

DECLARATION

cc

THE IMPLICATION OF HUMAN PERCEPTION ON THE
CONSERVATION OF SIRONGA AND KIANGINDA WETLANDS IN
KENYA. //

BY
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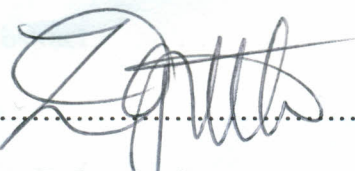
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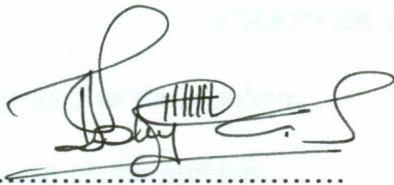
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ABSTRACT

This study examined the implication of human perception on the conservation of wetlands using Sironga and Kianginda wetlands in Kenya. Both primary and secondary data were used. Questionnaires focusing on perceptions of local people on wetlands, farmer activities and institutional roles on wetlands were used to collect primary data, while secondary data was obtained from various documents in government Ministries whose activities affected wetland areas. These sources were supplemented with reviews of both published and unpublished literature.

The study established that although wetlands provided ecological services and functions including habitat for different biota, 69% of the local people at Sironga and 79% at Kianginda perceived them mainly as frontiers for economic gains. This scenario poses a threat to the existence of wetlands. The study further established that apart from economic, socio-cultural and ecological perceptions also each exert some pressure on wetlands.

This study observed that, external actors mainly various Government Ministries had promoted unsustainable use of wetlands. Sironga was most hit because of early influence by Lake Basin Development Authority, its topography and good infrastructure. Establishment of development projects and pressure on land culminated in the distortion of traditional land uses leading to degradation of wetlands. Although the projects were supplementary sources of livelihood, little consideration was given to associated environmental impacts.

It was further established that recent (i.e late 1970s) activities have led to the distortion of sustainable use of wetlands as economic perception has taken the lead. Therefore the ecological importance of wetlands has little weight to individuals whose main interest is to draw direct benefit from the ecosystem. An average of 74% of the respondents perceived wetlands as an economic resource and as a source of income generation particularly through brick making industry. This perception is partly as a result of lack of awareness of the impact of these practices on the environment. The economic activities have led to wetland loss and degradation.

The people have little knowledge of the ecological functions of wetlands which can lead to wetland conservation. The socio-cultural perception on the other hand has been overtaken by modernisation and technology.

In conclusion, wetlands in Nyamira district stand to be degraded and lost due to predominantly economic perception among the people. There is need therefore to sensitize farmers on the need to conserve them for non-economic gains.

DEDICATION

This work is in memory of my mother, Esther Nyambeki Masese, who passed away in September 1994 in the course of this study. Her love, care and understanding inspired me throughout my life in school and her words of encouragement kept me strong, her wisdom is my treasure. To my late sister, Peris Kwamboka Keraro, whose love and understanding we all miss in the family. May God rest their souls in eternal peace. AMEN.

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LIST OF ABBREVIATIONS

Abbreviations:

ASALS	: Arid and Semi-arid Lands.
DIU	: District Irrigation Unit.
IUCN	: The World Conservation Strategy (formerly the International Union for the Conservation of Nature and Natural Resources).
KENGO	: Kenya Energy and Environment Organizations.
KVDP	: Kisii Valley Development Programme.
KWS	: Kenya Wildlife Services.
KWWG	: Kenya Wetland Working Group.
LBDA	: Lake Basin Development Authority.
MAL&M	: Ministry of Agriculture ,Livestock and Marketing.
MENR	: Ministry of Environment and Natural Resources.
UNEP	: United Nations Environment Programme.
UNESCO	: United Nations Education, Scientific and Cultural Organization.
WWF	: World Wide Fund for Nature.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem.

Wetlands account for about 6% of the global land area and are among the most threatened ecosystems. Turner (1990) notes that the physical extent and quality of wetlands has reduced. This change is associated with different human activities based on the different perceptions that people have on wetland resources and the recent realization that these ecosystems are valuable to many adjacent dwellers.

Wetlands once regarded as wastelands, have been converted into productive land uses such as crop production, pastureland and industrial development through draining. Thus, economic perception coupled with population explosion since the 1950s has accelerated the loss of wetlands (UNEP, 1992_a). In Africa, disturbance of wetlands was encouraged by colonial governments through, for instance, cultivation of cash crops such as rice. Although the projects associated with these activities were somewhat a success, the trade-off effects have been costly. There has been habitat loss in and degradation of water quality of water downstream (Finlayson and Moser, 1991). This situation calls for the conservation of the remaining wetlands.

