

Impacts of Wetland Drainage on Domestic Water Supplies and People's Livelihoods in Kabale district, Uganda

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Abstract

Increased population growth in Kabale District, Southwestern Uganda, has resulted into wetland drainage in search of more arable land. This has impacted on the livelihoods and water supply for the surrounding communities. Water situation gets worse when there is increased water demand during community ceremonies like weddings when a lot of water is needed to prepare food and local drinks in large quantities. During such ceremonies, wells yield muddy water or even dry up because of reduced filtration and recharge capacity of drained wetlands, respectively. If such water is contaminated with disease-causing organisms that have not been filtered off, then it becomes a health hazard to people. Stomach upsets have now become more common and related treatment using Metronidazole at a cost of one thousand Uganda shillings (about US\$ 0.6 or two litres of milk) per dose has to be incurred. Stomach upsets were not common before the wetlands were drained.

People's livelihoods based on drained wetlands include growing of sweet and irish potatoes, maize, cabbages, beans, sorghum and dairy animal grazing. Beans and maize brought the net returns per unit land area (ha) of Shs. 276,323(US\$ 154) per season, followed by irish potatoes, Shs. 54,101(US\$30) and lastly cabbages which brought net returns per unit land area (ha) of Shs. -510,540(US\$-283). Overall, 91% of the people have acquired more land in the drained wetlands (about 0.05 ha each on average), which they say is more fertile, and have milk at household level. Negative impacts associated with wetland drainage include reduced and/or loss of biodiversity such as the population reduction of Crested cranes (Uganda's symbol) while the Sitatunga or water antelope (*Tragelaphus spekei* Sclater), a globally threatened species, has been eliminated from many areas. Raw materials for traditional artisanal industries are no longer readily available as well as medicinal herbs. The District ranks number one in malarial cases in the country and this has been attributed to micro-climatic change (increased temperatures) due to wetland drainage.

Key words: Wetland drainage, Livelihoods, Kabale, Uganda

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1. INTRODUCTION

Wetlands are known for their productivity and are continuously being reclaimed. According to Dugan (1990), wetlands have been reclaimed Worldwide and are still being reclaimed and therefore diverting their original uses to new uses “regarded” as more profitable to man. He further states that, the rate at which wetlands have been destroyed is threatening their existence, leading to an environmental crisis in many countries. He also states that wetlands have been destroyed because society considers eliminating them as either good in itself or as a small price to pay for more benefits expected from wetlands and conversion to other uses.

About 58% of wetlands in Kabale District, Southwestern Uganda have been drained mainly for agriculture and to a small extent for dairy farming, tree growing and fish farming. This was brought about by increased population growth and infertile soils along the hillsides. In related studies, Dugan, (1990); Finlayson and Pomeroy, (1991); and Musali (1991) reported that most wetlands have been extensively drained for agriculture and dairy farming. Tukahirwa (1992) and National Wetlands Programme(1996) also noted that wetland degradation has been more severe particularly in areas of very high populations.

In Kabale district, wetlands functioned as a means of ground water recharge and wells are constructed at the edges of the Wetlands to provide good water for domestic use and for watering livestock.

Wetlands were used for transport purposes by the use of canoes, which crossed from one side of the swamp to another, other than using a road or footpath, which meander along the foothills and take long to reach the destination.

Fishing used to be a major activity carried out by men, especially looking for *Clarias* spp. to augment their families’ diet and for sale to improve their economic status. Hunting in wetlands was an activity that was well established in Kabale Communities.

Few studies have been conducted in Uganda to determine the impacts of Wetland drainage on domestic water supplies and people’s Livelihoods. Consequently, there is scanty information regarding domestic water supply and people’s livelihoods because of wetland drainage.

The aim of this work was to determine the impacts of wetland drainage on domestic water supplies and people’s livelihoods in Rubaya sub – county, Kabale district – Uganda.

