Retraction Notice

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X Some of the authors:

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History

Expression of Concern:

☐ yes, date: yyyy-mm-dd

X no

Correction:

☐ yes, date: yyyy-mm-dd

X no

Comment:

The paper does not meet the standards of "Natural Resources".

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Editor guiding this retraction: Prof. Miklas Scholz (EiC of NR).

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Stakeholders' Perceptions of the Problem of Wetland Degradation in the Ugandan Lake Victoria Basin Uganda

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Abstract

Wetlands are one of the most essential resources of Uganda. They are key components of the riparian areas filtering sediments from run-off thereby reducing water pollution. However, they are increasingly threatened by the expansion of agricultural activities. This condition prompted the study of stakeholder's perspective on the governance of Lake Victoria natural resources in Uganda. The purpose of the study was to analyse relevant stakeholders with a stake in wetland resource, their socio-economic characteristics, motives and perceptions on wetland degradation in the Lake Victoria Basin. We aimed at understanding how stakeholders influence decisions of managing wetlands in the Upper River Rwizi and Iguluibi micro catchments in light of the current farming systems and practices and their implications to the Lake Victoria Basin. A mixed method approach that includes both qualitative and quantitative surveying techniques was applied. We used a semi-structured questionnaire, focus group discussions, key informant interviews, ethnographic observations and secondary data. A stakeholder analysis framework was used to identify the relevant actors with a stake in wetland use and management. It further analyses their characteristics and perceptions of the problem of wetland degradation. Results reveal that around the 1950s, wetlands were intact ecosystems without any disturbances from human activities. Land use changes started around the 1990s when farmers started diversifying from subsistence-based economy to market-oriented. The interests, benefits and conflicts over use and management of wetland resources vary from one stakeholder group to another and their influence and power relations are quite distinct. These all combined with governance systems and perceptions influence the process of wetland degradation.

Keywords

Stakeholders, Perceptions, Wetland Degradation, Lake Victoria, Uganda

1. Introduction

The importance of wetlands goes beyond agriculture to include a range of other ecological functions and socio-economic benefits to human populations [1]. In Uganda, wetlands offer a variety of ecological functions and socio-economic benefits that naturally affect a range of stakeholders who interrelate as they find their niche in the wetland resource. These stakeholders include: civil society, farmers, private/business sector (e.g. papyrus harvesters, brick makers, charcoal burners, sand and clay miners), environment regulatory organs (e.g. National Environment Management Authority—NEMA), local government bodies and officials (e.g. district environment office, district agriculture and production department, etc.), central government (e.g. Ministry of Water and Environment—MWE) [2] [3] [4] [5] [6].

As a result, public participation is important for a successful management of wetland resources. Public participation is becoming increasingly embedded in national and international environmental policy, as decision makers recognise the need to understand who is affected by the decisions and actions they take, and who has the power to influence their outcomes [3] [4] [5] [6] [7]. Stakeholders' perceptions on wetland change have been very important in setting a clear view of stakeholder's impact on the state of natural resources.

The purpose of this paper is to identify and analyse relevant stakeholders with a stake in wetland resource, their socio-economic characteristics, motives and perceptions on wetland degradation in the Lake Victoria Basin. We analyse stakeholders because they influence decisions of managing wetlands. We analysed perceptions because they trigger the use of wetland ecosystems and are an important precondition to the shaping of policy responses. We also discuss the relationship between different stakeholders and the wetland ecosystem from a social-ecological systems perspective. This theory considers a resource, its users, its governance system and associated infrastructure as a coupled system [8] [9]. Wetland ecosystems form part of the tangible factors that contribute to the livelihood of the people in the study catchments. [8] and [9] assert that peoples' livelihood strategies are affected by their capability and role in the social system. These livelihood strategies may affect the ecosystem in a positive or negative way.

The first section provides mainly descriptive analysis of socio-economic characteristics of households (stakeholders) who are degraders (*i.e.* stakeholders who have converted wetlands to non-wetland habitats as a result of human activity) and non-degraders (*i.e.* stakeholders who have not converted wetlands to non-wetland habitats) of wetland resources. In this section, we also analyse land

use history, the current farming systems and practices in the study catchments and their impact on wetland use and management, factors influencing wetland degradation, and implications of wetland degradation to the Lake Victoria waters. The second section identifies and analyzes relevant stakeholders with a stake in wetland use and management, their motive (interests or concern) and power relations, their perceptions about wetland services and governance of the wetland ecosystems.

2. Materials and Methods

2.1. Description of the Study Sites

To identify and anayse stakeholders' perceptions about the problem of wetland degradation, we chose two case studies in the riparian areas of the Iguluibi and the upper river Rwizi catchments of the Lake Victoria Basin (**Figure 1**). These catchments are representative of the lake basin in terms of geology and geomorphology, soils, climate, vegetation and land use [10]. The study areas are characterised by a bi-modal rainfall pattern. The mean rainfall for Rwizi catchment is about 987 mm·per year with long rains occurring in the months of March through to Mayand short rains from September to November [6] [11]. Rainfall in Iguluibi catchment occurs from March to June and again from September to December with a mean annual precipitation of 1283 mm recorded

