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## Contribution of Wetland Resources to Household Incomes of Riparian Communities of Katonga Wetland in Mpigi District, Uganda

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### Abstract

Katonga wetland which lies to the western part of Lake Victoria covers an area of 237.4 km<sup>2</sup>. Although the wetland is known to contain flora and fauna that support livelihoods, there has been lack of information on the economic value of these resources and their contribution to livelihoods particularly of the rural riparian communities. The objective of the study was to generate information on the vital wetland resources, the economic value and contribution of these resources to riparian community livelihoods. The study was carried out in Nkozi and Kituntu sub-counties in Mpigi District-Uganda; it covered six parishes through which the wetland runs and involved 120 respondents. The study established that resources in the wetland are collected for subsistence and direct commercial extraction. The most important resource derived from the wetland for subsistence use was water for rural domestic use with each household using an average of 188l per day (23l per person) and was estimated at an annual economic value of Uganda shillings (Ushs) 490,191 (US\$ 233.4) per person per year. Fisheries were the most important commercial activities undertaken in these parts of the wetland involving 36% of respondents collecting an average of 119kg per week with an estimated annual value of Ushs. 3,991,367 (US\$ 1,900.6) per person. These activities particularly collection of water and fuel wood are undertaken throughout the year, while harvesting of craft materials is mainly done during the dry season (January-March and June-August). Fishing is done mainly in the wet season (March-May and September-November).

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The wetland is a source of income for at least 74% of the respondents. The majority of respondents, 57.5%, were among low income groups earning up to Ushs 600,000 per respondent annually. Fishing provides the highest gross incomes per respondent Ushs 200,000 per month hence the high value of the wetland to its riparian communities. It was noted that 30% of respondents depend on both the wetland and other activities with the wetland providing a buffer income source. It is recommended that the wetland hydrology which is vital for the sustainability of these activities be maintained through catchment improvement while sustainable harvesting levels be established for fishing activities. Environment management structures should be strengthened to sustainably manage the wetland. Local communities should also be sensitized about the importance of this wetland so that they can appreciate its ecosystem services and participate in its sustainable management.

**Key words:** *Economic values; incomes; Katonga wetland; riparian communities; wetland resources; Uganda.*

## **1. Introduction:**

Natural resources in Uganda play a vital role in the economy and sustenance of incomes particularly in the rural areas. Many tropical wetlands are being directly used to support human livelihoods through fishing, hunting, Fuelwood extraction, among others, whereas recreation or tourist use may often be limited. Valuation of the non-commercial direct use of wetlands by the local populations can be critical in determining the economic value of tropical wetlands in developing countries. The failure to take this value into account is often a major factor behind policy decisions that lead to the current over-exploitation or excessive degradation of tropical wetland systems [1]. Katonga wetland is one of the major wetland resources in Mpigi district supporting the incomes of rural populace in the district. It is a large expanse of partly permanent and partly seasonal swamp, one of the largest in Mpigi District, covering an area of 273.4 km<sup>2</sup> and traverses the sub-counties of Maddu, Kabulasoke, Kituntu and Nkozi, forming a boundary between Mpigi and Masaka Districts. The wetland name arises from the main inflow river Katonga that originates from Kibale forest.

The wetland lies in an area with impeded drainage with a floodplain that covers a vast area of seasonal wetlands and has mainly sandy soils. Other rivers flowing into it are the Kamurango and Biyanja while the wetlands draining into it include Sembula, Nabakazi, Muyanja, Kinyika and Kasembula. The Katonga wetland drains directly into Lake Victoria at the Katonga bay [2]. It contains most of the wetland vegetation types in Uganda including communities of swamp forest, *Miscanthus* sp., *Phragmites* sp., *Typha* sp., *Cyperus papyrus*, *Phoenix* palms, *Eragrostis* sp., *Loudetia* sp., *Echinochloa* sp., and *Sorghastrum* sp. Due to its high ecological diversity, it contains wild life such as Sitatunga (*Tragelaphus spekii*), Bushbuck (*Tragelaphus scriptus*), monkeys, fish, cranes and many other wetland birds [2]. These resources contribute to livelihoods of surrounding communities through extraction of materials for crafts, building and roofing, food, fodder, water for domestic and animal use and medicines, and cultivation of crops particularly in the dry season. The predominant vegetation of the permanent wetland, *C. papyrus*, is a very important craft and roofing raw material. Livestock grazing is also an important activity particularly during the dry season. Besides these the wetland also provides services such as flood moderation, nutrient retention, fish breeding areas

