CONTRIBUTION OF WETLANDS TO HOUSEHOLD INCOME AND FOOD SECURITY IN THE NYUMBA YA MUNGU WETLAND SYSTEM, NORTHERN TANZANIA

By

Halima, K. Hassan[1] and Munishi, KT Pantaleo[2]

[1]Open University of Tanzania, Faculty of Arts and Social Sciences
Department of Tourism and Hospitality,
PO Box 23409, Dar es Salaam, Tanzania
[2] Sokoine University of Agriculture, Faculty of Forestry and Nature Conservation,
Department of Forest Biology
PO Box 3010, Morogoro, Tanzania

Corresponding Author: kilunguh@yahoo.com

ABSTRACT

Wetlands ecosystems are diverse and have diverse ecological, environmental, socio-economic and cultural values that have not been fully quantified in Tanzania. This study was conducted to quantify the contribution of wetlands to socio-economic well being of the local communities adjacent to the 'Nyumba ya Mungu' wetland system in Kilimanjaro region Tanzania. Specifically the study assessed the contribution of wetland system to household income and food security and problems associated with the utilization of the wetland. Both primary and secondary data were used. Primary data were collected by use of structured questionnaire administered to different households whose income and food depend mainly on this wetland system. Secondary data were obtained from published and unpublished reports from various sources. Participant observation was used to supplement information from questionnaires. Data collected was analyzed using Statistical Package for Social Science (SPSS). Results indicate that about 92% and 95% of the households derive their income and food from the wetland resources respectively. Main products of socio-economic values at the 'Nyumba ya Mungu' wetlands are fish (71%), water (19%), roofing materials (6%) and vegetables (4%). Activities related to the presence of the wetland are fishing (52%), fish gutting (10%), fish business (29%), boat hiring (3%) and farming (6%). On average about 94% of the local community around 'Nyumba ya Mungu' wetland depend entirely on the dam for their income and food. Absence or degradation of the wetland may imply high costs to the society/government in providing the products and/or services that would be foregone. Environmental costs associated with alternative options that would be practiced by the community in sourcing out the missing products and services would also be high. With increasing population around the wetlands there is a need to design alternative income generating activities to reduce overexploitation and degradation of the wetland. Integrated approach in designing wise use/wetland friendly activities can be useful in sustainable management of the wetlands.

Key words: Wetlands, household, income, food security, fishing.

INTRODUCTION

Wetlands are ecosystems that arises when inundation by water produces soil dominated by anaerobic process and forces the biota,

particularly rooted plants to exhibit adaptation to tolerate flooding. Wetlands can either occur naturally or artificially constructed in case of water reservoirs. Wetlands form a complex watery ecosystem supplying food, habitat and cover to many living organisms.

Wetlands have been and are the basis of community economic activities. People who live within or around wetlands have been involved in various economic activities and their settlement patterns have been influenced by the wetlands (Kamukala and Crafter, 1993; Doody and Mesaki 2003). Wetlands have diverse ecological, environmental socio-economic and cultural values. Some of these include harvesting of wetland related products *e.g.* fish, forest products, medicinal plants, honey and wildlife, flood control, carbon sequestration, water storage and supply, grazing in dry season, recreation, and agricultural production. The economy of Tanzania also depends on wetland functions and products *e.g.* water for irrigation, fishing industry and food for human use. Many regional economies depend upon wetlands for food and income. Research has provided with empirical evidence showing that wetlands are among the most productive ecosystem in Tanzania (Loma, 1979; ODA, 1987; Bwathondi and Ngoile, 1990; Mwalyosi, 1990; Semesi, 1990).

Wetlands make the greatest habitat for water loving organisms *e.g.* waterfowls, deer and other game species that visit wetlands. Wetland mammals such as beaver, mink and muskrat are valued for their fur. Muskrat is becoming popular gourmet dish. Cattail shoots, wild rice and many other plants that grow in wetlands are edible. Wetlands are not well known as important natural resource to many societies in Tanzania, despite their many values. Wetlands therefore face many threats including but not limited to conversion to agricultural use and over harvesting of its products.

The socio-economic and food security aspects of wetlands are numerous though not well documented in Tanzania. For the existing information, very little has focused on household income and food security in relation to wetland conservation. The information is even more scanty for created wetlands whose objectives of construction are different from those related to direct socio-economic well being of the society (Kamukala and Crafter, 1993; Keddy, 2000; Munishi, 2002).