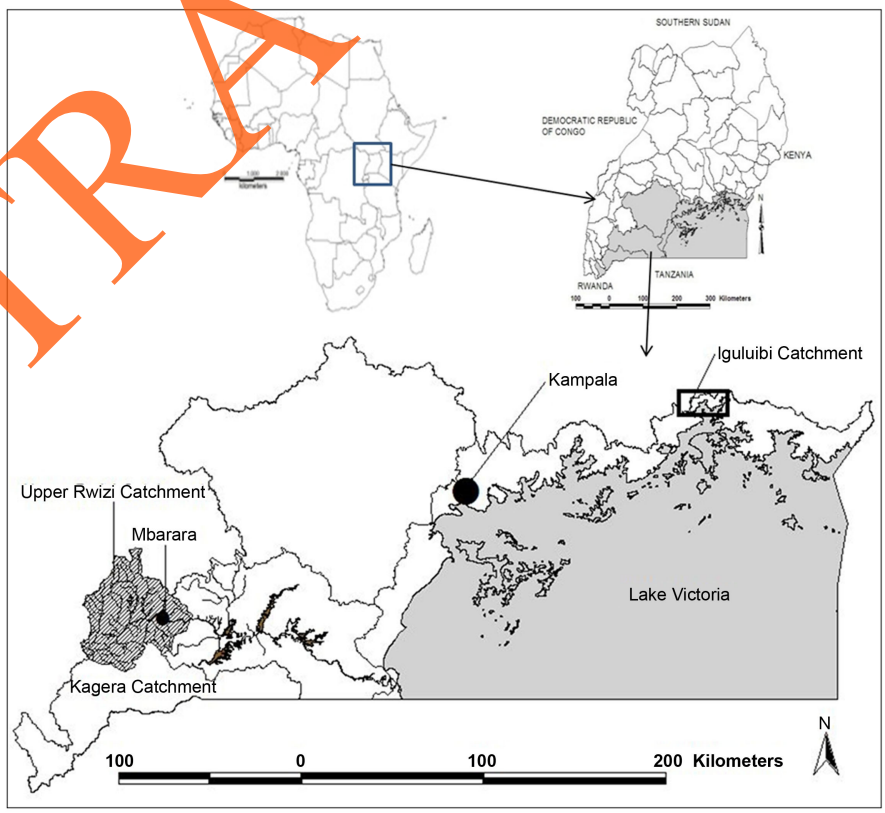

Figure 1. Lake Victoria Basin showing the Rwizi and Iguluibi catchments. Source: Generated from study catchments using geographical information system software.

over the last 40 years [12] [13]. Both areas are dominated by intensive mixed agriculture consisting of banana-coffee systems with maize, beans and sweet potatoes as annual crops. Livestock keeping is more extensive in the upper river Rwizi catchment than in the Iguluibi catchment.

The Iguluibi catchment is located in the Mayuge district of Uganda, north of the lake. It covers 1593 km^2, *i.e.* 5.2% of the Lake Victoria catchment in Uganda. Many residents in the Iguluibi catchment are changing from growing traditional crops to sugarcane due to the proximity to the Kakira sugar factory of the Madhivan company group and Mayuge sugar factory. Fishing is an important off-farm activity with Tilapia (*Tilapia nilotica*) and Nile Perch (*Lates niloticus*) as the most favored species [10].

The Rwizi catchment is located in the Mbarara district, west of Lake Victoria. It covers 2070 km^2 of the lake catchment in Uganda. The Rwizi catchment is supplied by the river Rwizi, which begins in the Buhweju hills in the Bushenyi district and flows east through a number of papyrus swamps eventually discharging into Lake Victoria through the river Bukora and the Sango plains. The Rwizi gets water from the Itojo wetland system (Ntungamo), the Bujaga wetland (Mbarara), the Nyakambu wetland (Bushenyi) and the Kooga wetland system (Kashari). These wetland systems are naturally replenished by the water sources in the ridges of Buhwa, Bucuro, Ryengoma, and Rubindi. The hill slopes in the Rwizi catchment, mostly bare of trees, are predominantly used as pasture land for grazing livestock. However, burning of rangelands and the expansion of livestock keeping into the wetlands, especially during the dry season, is now common [2] [14]. Foot slopes are planted with bananas, sometimes intercropped with coffee and other crops such as beans, and maize. Natural vegetation, mainly papyrus and reeds, cover the lowlands.

2.2. Methods

We applied a mixed method approach including both qualitative and quantitative surveying techniques to assess stakeholders' perceptions about the problem of wetland degradation in the Iguluibi and upper river Rwizi catchments [15]. Mixed methods are very useful when examining complex systems such as social-ecological system.

Survey data were collected from a sample of 150 farmers who were selected from a three-stage stratified random sampling design. In the first stage, five sub-counties were randomly selected (two from Iguluibi and three from the upper river Rwizi). In a second stage, 15 villages in these sub-counties were selected. For the final sampling stage, households were stratified according to whether they use wetlands for expansion of crop land or animal grazing or not and 10 households per selected village were selected from both strata. A list of all residents in the selected villages was used to identify all farmers using wetlands and those not using wetlands and then a systematic random sampling interval was used to select the 10 households. The total study population was 540 res-

pondents. The interval for systematic selection was arrived at by dividing the number of farmers using and not using wetlands by the sample needed per village. We used a semi-structured questionnaire to capture issues such as socio-economic characteristics of households (stakeholders), land use and farming systems and practices, factors influencing wetland degradation, and implications of wetland degradation to the Lake Victoria waters. The relevant stakeholders with a stake in wetland use and management, their motive (interests or concern) and power relations, their perceptions about wetland services and governance of the wetland ecosystems among others. The response rate during the survey was 100%, which might be due to the fact that enumerators were experienced researchers and were familiar with the local language and community setting. Enumerators conducted the survey interviews and the researchers conducted the focus group discussions and key informant interviews. For communities where the researchers could not speak the local language, enumerators translated the interviews. Data was transcribed by the entire research team.