Wetlands offer numerous services and functions such as hydrologic, micro-climatic, nutrient dynamics and provision of habitats for different biota, and livelihood products, respectively. They, for example, control floods by regulating river discharge, reducing the velocity of run-off and increasing infiltration which results in the rise of the water table (Balek, 1983; Williams, 1991). The preservation of 3,800 hectares of mainstream wetlands along the

Charles river of Massachussets in the United States, for instance, provides natural valley storage of flood waters (Williams, 1991). Wetlands facilitate sedimentation through reduced velocity low gradient and increased channel width, and by wetland vegetation which traps the silt. Other than silt, nutrients are also trapped, making wetlands one of the world's most productive ecosystems (Ochumba and Kabaara, 1989; Krhoda, 1992).

Wetlands also trap water and filter out pollutants, hence, improving water quality by acting as natural filters for a variety of biocides and agricultural pollutants from the catchment (Mavuti and Juma, 1989). In Uganda, the national sewage and water corporation supports conservation of papyrus swamps and other wetlands in the Kampala environs because of their role in absorbing sewage and in purifying water supplies (IUCN, 1992; Krhoda, 1992). Once sewage is absorbed, the non-biodegradable metals sink to the bottom of a wetland and are buried under sediment accumulation as the swamp decays into bog (Mavuti, 1992).

Despite their numerous functions and services, wetlands are threatened by human activities that are largely influenced by the peoples' perception of wetland resources. Different people perceive wetlands as either economic, ecological or socio-cultural resource leading to activities such as drainage for agriculture, settlement, industrial development and tourism (Balek, 1983; Muthuri, 1987). As observed by Kareri (1992), utilization of wetlands vary with peoples' perception. Okondo (1989), describes the Yala swamp as being 'useless' in its natural state but useful if exploited "economically". In some cases economic perception of wetlands has led to their loss. In Kenya, wetland loss has been widely observed: about 2,300 hectares of Yala

swamp, for example, have already been cleared for agriculture (Muthuri, 1985). In 1982 seventy families were settled in Lelmolok swamp (Michiemo and Mugwanja, 1987). Wetland areas in Nyamira district have not been an exception. This study examined the implications of human perception on Sironga and Kianginda wetlands in Nyamira District.

In the study area, perception of wetland resource in the past was more of ecological. Residents of Nyamira, for example, cultivated only the upper slopes of the ridges while the valley bottoms were reserved for collection of clay, thatching grass and grazing. Legislation of wetlands as trustlands also prohibited their use for cultivation, making them excellent buffer basins for the various rivers in the area. However, since the 1980s perception on wetlands has changed to economic as most wetlands have been invaded for crop production, brick making, agroforestry, livestock grazing, and fuelwood collection (Nyamwaya and Were, 1986). All these activities are posing a threat to the existence of wetlands yet they are sources of domestic water besides acting as buffer zones. Thus, the residents have either ignored or are not aware of the non-economic roles of wetlands.

1.2: **Statement of the Problem**

For the last three decades there has been increasing utilization of wetlands in different parts of the country, particularly in the study area. The utilization could largely be a consequence of human perception which has resulted into wetland loss. In Nyamira District, for example, most wetland areas have been converted to various economic uses such as crop cultivation, agroforestry, livestock and brick making. These activities can be carried out in other

areas depending on the perception of this ecosystem. The extent to which perception influence the conservation of wetlands is not fully understood.

Although there are different studies (e.g Muthuri, 1985; Otieno 1993; Ogutu and Khayesi, 1994) on wetland resources, little attention has been given to human perception. Previous studies on wetlands have concentrated on wetlands as habitats for plants and animals particularly waterfowl (Gichuki and Gichuki, 1992) and on their productivity (Muthuri, 1985; Cunningham, 1994). Thus, this study investigated the extent to which human perception influences wetland conservation among the Abagusii of Nyamira District, Kenya.

1.3: **Research questions.**

In trying to establish how perception influences wetland conservation, this study attempted to answer the following questions:

- a) What are peoples' perceptions of wetlands?
- b) Which activities carried out on wetlands arise from human perception ? them?
- c) What is government policy on wetland resources ?

1.4 **Objectives of the study.**

The study had the following objectives:

- a) To assess human perception of wetlands, among the residents within and in adjacent areas.
- b) To examine activities arising from human perception of wetlands and their impact on sustainable management of wetlands.
- c) To outline government policies on the conservation of wetlands.