The specific objectives of the study were:

- (a) To assess cultural and aesthetic values the local community derive from the wetlands;
- (b) To determine and evaluate the costs and benefits to the local community as a result of wetland reclamation.

2. Area descriptions, methods and materials used

2.1 Study Area

The study was carried out in Rubaya sub – county , Ndorwa County , Kabale District –Uganda (Fig. 2.1). The study concentrated on Buramba –Kahungye wetland whose western part, originally a wetland, was drained for cultivation and dairy farming and the intact wetland of Mugandu – Buramba. Both wetlands drain into L. Bunyonyi, at Gweru Bay (formally known as Rweru Bay) (Fig. 2.2).

The geographical coordinates of the Gweru Bay Wetlands are: Mugandu – Buramba wetland is found at 29°56"E, 1°25"S while Buramba-Kahungye wetland is found at 29°55"E, 1°25"S. The Gweru Bay wetlands occupy an area of 8.5Km² and are located at an altitude of 1,920m(6,300ft) above sea level. Gweru Bay receives water from River Kibirita and River Mugyera, both of which drain into Lake Bunyonyi through the said wetlands.

Figure 2.1. Rubaya Sub-county

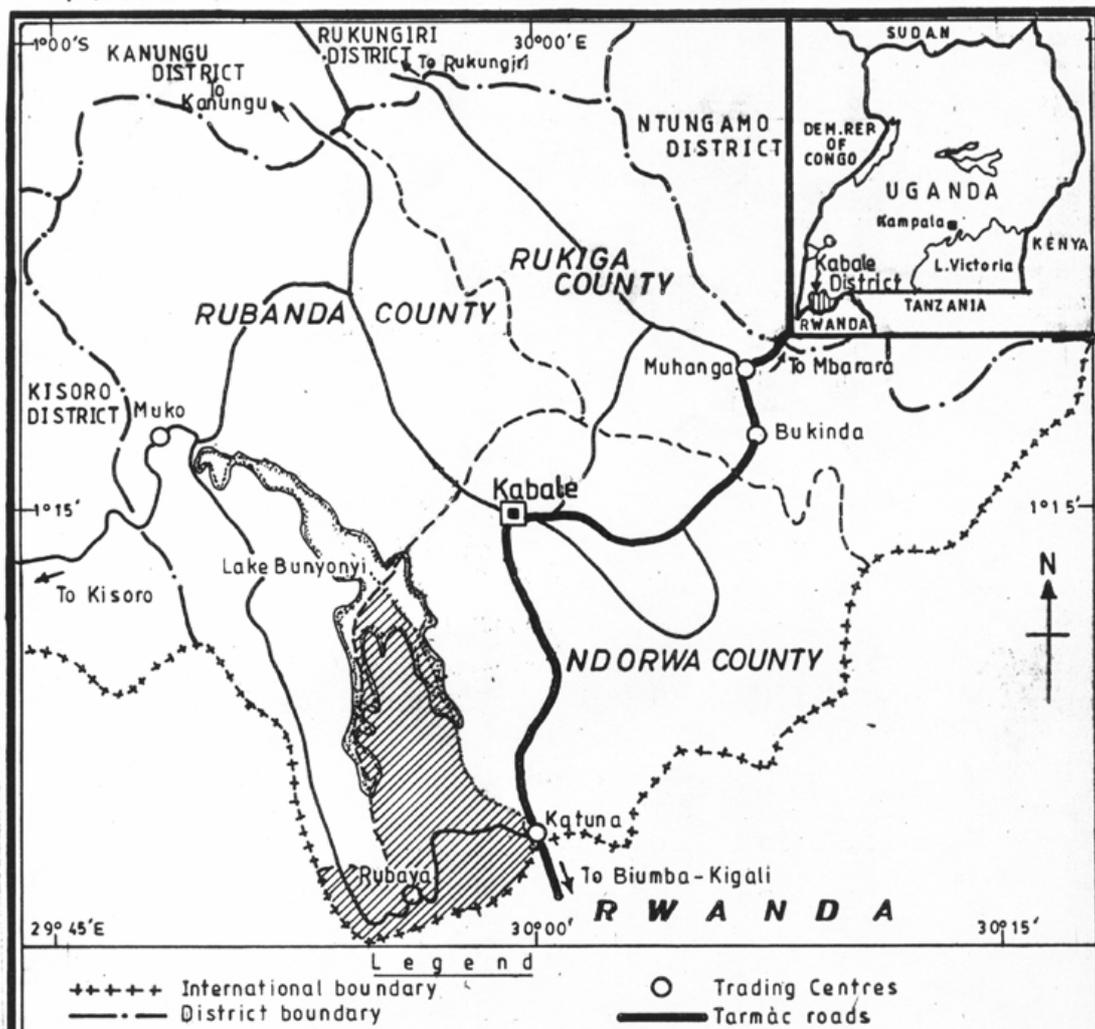
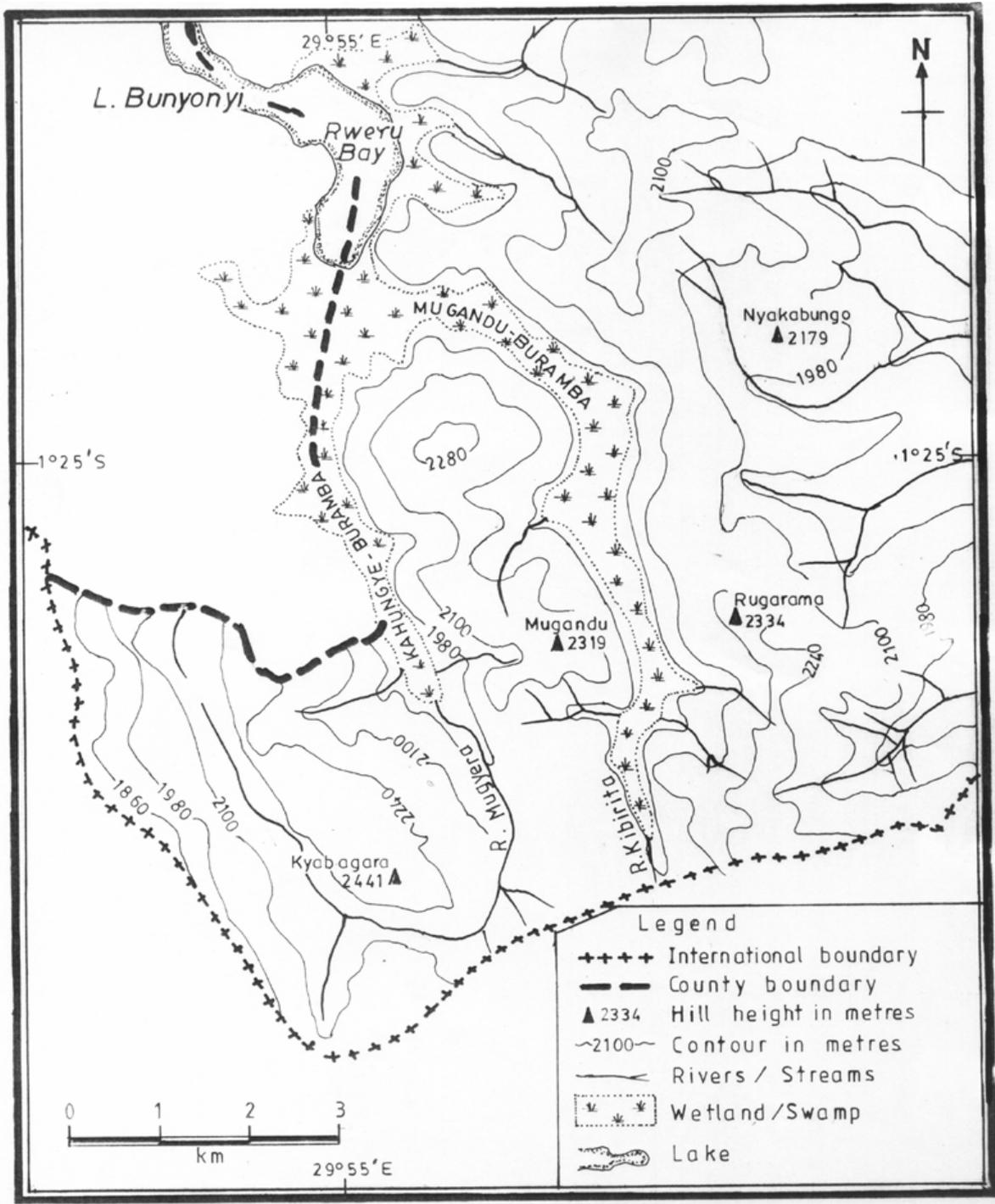