In addition, qualitative interviews were conducted, targeting leadership at the local level, to collect in-depth information of the problem of wetland degradation in the two study sites. We selected 30 key informants, including local council leaders, extension officers, environment officers, agricultural officers, politicians, and local environment committees for individual interviews. In addition, we organized 3 focus group discussions in each of the 15 selected villages, including 8 farmers per group with homogenous characteristics. Complementary secondary data from scientific reports were used as additional sources of information (Uganda Bureau of Statistics, Constitution of Uganda 1995, Local government Act 1997) among others. A data code sheet was developed and used to code the data uniformly for data entry purposes. Quantitative survey data were entered and analyzed using descriptive summary statistics with the help of Statistical package for Social Sciences (SPSS) software to report all quantitative information. Frequencies and percentages were calculated to facilitate the drawing up of inferences related to wetland governance. Qualitative data analysis involves the categorization of verbal and behavioral data for purposes of classification with the use of Nvivo software. Data were analyzed at two levels: the descriptive level of analysis—which is the account of the data in terms of what was said, documented or observed with nothing assumed about it. The second level of analysis was interpretive—where data is transformed into what is meant by the responses and conclusions are drawn. All recorded interviews were transcribed into a written report.

3. Results and Discussions

3.1. Land Use and Farming Systems

Land Use History

We explored the land use history of the two study catchments in order to understand the trends in farming systems over time and how this can help us to

understand wetland degradation processes [16] [17]. Findings from key informant interviews and focus group discussions with stakeholders in the Iguluibi catchment revealed that in the 1950s farmers could not cultivate near the lake shores. As the forest was cleared, farmers recall, the land turned into a wetland during flooding of the lake and the population started increasing. In the Rwizi catchment, farmers recall having large chunks of land for either cultivation or grazing. There were communal lands including wetlands, where cattle would be grazed. Areas around the river Rwizi were left for grazing animals, roofing grass for thatching houses, grass for mulch in the gardens, and women would collect fuel wood from such places and medicinal plants to cure illness such as stomach pain and fungal infections. Farmers were not cultivating in wetlands because there was enough arable land available. Wetlands were used as fishing grounds especially for cat fish to meet the community's livelihood needs. During the late 1990s, the upland was all covered with sugarcane, women farmers resorted to wetlands for food production as an alternative. Sugarcane growing has taken over, and most farmers have reduced growing food crops which have led to increased food insecurity in the communities around the Iguluibi catchment. The role and importance of subsistence agriculture has changed and the importance of traditional crops has declined in favour of cash crops.

3.2. Current Farming Systems

For this section we asked stakeholders both in the focus group discussions and key informant interviews about the current farming systems practiced in their communities. We were interested in knowing how the current farming practices may contribute to the problem of wetland degradation. Current farming systems mentioned consist of coffee-banana farming intercropped with many other food crops, and lowland maize, millet and beans. Livestock is freely grazed in the lowlands. Changing local livestock breeds into improved dairy breeds has been a common trend. The main land-use type is cropland with mainly banana cultivation and livestock grazing. In the valley bottom, the land-use change involves encroachment of wetlands by cropland, livestock grazing and planting of Eucalyptus trees. On the hill slopes, land-use change involves conversion from communal grazing land to cropland without a fallow period, intensification of livestock grazing and deforestation for cropland and livestock grazing [18]. Grazing is becoming a problem due to the shortage of land especially in the dry seasons with a change in livestock grazing systems from communal grazing to individualized restricted grazing by use of fences. Livestock densities have increased. Wetlands which were communal grazing areas have all been cleared by farmers for agricultural expansion and now there is no grazing area. During the dry season farmers tend to burn the hill tops in search of grazing pasture for their goats and other livestock. Rampant and frequent fires lead to depletion of vegetation cover. At the onset of rains, the grassland is often bare and this has facilitated soil erosion and hence low soil productivity. In the Rwizi catchment, some far-

mers have cultivated close to the river removing all the vegetation.

3.3. Household Characteristics

Based on our survey data, we summarized the socio-economic characteristics of households in the study catchments in **Table 1**. These characteristics are further differentiated between degraders and non-degraders. Degraders are households who have converted wetlands to non-wetland habitats as a result of human activity. Differences between degraders and non-degraders were investigated using a Pearson chi-square test or a t-test.

3.3.1. Gender of the Household Head

Results show that female headed households degrade wetlands more than male headed households. This is supported by the Pearson chi-square test ($p = 0.001$). Our study further shows that the majority of the heads of households are men, who are the most influential decision makers either at household or community levels. The reason why female farmers degrade more was revealed during the focus group discussions with farmers, especially in the Iguluibi catchment. When men planted sugarcane upland, women had nowhere to plant food crops. Hence, women were the first ones to carry out agricultural activities in the wetlands. It was reported that men are now pushing women out of the wetland to expand sugarcane plantations. The motive is to maximise profits from sugarcane and clear as much wetlands as they can because wetlands are perceived as free resources that can be exploited any time by any one. This has implications for food security for most of the already needy households. Further, a good number most of the household heads who are women are widowed or separated. Single and female heads of households have a different outlook and life expectation than those married. The data support earlier studies, such as [19] [20] who found that men and women have different roles and responsibilities in land use and economic systems. Gender greatly impacts land use and land management practices which eventually leads to land degradation. According to [20] and [21], in male dominant societies such as in the rural areas, it is expected that male household heads have higher chances of applying land conservation measures than female headed households.

3.3.2. Age of the Household Head

Household heads were asked to mention their age and for those who were not sure, we asked them to describe what events surrounded the period when they were born. The researchers were then able to analyze when exactly that historical event took place and the age of a household was calculated. An independent t-test (0.617) with $p = 0.538$ shows no statistically significant relationship between the age of household head and wetland degradation either at 1%, 5% or 10%. The results suggest that age has no effect on wetland degradation. However the difference between the two means—of the degraders (47.90) and non-degraders (46.43)—indicate that degraders are mainly middle aged and older farmers,

which is likely to be due to mobility of young people. This could also be due to the fact that in the African setting and specifically in Uganda where most land is under customerly tenure, young people do not own land, land is owned by middle aged and older farmers. According to **Table 1** below, there were more degraders under the customerly tenure with P = 0.002 compared to other land tenure systems. The age of the household head is believed to influence land management practices and impacts on investment behavior. Qualitative findings

Table 1. Socio-economic characteristics of farmers.