Farming activities are among the major economic pursuits around wetlands with the cultivation of crops such as paddy, maize and various types of vegetables and fruits. The practice of growing rice in swampy areas is increasing in many African countries and the world at large. Between 1974-75, Tanzania produced 160,000 tones of paddy from its wetlands (Jarret, 1979). Seasonal floods allows the planting of a range of crops. A substantial traditional subsistence farming is practiced in wetlands and with the introduction of money economy peasants have also been producing for sale. Paddy production through small holders help the country to meet its food production targets. In swampy areas in the Malagarasi and Kagera basins peasants normally cultivate at the edge of the water producing various crops such as paddy and maize (Kamukala and Crafter, 1993).

Fishing is another major socio-economic activity in wetland systems. Jackson (1975), estimates that 51,000 sq. km of freshwater and 10,000 family fishponds produce 83 percent of Tanzanian total fish catches by weight, and 60 percent by value. The economic implications of changes in the fishing industry however may have diverse effects on the socio-economic well being of the society. For example demand for fishmeal, made from “dagaa” for use in stock feed industries may affect the economics of the fishery industry by increasing the price of “dagaa” beyond the scope of the poor. People's nutrition status is

often threatened by commercialization of the fish industry, as fishermen often sell the whole catch retaining with nothing for their home consumption. Price rise also may make the poor unable to afford to eat fish. The income from fish can be quit substantial to farmers (Ramsar Convention Beaural, 1971). At 'Nyumba ya Mungu' dam in Kilimanjaro, many women are involved in fishing business and may own fishing gears, transport facilities and fish business.

Local people have used some wetland trees, leaves and flowers as traditional medicine. Native Americans used inner bark of *button bush* to relieve tooth ache, *Joe Pye weed* to cure typhus fever, *horsetail* plant to cure kidney and bladder ailments. In India *Marsh Marigold* have been used to make a popular cough syrup. *Wild leek* have been used to relief ear aches, *service berry* was used on children with worms and *purple lythrum* have been used as an astringent to stop bleeding in some parts of the world (*www.seaworld.org* - last visited May, 2004).

Wetlands are green throughout the year and attract various birds and mammals. They have their own unique and balanced environments. Such areas are attractive to both local and foreign visitors, and have become tourist centers. When these environments are developed and conserved, they become a source of income, recreational and are a pride to the nation (Omari, 1989).

Many of the species that have made Tanzania renown for its wildlife are migratory and have well defined dry and rainy season habits, which include wetlands. Many wetlands are rich in wildlife, which provide important recreational and food resources and commercial products including trophies, hides and skins. Tourism is a major activity in wetlands where there is a high concentration of wildlife (Kamukala and Crafter, 1993). The wetlands of Lake Manyara National Park in northern Tanzania for example are among the highest tourist attraction in Tanzania (Munishi and Halima – personal observations).

Food security is a fundamental problem facing the world today. Food security has been defined as "economic and physical access to food by all people at all time" (FAO, 1988). Wetlands provide good sources of food in various ways (Kamukala and Crafter, 1993).

Wetlands ecosystems in Tanzania are diverse and have diverse ecological, environmental, socio-economic and cultural values that have not been fully quantified. This study was conducted to quantify the contribution of wetlands to socio-economic well being of the local communities adjacent to the 'Nyumba ya Mungu' wetland system in Kilimanjaro region Tanzania, specifically assessing the contribution of wetland system to household income and food security and problems associated with the utilization of the wetland.

Materials and Methods

Study site

'Nyumba ya Mungu' wetland is shared by Mwanga and Simanjiro Districts and is approximately 19 km south wet of Mwanga town. It lies between 03'40'S-37'20'E at an altitude of 670 m. The wetland is an integral party of Ruvu-Pangni river system that drain from mount Kilimanjaro and Meru, entering the sea at Pangani river in Tanga region. Am is bordered by Moshi rural district in the north, Mwanga district in the east and south and Simanjiro district in the west (ICUN,1999; Mwanga District Council, 2002). The dam which forms a big portion of the wetland system was constructed in 1960 for hydroelectric power (HEP) generation. The reservoir covers an approximate area 56 km^2 being about 15.5 km long measured from north-south (through the middle of the reservoir) and between 2 - 4.5 km wide east-west. The surrounding habitat is dry *Acacia-Commiphora* woodland that slope gently into

the dam. The shoreline is utilized by fishermen who have established about 15 permanent settlement (villages) around the dam. From the dam and its surrounding swampy areas the vegetation grades slowly into extensive woodland of yellow bark Acacia, *Acacia xanthophloea* (Neil, *et al.,* 2002).