Figure 2.2. Gweru Bay wetlands



2.2 Population

The sub – county of Rubaya is made up of 8 parishes namely, Karujanga, Kibuga, Rwanyena, Kahungye, Mugandu, Buramba, Bigaaga and Kitooma. These parishes together have a total population of 153,227(1991, Population and Housing Census). The population of the study area is distributed as follows: Mugandu parish had population of 3708, Buramba 4013 and Kuhungye 3441 people as per 1991 Housing and Population Census.

2.3 Sample Selection and Data Collection.

The study covered 210 households, which were selected from the study area using a multi-stage simple random sampling technique. At the first stage, a sample of three parishes was purposively selected from the 8 parishes that make Rubaya sub – county. The reason for selecting these three parishes was that they surround Gweru Bay wetlands, which drain into Lake Bunyonyi, and it is these wetlands that formed the study area as a larger proportion of these wetlands has been reclaimed. From each selected parish, a list of LC1s was obtained from LCII chairperson and a simple random sample of 10LC1s was selected. From each selected LC1 a list of households was obtained from LC1 chairperson and from this list, a simple random sample of seven households was chosen and the heads of these households or the most senior person who was found at home was interviewed for purposes of enlisting the required information.

Photographs were taken during data collection to illustrate the current activities carried out and the state of the wetlands in both intact and reclaimed wetlands. The in –depth interviews of respondents were used to collect information about what used to be carried out or obtained from the wetlands before they were reclaimed in comparison with what was being carried out or obtained from the wetlands after they were reclaimed.

The respondents were also asked what they gained as a result of wetland reclamation that they never used to obtain before the wetlands were reclaimed. They were further asked what they were no longer getting as a result of wetland reclamation and what they incurred in terms of monetary and /or time in order to obtain the same product or resource. The respondents were again asked what they incurred in order to get an option to fulfill the same function as to that which was lost. This is because, environmental resources that have no direct market, the prices of substitute goods are considered to represent what it would cost to buy the next best alternative if environmental resources were not available.

2.4 Data analysis.

Data collection was done in two months. At the end of each day, the respondents' views were edited so as to detect any error before coding. A contact Summary sheet, covering the finding was made at the end of every week for every LC1. This ensured that information gaps were detected while still in the field. Data collected was analysed according to questions set in the questionnaire.

The costs and benefits to the local people as a result of wetland reclamation were evaluated using the current market values for these products obtained from the market that needed to be priced, in comparison with what the respondents incurred to obtain a product that performed the same function from the wetlands. Percentage distribution tables were computed in order to illustrate some points, and in other cases, respondent's voices were used.