(a)

Variable	Degraders[1] (%) n = 87	Non-degraders[2] (%) n = 63	χ^2	p-value[2]
Gender of household head				
Male	40.7	40.0	14.788	0.001***
Female	17.3	2.0		
Land tenure systems[3]				
Mailo	4.7	2.7		
Customary	28.7	10.0		
Leasehold	2.0		15.166	0.002***
Freehold	22.7	29.3		
Sources of pressure on wetlands				
Population increase	33.3	33.3		
Trade & markets	14.0	3.3	8.901	0.012**
Poverty & others	10.7	5.3		
Farming activities (evidence of wetland loss)				
Conversion to livestock	12.7	24.7		
Conversion to sugarcane growing	28.0	6.7	33.529	0.001***
Conversion to rice	7.3			
others	10	10.7		

(b)

	Degraders		Non-degraders			
	Mean	Std deviation	Mean	Std deviation	T-test	p-value[4]
Age of HHH[5]	47.90	13.487	46.43	15.536	0.617	0.538
Size of HHH	8.55	4.395	7.79	3.385	1.145	0.254
Education HHH	5.33	4.057	7.21	4.380	2.692	0.008***
Years spent in active farming	21.72	12.758	19.16	11.783	1.255	0.212
Size of land farmed in hectares	1.80	2.284	1.71	1.949	0.233	0.816

Source: Own calculations based on survey data.

[1]Degraders: Farmers who have converted wetlands to non-wetland habitats as a result of human activity (converting wetlands into cropping (bananas, sugar cane) and grazing land, clay and sand mining, charcoal and brick burning, papyrus harvesting).

[2]Non-degraders: Farmers who have not converted wetlands to non-wetland habitats.

[3]Land tenure systems.

[4]Significance is indicated at the 1***, 5** and 10* percent level.

[5]HHH-Household Head.

support these data, for example in the Iguluibi catchment, it was reported from focus group discussions and key informant interviews that most young people have resorted to work for the sugar companies due to the proximity and some are involved in other off-farm transport activities as motorcycle riders and taxi driver. This probably can be one of the reasons to explain why the majority of the young people fall under the non-degraders. In the Rwizi catchment, banana is a booming business and it was reported that most of the young people have resorted to work as middlemen to buy bananas from farmers to take them to collection centres where they sell it to traders taking it to neighbouring countries like Sudan. This has implications on labour in the short term. For example, there is likely to be a decrease in active labour force for implementing land management practices as most of the young people are on the move.

Findings of the study support earlier studies. For example, [22] and [23] observed that an older farmer may have a wealth of experience but may be unwilling to invest in long-term soil conservation given his or her short time horizon. Young farmers on the other hand may be quicker, dynamic and energetic in applying soil conservation measures especially those that are labor intensive. In addition, the younger farmers may be having a longer planning horizon, more understanding and are more interested in land conservation than older farmers. These findings support previous studies such as [24] and [25] who found that age of the head of household influences the area of cultivated land. But on the contrary, [21] [26] and [27] argue that as people reach a peak of physical strength, the area of land cleared falls. Old household heads retired from non-farm jobs may still bring in an infusion of capital earned from years working off the farm.

3.3.3. Household Size

This variable is a measure of the household size including the amount of labour that households have at their disposal and children. The household heads were asked to give the total number of people living with them. The independent T-test (1.145) with a $p = 0.254$ indicates that there is no statistically significant relationship between household size and wetland degradation. Although the mean for degraders is higher (8.55) than the non-degraders (7.79), the absence of correlation is likely to be due to the fact that a good number of farmers in both study catchments are engaged in off-farm activities which leaves them with less time to clear wetlands. Survey data further indicate that most households have between 6 and 10 people with an average of 8 persons per household. This has implications for labour provision for farming activities. [25] and [28], argue that low household labour availability makes households tend to adopt agricultural practices suitable to the low labour supply and when the availability of labour is high, more intensive land-use strategies or off-farm employment are pursued. In addition, [26] and [29] argue that household size and composition may promote the expansion of crop land, due to more hands to work the land and more labour available for clearing land or for intensifying production. Thus,

a positive influence is expected for wetland use with large household size available for farm work [21]. Similarly, findings from a study carried out by [15] reveal that household size determines the sustainability of natural resources in an ecosystem. This is due to the fact that large households tend to over-exploit their resources in order to meet their demands and while so doing, undermine their sources of livelihood [29].

3.3.4. Education Level of Household Head

Education level for this study measures the level of education of the household head. The independent T-test (−2692) with a p = value of 0.008 indicates a statistically significant difference between the mean levels of education of degraders and non-degraders. Well educated households have access to new information related to land management practices and can easily adopt land management measures. Less educated households find it a challenge to easily access and interpret information related to land management. These findings seem to support earlier findings by [21] and [30] who indeed found that longer schooling of the household heads increases their ability to access information and strengthens their capabilities with conservation measures. [15] argues that education promotes better management of household resources and reduces pressure on easily accessible natural resources and this leads to sustainable natural resources management.

We observed a higher percentage of non-degraders (mean = 7.21) in the group with the highest education compared to the degraders with a mean (5.33) level of education. This may be due to the fact that as people get higher qualifications, they look for off-farm formal employment sometimes far away from home and such farmers may hardly have time to clear more land which releases pressure on the wetlands. This could also be to the fact that educated households may have a positive attitude and perceive wetland conservation as beneficial to them in the long run. If this is the case then, the government should promote such activities by investing more in services which attract young people to off-farm activities for example expanding rural electrification, youth skilling which increases such opportunities. However, [31] argues that improving education is crucial for increasing household incomes, but this is not solving problems of land degradation in Uganda. They argue that by increasing household members' opportunities off the farm, education may reduce small farmers' effort to conserve the soil. However, they affirm that this does not suggest that investing in improved education should not be pursued, but other means may be needed to address land degradation including designing educational curricula with components to teach the principles of sustainable agricultural production. This might help to minimise negative impacts or even have positive impacts on sustainable land management.

