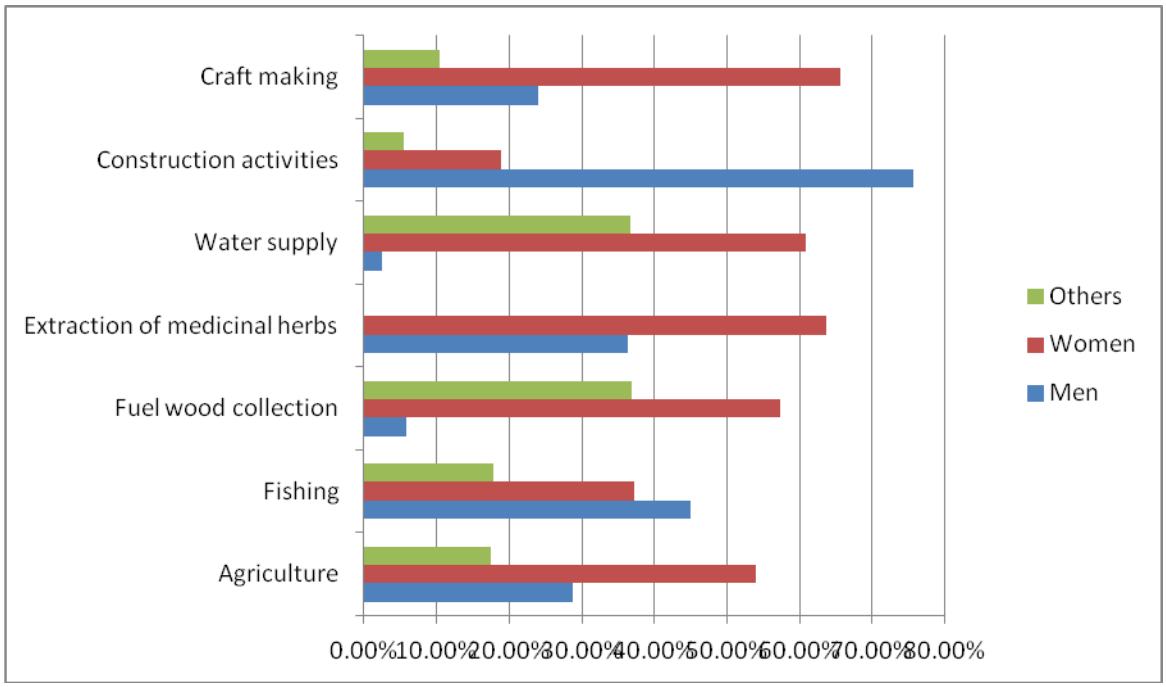

Fig: 3. Percentage of gender participation in wetland resource utilization in Okana.

Table 9.: Estimated cost of water consumed at Okana wetlands

Source	**Quantity used/Day (l)**	**Quantity used/Week (l)**	**Price/20l (KES)**	**Total Cost (KES)**
River	7,300	51,100	2	5,110
Pond	8,930	62,510	2	6,251
Well	207,540	1,452,780	2	145,278
Borehole	42,100	294,700	5	29,470
Water pan	8,460	59,220	2	5,922
Total	**274,330**	**1,920,310**	**13**	**192,031**

5.5 Medicinal values

The survey revealed that Okana wetlands host numerous flora, which have medicinal values. Medicine men and women (herbalists), popularly known locally as "*Nyamrerua"*, gather some of these plants and administer them for treatment of different diseases at a cost. The plants may also be gathered and used by individuals to treat certain ailments, without necessarily consulting a medicine man or woman. Part(s) of the plant(s) such as roots, stems, leaves or whole plant(s) may be used in the treatment of specified illnesses (Table 10).

Income derived from sale of medicinal plants is sufficient enough to sustain livelihood. The cost of drug (herb) usually varies from herb to herb depending on its availability as well as the type of illness to be treated. On the average, a regular medicine man or woman (herbalist) fetches an estimated income of about KES. 170,830 per week (Table 10). However, not all residents engage in the extraction of medicinal plants as an economic activity. In fact, only 4.2% of the respondents extract and sale the herbs. The majority (95.8%) of the residents collect the herbs for their own household use. In terms of gender participation, 36.4% and 63.6% of men and women respectively extract the medicinal plants from the wetlands. The higher involvement of women in the activity indicates the latter's role in the provision of medical care services to infants and under five (5) children, who often suffer from ailments such as measles, skin diseases, pneumonia and colds.