3. Results and analyses

3.1 Resources of drained wetlands

The common crops grown in the drained wetland are irish potatoes followed by sweet potatoes; others are beans, maize and cabbages in the descending order. Sorghum, which is the most popular grain, is mostly grown on hill slopes (Foreground in Plate 1). This tends to solve a problem of food shortage in the study area, since the hill slopes are no longer very productive to yield enough food for the populace. Drained wetlands support trees and planted pastures as well (Plate 1; Table 3.1).



Plate 1. A typical drained wetland for crop growing and animal rearing

Table 3.1. New resources obtained from reclaimed wetland (n= 210; * multiple responses)

New resources	Number*	Percentage
Irish potatoes	108	51
Sweet potatoes	68	32
Beans	28	13
Maize	21	10
Cabbage	11	5
Fish (Tilapia)	4	2
Grass for grazing	4	2
Trees	7	3
Spear grass	4	2
Dairy farming	3	1

Agricultural food products are used to meet both food and financial requirements of the home as shown in Table 3.2.

Table 3.2. Expenditure of the income generated from the activities done in the reclaimed wetland (n=81; *multiple responses)

Expenditure	Number*	Percentage
Buying of household items	74	91
Paying for health services	70	86
Paying for school fees	66	81
Paying for graduated tax	59	73
Paying for leisure	18	22
Income generating activities	7	9
Ekibiina (Cooperative)	4	5
Supplementing diet	3	4

Majority (91%) of the respondents reported that, they spent the income generated from the activities done in the reclaimed wetland by buying household items, followed by paying for health services, and school fees. Others included paying graduated tax, leisure and for income generating activities in the descending order.

3.2 Economic valuation of the respondent's four major agricultural products.

The monetary economic valuation of the respondents' four major agricultural products was carried out. The products include cabbages, irish potatoes, beans and maize (Table 3.3).

Table 3.3 Economic Valuation of the agricultural products.

Measure	Cabbages (Ug. Shs)	Irish Potatoes (Ug. Shs)	Beans and maize (Ug. Shs)
1. Gross returns per resource user per season.	51,500	228,000	72,500
2. Gross returns to labour per resource user per day.	1,171	5,181	1,576
3. Net returns per resource user per season	-25,272	2,678	13,678
4. Net returns to labour per resource user per day	-574	61	297
5. Gross returns per unit land area (ha) per season.	1,040,404	4,606,060	1,464,647
6. Net returns per unit land area (ha) per season	-510,540	54,101	276,323

The net returns per unit land area (ha) per season for beans and maize is Shs. 276,323 while that for irish potatoes is Shs. 54,101 and cabbages' Shs. -510,540, in the descending order. It is manifested that cabbages' net returns per unit land area (ha) per season to the respondents is negative. Therefore growing cabbages by the respondents led to losses. As observed, the other three agricultural products income to the respondents was small compared to the land utilized and also basing on the fact that the expenses incurred were only monetary but never included ecological expenses. Therefore, compared to the expenses the respondents incurred by consuming less filtered water brought about by replacing the natural ecology of the wetlands with the agricultural crops, they were at a very big loss!

3.3 Water collection for domestic use

In the study areas, water collection is from the wells, which are constructed near the wetlands. During the study, respondents reported that, wetland reclamation had made them drink less filtered, muddy water compared to the clean waters they constantly obtained from the wells constructed near the wetlands before their reclamation. They reported that such a scenario happens when there are ceremonies like weddings being organized in a particular village and a lot of water is needed to prepare the local brew (omuramba) and the local soft drink (obushera) in large quantities. During this activity, the wells dry up due to reduced recharge and filtration capacity of reclaimed wetlands, and only muddy water would be available (Plate 3). They further reported that after drinking the water, they occasionally experienced stomach upsets and in most cases would buy a dose of medicine (metronidazole) at Uganda shillings 1,000/= (US\$ 0.6), the cost that never used to be there before the wetlands were reclaimed.



