# UTILISATION AND ECONOMIC VALUATION OF THE YALA SWAMP WETLAND, KENYA

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## ABSTRACT

The Yala swamp is an extensive wetland in western Kenya, covering an area of 17'500 ha. The wetland, together with its three lakes, is an important site for biodiversity conservation. The local community has been associated with the wetland for a long time, and they obtain key resources from it. To date, however, 2300 ha of the wetland have been reclaimed for agricultural production, and there are fresh proposals for further reclamations.

The aims of this paper are to describe the patterns of utilisation of the wetland, including a preliminary economic valuation of the resources, and compare these with the costs and benefits of conversion. Surveys, interviews, and participant observation were used to obtain information. Direct economic values were calculated for fisheries, water transportation, agriculture, building materials, fuelwood, grazing, hunting, mat making, salt licks, and tourism. Indirect values include medicinal plants, vegetables, flood control, and wildlife habitats. The wetland also has existence and option values, which will be lost if the swamp is converted.

Comparing these values with the short-term gains, and the cost of conversion, and considering soil degradation and disruption of the socio-cultural situation, it is suggested that the wetland provides valuable economic resources to support the population, and should not be converted. Instead, traditional sustainable uses of the wetland should be promoted for the benefit of the local people.

## INTRODUCTION AND BACKGROUND INFORMATION

This paper is part of a wider research programme that has been initiated in the Yala swamp to study community utilisation, perception, and conservation of the wetland. The results will be used to initiate a community-based conservation programme. To achieve development, resource exploitation is necessary. The widespread lack of sustainable use of wetlands can be attributed to a lack of recognition of traditional values of these wetlands, and the desire for modernisation. Thus there is a compelling need to enhance traditional wetland uses through integrating them into modern management concepts. As rural African societies depend heavily on natural resources for their livelihood, conservation and rural development should be pursued jointly.

The Yala swamp is one of the few extensive wetlands found in western Kenya. The wetland covers an area of 17,500 ha and contains three freshwater lakes, Kanyaboli, Sare, and Namboyo. The swamp vegetation is mainly papyrus (*Cyperus papyrus*) and *Phragmites* reeds. This wetland is nationally important in that it is one of the few habitats where the threatened Sitatunga antelope (*Tragelaphus spekeii*) is found in Kenya. The associated lakes contain some critically endangered haplochromine fish species, some of which are no longer found in Lake Victoria (Kaufman and Ochumba, 1993).

Lake Kanyaboli has suffered as a consequence of land reclamation. In 1970, inflow into the lake from the Yala River, the lake's only major inlet, was stopped, by the construction of a diversion canal, 8 km long, to convey the river water directly into Lake Victoria. At present the only inlets into the lake are through River Rapudo, a small stream flowing from the east and through some broken dykes.

The wetland is important for biodiversity, but also has great socio-economic value to the local communities, for whom the wetland has long been a source of fish, vegetables, medicinal plants, building materials, and agricultural land. Since the wetland is not protected, it is vulnerable to over-exploitation. Currently there are fresh proposals supported by the local politicians to fully reclaim the wetland for agro-industrial sugar cane and rice plantations (Okondo, 1989). Its future cannot therefore be taken for granted.

The Yala swamp wetland is thus important to three different, and sometimes conflicting constituencies:

1) to the local people, who use it for agriculture, fishing, grazing, brick making, papyrus exploitation etc.
2) to development planners, for whom it represents a potential area where agro-industrial exploitation could lead to economic development
3) to conservationists and traditionalists, for whom it represents a unique area, important in its own right.

This situation raises some important issues:

- To which of the three broad uses – community-based resource management, agro-industrial development, or biodiversity conservation – should the wetland be put, in order to yield maximum benefits?

- What management practices could be adopted to ensure that the three conflicting uses of the wetland could be pursued to yield maximum economic gains to the local people?
- Is conversion of the wetland the most effective and economical use of the wetland?

While reclamation has received immense political support, evidence on the ground shows that past attempts were not well received. This was because the local people were displaced, and they were not even given access to the agricultural produce.

This study addressed these issues by pursuing the following research activities:

- elucidating the economic dependency of the local community on the swamp
- describing the patterns of utilisation of the wetland resources
- estimating the replacement value of economic activities that would no longer be possible if the wetland were converted.

Critical examination and analysis of the findings of this research will inform the basis of future activities in this wetland in collaboration with the local communities.