and ground water recharge and discharge [2]. The general objective of the study was to estimate the economic contribution of Katonga wetland resources to livelihoods of communities surrounding the wetland. Specifically, the study was aimed at identifying and ranking the resources of importance to communities in this part of Katonga wetland, estimating quantities harvested and their value and estimating the contribution of these resources to incomes of these riparian communities. The study focused on valuation of direct use benefits due to inadequacy of information on other services and values provided by the wetland.

## **2. Materials and Methods:**

The study was undertaken in the downstream part of the Katonga wetlands in six parishes of Kituntu and Nkozi Sub Counties through which the wetland runs. In Nkozi Sub County there were four parishes of Nnindye, Bukunge, Kayabwe and Nakibanga, while in Kituntu there were two parishes of Kantiini and Bukasa. The study covered a sample of one hundred and twenty (120) respondents. Two Focus Group Discussions were held in each of the Sub Counties and interviews with key informants such as extension staff in the study area undertaken mainly to obtain information about the activities undertaken in the study area. Questionnaires were then administered on the 120 respondents. Observations were also made of the activities undertaken in the wetland. Data was then analyzed mainly to obtain frequencies and presented using frequency tables and charts. To obtain the economic value of resources and their contribution to incomes, the market price method was used and gross incomes used to compare incomes.

## **3. Results:**

### ***3.1 Important Resources from Katonga Wetland and Quantities Harvested/Collected***

Water for domestic use was identified as the most important resource collected from the wetland, followed by Fuelwood, water for animal use, *Phoenix* palm leaves, fish, agricultural land, charcoal, *Phoenix* palm stems, clay, fodder grasses, Rattan cane, sand, *Phragmites* reeds, herbs, monitor lizards (*Tragelaphus Spekii*) in that descending order. The wetlands support subsistence activity with collection of water for rural domestic use supporting 58% of respondents and each household collecting an average of 753l of water per week. This translates to 188l per household per day translating to an average of 23l of water a day per person (average household size of 4.6 in Mpigi District). Collection of Fuelwood is another key subsistence activity supporting 52% of respondents who collect an average of 13 bundles (head-loads) per household per week. Fishing is the main commercial activity undertaken in the wetland particularly in the Katonga Bay of Lake Victoria and 36% of the respondents were engaged in the activity and an average of 119 kgs can be harvested per respondent per week. These activities particularly collection of water and fuel wood are undertaken during most of the year, while harvesting of craft materials is mainly done during the dry season (January-March and June-August). Fishing is done mainly in the wet season (March-May and September-November).

### 3.2 Economic Value of Resources Harvested and Contribution to Incomes

The total annual value of the various wetland resources is shown in Table 1a; for instance water for domestic use, identified as the most important resource (58% of respondents) was valued at a total annual value of Ushs 361,391/- (USD 298) per respondent. Fuelwood use was valued at Ushs 626,323/- (USD 298) per respondent. Fisheries activities dominate the commercial use and generate an average of US\$ 3,991,367/- (USD 1900) annually for each respondent.