Transport across the wetlands

The respondents reported that, the presence of a lot of water in the wetland as a result of heavy rains made the drier paths across the reclaimed wetlands impassable. Here, the local people took an average of 2 hours to move along the wetlands' edge to reach a particular destination across the wetland. They said that before the wetland was reclaimed, canoes used to be a means of transport to cross the wetland and that it would take them about 20 minutes to reach the same destination.

Negative impacts to the local people as a result of wetland reclamation

Wetland drainage led to the reduction and in some cases complete disappearance of biodiversity from the study area as reflected in table 3.4.

Table 3.4 Resources no longer obtained after wetland reclamation (n=210; *multiple responses).

Resource	Number*	Percentage
Fish	97	46
Raw materials for building	95	45
Raw materials for craft	81	39
Herbs	63	30
Game	31	15

Game especially the sitatunga (*Tragelaphus spekei sclater-*) completely disappeared from the reclaimed wetlands as well as from the remaining parts of unreclaimed wetland. This is probably because of the shrinkage of the wetlands and yet the home range of sitatunga is assumed to be big.

Fish especially *Clarias* spp. is also no longer obtained by some people (46%). This is because, when wetlands are drained, the mud where this type of fish easily thrives is oxidized hence rendering the place uninhabitable.

Raw materials for building and crafts were the second (45%) and third (39%) resources respectively, no longer obtained by the respondents. In the study area, these materials have been reduced tremendously and are only still present in the small portions of the unreclaimed wetlands. People who live in the reclaimed wetlands' environs must travel for about 2½kms to have access to the raw materials in the unreclaimed wetlands.

30% of the respondents reported that medicinal herbs have been completely lost since most of them only flourish in the undisturbed wild environment. It was also reported that the population of the crested cranes (*Balearica pavonina*), have generally been tremendously reduced from the study area and particularly in the reclaimed wetlands. A few which are still present are sometimes harassed by the people who own crops in the reclaimed wetlands in a guise of protecting their crops.

Other respondents reported, the destruction of the wetlands caused unpredictable climatic and weather patterns. They said that, they were experiencing long dry spells which have made the conditions in the study area

worse off than before. This has led to the drying of soils, becoming more and more incapable of supporting the growth of few crops grown. The long dry spells were being punctuated by heavy rains, which resulted into landslides, further destroying and washing away the crops along the hill slopes. These landslides still create floods that also destroy the crops found in the reclaimed wetlands. Another respondent reported that, fog coupled with low temperatures used to persist up to around 11:00am in the study area. This enabled the peasants to work in their gardens with ease and would work up to around 6:00pm with little fatigue.

However, after wetland reclamation, the fog and the low temperatures disappear by 7:30am and the rest of the day is hot. High temperatures used to be experienced for only 5 hours. That is, from 11:00am to 4:00pm, before the wetlands were reclaimed. These days high temperatures are experienced for about 8 hours. That is, from 8:00am to 4:00pm. This has reduced the peasants' performance in their fields and also has led to drying of the soils making them difficult to till.

Increase in temperatures in the study area has also led to the flourishing of diseases especially malaria, which used to be regarded as " a foreign disease". One respondent sadly noted that, early 1970s men who used to go to sell labour in Buganda (Central Uganda, which is always warm) would be the ones to suffer from malaria after returning home. But these days, malarial attacks are in every homestead and it has claimed the lives of many people, young and old because of the destruction of wetlands. She noted that, when her children fall sick, they are left to the lords' mercy because she cannot afford the expensive medicine.

4. Discussion and conclusion

Wetlands are generally known for their functions and attributes. One of their functions is nutrient retention and filtration as reported by Dugan (1990). So, when wetlands are drained, they lose this capacity and this affects the livelihoods of people who live in the wetlands environs and they depend on water from the wells constructed near wetlands as in the study area.