3.3.5. Years Spent in Active Farming

This variable is the number of years the farmer had been continuously cultivat-

ing on the farm. We asked households to mention the number of years they have been cultivating on the land. We relied on farmers' estimates of time or years spent in active farming. The independent T-test (1.255) with a p = 0.212, indicates that there is no statistically significant association between years spent in active farming and wetland degradation either at the 1%, 5% or 10% level. We anticipated duration of farming to lower clearing of wetlands because farmers have more secure tenure rights to their land. New farmers are said to clear more wetland to establish themselves especially wetlands that are regarded as communal lands. [25] and [32] found that higher rates of deforestation occur at early stages of farm settlement. Long cultivation results in declining yields so that an investment in the quality of the land would sustain its productivity, thereby increasing the benefits from the investment, which might encourage farmers to invest. These data further support findings of [33] who observed that a declining yield due to low soil fertility resulting from long-term cultivation may cause a declining capability of the households to invest thereby leading them into the Malthusian "poverty cycle". They concluded that long cultivation results in declining yields hence farmers have to intensify cultivation into wetlands.

3.3.6. Size of Land Farmed

This variable reflects the amount of household's land holdings that could serve as an input to agricultural production. We asked the farmer to tell us how much land they farm. The measurements were given in acreage because this is the familiar numerical unit farmers use in Uganda while measuring land but we converted it to hectares. The independent T-test indicates there is no statistically significant relationship between size of land farmed and wetland degradation. The results suggest that size of land farmed has no effect on wetland degradation. The average farm size for degraders is (1.8 ha) and the non-degraders is (1.7 ha). This indicates that most respondents were subsistence farmers. The size of most fields observed was too small to produce enough food and cash income for an average family of between 6-10 people. As a result, many farmers cultivate in wetlands where they can get high yields for both cash and food crops. Almost all farmers are reluctant to implement sustainable wetland measures such as leaving 200 meters of wetlands away from cultivation land, out of fear that their cultivation fields will reduce by such measures. Farmers are aware of the problem of wetland degradation but regard small farm size as a limiting factor to wetland conservation.

These findings do not seem to support earlier studies such as [19] and [34] who found that the distribution of land between households may greatly influence local land use patterns. They further observed that farmers with larger farm sizes are more capable of undertaking investments because they can spare land areas for fallow, and for planting trees, while putting larger portions of their lands under cultivation. [35] however, asserts that for rural households in Sub-Saharan Africa, land is one of the most important assets because most households rely heavily on farm income. Land holding size affects the sustaina-

bility of wetland resources. This is similar to the findings of [33] who found that households with large areas had a stronger tendency to invest in land quality and thus in the adoption of land management practices. In addition, they assert that a large farm is often correlated with wealth and this helps to motivate farmers to invest in land conservation measures as they expect to earn a larger income from the farm and this releases pressure from wetlands. However, [19] argues that the impact of wealth on land use may be very visible if the land is consolidated, e.g., a plantation or ranch, but may be less obvious if farms are fragmented which is the case in the two study catchments. Limited size of land farmed may change livelihood strategies and lead to higher dependence on wetlands and off-farm income. This may have an effect on decision-making, farming practices and on household priorities for investing cash and labour resources in conservation strategies [36].

3.4. Land Tenure Systems

Our results show a statistically significant relationship between wetland degradation and land tenure systems (at the 1% level). Land under freehold is generally much less degraded than land under mailo, customary or leasehold systems. This is not surprising as wetlands are still largely an open-access resource the exploitation of which is poorly controlled. However, also land that is under lease (leasehold or mailo) is more likely to be degraded.

3.5. Relevant Stakeholders with a Stake in Wetland Degradation

3.5.1. Stakeholder Groups in the Study Catchments—Their Interests, Benefits, Influence, and Importance

Analyzing stakeholders' perceptions is a way of generating information on the relevant actors to understand their behaviour, interests, agendas, influence on decision-making processes, and the diverse range of potentially conflicting interests. Stakeholders for this study are presented in two groups: primary stakeholders (those that are directly dependent on wetlands resources for their livelihoods) and secondary stakeholders (those with an interest but not directly dependent on wetland resources). The results of the stakeholders' analysis are presented in **Figure 2** below. The main groups of primary stakeholders involved in wetland resources at community level were identified as follows: the farmers (both crop cultivators and cattle grazers), papyrus harvesters, brick makers, charcoal burners, sand and clay miners, living in and around swamps. At the sub-county level (third administrative unit to the central government) we identify secondary stakeholders (those with an interest but not directly dependent on wetland resources) as follows: community-based organizations (CBOs), Local environment Committees (LECs), and Environment and wetland officers (EWO). At the district level (second administrative unit to the central government) we identify secondary stakeholders as follows: District environment committees (DECs), Community based organizations (CBOs), District environment office (DEO), District Agriculture and production department (DAPD). At national