1.5: Research Premises.

This study was guided by the following premises:

- a) That wetland conservation is largely dependent on human perception.
- b) That on-going human activities are a result of different perceptions of wetlands.
- c) That wetlands provide adjacent households with important services and goods, and that these households have instituted various conservation measures.
- d) That government policies on wetland conservation are sectoral and conflicting.

1.6: Justification of the study.

Previous studies on wetlands in Kenya have been more biological and gave little attention to social dimensions of the people who benefit or suffer from the presence of wetlands (Njuguna, 1982). Therefore, there is dearth need of knowledge on how best land users can be incorporated into into a sustainable wetland management. This situation jeopardizes increasing emphasis on alternative approaches of resource management. This is true of community participation in resource conservation (Kiss, 1991). This study therefore was to provide knowledge on human perception and its impact on wetland conservation.

The wetland areas of Kisii highlands were selected for this study because they are among the most important catchment areas in Kenya (Ojany and Ogendo, 1982). Rivers such as Kuja, Sondu and Awach Kasipul originate from these highlands and drain into Lake Victoria. Any human activities on wetlands in this catchment are therefore likely to affect water in the lake basin. If the wetlands are drained, for example, the water table will fall, reducing the amount

of water. This will affect the communities downstream that rely on these rivers for water for domestic, municipal, agricultural and ecological uses.

Two wetlands were considered so as to establish whether or not there was variation in the way adjacent communities impact on wetlands. Sironga wetland has been exploited since 1979, by various actors from outside Nyamira district Kenya. The actors include Kisii Valley Development Programme (KVDP), Lake Basin Development Authority (LBDA) and government Ministries (e.g MAL&M, 1995). The various actors could have influenced the local people's perception. Kianginda wetland, on the other hand, has had little or no interference from external influence. This wetland was therefore used to put Sironga into context with a view to understanding the influence of perception among the various actors on wetland conservation.

Finally, it was necessary to find out the role of policies in existence on conservation of wetlands. It was important, for instance, to establish if the policies had a clear-cut structure or were conflicting. This was necessary, so as to recommend necessary wetland policy changes while taking into account peoples' needs.

1.7: **Significance of the Study.**

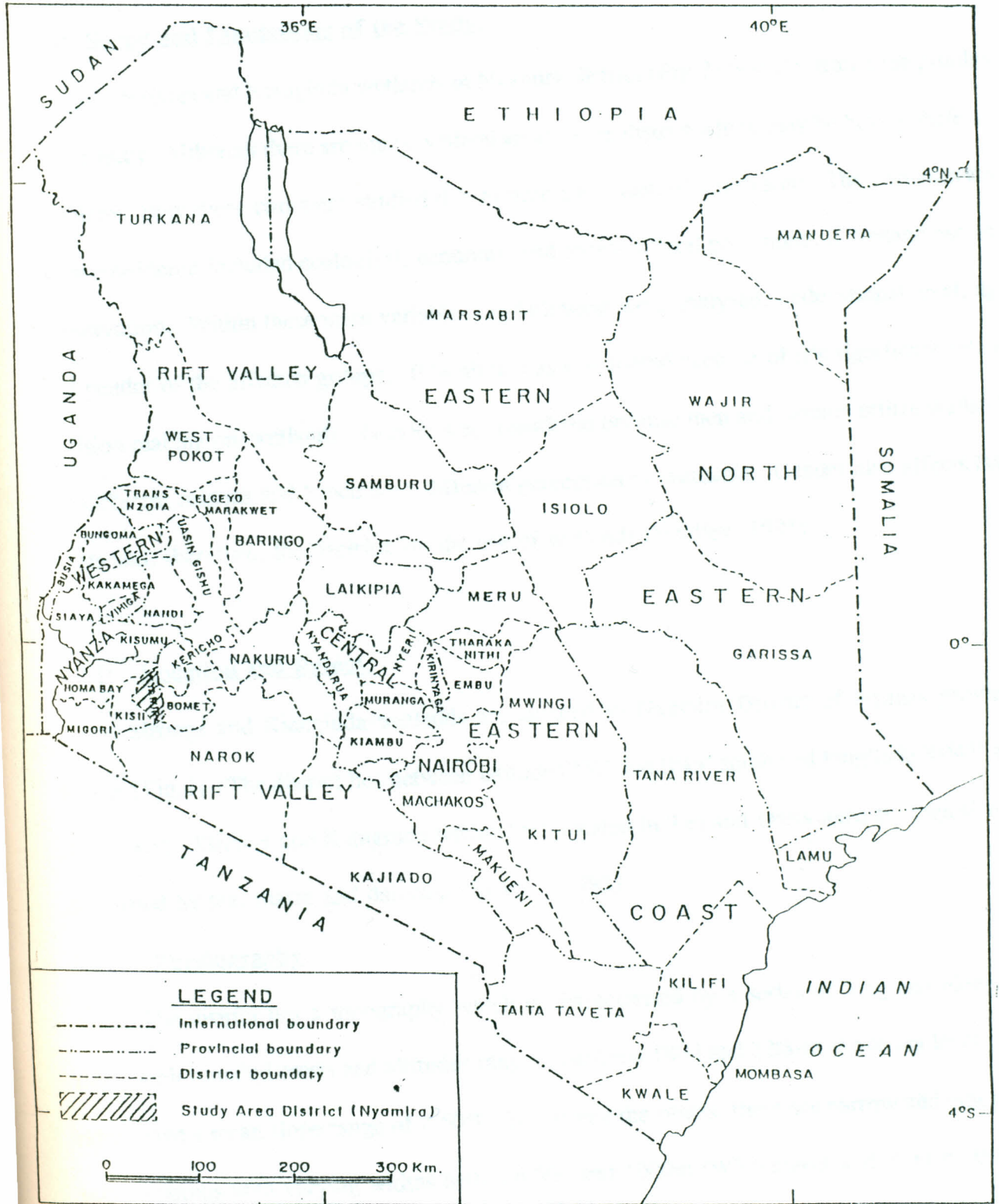
People adjacent to wetlands derive their livelihood from these ecosystems. They draw water for domestic use, fuelwood and building materials such as grass for thatching, clay for pottery and brick making. They also graze their livestock on the wetlands mainly during dry periods when on-farm grazing resources become scarce. Due to these social and economic uses,