Table 1a: Value of Important Resources Harvested from Katonga Wetland

	Resource				
	<i>C. papyrus</i> (bundles)	Fuel-wood (bundles)	Charcoal (bags)	<i>Phoenix</i> sp. leaves (bundles)	<i>Phoenix</i> sp stems (trees)
Resource qty collected/resource user/month	15	52	67	20	93
Resource market Price (Ushs)	1,500	1,000	20,000	1,000	1,500
Resource value/ resource user/month (Ushs)	23,197	52,194	1,342,857	20,492	140,000
No. of months resource collected	12	12	12	12	9
Quantities collected/ resource user/year	186	626	806	246	840
Resource value/resource user/year (Ushs)	278,366	626,323	16,114,286	245,908	1,260,000
% of respondents	59	52	12	54	10
Total Value to % of respondents (Ushs)	19,764,000	38,832,000	225,600,000	15,984,000	15,120,000

Table 1a contd: Value of Important Resources Harvested from Katonga Wetland

Resource					
	Water domestic (litres)	Water livestock (litres)	<i>Calamnus</i> sp. (bundles)	<i>Phragmites</i> (bundles)	Fish quantity (kgs)
Resource qty collected/resource user/month	3012	4414	23	11	475
Resource market Price (Ushs)	10	10	1,500	1,500	700
Resource value/ resource user/month (Ushs)	30,116	44,140	34,286	16,800	332,614
No. of months resource collected	12	12	9	11	12
Quantities collected/ resource user/year	36,139	52,967	206	123	5,702
Resource value/resource user/year (Ushs)	361,391	529,674	308,571	184,800	3,991,367
% of respondents					36
Total Value to % of respondents (Ushs)	58	36	6	4	171,628,800
	24,936,000	22,776,000	2,160,000	924,000	

Table 1a contd: Value of Important Resources Harvested from Katonga Wetland

Resource					
	Clay (tons)	Sand (tons)	Fodder/ grazing (animals)	Monitor lizard	Sitatunga
Resource qty collected/resource user/month	5	99	113	4	4
Resource market Price (Ushs)	6,000	7,000	1,500*	16,000**	***
Resource value/ resource user/month (Ushs)	28,286	694,587	169,333*	64,000	***
No. of months resource collected	12	12	12	6	6
Quantities collected/ resource user/year	57	1,191	1,355	24	24
Resource value/resource user/year (Ushs)	339,429	8,335,040	2,032,000	0	0
% of respondents	6	8	8	1	2
Total Value to % of respondents (Ushs)	2,376,000	75,015,360	18,288,000	0	0

\*For the forage resources, respondents were asked to provide the number of animals taken to graze in the wetland and the cost it would take to feed one animal to arrive at the final estimate.

\*\*Net values reflected. Monitor lizard skin is used to make drums. 1 monitor lizard can make 2 drums each sold at Ushs 20,000/-. Costs of making each drum were estimated at Ushs 12,000/- which includes tree stem=Ushs 2000/-, ropes=Ushs 2000/-, nails=Ushs 800/- and Labour (the value of family labour that would be spent doing other activities) = Ushs 7000/-. The meat is used in traditional rituals.

\*\*\*Actual values of Sitatunga could not be estimated as it was reported that the availability had reduced greatly and they are rarely seen these days.

The largest percentage of respondents (74.2%) do obtain some form of income from the wetland from either *ad hoc* sales of surplus products or involvement in commercial extraction activities while only 10.8% of the respondents did not have another income source apart from activities undertaken in the wetland (Figure 1).