Dugan (1990) also wrote that the function of the ground water recharge occurs when water moves from the wetland down into the underground aquifer, the water is usually cleaner than it began to filter down from the wetland. Once in the aquifer, it may be drawn out for human consumption. Dugan (1993) further stated that in the developing world, the rural economy and human well-being are even more closely dependent upon the wetland resources. Only rarely are national or household economies strong enough to replace goods or services once provided free by the wetlands.

The consequences of wetland loss are therefore, fundamentally more severe in developing countries. There, loss of wetland resources leads to flood damage, contaminated water, human suffering and death.

Transport across the reclaimed wetlands on drier paths was occasionally hampered and becoming impassable. In relation to this Gosselink (1993) reported that wetlands have a value to the public for flood mitigation, because they influence the regional water – flow regimes. They intercept storm runoff and store storm waters, thereby changing sharp runoff to slower discharges over longer periods of time. Dugan (1990) reported that open water habitats of wetland ecosystems carry goods and public transport, and may serve as a convenient alternative to normally more expensive forms of road transport and in some cases water ways are the only available means of transport that are very important.

The new resources obtained from the utilization of reclaimed wetlands are, mainly agricultural products. They include Irish potatoes, cabbage, sweet potatoes, maize and beans. The local people have almost abandoned the hill slopes for the reason that they (hill slopes) have increasingly become infertile, incapable of supporting most of the crops for good yields.

Dugan (1990), Finalyson and Pomeroy(1991) , Maltby (1986), Michael (1990), Omoding (1989) and Nakijoba (1996) all reported that wetlands are reclaimed and converted to different uses mainly agriculture and dairy farming. The New Vision December 10th (2002), also reported that due to soil exhaustion in Kabale, most of the crops no longer yield considerable harvests without use of fertilizers. It further reported that the local people cultivate the rest of the crops apart from maize due to lack of an alternative. That people grow them in order to survive or else they would starve to death!

In the study area, sitatunga completely disappeared probably because they are categorized as wetland limited animals (Hook *et al*, 1988).

The decrease in numbers of the Crested Cranes was brought about by the loss of the habitats where they could ably live (Kasoma and Pomeroy, 1996). Mitsch and Gosselink (1993) further stated that the loss of wetlands is a major factor in the decline in the nesting success of waterfowl. Mafabi (1989) in the same argument reported that crested Cranes have specific breeding requirements consisting of an unreclaimed wetland with little human interference. He claimed that a decrease in Crane population could in part act as an indicator of habitat change because if the birds fail to breed or fail to find suitable breeding sites due to human activities, they migrate.

The local people were experiencing unpredictable climatic patterns presumably because of wetland reclamation. There is no longer a specific season for planting crops in the study area as it used to be in the past before wetlands were drained. This has then led to poor yields creating food insecurity in the study area since the crops may be sown too early or too late. Indeed, the New Vision of December 10th (2002) reported that the food shortage in Kabale was due to prolonged drought and heavy rains and also due to soil exhaustion and use of poor seeds.

The malaria outbreaks among the population in the study area are as a result of wetland reclamation. In relation to this, the New Vision, April 25th (2003) reported that Kabale district, where the study area is located is one of the malarial epidemic prone districts in Uganda. The paper goes on to say that Malaria infection is in large numbers possibly because of being in highlands and may be because of people are less immune to the disease and to a greater extent, because of wetland reclamation. Scholars who also attribute climatic changes to the wetland destruction include; Micheal (1990) who reported that although little research has been done on atmospheric and climatic fluctuations, there are indications that part of this fluctuation includes global biogeochemical fluxes. Taylor and Mafabi (1991) said that one of the principal functions of Kabale district valley swamps is for microclimate stabilization. Finlayson and Moser (1991) also stated that, if the wetland shrinks, evapotranspiration, which effectively reduces extremes of temperatures, reduces accordingly. At the same time, a rise in mean daytime temperatures may be expected.