Data collection

Data were collected from primary and secondary sources. Primary data were collected using questionnaires (open and closed ended) and participant observations. Questionnaires were administered to randomly selected households. Two villages (13%) were randomly selected for this survey; Handeni and Lang'ata both from Mwanga District. With the help of the village government, the village register (a list of households in the village) was used as a sampling frame, and twenty households (25%) selected for interviews from each village. The questionnaires sought to give information on the products obtainable from the wetland, the uses of these products by the local communities, income generation by different wetland products and proportion of household food generated from wetland products. Secondary data were collected from published and unpublished documents from the Regional and District Natural Resource Offices and Water Department.

Data analysis

The quantitative data collected were subjected to descriptive statistics using SPSS (Statistical Package for Social Sciences). Qualitative data were analyzed through content analysis and the information presented in tabular form.

Results and Discussion

Respondents characteristics in relation to socio-economic values of wetland.

Table 1 shows the characteristics of the different respondents interviewed. Majority were males, married, over 40 years of age, migrants, had primary level education and practiced fishing as the main socio-economic activity. Other socio-economic activities than fishing and associated activities are minimal thus majority obtain their income through fishing.

Table 1 Respondents characteristics in the 'Nyumba ya Mungu' Dam Wetlands northern Tanzania

Respondents characteristics	(%) Respondents
Gender	
Male	61
Female	39
Age	
21-30	16
31 - 40	32
>41	52
Marital status	
Married	84
Widowed	13
Single	3
Residential place	
Residence	26
Non-residence	74

Education level	
Primary	97
Secondary	3
Occupations	
Fishing	52
Fish gutting	10
Fish business	29
Boat hiring	3
Fish & farming	6

Potential wetlands products of socio-economic value

The major products from the wetland were fish, water, roofing material and vegetables (Table2). Wetland products are used either directly and/or indirectly as a source of food and construction. The local communities afford to build less expensive houses using products from the wetland such as grass (*Cyperus species*) as roofing or building materials. About 75% of the local communities around the dam have their houses built of aquatic grasses.

Table 2 Wetland products of socio-economic values in the 'Nyumba ya Mungu' Dam Wetlands northern Tanzania.

Products	Percent
Fish	71
Water	19
Roofing materials	6
Vegetables	4

Wetlands contribution to household income

Table 3 shows the general household income distribution accruing from the use of the wetland system at Nyumba ya Mungu dam. It is observed that majority of the population get an average of 21,000 TAS/week from wetland related activities while about 39% get an average income of over 21,000 TAS/week. On average this income is almost twice the minimum wage earning in Tanzania. Under normal income earning for majority of rural populations in Tanzania, this is a substantial income which has been made possible by the presence of the wetland system.

Table 3 General household income at 'Nyumba ya Mungu' dam wetlands northern Tanzania.

Income range (TAS)/week	Average income (TAS)/week	% Respondents
2,000-40,000	21,000	61
41,000-80,000	60,500	26
81,000-160,000	120,000	3
>160,000	160,000	10

This variation of income depends on one's occupation. An activity which has the most lucrative income is boat hiring and is

performed by minority of the population who have the knowledge of boat construction or have enough to capital invest in boat

procurement. Fishing is the most universal activity among the population with multiplier effect through generation of other economic activities such as fish gutting, fish smoking, fish frying and fish business. Fish gutters most

of whom are women earn 2100-3000 TAS/week. Though this seems little contribution to house hold income, it is an important subsidy to family income (Table 4). Other researchers estimate that 11,000 artisanal fishermen are engaged in fishing industry in Tanzania (DANIDA, 1989). The fishery potential in large lakes is not known, while fish biomas in Tanzania coastal water is about 100,000-200,000 tones. Swamps and reservoir have been said to play a very important role in total fish supply because of their wide distribution throughout the country (Kamukala, 1990). Other studies have shown that income from fish can be quite substantial to farmers making up to US$ 40 per person a day which is essentially a net- profit bearing in mind that very little or non-expenses are spent by farmers in culturing the fish (Ramsar Convention Bureau, 1971).