it was the intention of this study to offer policy suggestions on how to sustainably incorporate local stakeholders in the management of wetlands. Enactment of relevant policies require knowledge of human perception of wetland conservation. It will also contribute towards the development of the on-going formulation and adoption of a wetland policy in Kenya. Successful development of a wetland policy requires participation from different stakeholders such as farmers, institutions and the international community. This study would enable people to have inputs into what should become a consensus view. In this way the resultant policy will most likely be attractive to the affected parties and implemented willingly (Howard, 1995).

By availing the research findings to local people and extension workers, this study will assist to improve local awareness of the importance of wetlands and create positive perception among the local people of wetlands. Further, the findings of this study could be used elsewhere in the country and outside for awareness building on social dimensions of wetlands and, hence, improve user knowledge of the risks involved in the event of unsustainable use of wetland resources.

Finally, the study could provide data on wetland management in a high potential area in Kenya. Previous studies have concentrated mainly on low potential areas which have demonstrated local dependence on wetlands for domestic water, dry season grazing etc. Therefore it was useful to establish whether similar relations existed between the local people in high potential wetlands and how they affect the perception of the people towards the ecosystems.

Fig 1: Map of Kenya. Location of Nyamira District



Source :Kenya, 1994-96

1.8: **Scope and Limitations of the Study.**

Sironga and Kianginda wetlands in Nyamira district (Fig.2) best illustrated the problem under study. Although there are many wetland areas in the district which may be having different problems, only these two were studied due to time and financial constraints. The variables that were considered included ecological, economic and socio-cultural perception of wetland use and conservation. Within these main variables the following were analysed: educational level, age and gender of the affected groups. Education was considered because of its significant role in decision making on wetlands. Gender was considered because men and women utilize wetlands for different reasons and hence have different perception of wetlands. Gender also affects land rights and, therefore, the decision on the use of wetlands (Bradley, 1991).

1.8.1: **Location and Extent:**

Sironga and Kianginda wetlands are situated in Nyamira District of Nyanza province Kenya (Fig.1). The district lies between latitude 0°30' and 0°45' south and longitude 34°45' and 35°00' east. Sironga and Kianginda wetland are located in Tea and Dairy agro-ecological zone dominated by tea, maize and dairying (Kenya, 1995).

1.8.2: **Physiography.**

The district has a topography which is characterised by a series of long and elongated ridges with rounded crests and altitudes ranging between 1800 and 2200m above sea level. The ridges have a mean slope range of 2-50%. In between the ridges, there are narrow and elongated valley bottoms with varying widths between 300 and 1000m (Wielemaker and Boxem, 1982). It is in these valleys that the study areas were located.