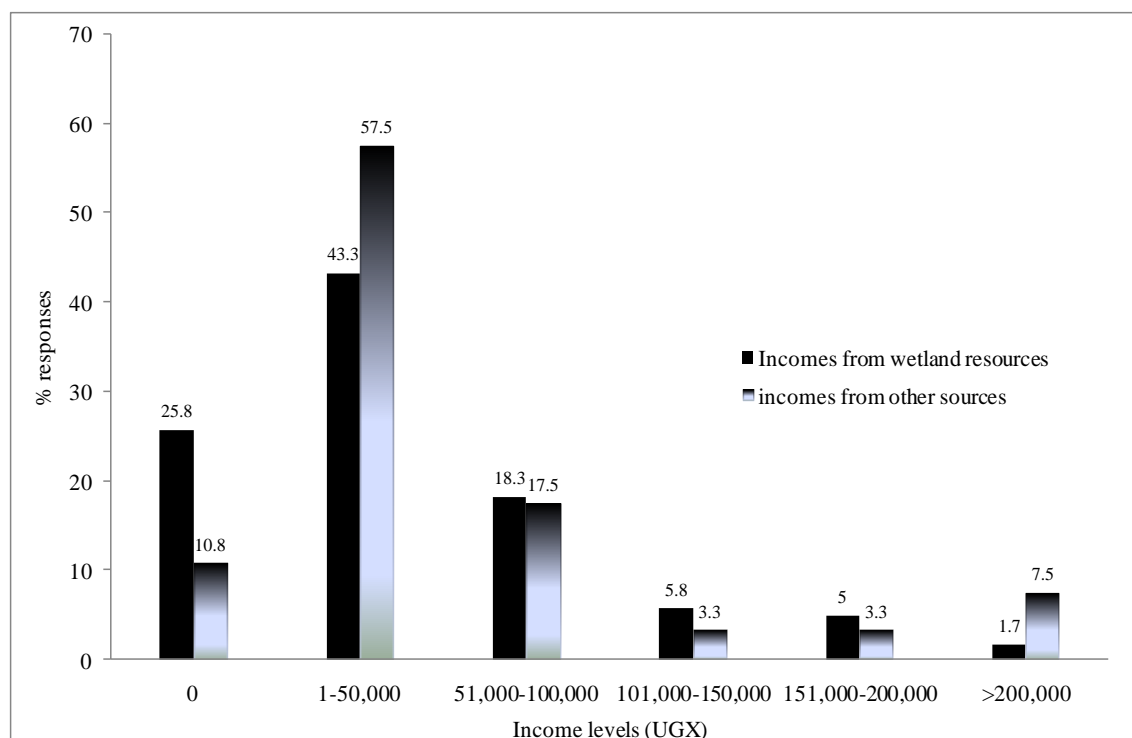


Figure 1: Average Monthly Incomes of Respondents from Katonga Wetland Resources and Other Income Sources/Activities (1USD ≈ UGX 2,100).

The majority of the respondents earn an average gross income of up to Ushs 50,000/- (approximately US \$28, Exchange rate UShs 1800/- at the time of the study in 2005-2006) per month which translates to Ushs 600,000/- per respondent annually (US\$ 333/resp/yr) from either wetland related activities (43.3%) or other activities (57.5%) which include sale of agricultural produce, general merchandise and unskilled labour. Respondents earning more than Ushs 200,000 from other activities were mainly salaried employees such as teachers and some people involved in agriculture while those earning the same amount from wetland resources are mainly involved in fisheries activities. A comparison was made for incomes from Katonga wetland resources and other activities undertaken by the surrounding communities for the income category of UShs >0 - UShs 50,000/- as this was the majority income category. It was noted that 30% of the respondents depend on both the wetland and other activities and earn up to UShs 50,000 from both wetland resources and other income sources. It was observed that the majority of these earn between UShs >10,000 – UShs 20,000 per month from either the wetland or other activities (Figure 2).

Comparing incomes of respondents dependent and those not dependent on the wetland revealed that the largest majority still earn Ushs 50,000 per month in both categories (Figure 3). It was noted that 40% do not have other

easily accessible sources of these wetland resources. It was reported that there was generally a declining trend in resource availability over the years. Despite the existence of national laws and regulations governing use of wetland resources in general, majority of the respondents (80%) mentioned that they were not aware of any laws and regulations governing resource use. It was noted that the National laws and regulations are currently not being strictly enforced due to the weak institutional structures particularly at lower levels and this could threaten continued existence of the wetland and the associated resources it provides to the communities.