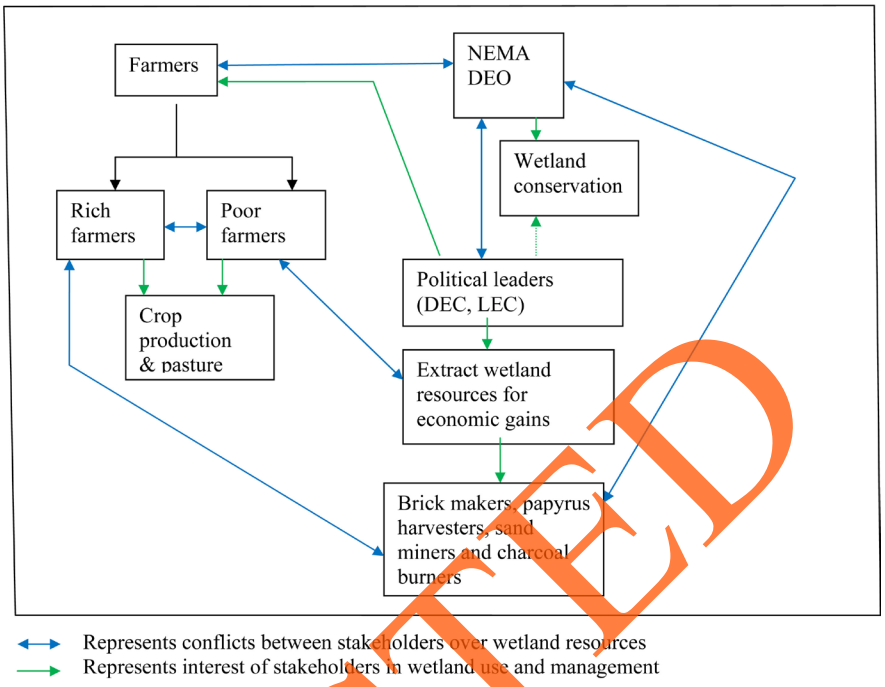

Figure 2. Interest, benefits and conflicts of stakeholders in wetland use and management in the study catchments.

level (Central government) we found the following secondary stakeholders: Ministry of Water and Environment (MWE), National Environment Management Authority (NEMA), Wetland Inspection Division (WID).

However, it should be noted that these groups are not homogenous. There are differences within these stakeholder groups with regard to attitudes towards the management of the wetland resources as well as perceptions of other groups. The intention in this section is to highlight the differences between different stakeholder groups that may bring about conflict and are detrimental to effective wetland conservation and management.

3.5.2. The Interests, Benefits and Conflicts of Stakeholders

The interests and roles in wetland use and management are quite different for different stakeholder groups. Whereas the primary stakeholders such as farmers, sand and clay miners, papyrus harvesters, brick makers and charcoal burners may be interested in the utilization of wetland resources, secondary stakeholders like at sub-county, district and national levels are interested in wetland protection and conservation (**Figure 2**). These different interests cannot be met without conflicts between the various groups of stakeholders. The most common conflicts mentioned during the interviews with these stakeholders were of three types. First, conflicts exist between the poor farmers and rich farmers who are fencing off what was once known as communal land for purposes of primitive accumulation. This denies poor farmers access to grazing pasture and cattle watering points. The second conflict is between the farmers, sand miners, brick makers, papyrus harvester and the district environment office and NEMA. The

farmers and sand miners, brick makers and papyrus harvesters are interested in extracting wetland resources and NEMA and the district environment office are interested in conserving the wetlands. Farmers are interested in crop farming and animal gazing but this is not being done in a sustainable manner. The third conflict is between the district environment office, farmers and the political leaders at the various government levels. The district environment office and the political leaders at the district both represent different interests when deliberating on wetland management issues. For example, it was mentioned that in most cases when the district environment office tries to implement wetland activities which touch the interests of the famers, the political leaders protect the interest of the famers and this in the end protects their interests as politicians. This has implications for sustainable wetland management due to lack of collective responsibility.

3.5.3. The Influence and Importance of Stakeholders Involved

We assessed the influence and importance of stakeholders in relation to wetland use and management (**Figure 2**). We found that the Local Council leaders, LECs, DECs, DEO, DAPD, NEMA, MWE, WID and EWO have high influence on wetland use and management because of their legal mandate, authority, established organization structures, human resources, technical know-how, management capacities, financial resources, logistics, and commitment. Their importance was also found to be high because of their control over strategic resources such as budgets, management capabilities and their positioning.

The primary stakeholders such as the farmers (crop and livestock), papyrus harvesters, sand and clay miners, brick makers and charcoal burners have a high importance but low influence to wetland conservation. Because most of these stakeholders are in close interaction with wetlands, they are the targeted beneficiaries in wetland management and they are very important for the successful implementation of any conservation project for wetlands. They have a low influence because of they lack information for effective decision making, some have no permanent stake, and they are seasonal migrants and have weak community institutions.

The agricultural departments and local Councils have got a low importance but high influence. They have low importance due to the fact that they do not benefit directly from the wetland resources. But on the other hand, they have high influence acting as change agents because they actively participate in the mobilization of wetland user communities and have a strong linkage with wetland users.

3.6. Factors That Induce Wetland Degradation

3.6.1. Perceptions by Stakeholders of Wetland Services

Stakeholders perceive wetlands to play several roles and provide a range of provisioning, regulating, cultural and support services. According to [37], the misuse of wetlands affects the productive capacity, physiological, cultural and eco-

logical functions of land resources through reduced essential environmental services required by humans such as food, water, wood fuel, and climate regulation among others. Crop farming and cattle grazing were among the most important activities that support livelihoods for the households in the study catchments. Crops are grown for both subsistence and commercial purposes which has a direct effect on the livelihoods of the communities. On the other hand, crop farming involves clearing of wetlands for crop land and this acts as a threat to the sustainability of wetland resources and yet wetland resources should be sustained for improving community livelihood. Findings from both study catchments indicate wetlands are important sources of livelihoods to the surrounding communities by providing resources used as raw materials for housing, supplying and storing drinking water during the dry season for domestic use, act as drinking points for animals, provide fuel wood for domestic and commercial purposes, grass for mulching gardens, and fodder for cattle [38] [39] [40]. Wetlands are further utilised for local medicine for treating diseases like skin infections, snake bites, skin rush, stomach pains and deworming children and [38] [41]. It is a very important source of vegetables and food production for women during the dry season. Wetlands act as hatching and breeding grounds for fish. Wetlands play a key role in the regulating and stability of the physical environment [38] [42].