Uplands and plateau remnants also occur in the area. The uplands include Magombo, Kiabonyoru and Keroka, the latter is the highest upland in the area, with an altitude of 2150m. There are also plains which are poorly drained with a maximum altitude of about 1500m.

1.8.3: **Geology and Soils.**

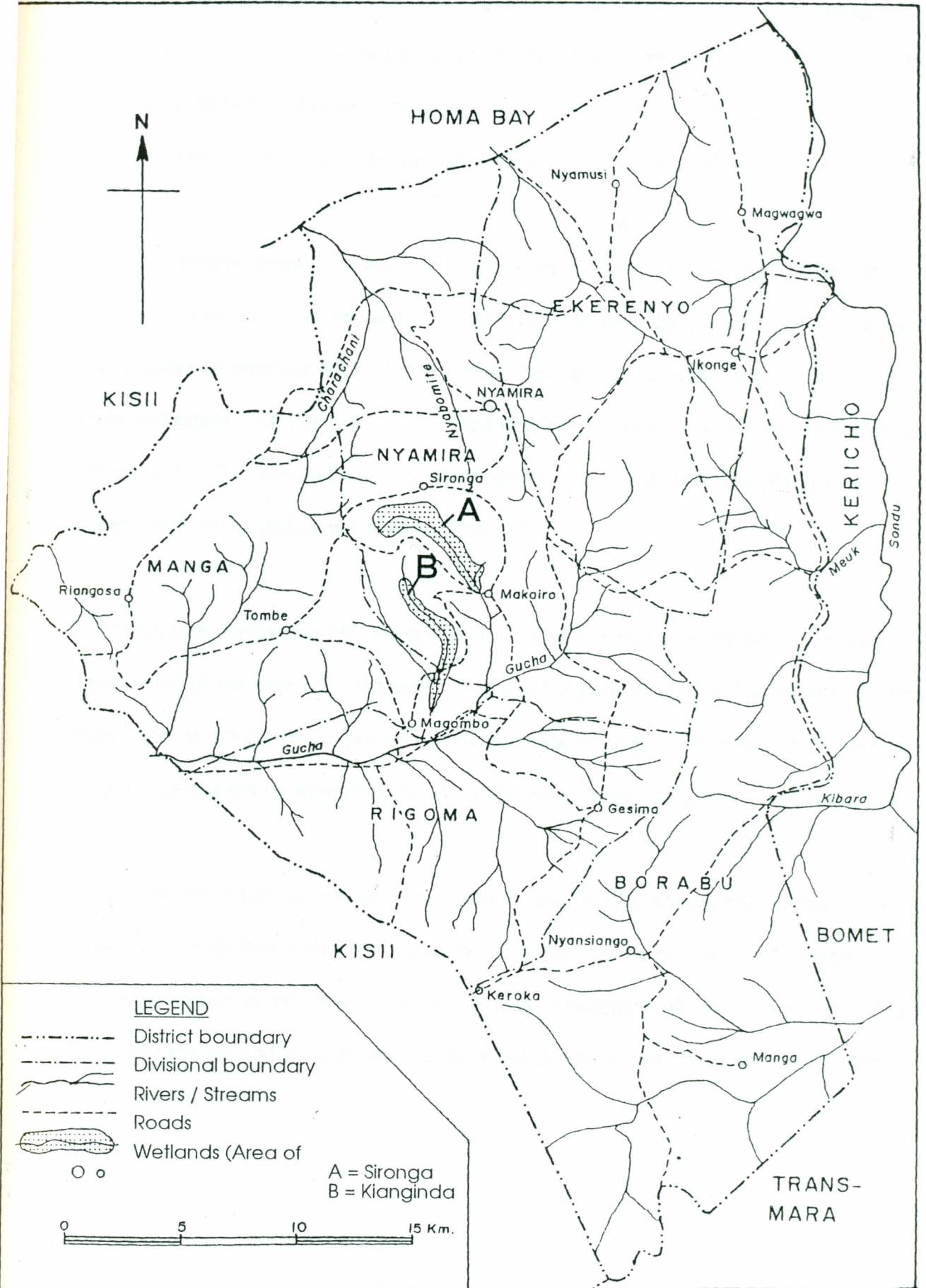
The rocks in the study area are of the Precambrian age and are composed of the Bukoban system which the Kisii series are part. This system consists mainly of lava, basalts, felsites and rhyolites and rhyolitic tuffs. Soapstone occurs locally between the basalts and the quartzites of the Bukoban system. The presence of resistant quartzites govern the present geomorphological structure of the Kisii highlands. In the flat bottomed valleys ash deposits are found in layers of 4 metres thick (Wielemaker and Boxem, 1982). These rocks have weathered down to form fertile soils, which are mainly volcanic (Ojany and Ogendo, 1982).