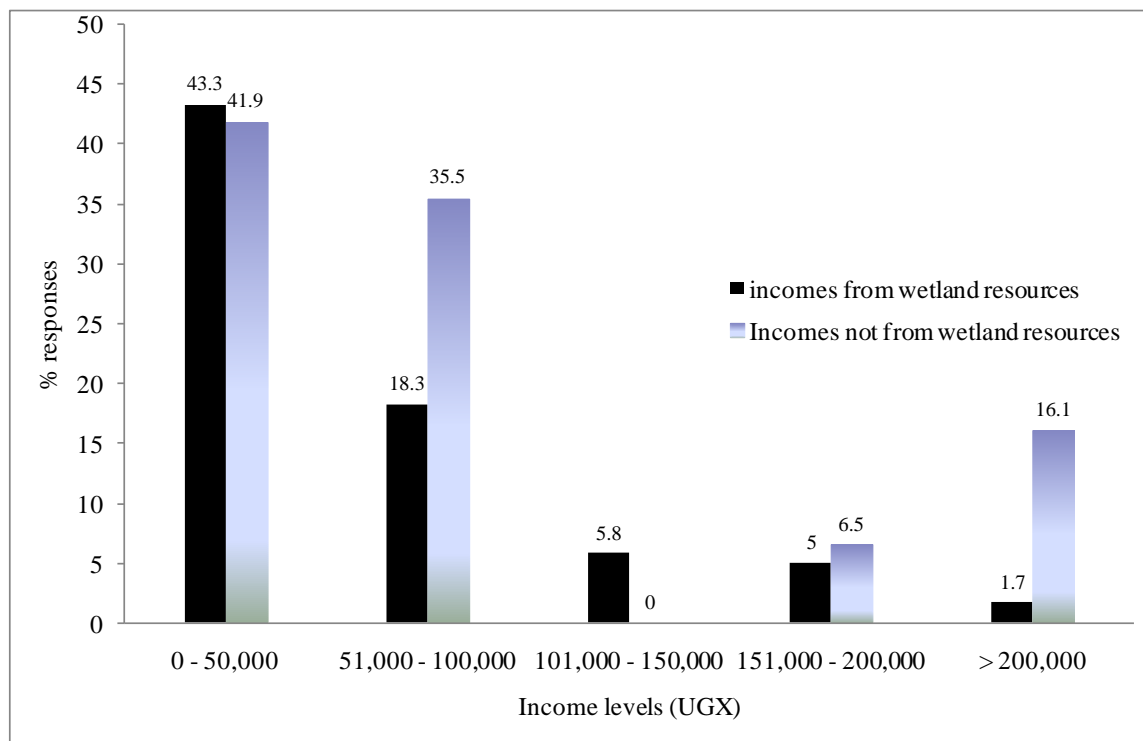


Figure 2: Comparison of Wetland Incomes and Incomes for Respondents not Dependent on Wetland (1USD ≈ UGX 2,350).

#### 4. Discussion:

##### *Important Resources Harvested from Katonga Wetland and Quantities Harvested*

The resources collected from Katonga wetland are numerous and of particularly high importance to surrounding communities are water, fuel wood, craft materials such as palm leaves and papyrus and fish. As is the case with other wetland riparian communities, wetlands play a major role in water, Fuelwood and fish supplies [3, 4, 5]. Wetlands play a major role in water purification and wetland water is most often cleaner, free of pollutants compared to other natural surface water sources and easier to extract through hand dug wells among others [6, 4, 7]. It is therefore a preferred source of water.



A large percentage of households in Mpigi District (89%) depend on firewood for cooking [8] hence the importance of the wetland as a source of Fuelwood. It was observed that craft materials are put to limited uses by Katonga wetland communities compared to other sites [4, 9, 6] probably due to differing community needs and limited markets for the finished products [10]. These resources are extracted in quantities that enable communities to meet their basic requirements for instance for water and Fuelwood. The World Health organization (WHO) recommends that the minimum requirement for drinking, cooking and ablution should be 25 l [11] while in Uganda 20 l per capita is recommended as the minimum design allowance for water sources [12]. In Pallisa district the daily water requirement per person was estimated at 23l [4] and in Mpigi Town Council the average water consumption is reported to be 24l. The Katonga wetland is able to support 58% of the respondents obtain an average of 23l per respondent per day. Fuelwood quantities are also comparable with quantities harvested in other parts of the country for instance in Kibale Forest National Park communities [13].