Because extraction of these resources from wetlands is perceived to be free for all stakeholders involved, except for clay, sand and poles where permission is required from owners of land in case of individual ownership, stakeholders tend to over-extract them for each one to have as much as they can before the resource is exhausted. This facilitates overuse of wetlands and leads to their degradation. Most of the stakeholders interviewed especially those who benefit from the resources directly were much concerned about the degradation of wetlands, and said when the resource is completely exhausted, their livelihood resource base will be no more which will affect their families socially and economically. However, these stakeholders show no indication that they are willing to conserve the wetlands or use them sustainably to benefit future generations. Their concern is immediate and short-term livelihood gains. From the literature it is clearly indicated that wetlands systems both contribute to and are affected by the production of goods and services that is of value to people [38] [42]-[47]. Over 70% of all wetlands in Uganda are used for crop production and livestock grazing and natural tree harvesting [47].

Discussions with stakeholders revealed that they only understand socio-economic functions of wetlands which deliver direct benefits to them and ecological functions were not mentioned at all in all the discussions. Ecological functions were mainly reported by the technical staff both at the central, district sub-county local government levels. The technical staff interviewed was worried about the state of wetlands and concerned about other stakeholders' lack of understanding of the ecological functions of wetlands which is likely to facilitate their degradation.

At present, in both catchments, short term gains from wetland use are obtained at the cost of long term benefits to be held from keeping wetlands services intact, for example benefits such as water purification or the regulation of water flow. However, such short-term gains are unavoidable for some actors like farmers because it is a way of living; therefore they need to be controlled. The technical staff was concerned about the state of wetlands and the need to conserve them especially due to the fact that other stakeholders whose day-to-day livelihoods depend on wetlands did not know their ecological functions. However, they mentioned, the lack of both human and financial resources to implement the activities of wetland conservation as limiting factors. These results support earlier studies. For example, [48] and [49] report that protecting wetlands is a practical way of retaining the existing carbon reserves and thus, avoiding emission of carbon dioxide and greenhouse gases. [47] observed that retention, recovery and removal of excess nutrients from water help to protect the quality of water. [43] found that wetlands reduce the load of nitrogen in surface water originating from agricultural fields. [47] observed that such long-term benefits of wetlands are easy to overlook since they are not fully valued economically.

3.6.2. Perception by Stakeholders of Wetland Governance

Perceptions of Wetland ownership and management:

Individual stakeholders have varying perceptions of the ownership and management systems of wetland existing in their communities. Respondents from the survey, focus group discussions and key informant interviews were asked to mention who owns and manages wetlands in their community. According to survey data, 68.0% of the farmers considered the wetlands existing in the community as owned by individual households adjacent to these wetlands. 24.7% considered wetlands to be government owned land, and only 6.7% considered wetlands as communal lands which can be used for the benefit of all community members.

Responses from focus group discussions and key informant interviews support survey findings and indicate wetlands are owned and managed by individual stakeholders. Technical staff from the district and central government perceives wetlands as communal lands that are supposed to govern community benefits that are sustainable. They indicate that the current situation is that every wetland, lakeshore, or hilltop belongs to whoever has land stretching to that particular resource. They report that when farmers introduced improved cattle breeds, they started the culture of each farmer fencing off their land and this meant stopping other community members from using such land which was once communal land.

Since individual stakeholders dominated the management of existing wetlands, most of them felt there was no form of management exercised over wetlands in the community by the responsible authorities. The current form of management is not acceptable. One farmer said:

"*Wetlands are owned by individual land owners not government. When my*

land has part of the wetland then that is my land: I control it. During meetings with the Resident District Commissioner (*RDC*) *they say we should not use wetlands but according to the way I see it, they will just use force to drive people from wetlands*" (*Farmer*, *Rwizi catchment*).

The change in system of governance is attributed to factors such as pressure for land and poor implementation of government policies, increased income levels among community members and this has brought in a culture of individualism. This has been worsened by the increased economic value for land and almost all land including wetlands has been fenced off in the catchment.

In the past, they said, farmers did not individualise wetland ownership because the uplands were still very fertile and no farmers were interested in cultivating in wetlands since most of them were water logged. Farmers could still get enough yields from their field without necessarily encroaching on wetlands. Currently, wetlands have been commercialized and individualised because of loss of soil fertility upland. Community members are now selling wetland portions to others as part of their land. In the past, if one bought land, the wetland was not included in the sales agreement. But now farmers see wetlands as places where they can grow crops because even when there is no rain they can get some reasonable yields so most farmers have resorted to wetlands cultivation without using any method of soil conservation measures. This has led to wetland degradation as a result of soil erosion which is a serious problem in both catchments.

3.6.3. Breakdown of the System of Wetland Management in the Study Catchments

Key informants and focus groups were asked to identify among the various actors who is responsible for the breakdown of the wetland management system in the study catchments. Majority of the respondents from both focus group discussions and key informant interviews believe government has a role to play in the breakdown of the wetlands management system because most farmers have surveyed their land, some have gotten titles though this is against the law and have leased land in order to use it as security to get loans from the banks. They felt that if the government had said no to those leasing land, then famers would have not leased wetlands. They further said the government has not implemented the policy of reserve land. According to [50], reserve land for major rivers like the Rwizi is 100 meters calculated from the highest water mark[6]. For other, minor rivers the recommended reserve land is 30 meters. For the major lakes like Lake Victoria, they recommend a protection zone of 200 meters from the low water mark[7]. For other minor lakes, a protection zone of 100 meters from the low water mark is recommended. The issue of reserve land is still not clear to farmers, as they confessed only hear that they are supposed to leave a certain distance from the lake then plant the trees, but they have never been told

[6]Highest water mark is the highest point in history towards the dryland where the water-land interface last occurred when there was heavy discharge of water.

[7]The lowest water mark is the lowest point in history towards the lake where the water-land interface last occurred when there was drought and water tended to decrease.

officially specifications of the measurements. There is a need for the government to educate farmers about the issue of reserve land in order to protect wetlands. Farmers said they would prefer to practice sustainable farming systems within the wetlands but do not know how to practice it. This might be different and quite possible that they may be interested in having more projects in the community.