Table 10. : Estimated cost of medicinal herbs at Okana wetlands

Type of herb	Part(s) used	Disease(s) treated	Quantity sold/Week (Pkts)	Price/Unit (KES)	Total (KES)
Polygnum pulcheria	Roots	Tropical ulcers	4	100	400
Pentas longiflora	Leaves	Fever	3	100	300
Adenia umicifolia	Whole plant	Neurotic illness	2	500	1,000
Vernonia amigdalina	Leaves	Stomachache	1	200	200
Balanites aegyptica	Leaves	Boils	2	200	400
Melia azedarach	Leaves	Stomachache	7	100	700
Vernonia aurculifera	Leaves	Stomachache	4	80	320
Terminali brownii	Bark	Neurotic illness	7	20,000	140,000
Ochna ovata	Roots	Stomachache	2	1,200	2,400
Nymphaea caerula	Roots	Stomachache	7	3,000	21,000
Aloe vera	Succulent leaves	Many ailments (STD, Amoeba, etc)	2	100	200
Solanum incanum	Leaves and fruits	Wound (fresh cuts), milk treatment	5	2	10
Ocimum basilicum	Leaves	*Chira*	2	800	1,600
Cassia floribunda	Leaves	Stomachache	2	200	400
Achyranthes aspera	Leaves	Stomachache	4	150	600
Sesbania sesban	Leaves	Livestock medicine	5	100	500
Cissus rotundifolia	Leaves	Stomachache	2	100	200
Dracaena steudneri	Dry bark crushed in powder form	Common cold	2	50	100
Indigofera spicata	Leaves and roots	Skin diseases	1	100	100

Tylossema tassoglensis	Leaves and seeds	Stomachache	2	200	400
Total			**66**	**27,282**	**170,830**

5.6 Sources of handicrafts

Raw materials from Okana wetlands such as papyruses, grasses, clay, reeds and macrophytes have been harvested and processed by the riparian communities to make numerous handicrafts. The handicrafts made are mostly sold to earn income, which in turn is used to meet; several household financial or basic needs such as food, clothing, healthcare and education. In some cases, the income accrued is invested in other household enterprises like farming, small scale businesses or remitted to Community Based Organizations (CBOs) such as self-help groups, youth groups, women groups and *Mary Go Rounds*.

The handicrafts are either made by individuals or as a group. The most commonly made handicraft is mat, which accounts for 48.3% of all crafts made (Table 11). Other handicrafts made using wetland materials from Okana include ropes and strings, ceramics, furniture, table mats, wall hangings, floor mats, baskets, sisal fibres and fishing gears (Plate 2 and Table 12). These handicrafts fetch a lot of income to the community when sold in the local markets within and outside the study area. Income estimates of the handicrafts made per week are shown in Table 12. There is a potential of higher incomes accruing from the craft making industry since the income estimates in Table 12 do not include value addition.

Table 11. Percentage of handicrafts made at Okana using wetland materials

Craft	**Percentage (%)**
Mats	48.3
Ropes	16.7
Baskets	1.7
Furniture	4.2
Fishing gears	15.8
Ceramics	6.6
Other crafts	6.7

The overall engagement in the craft-making related activities by the residents is 80%. However, in terms of household participation, men trail women at 24% and 65.6% respectively, while others (children, relatives, dependents and casual labourers) make up 10.4% (Fig 2). Whereas men are involved in the harvesting of the materials such as papyruses, sisal leaves, twigs, reeds and grasses, women undertake the actual weaving of the crafts especially mats, ropes and baskets. Besides, the latter gender also harvests the materials and at times assisted by children, relatives and dependents. Making of fishing gears and other crafts is dominated by men due to complexity of art involved in the activity.

a. Ceramics made in Okana

Plate. 2. Handicrafts made from wetland materials. Source: Field Data.

Table 12.: Estimated income from handicrafts in Okana wetlands

Handicraft	Material(s) used	Quantity/Week	Price/Unit (KES)	Total Income (KES)
Mats	Papyruses and sisal leaves	11,780	50	589,000
Ropes	Sisal leaves	555	15	8,325
Baskets	Papyruses, sisal leaves and grasses	9	60	540
Furniture	Papyruses, reeds and sisal leaves	37	150	5,550
Fishing gears	Papyruses, reeds and sisal leaves	211	120	25,320
Pots	Clay	100	50	5,000
Sisal fibres*	Sisal leaves	38	40	1,520
Other crafts	Papyruses, reeds, sisal leaves, twigs and grasses	46	150	6,900
Total		**12,776**	**635**	**742,155**

KEY

* Unit of measurement is in Bundles

Craft-making activity experiences three (3) main constraints namely difficulty of getting raw materials by clearing the papyrus thickets, poor roads to transport the handicrafts to the market and lack of organized markets for the products. Besides, the craft makers also lack skills in value addition of the handicrafts made.

5.7 Energy source

Fuel wood forms the major source of energy in most rural areas in developing countries such as Kenya. The fuel wood may be collected from the surrounding thicket, bush or forest. For the people of Okana, fuel wood is derived from the dry wetland macrophtyes or vegetation such as papyruses, *Asao* (*Sesbania sesban*), *Osiri*, *Omburi*, *Obong'*, planted cyperus (eucalyptus), *Acacia* spp., sisal stock, *Owich*, reeds, grass, euphorbia as well as crop residues or detritus from crop farms such as maize stalk, sorghum stalk, banana leaves and stalk, and sugar cane bagasses. However, due to increasing demand for land for agriculture and human settlement, most of wetland vegetation has been cleared to give room for the same. The scenario has been depicted in the PRA report, which indicated a general decline in abundance of natural resource base, of which wetlands are one. Nevertheless, residents of Okana would save an estimated KES. 267,420 per week, which would have been spent on fuel wood from nearby markets (Table 13).