The soils in Nyamira District are young and poorly drained. In the upper parts of the wetlands, deep planosols have developed while in the lower parts there are mainly histosols and gleysols. These soils are fertile and encourage drainage for agricultural use (Wielemaker and Boxem, 1982)

1.8.4: **Drainage.**

The whole area drains into Lake Victoria. The major rivers draining the area in order of importance are: Kuja, Awach Kasipul and Sondu. River Kuja has several large tributaries such as Riana, Sare, Migori and Osani all originating in the Kisii highlands (Fig. 2). Numerous springs and small streams occur some of which are perennial.

Figure 2 : Location of study area and drainage system.



LEGEND

- District boundary
- - - Divisional boundary
- ~~~~ Rivers / Streams
- Roads
- ▨ Wetlands (Area of

A = Sironga
B = Kianginda



Source : MAL&M (1995)

In the study area wetlands are much wider than the streams which flow through them. The streams are 'misfits' or 'underfits' and therefore they do not erode the valley sides. It is estimated that the buffer capacity of the wetlands reduces the peak outflow by 20-30% (Van der wal, 1979). There is also a considerable time lag in the outflow from the swamps after rainfall.

Many poorly drained flat bottomed valleys occur along the tributaries of the Kuja river and along its upstream. The incision of streams proceed irregularly because of very resistant conglomerates and quartzite lenses in the rocks. Near these lenses the valleys narrow, giving cataracts and rapids. All bottomlands are filled with fine clay deposits, 4-6 metres thick layers of volcanic ash. The clays and ashes are partly eroded. The eroded parts are filled up with peat and peaty clays (Wielemaker and Boxem, 1982).

Other than surface run-off, seepage occurs. This is found as perennial springs mainly at the intersection of the slopes and the valley floors and as permanent waterlogged soils in valley bottoms. Due to poor farming practices including lack of proper soil conservation measures, some of the springs dry up soon after the end of the rainy season (Nyamwaya and Were, 1986).

Severe splash and rill erosion are common on steep slopes, scarps, hills, ridges and steep-sided valleys with shallow soils. The well drained deeper soils on rolling to hilly terrain are not susceptible to erosion except under poor management. Imperfectly drained heavy clay soils are susceptible to run off and gully erosion, even on gentle slopes, especially with overgrazing.

1.8.5: Climate.

The district has a highland equatorial climate. Rainfall distribution is bimodal with long rains (March - June) comprising 60% and short rains (October - December) comprising of 40%. The annual rainfall varies between 1400mm and 2200mm per year. There are also two dry spells during December and January and, July and August. The long wet season is characterized by heavy rains in short periods while the short rains show a more evenly distributed rainfall pattern.

Annual rainfall exceeds evaporation for all valley bottoms which remain waterlogged most of the year, making crop cultivation difficult. The high and reliable rainfall promotes a wide range of agricultural activities, a factor which has made the district a major agricultural zone in the country. The favourable climatic conditions, high population density and the need for self sufficiency in food production encourage wetland drainage regardless of their ecological roles and functions (Van der wal, 1979).

Due to its high altitude, the district does not experience excessive temperatures. The minimum average night temperature is 10°C and the maximum average day temperature is 29°C (Kenya, 1989/93; Koning, 1984). In the valley bottoms, more extreme values may occur due to their specific physiographic positions. This is as a result of temperature inversion. The temperature sometimes falls below freezing point due to concentration of cold air in the lowest parts at night due to thermal radiation of dry surface. This occurs in the dry season when the top soil has dried out. The valley bottoms are 1 to 2°C colder than the surrounding. This low temperature further complicates crop cultivation (Koning, 1984).

1.8.6: Vegetation.

The vegetation of the district is classified as wooded and bushed grassland with scattered or grouped trees (Nyamwaya and Were, 1986). The original wet montane forest on the hills has been replaced by land under permanent cultivation. The crops planted include maize, beans, coffee, tea and pyrethrum. On steeper slopes, there are small wood plantations of cypress, eucalyptus and wattle. The gentle hill slopes are under grass. Some areas contain temporary pastures with herbaceous vegetation or shrubs. The upper parts of valley bottoms are used for maize cultivation while the lower parts contain clumps of grassland with swamp shrubs such as *Sesbania gomphocarpus dissotus*. The lowest parts contain sedges, reeds, bulrush and papyrus. *Eucalyptus* tree species has been planted along most river banks and this has greatly reduced stream flow because it draws a lot of water into its system. Draining of valley bottoms has reduced *Echinochica pyramidalis* which are used for thatching houses and other structures (Nyamwaya and Were, 1986).