Community-based management approaches for wetlands management are limited in the community with no traditional mechanisms of preserving wetlands. Reasons for this are the lack of implementation of the available government policies by those who are in charge. However, other respondents felt the farmers also share the responsibility of system breakdown, because they have not taken up their individual responsibilities to protect wetlands. If policies are enforced on people (using a top-down approach) who have not been involved in the making of those policies, they are bound to fail. Local leaders at the sub-county level were not involved in the policy formulation process, and only in the implementation of policies which have been formulated. This has created conflicts between politicians who are involved in the policy formulation and those who implement, because when the latter enforce any policy, politicians try to protect their votes.

The system of democratic election of leaders has thus contributed to the breakdown in the system. One respondent said:

"*The government has contributed to the breakdown of the system, for example there is a counsellor who was trying to fight so that the district local government does not rent out the biggest wetland in the district to the Japanese for rice growing, but it was the very government which mobilized people to vote him out of office because he was disorganizing their plans and there were many community members who were previously benefiting from this wetland*" (*Farmer Iguluibi catchment*).

The technical staff cited that due to current government ideologies promoting capitalism/individualism, people no longer look at resources for community wellbeing but focus on individual gains, or ownership of projects rather than communal. All resources have been commercialized. The implication here is that farmers are looking at money and have a feeling that what belongs to the community does not benefit them directly. They want something where they have direct benefit but not for the community. Local councils have no say over the use of wetlands because elections interfere with the management of such natural resources whereby they have to guard their votes during future elections in office. The change in political system implies that the leaders are democratically elected in office by the power of the ballot. From respondents' constructs and our own observation, we noted that democratic election does not represent interests of the people hence need for checks and balances to control behaviours of elected people.

Community bylaws, which in the past used to govern natural resources through community self-help projects, have diminished and this has contributed

to lack of care for natural resources by community members. This breakdown has serious implications for households, for example, those who use grass thatched houses need grass to prepare and maintain their houses. Before, people were free to go to someone's farm, cut grass and repair their houses, but now if one is seen crossing into someone's farm, he can be taken to court. Such grass used to work as a soil conservation measure as mulch, but now it is only the rich who can practice that, because they have access to large pieces of land and the money to buy and transport the grass hence leading to loss of soil fertility. This reflects on the theory of primitive accumulation where the communal resources like wetlands for the use of everyone have been imposed into private property fenced off in order to accumulate wealth.

4. Conclusions

The purpose of this study was to analyze stakeholders' perspectives on the governance of wetland resources in Ugandan Lake Victoria Basin focusing on the upper river Rwizi and Iguluibi micro catchments. The study was guided by the hypothesis "Stakeholders' perceptions influence decisions for wetland use and management". The main findings indicate a significant correlation between farming activities, gender of household head, land tenure systems and wetland degradation. However, age of household, experience of farming, household size, size of land farmed were found to be negatively correlated to wetland degradation. We also found out that different stakeholders have different interests and benefits from wetland use and management and these contribute to conflicting situations at various levels. The stakeholders also have different ways they influence wetland use and management and their levels of importance also differ. This implies that for successful implementation of sustainable wetland management, every stakeholder's interests, benefits, conflicts, influence and importance have to be considered as a unique situation. Stakeholders also have differences in the way they perceive wetland services and governance, for example farmers look at socio-economic functions as the only benefits. This implies that once the stakeholders who use wetlands on day-to-day basis fail to understand their ecological functions, this may lead to their degradation. The governance of wetland resources was also found out to be unclear to majority of the wetland users. This was found to facilitate their degradation. This calls for a need for the government to empower actors with a stake in wetland conservation to ensure that wetlands resources are protected. It was surprising to note that the issue of reserve land has remained a myth to farmers without any proper explanations. Community-based management approaches for wetlands management are limited in the community with no traditional mechanisms of preserving wetlands. Reasons for this are the weak enforcement of government policies and the lack of implementation of the available policies by those who are in charge. The community bylaws, which in the past used to govern natural resources through community self-help projects, have diminished and this has contributed to lack

of care for natural resources by community members. This breakdown of the traditional governance systems has serious implications for wetland conservation and for households since they cannot attain the basic resources from wetlands as it was in the past. Findings of this study support the research hypothesis which states that stakeholders' perceptions influence decisions for wetland use and management.

The current level of reliance on wetlands for survival is too overwhelming and in most communities visited during the study and the footprint can be seen which indicate daily use of wetlands. The demand for wetland resources in the study catchments is far beyond their carrying capacity, which is the circumstance for wetland degradation, reduced production, poor community health and worsening poverty. There is, therefore, a need for government, with the support of the districts, to assess needs of communities adjacent to wetlands and advise accordingly on how such needs can be addressed without necessarily degrading the wetland resources.

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The government should advise stakeholders on activities that can be sustainably carried out in wetlands in an environmentally sound manner but yet making considerable contributions to household incomes. Activities related to fish farming, craft making, and bee keeping have proven their capacity to improve communities from poverty and when well designed, they are more income generating than traditional destructive activities that communities find comfort in, in wetlands. Promotion of pro-environmental activities that although still using the wetland ecosystem and occupying its areas, could have a lower environmental impact on the overall system quality. It may be difficult to tell farmers to move out of wetlands but better to find out how wetlands can be used sustainably through sustainable activities.

The way information on wetlands is packaged and communicated to its stakeholders will make a considerable difference from communication in the ordinary sense of the word. The study findings reveal that formal education levels of most of households in the catchment communities surrounding the wetlands are generally low. About 80% of the households had no education or had primary-school education. The fact that majority of the household decision makers have less or no formal education has implications for the type of wetland management and conservation message packaged for their consumption. As such it

is important for the government to package its information in tailor-made styles and adopt direct communication methods through village meetings and radio communication, and probably posters in the local languages.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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