The study area was divided into three regions reflecting differences in socio-economic status and land uses:

- **Area 1. Usigu-Lake Sare area.** This area lies in the south-western part of the Yala swamp in the Yimbo administrative division, and includes two lakes, Namboyo (2 $km^2$) and Sare (5 $km^2$). This area borders Lake Victoria, and fishing forms a major economic activity. This area is occupied primarily by the Luo people; 200 interviews were conducted.
- **Area 2. Yala swamp complex / Lake Kanyaboli area.** This area houses the Yala Swamp reclamation field station, and several reclamation experimental farms are found here. This is the area where 2300 ha had been reclaimed. The main economic activities are subsistence farming, brick making, papyrus harvesting, and fishing in Lake Kanyaboli. This area is also occupied primarily by the Luo tribe; 150 people were interviewed.
- **Area 3. Sumba-Usonga area.** This area lies in the northern part of the swamp in the Uranga administrative division. A large expanse of the wetland is used for drought grazing. Subsistence agriculture as well as rice farming are predominant. Unlike the other two, this area is inhabited by the Luhya tribe; 150 people were interviewed.

In each of the three areas, wetland residents living within a radius of about 5 km responded to open-ended questionnaires. Information was obtained on: residents' activities in the wetland, role of these activities in wetland destruction, degree of dependence, socio-cultural values, role of economic activities and other factors in species decline, and conservation needs of the wetland. Surveys were done in the local markets to establish the prices of wetland products.

## ECONOMIC DEPENDENCE ON AND VALUATION OF THE WETLAND

The research revealed that the local community is highly dependent on the wetland's resources. These resources are either consumed directly, used as materials in production, or sold. While almost all resources are exploited at subsistence levels, some of them are also exploited commercially. Fully 84% of the respondents indicated that if access to these resources is removed, then their lives will be affected, while only 11% indicated that their lives would not. Only 24% would have alternatives, whereas 69% said that they would not have alternative economic activities (the difference from 100% in each case represents those who did not respond).

To estimate the total economic value of the wetland, we calculated the use value of the various products. In the case of commercial goods such as harvested fish, we calculated the 'willingness to pay' value by computing the net benefit of the product to the consumer and to the producer. However, in attempting to produce an economic value of the wetland, we are aware of the intricacies of trying to assign a quantitative value to wetlands (Folke *et al.* 1993). Secondly, due to the difficulty of obtaining accurate quantitative information, a quantitative evaluation was not feasible, and we opted for descriptive, qualitative valuation.

The valuation of these commodities and services for purposes of wetland management is complicated by the difficulty of computing a common denominator for the various values of wetlands against human economic systems (Mitsch and Gossenlink, 1993). Table 1 provides a summary of the main economic activities found in the Yala swamp wetland, and the computed average monthly incomes from each.

## PATTERNS OF WETLAND UTILISATION

**Fisheries:** In the satellite lakes, the main method of exploitation is by use of gill nets. As fish sizes decline, the mesh sizes used are correspondingly reduced. The consequence of this is that the sizes of the fish caught are getting smaller and smaller – a clear indication of over-exploitation. Imposition of regulations by the fisheries department and a local NGO have met with resistance. However, through the establishment of fisheries co-operatives, the fishers, through their officials, are beginning to understand the need and importance of closed seasons. Other methods of fishing include use of long lines, and, in areas bordering Lake Victoria, seine nets. Fish is the most important wetland product, and 98-100% of the respondents are dependent on the fish, either commercially or for subsistence. The average income per day per fisher is about Ksh 143 (1$=Ksh 60 at the time of research; 1$=Ksh 75 in September 1999). Other commercial activities, such as net repairing, are indirectly associated with fishing. The net repairers earn Ksh 100 per person per day.

**Hunting:** Traditional spears, trapping, and use of dogs are employed. No guns are used. Hunting is irregular, is carried out to augment food requirements, and is usually done by individuals, rather than groups. Animals hunted include sitatunga, impalas, squirrels, hedgehogs and wild pigs. Since hunting is illegal, most people were reluctant to divulge information. The actual number of people involved in hunting, and hence its economic contribution, is undoubtedly higher than the data presented here. Only 14% of the respondents around Lake Kanyaboli said they are dependent on hunting. None admitted to being involved in hunting as a commercial activity. Around Lake Sare 46% of the respondents admitted they are dependent on hunting. The average prices for some of the target animals are: sitatunga (Ksh 1000), duiker (Ksh 500), hare (Ksh 200), waterfowl (Ksh 120), Guinea fowl (Ksh 250) and harlequin quail (Ksh 20-50).

**Grazing** is carried out in the swamp, which is a free access property, and so grazing is not controlled. The wetland is particularly important for grazing during droughts. Of the people living around Lake Kanyaboli and Sare, 68% and 80% respectively depend on the wetland as a grazing ground. A special kind of clay containing minerals required by animals, and found only at particular spots, is used by cattle as a salt lick.