The slopes surrounding Sironga wetland are under permanent cultivation. The crops planted include maize, beans, sugarcane, bananas and tea. Tea covers most of the areas that border the wetlands (Plate 1). It therefore protects swamps against soil erosion. Most wetlands are planted with *eucalyptus* trees with the intention of draining excess water to allow crop cultivation and cattle grazing. The trees are also important for woodfuel. However, in waterlogged areas sedges, reeds and bulrushes are still common.

Transformation of wetlands is relatively recent in Kianginda. However, tea and *eucalyptus* trees are currently grown on the wetland periphery while the lowest parts of the bottomland has large amount of *Echinochica pyramidalis* (Plate 2).

PLATE 1



A section of Sironga wetland showing the vegetation. *Eucalyptus* trees can be seen in the background with piles of bricks which have been covered using *Echinochica pyramidalis* from the wetland there is short *Echinochica pyramidalis* in the foreground.

PLATE 2



A section of Kianginda with rich *Echinochica pyramidalis* and, *Eucalyptus* trees at the background.

1.8.7: Land use and socio-economic profile.

Nyamira District has a high agricultural potential as a result of its fertile soil and, high and reliable rainfall patterns (Section 1.8.3). Out of a total of 861 square kilometres of land, 818 square kilometres is suitable for agricultural production while the rest is under forest, wasteland and infrastructure (Table 1). 10% of the total land area falls under imperfect to poor drainage. Therefore, according to the Ministry of Agriculture, Livestock Development and Marketing, 'the district has high potential for agricultural production if the drainage status can be improved' (MAL&M, 1995), notwithstanding the threat this move poses to wetland conservation.

Table 1: Land uses in Nyamira District.

Land use	Average (Ha)	Relative coverage (%)
Arable land	81,800	96.24
Forest	100	0.17
Wastelands (wetlands)	400	0.47
Water bodies	200	0.24
Their (infrastructure)	3,500	4.12
Total land area	85,000	100.00

Source: (Kenya, 1989/93)

The above table shows that most of the land area is cultivated. Wetlands which are among wastelands form 0.47% of the total land area of the district and for economic development, thus perceived as wastelands, implying that they can be drained to be more useful. The acreage of wastelands seem to have decreased significantly over the last ten years. The major activities in wetlands include brick making, grazing and crop cultivation.

There are approximately 58,670 small holdings with farm sizes ranging between 1.4 and 2.2 hectares. The average size of holding is about 1.8 hectares (Kenya, 1994/96). Table 2 shows the status of small farm sector according to administrative divisions. In all the divisions

the major food crops are maize, beans, finger millet and horticultural crops. Apart from local consumption, these crops are a source of income. The major cash crops grown are tea, coffee, pyrethrum and bananas.

Table 2: Small farm sector per division.

Division	Farm area	R u r a l E s t . 1989 Km ² .	*HH per Km ²	Main food produce	Main cash crop	% *HH with H i g h value	N o o f producers
Nyamira	173	18,139	105	Maize, beans, finger millet, s o r g h u m , horticultural crops	T e a , coffee, bananas	80	8
Ekerenyo	210	18,092	86	Maize, beans, finger millet, horticultural crops	T e a , coffee, pyrethrum bananas	80	5
Manga	100	9,506	95	Maize, beans, finger millet horticultural produce	T e a , coffee, pyrethrum	80	2
Borabu	230	7,758	34	Maize, beans, finger millet horticultural crops.	Tea	60	12
Rigoma	120	14,062	117	Maize, beans, finger millet horticultural crops.	C o f f e e , tea, pyrethrum	80	9

Source: (Kenya, 1989/93)

*HH - Household

1.8.8 Social profile

The population in Nyamira has increased steadily over time. The population census of 1969 revealed a population of 248,539, which increased to 300,756 in 1979, a 3.8% increase per year. The population was projected at 392,571 in 1989 with a growth rate of 2.7% and at 443,561 in 1993 with a growth rate of 3.1%. It was projected at 486,104 persons by the year 1996. The rapidly increasing population has led to land subdivision and need for more land for cultivation, threatening existing swamps (Plate 3). The average district population density in 1993 was 349 per square kilometre. This was expected to be around 564 persons per square kilometre in 1996. Consequently, the average farm holding in the district will have decreased to an extent that meaningful agriculture may not be easily carried out. Hence the need to explore agricultural frontiers, a move that threatens the very existence of wetlands (MAL&M, 1995).