Fishing is an important activity undertaken in Katonga wetland both for subsistence and income gain with commercial fisheries being concentrated downstream in Katonga Bay while in other upstream areas of the wetland fish is mainly caught for subsistence. Quantities of fish harvested are also comparable to those established by other studies in the Katonga Bay and other sites on Lake Victoria such as Nabugabo [14]. Namirembe Landing site is the second biggest landing site in the Katonga bay. It has a total of 69 fishers with a total annual fish catch of 148.9 tons in 2008 [14], this would translate to an average of 2.2 tons per fisherman per year. The quantities of fish harvested reflect that the wetland is likely to play an important role in the local economy and livelihoods of communities.

#### ***4.1 Economic value of Katonga Wetland Resources and their Contribution to incomes:***

The annual value of domestic water use in Katonga wetland communities (Ushs. 361,391 per household is higher than values in Nabugabo wetlands at Ushs. 91,250 [15] and Mpigi Town Council, Ushs. 124,354 and comparable to the value of wetlands in Pallisa district which are estimated at Ushs 3 billion for 86% of the district population. The annual resource value of Fuelwood at Ushs. 626,323 per respondent (approximately US \$ 1 per day) is comparable to other wetland riparian communities for instance in the Hadejja-Nguru wetlands, Nigeria estimated at US \$ 0.5-7.5 net values per person per day [16]. Given that many people in the area are believed to live on or below US \$ 1 a day, this indicates a high value for Fuelwood. Annual Gross returns to fishing were valued at Ushs. 3,991,367 per respondent, a value comparable to those established by similar studies in the area of Ushs. 4,095,625 per fisherman in Namirembe landing site [14]. In Pallisa district, fisheries have been valued at gross annual returns of Ushs. 6,480,000 per fisherman. The difference in values with Pallisa could be due to the difference in prices however, the values indicate the high economic importance of fishing in the Katonga wetland.

Although a large percentage of people are dependent on the wetland for incomes (74.2%), incomes are still generally low irrespective of the source with the majority earning up to Ushs 50,000 per month (about US \$ 1 per day). For respondents earning these low incomes, incomes from wetland related activities are generally higher than those from other activities. Incomes of Ushs 200,000 from the wetland are mainly from fisheries activities however,

respondents in this category were few. These findings were in consistence with findings from similar studies in Lake Bunyonyi were the poorest sector of the community receives the most benefits from wetland activities Particularly at times when other sources of income are unavailable [17]. This indicates that Katonga wetland similar to other sites mainly supports low income groups. Gross returns were generally lower in the study area compared to other sites such as Nakivubo wetland were mat making generates Ushs 144,000/person/month, in Entebbe and Lugazi were craft making generates Ushs 98,000 and Ushs 97,000 respectively [6, 9]. This is probably due to limited availability of markets for wetland products in Katonga wetland area compared to the urban areas.

For the few respondents that do not depend on the wetland, majority incomes are still low at about Ushs 50,000 but incomes are generally higher than those earning from wetland activities. Although most of these were engaged in crop farming and livestock rearing, a few were salaried employees. Among the riparian communities of Katonga wetland, wetland resource extraction and use is not the primary activity undertaken but rather agriculture, however, the study and similar studies have revealed that the wetlands are important in acting as a buffer for agricultural incomes [17, 18, 9] particularly for the low income groups. As is the case with many riparian communities, resources obtained may not easily be accessed from elsewhere hence dependence on the wetland. The study concurred with findings from Nabugabo wetland where there seemed to be no immediate option for provision of water to the community [15]. In Katonga wetland although for the majority of the respondents (59%) these resources can be obtained from elsewhere, it was observed that they are not readily accessible or would be expensive to obtain. Nkozi sub-county is reportedly deficient of springs and largely depends on shallow wells as the cheapest option for water supply (Water Department Mpigi). It is much cheaper to construct hand dug wells near wetlands than to drill boreholes in the absence of wetlands [4]. This indicates a high level of dependence on these resources.