Table 4 Different occupations and their earnings potential at 'Nyumba ya Mungu' Dam Wetlands northern Tanzania.

Occupation	Income (TAS)/Week	% Respondents
Fishing	2,000-50,000	69
	51,000-80,000	19
	> 80,000	12
Fish business	2,000-50,000	78
	51,000-80,000	22
Fish gutting	2,100-3,000	100
Boat hiring	>1,550,000	100
Fishing & farming	40,000-50,000	100

Note: US$ 1 = Tshs. 1080

Wetlands contribution to household food security

Over 90% of the population use fish directly as source of food and protein while about 87% of the population spend over 25% of their income from fishing and fishing related activities to buy other food staffs. This suggest that majority of the people surrounding Nyumba ya Mungu wetland systems are highly dependent on that wetland as a source of food directly or indirectly (Table 5). The current per capita consumption of fish in Tanzania has been estimated at 13.5 kg, which was estimated to rise to 20 kg by the year 2000 (Bwathond, 1990).

Table 5 Direct and indirect uses of wetland products as a source of food in the 'Nyumba ya Mungu' Dam Northern Tanzania.

Average value (TAS/week)	% Respondents
Direct use	
> 3,000	90
> 8,000	3
> 10,000	7
Indirect use	
> 1,500	3
> 8,500	87
> 15,000	10

Utilization Problems of 'Nyumba ya Mungu' Dam Wetland System

Major problems associated with utilizing the Nyumba ya Mungu wetland are water borne diseases and wildlife damage (Table 6). About 39% of the population suffer from water borne diseases frequently, e.g. bilharzia and malaria. The wildlife problem seem to have been contained by respective authorities (District Wildlife Department). The health problems are also controllable thus will not be as critical if preventive measures are practiced and the problems cannot in any way override the benefits obtainable from the wetland by the society.

Table 6 Problems associated with the 'Nyumba ya Mungu' Dam wetlands in northern Tanzania.

Problems	% Respondents
Water borne diseases	39
Wild animals	16
No problem	45

Problems that would be experienced in the absence of the dam and proposed alternative options for the supply of the missing products

The environmental/ecological and socio-economic consequences that would be suffered in the absence of the dam are diverse. About 64% and 36% of the population agreed that they would suffer food and water scarcity respectively in the absence of the dam. This is because the almost the entire community depends on the wetland for their livelihood and the alternative options for food acquisition would be quite detrimental to the environment. For example majority of the population opted for sell of fire wood and/or charcoal while almost an equal proportion opted for migrating to other water sources for fishing (Table 7). All these options would likely be unsound environmentally as they would lead to vast deforestation of different areas and possible overpopulation that may lead into vast land degradation.

Table 7 Problems and alternative options in the absence of the Nyumba ya Mungu Wetland.

Problems & Alternative Options	% Respondents
Problems	
Food scarcity	64
Water scarcity	36
Alternative Options	
Selling fire wood and/or charcoal	48
Moving to other water source for fishing	32
Agriculture and other business	20

In the absence of the wetland system there would be an associated cost to the government and or community in supplying the products that would be missed (Table 8). The amount of money that an individual and/or government were to incur if this wetland was not socially and economically productive as an opportunity cost would be between TAS 6.7 – 44 mill to provide over 5250 people with water, construction material, energy and environmental conservation.

Table 8 Costs which the community and/or government were to incur in the absence of the wetland

Products	Number of people	Unit Cost (TAS)	Amount/year (mill TAS)
Water	> 5250	50,000	6.7
Firewood/Charcoal	> 5250	300,000	17.0
Roofing materials	> 5250	500,000	44.0

Note: US$ 1 = Tshs 1080

Conclusion and Recommendations

Over 90% of local communities around 'Nyumba ya Mungu' wetland depend entirely on the dam for their survival in terms of income and food security. Wetland related activities especially fishing have a multiplier effect with regard to generating other income providing activities with implications on household income and food security locally and in other parts of the country. The absence or degradation of the wetland would imply high costs to the society/government in providing the products and/or services that would not be available. Further, there would be high environmental costs associated with alternative options that would be practiced by the community in sourcing out the missing products and services. Like any other wetland, the 'Nyumba ya Mungu' dam suffers problems related to over exploitation of resources especially fishing and health problems such as diseases associated with the wetlands. With the increasing population around the dam there is a need for designing other income generating activities to reduce over-exploitation and degradation of the wetland. Environmental extension and education is essential to serve this wetland resources. Integrated approaches to management would be useful. More detailed research on the value of this wetland both ecological and socio-economic significance and viable conservation approaches are necessary.