**Agriculture**: A number of crops are grown in the wetland, as shown in Table 2. Agriculture takes place on privately owned farms, based on traditional methods of land cultivation, with little use of fertiliser or biocides.

**Fuel** is provided by firewood or charcoal; no biogas production takes place. In the area around Lake Kanyaboli, 78% of the people are dependent on fuelwood, for either commercial or non-commercial purposes.

**Building materials:** Papyrus and grass are used as roofing materials. The papyrus is sold in bundles costing Ksh 70 each, and 30 bundles are required to build an average sized house (Ksh 2,100 for the roof of a 13x20-foot house). To build a similar house using iron sheets for roofing would cost Ksh 11,500. This then is the replacement value of papyrus as a building material. The wetland also provides clay and trees as building materials. Traditional houses in the wetland area are made of clays, sand, wood and papyrus, and 86% of the respondents are dependent on the wetland for building materials. Around Lake Kanyaboli, 12% earn direct income from selling building materials, while in the Lake Sare area this is 44%. Around Lake Kanyaboli 54% gather their own building materials, while 35% buy the building materials. Around Lake Sare, the figures are 14% and 42% respectively. The wetland further provides wood and clay that is used to construct and plaster the walls of houses. If these wetland products are no longer available, bricks would have to be used as a substitute and the cost of the bricks needed to make an average sized house would be Ksh 21,600. Bricks are made by baking the special clay from the wetland in earth furnaces. The Yala wetland is an important source of building materials.

**Mats, seats and basket making**: Papyrus reeds are cut and used to make a variety of products, either for sale or for personal use. Mats are used both as bedding materials or drying surfaces, and also have potential as roof ceiling materials. Mats of various sizes, ranging from 3x3 to 9x10 feet, are made from papyrus, and are sold for Ksh 100-350. Papyrus is also used for making chairs and roof cover.

**Water** from the wetland is used for domestic purposes such as washing, cooking, and building. The waters are also a medium of communication from one point to another. In addition, boat owners earn Ksh 3000-3300 per month for ferrying passengers.

## CONCLUSIONS AND RECOMMENDATIONS

The above survey of direct use values suggest that the Yala swamp wetland provides the local population with a variety of economic benefits, and indicates that the wetland has enough economic potential to support its population.

Proponents of reclamation have argued that conversion of the wetland would improve incomes. We examined this argument by calculating the replacement value of each activity. Replacement value is defined as the cheapest way of replacing a value obtained from the wetland by some technology (Folke *et al.* 1993). For example, the cost of a water purification plant would be the replacement value of the wetland for maintaining drinking water quality. Some of the replacement values of the wetland to be calculated are as shown in Table 3. It is likely that the replacement values of substitution activities – when possible – will be much higher than the activities currently taking place. Conversion of the wetland would bring an end to, or greatly reduce, these economic activities, and thus it is unlikely that it would be economically justified to drain the area.

We also noted that, in addition, conversion would lead to the loss of important ecological and socio-cultural values, listed in Figure 1.

Conversion of the wetland, while it may give short-term gains, will lead to long-term economic, social, and environmental problems such as inflated costs, and reduction or loss of yields after irreversible soil fertility exhaustion. Examples of this pattern are known from elsewhere, e.g., in Uganda's Kibimba Rice Scheme, yields fell from 4.9 T/ha in 1986 to 1.7 T/ha in 1988 (Denny and Turyatunga, 1992). Other problems resulting from conversion include resettlement, compensation, siltation, eutrophication, and loss of habitat for animals. Since reclamation of the wetland will likely result in numerous and severe problems, we recommend that it should not be undertaken. Instead, present economic activities should be enhanced and their wise use promoted.

Possible sustainable development programmes that should be pursued would include:

a) Papyrus industry. This could involve formation of groups to make mats, baskets, seats etc. NGOs could be consulted in order to improve the technology and the quality of the products, to help develop other innovative papyrus products, and to explore better marketing strategies.
b) Brick making. Again groups could be formed to be develop brick-making activities.
c) Aquaculture. At present, this is not practised in the wetland at all. Aquaculture could be developed by cutting wide channels into the swamp at right angles to the shore, as proposed by Denny and Turyatunga (1992) for Ugandan Lake Victoria wetlands. The soil removed from the channels would be heaped between the channels to form raised beds. These channels could be used to raise *Clarias* and *Tilapia*, while the fringe of the ponds could be used to cultivate papyrus. Furthermore, aquaculture development would reduce pressure on the satellite lakes.
d) Tourism. This is the least developed activity at present, and it holds the greatest promise. Potential tourist attractions include birdwatching, sportfishing, boating, and viewing animals. Further income could be obtained by charging scientists visiting the wetland. The wetland could be aggressively promoted as a locally controlled, people-centred tourist destination, and included in Kenya's "western circuit".
e) Energy. To reduce pressure on trees, the use of papyrus as a source of renewable energy through harvesting and briquetting, or through biogas plants, should be encouraged.