Generally, majority of the respondents (97.5%) depend entirely on the wetland as source of fuel wood for their domestic use. A paltry 2.5% of the respondents buy fuel wood from the nearby market/trading centres in order to supplement the wetland source. The latter group comprises vendors in consumables such as tea, porridge, cakes, *mandazi* and *chapattis*. Consequently, they have relatively higher demand for fuel wood. In terms of gender participation, women dominate the activity with 57.3% while only a handful 5.9% of men take part in the same. Children, relatives and dependents (others) make up 36.8%. The apparent low involvement of men in the fuel wood collection is due to their roles in herding of livestock. The latter activity coincides with the time when fuel wood collection is undertaken.

Table 13. : Estimated cost of fuel wood per week at Okana

Wetland tree	**Quantity/Week (Bundles)**	**Price/Unit (KES)**	**Total Cost (KES)**
Papyruses	413	100	41,300
Reeds	705	50	35,250
Sesbania sesban	65	50	3,250
Eucalyptus	84	150	12,600
Aeschimene elaphroxylon	28	50	1,400
Scutia myrtina	73	100	7,300
Sisal stalk	154	40	6,160
Acacia	280	100	28,000
Grass	50	100	5,000
Dombeya burgesiae	196	60	11,760
Cajanus cajan	55	50	2,750
Maize stalk	434	50	21,700
Sugar cane bargasses	329	100	32,900
Euphorbia	161	200	32,200
Banana stalk	42	100	4,200
Lantana camara	435	40	17,400
Albizia zygia	85	50	4,250
Total	**3,589**	**1,390**	**267,420**

5.8 Grazing on Wetland Pasture

The vast flood plain of Okana, known locally as "*Nam*" (place of plenty of water) provides green lash pasture that local communities graze their livestock. The flood plain is particularly important during dry seasons when grazing pastures on higher grounds have dried up. The wetland thus becomes a common grazing field (*Lek*) for the adjacent

riparian community and even beyond (Plate 3). Herders come from as far places as Sidho and Ombeyi, which are about 5 km from the flood plain.

Plate: 3. Animals grazing in flood plain of Okana wetland. Source: Field Data.

Generally, there is no restriction as per how many animals should graze on the wetland, which results in overgrazing. The phenomenon consequently results in severe animal health problems and environmental impact. The frequent interaction and mixing of different heads of livestock often lead to infections by contagious diseases such as anthrax and foot and mouth. Environmentally, the concept of tragedy of the commons as advanced by Garrett Hardin in 1968 comes on the fore.

On the average, an estimated cost of hay or livestock feeds (grass, rice husks or maize husks) per week would be KES. 409,640 (Table 14). However, the residents of the study area seldom buy the feeds from elsewhere. Moreover, they do not sell wetland grass to farmers from other places. Besides, restricted grazing of livestock (zero grazing or paddocking) is hardly practiced.

Table 14. Estimated cost of livestock feed per week

Livestock	Average no./household	Quantity used/Day (kg)	Quantity used/Week (kg)	Price/Unit (KES)	Total Cost (KES)
Cattle	7	700	4900	70	343,000
Goats	8	80	560	70	39,200
Sheep	7	56	392	70	27,440
Total	**22**	**836**	**5852**	**210**	**409,640**

6.0 Conclusion and Recommendations

The results of the study show that wetland resources contribute significantly in enhancing household income of residents of Okana. This is through the social and economic values that they provide to the residents. The community utilizes the ecosystems as sources of food, water, building and construction materials, energy, handicrafts, medicinal herbs as well as grazing fields for domesticated animals especially during dry seasons. In fact, more than 95% of the residents of Okana depend either directly or indirectly on the wetland resources for the sustenance of their livelihoods. An estimated income of about KES. 7,277,056 seasonally from wetland resources obviously depict significant household income that the wetland contributes to the community. Livelihoods would be deplorable if the wetland ecosystems ceased to exist through overexploitation, degradation and loss.

The study however, did not undertake valuations on the cost of game meat, wild greens and fruits as well as the ecological functions of wetlands in the area. It therefore recommends that further study on such should be undertaken so as to provide a comprehensive economic value of wetland goods and services in order to form basis for their planning and management in the Lake Victoria Basin and other regions. The study also provides the following specific recommendations for sustained livelihoods in the study area.

- Provision of subsidies and credit facilities to farmers to enhance their economic power in improving small scale crop and livestock husbandry. Besides, they should be trained on modern farming techniques which promote soil and water management, skills on livestock rearing as well as market research for the wetland products.
- Shallow wells should be desilted to increase their depths; their walls should also be lined with concrete culverts to avoid frequent collapse. Regular maintenance of the pumps and wells is also

necessary. All these will enhance availability of clean and safe water.

- Training of residents on Value Addition skills of the wetland products, induction on market information and formation of groups to market their products in order to avoid exploitation by middlemen. The groups should also lobby for repair and improvement of poor roads which impede transportation of wetland products to the markets.

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