Acknowledgments

We would like to thank the representatives of Mwanga District Council for the assistance they provided during field data collection. We greatly appreciate financial support from Sokoine University of Agriculture (SUA) without which this study would not have been possible

References

Bwathondi, P.O.G. and M.A.K. Ngoile.(1990). Environmental Aspects of the Utilization of Aquatic Resources. Paper Presented at a Workshop on the National Conservation Strategy. Dodoma, Tanzania 12-17, November, 1990. 98*pp*

Chabwela, H. (1991). Tanzanian Southern Africa Wetland Program. Draft Report. IUCN, Harare, Zimbabwe 116 *pp*

Chris, H. (2002). Sustainable Fishery Development at " Nyumba Ya Mungu" Dam. Mwanga District, Kilimanjaro 98 *pp*

DANIDA, (1989). Environmental Profile. Tanzania. DANIDA, Copenhagen, Denmark. 71*pp*

Doody K. and Mesaki, S. 2003. Rufiji-Mafia-Kilwa Ransar Site. Feasibility Study . Report for the Wetlands Unit, Wildlife Division, Ministry of Natural Resources and Tourism. Dar es Salaam Tanzania 61 pp.

Kamukala, GL and Crafter, SA. 1993. (Eds.). Wetlands of Tanzania. Proceedings of a Seminar on The Wetlands of Tanzania. Morogoro, Tanzania, 27 - 29, Nov. 1991. 170*pp*

Keddy, P. (1999) Wetland Restoration. The Potential for Assembly Rule in the Conservation of Wetlands. Vol. 19 (4). 716 - 732

Leader Willians, N. Kayera, J.A. and Overtone, G.L. (1996). (Eds.). Tourist Hunting in Tanzania. *Proceeding of a Workshop on Planning and Assessment for Wildlife Management*. IUCN Gland Switzerland and Cambridge, UK *138 pp*

Loma, A.J. (1979). Crop Water Requirements and Beneficial Flood for the Rufiji Flood Plain Agriculture. *Unpublished Report*, Institute of Resource Assessment (IRA), University of Dar Es Salaam.68pp

Munishi, PKT. (2002). *Lecture Notes*. Wetland Conservation. Sokoine University of Agriculture 40 pp

Mwalyosi, R.B.B. (1990). Resource Potentials of Rufiji Basin Tanzania, Ambio. 19(1):16 – 20

Neil, E, Baker (2002), Important Bird Areas of Tanzania. Wildlife Conservation Society of Tanzania (WCST), Tanzania. 122 – 123

NEMC/WWF/IUCN.(1990). Development of a Wetland Conservation and Management Program for Tanzania. IUCN, Switzerland.113*pp*

Omari, C.K (1990). Traditional African Land Ethics. Pages 167-175. *in* J.R Engel and J.G. Engel (Eds.). *Ethics of Environment and Development: Global Challenge and International Response*. Belhaven Press. London

Omari, C.K. (1993). Socio-Economic Values of Wetlands, *in* GL Kamukala and S.A. Crafter (Eds.) *Wetlands of Tanzania*, Morogoro, Tanzania. 95:101

Overseas Development Assistance (1987). Profile of Agriculture Potential in Tanzania Land Resource Development Center, (LRDC), Oversees Development

Assistance, (ODA), Surbiton, UK. Unpublished Report. 66pp

Ramsar Convention Bureau (1971). Ramsar Center, Rue Mauverney 28, CH 1196, Gland, Switzerland

Semesi, A. (1989). Conserving Mangrove Forests of East Africa. The Case of the Rufiji Delta Mangrove. *Paper Presented to the Workshop on Marine Science in East Africa*. 14-16 November, Dar es Salaam, Tanzania. www.seaworld.org - last visited May, 2004