Although it is not possible to give a single robust figure that states the total economic value of the wetland, this study strongly indicates that the wetland has enough economic values to sustain the population, if resources are used sustainably. In addition, inclusion of value-added data on commercial use value would further increase the wetland's value. The total value of the wetland is even higher if we take into account the non-use values illustrated in Figure 1. To get a complete picture of the total value of an economic benefit, such as fishing or agriculture, one must look at the whole chain from harvest to end-market. Taking these and the entire range of values of the Yala wetland into account, it is recommended that conservation and wise use, rather than conversion of the wetland should be pursued.

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**Table 1.** **Patterns of exploitation of the Yala Swamp Wetland**

| Activity | % people involved | Mean monthly income (Ksh) (Commercial) | Subsistence |
|---|---|---|---|
| Grazing[1] | 49.3 | 300 | ✔ |
| Hunting | 11.2 | 150 | ✔ |
| Fishing | 80.6 | 5015 | ✔ |
| Tourism | - | - | - |
| Fuel wood collection | 66.15 | 984 | ✔ |
| Papyrus | 21.0 | 1000 | ✔ |
| Exploitation[2] | | | |
| Agriculture[3] | 89.53 | 1263 | ✔ |
| Salt lick | 35.0 | - | ✔ |
| Water for domestic use | 97.0 | - | ✔ |
| Transport | 70.0 | 3000 | ✔ |
| Brick making | 5.58 | 2000 | ✔ |
| Building materials (papyrus) | 28.00 | 2100 | ✔ |

1- Sale of milk only (meat not included)
2- Chair, mat making
3- Mean for all crops

**Table 2.** **Income from agricultural crops grown in the Yala Swamp Wetland**.

| Crop | % people involved | | Income (Ksh/month) |
|---|---|---|---|
| | Commercial | Subsistence | (commercial) |
| Sorghum | 1.6 | 36.0 | 210 |
| Cassava | 1.3 | 47.0 | 290 |
| Maize | 5.8 | 52.0 | 552 |
| Peas | - | 5.5 | - |
| Yams | 2.3 | 9.1 | 55 |
| Beans | 1.3 | 21.7 | 148 |
| Tomatoes | 14.0 | 10.0 | 1466 |
| Onions | 1.9 | 1.6 | 196 |
| Cotton | 12.0 | - | 5000 |
| Kales | 15.8 | 42.4 | 2197 |
| Sweet potatoes | 2.6 | 28.8 | 300 |
| Rice (only in area 3) | 10.6 | 2.7 | 7000 |
| Fruits (oranges, pawpaws, bananas, mangoes) | 1.6 | 10.4 | 1500 |
| Others (sugarcane, sesame, groundnuts) | - | 5.0 | - |

**Table 3. Replacement values of some Yala Swamp Wetland Resources.**

| Economic activity | Replacement Technology | Replacement value |
|---|---|---|
| Grazing | Replacement not possible | None |
| Hunting | Cost of meat bought | None |
| Fishing | Replacement not possible | Cost of buying fish from the wetland |
| Tourism | Replacement not possible | None |
| Fuel wood collection | Installation of energy sources | Cost of installation, cost of fossil fuel |
| Agriculture | Reclamation | Cost of reclamation, cost of compensation |
| Brick making | Block making factory and other building materials | Cost of blocks purchased from far |
| Papyrus exploitation | Replacement not possible | Value of other building materials e.g. iron sheets |
| Salt lick | Replacement not possible | Coast of commercially produced salt licks |
| Water for domestic use | Water treatment plant<br>Water quality inspection | Coast of installing the plants, purchase of chemicals, water transport, maintenance coasts |
| Transports | Building bridges and roads round the wetland | Coast of bridges and roads; maintenance costs |

Some calculated replacement values:

1. Hunting: Ksh 50 per family per day
2. Fuelwood collection: Ksh 300 per month per family on charcoal. Ksh. 1000 per month per family on gas.
3. Brick making: Ksh 30 per block. Ksh 30,000 for a whole house
4. Papyrus exploitation: Ksh 11,550 to build a whole house.

**Figure 1.**
**Total Economic Value of Yala Swamp Wetland.**