In conclusion, wetland reclamation brought negative impacts to the people who live in the surrounding environs whereby the people consume muddy and possibly contaminated water due to the reduction on the filtration capacity of the wetlands. The rivers that supply water to the wetlands stretch form the neighboring country of Rwanda, where possibly some small scale industries may be constructed and empty their contents into these rivers. Therefore, a detailed scientific study should be carried out to determine which types of metals if any, are present in such water. Different microbes in the water must also be determined, whether harmless or harmful so that the information may help policy makers on strategies for combating the water related diseases in the area.

5. Recommendations

The study came up with the following recommendations that may help in conservation and preservation of wetlands and hence improve on the livelihoods of people living in wetland environs.

- Sugarcane growing should be encouraged at the edges of the un-reclaimed wetland other than reclaiming the whole wetland. This is because, it was observed that, a few people who were involved in this type of farming yielded highly and were better off than those who had planted other crops like beans, peas and sorghum along the hill slopes.
One respondent reported that, he had harvested sugarcane from an area of about 0.15 ha near the swamp edge in one season and after selling the sugarcane, he bought 900 kg of sorghum using the money. He observed that, he was then better off than someone who had planted sorghum in four plots (about 7.20 ha) along the hill slopes and harvested about 600kg of sorghum (150kg from each plot) in the same season.

- The organization concerned with the introduction of fish in the area (NAADS) should avail fingerlings cheaply, if not free and also educate the farmers the best way to look after the fish and better fishing methods. Fishing materials and fish feeds should also be availed to the farmers to encourage them and others who have not yet picked interest in fish farming.

- Provision of alternatives by the government would assist in wetland conservation and hence would reduce pressure on wetlands by the increasing population. The alternatives include;
 - (i) Availing the local people fertilizers to apply on land along the hill slopes, since one of the reasons for wetland reclamation was that the land along the hill slopes had become infertile, incapable of yielding enough food to support the needs of the people.
 - (ii) Introduce other types of crops and encourage the local people to grow those crops that favourably grow well in the study area and are easy to market. For example, apples and passion fruits are believed to do very well in places like Kabale but have not yet been recognized by the local people. Also, in regard to this matter, the local people need to be educated and sensitized so that they leave their former methods of agriculture and adopt new ones which suite the changing environment. For example, they should leave planting particular species of beans and taken on the Misingiriro type of beans, which seem to do well in the area and yet the local people are still reluctant to plant such species of beans just because they are new in the area.

- Programmes should be designed to improve soil management practice in the upland. As mentioned, policy makers could lobby for subsidy on fertilizers as a short term solution to poor soil fertility. Integrated resource management at local level should be encouraged for long-term solution to sustainable utilization of wetland resources. Also growing fast growing tree species, which are multiple in purposes. The trees should be able to provide fuel wood, improve soil fertility, and provide fruits for both subsistence and commercial purposes and fodder for livestock. This programme in a long run would lead to improving the people's livelihood. Empowering the people economically is likely to reduce pressure on the wetland resources eventually.
- If the reclaimed wetland must continue being utilized for agricultural purposes, growing of beans and maize should be encouraged since these crops are likely to improve the livelihoods of the farmers, because of their high revenue yield as compared to other crops. These crops also need little input and are not easily destroyed by uncertainties and in addition, these crops maintain the soil fertility in the reclaimed wetlands.
- Cabbage growing should be discouraged completely since it brought losses to the farmers in the study area. Irish potato growing should be done on a smaller scale for only household consumption since the farmers realized very small net returns.
- One of the members from Wetlands Inspection Division said that, after the elapse of the lease period, that is, 49 years, then, no other people or groups of people will be allowed to channel or re-drain a particular wetland. However, waiting for such a period to lapse is too long a time to allow conservation of these wetlands. The government should therefore encourage edge farming and if necessary construct fishponds at the edges of wetlands. There should be zoning of the middle areas of the wetlands so that farming do not take place in these areas. This would allow a slow but sure regeneration of the reclaimed wetlands.

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