It has generally been observed that major natural resources used by communities are on the decline. While the wetland mainly supports subsistence activities, commercial resource extraction is increasing and could be one of the reasons for decline in resource availability. Decline in wetland resources have been reported in wetlands around Lake Victoria [9], Kibaale Forest (National Park) [13], and in the Hadejia-Nguru wetlands in Nigeria [16] and the fisheries catches of Lake Victoria have also been reported to have declined [14]. There was no indication that the quantities of water collected had affected availability of water in the area, rather other factors such as draining the wetland for agriculture and changing climate conditions were attributed to the decline in water availability. Conversion and drainage for agriculture has been the principal cause of inland water loss worldwide [3]. Possible causes put forward for the decline in other resources were mainly over harvesting and changing land use from wetlands and forests to agricultural land. In Katonga wetland, activities such as fisheries, charcoal burning, sand and clay mining tend to benefit a smaller proportion of respondents and yet these were found to be degrading to the wetland. The study revealed that environment management structures are non – existent or weak and there was inadequate enforcement of existing laws.

## **5. Conclusion:**

Seventeen resources were identified as being extracted from Katonga wetland and of these, water for domestic use, Fuelwood craft materials such as *C. papyrus*, *Phoenix palms* and Phragmites and fisheries most important to riparian communities. The quantities collected reflect that communities are able to meet major requirements for water, fuel wood, food and incomes from the wetland. These resources can be collected all year round and if harvested sustainably are vital in maintaining community livelihoods. Quantities harvested also reflected that different parts of the system support different livelihood activities. Fisheries activities were the main commercial activity and the Katonga Bay area plays a key role in supporting fisheries

The economic value of the wetland resources to its riparian communities through costs avoided and incomes earned reflected the high importance of the wetland and is worthy of promoting the sustainable use of these resources to maintain the flow of benefits. The wetland plays an important role in supporting incomes particularly among low income groups in its riparian communities and wetland activities undertaken provide a vital income buffer for other activities undertaken in the area. Although respondents who do not depend on the wetland may earn more than those dependent on it, these are the minority. Communities expressed high levels of dependence on these resources particularly water and yet the water regime of the wetland was reportedly being altered by other activities such as agriculture and land conversion. The lack of proper institutions and management regimes is likely to negatively affect the wetland and limiting the resources available for communities.

## **6. Recommendations:**

Due to the importance of the wetland in rural water domestic supply, any activity that is to be undertaken in the wetland must ensure that the hydrology is maintained so as not to affect a large section of the community. Efforts should be undertaken to protect and improve the catchment to maintain water flows. The wetland is vital in supporting fisheries activities. An in-depth study of the influence of the wetland on Katonga Bay fisheries can be undertaken to establish sustainable harvesting levels and viable options for promoting conservation in this area explored in view of the declining resource trends. Activities generating incomes among communities such as fisheries and production of craft materials should be promoted through formation of resource user groups, skills development training and improving access to markets. Especially for craft materials the majority of activities are undertaken on subsistence level. These activities should be promoted and reflected in district budgeting and revenues ploughed back to improve management. The value of the wetland should be put in consideration during in policy and development planning decision making particularly for those resource groups that are highly dependent on it.

There is need to conserve key points in the wetland for sustainability especially those supporting commercial exploitation that are under threat such as the Katonga Bay. This should involve strict enforcement of the laws and regulations relating to fisheries and wetland management. The National Wetlands Strategic Plan 2001-2010

advocates for the establishment and strengthening of community based institutions for the management of wetlands. These institutions are lacking in the area and for the few existing such as BMUs there has not been effective implementation of regulations. Resource user institutions should be developed, trained and supported to assist in improving income generation from the wetland while regulating use of the wetland resources. BMUs should be trained to also emphasize the wider wetland catchment. Other institutions should be developed to cover the whole wetland. It is also possible to use economic incentives and disincentives to regulate activities in the wetland. Some of the existing ones include wetland resource use permits and fisheries licenses. There is need to undertake a detailed inventory and to study the ecology of the flora and fauna in the different parts of the wetland to ascertain sustainable harvesting levels. It is likely that the wetland plays an important role in supporting agriculture in the surrounding areas. A cost-benefit analysis of agricultural activities in and around the wetland can be undertaken to establish the viable options for conservation such as seasonal wetland edge gardening which is acceptable in the wetland laws and regulations of Uganda.

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