1.9: Definition of operational terms.

Conservation. Refers to the wise use of a resource which does not lead to its loss, waste or damage. Wise use in the sense that the resource can be used by the present generation and the generations to come.

Participation: Refers to the involvement of the grass root people in project decision making and implementation right from the start.

Perception: Refers to awareness of things and events through senses and impression formed as a result. It is influenced by personal experience, indirect experience and culture (Iradu, 1990).

Ramsar convention: This refers to an inter governmental treaty which provides the framework for international co-operation for the conservation of wetland habitats.

Sustainable use: This is the practice of wetland utilization which will ensure that the production of goods or services derived from that source are available at the same level in perpetuity.

Wetlands: Used in this study to refer to areas of marsh, fens, peatland or water whether natural or artificial permanent or temporary with water that is static or flowing, fresh, brackish or salty (Dugan, 1990).

CHAPTER TWO

LITERATURE REVIEW

2.1: Introduction.

This section reviews literature on wetlands at four different levels; the status of wetlands, human perception and its implication on wetland conservation, government efforts and strategies towards conservation of wetlands and the conceptual framework.

2.2: The Status of Wetlands.

Wetlands occupy about 6% of the total land area excluding open water world wide. Much of this, however, has been drained for intensive agriculture, industrial use, pollution and unsustainable level of grazing and fishing activities. Until two decades ago, a large proportion of the world's wetlands was protected by their marginal usefulness for agriculture or other activities. The last thirty to fifty years have, however, witnessed rapid conversion of wetlands in all developing countries (Turner, 1990; Finlayson and Moser, 1991).

In Asia, 50% of wetland areas are moderately to severely threatened. In Malaysia 86% of the wetlands are under threat, while in Bangladesh 82% are threatened. In the seventeenth century, Europe had three hundred and eighteen wetlands which had been reduced to a mere fifty eight wetlands in the twentieth century and by 1980, 69% of the wetlands in United Kingdom and Netherlands had been lost (UNEP, 1992_b; Finlayson and Moser, 1991). The foregoing scenario suggests that there is rapid wetland loss, a trend which calls for their conservation.

Although Africa still has a good proportion of its natural wetlands, they are under

increasing threat from drainage for agriculture, industrial development, over exploitation for their fish, wildlife and waste disposal. Some are threatened indirectly through forest destruction and, hence, siltation. This is true of the wetlands of the Niger and Zaire forests. Mining of swamp peat for energy in Rwanda and dam construction such as Aswan high dam on the River Nile and Kainji on the Niger is a further threat to wetland conservation (Finlayson and Moser, 1991).

Degradation of wetlands is not an exception in Kenya. The resource is threatened by human activities such as reclamation for agricultural use, establishment of industries and settlement as a result of rapid population growth since the 1950s. Wetlands in the Lake Victoria region, for example, are further threatened by dumping of wastes from industries, urban sewage, pesticides and siltation as a result of soil erosion (Gitonga, 1992).

In the drylands of Kenya, wetlands have been affected through the reduction of infiltration as vegetation is cleared which results in reduction of evapotranspiration and storage capacity (Ingram, 1991). The growing horticultural industry is a great threat to dryland wetlands, it has contributed a great deal to lose of the wetlands in the dry areas. These dry land wetlands are important for dry season grazing and are the only source of water in the area. But draining them for economic use has continued regardless of the needs of the communities around them.

Ingram (1991) argues that change in hydrological status of the catchment brought about by land use activities may result in increased erosion and degradation of wetlands as well as of the catchment as a whole. Despite increasing knowledge of wetland destruction, little is known

about the peoples' perception and how it contributes to wetland management.

Drainage of wetlands in Kenya for agricultural use is a recent phenomenon associated with increasing population and farmer realization of the potential of wetlands for agricultural production (Gichuki, 1992). During the colonial era cultivation was confined to arable lands while wetlands were used mainly as water sources and for dry season grazing. Reclamation of wetlands for agriculture started in the late fifties, aggravating in the 1970s and early 1980s due to increasing food scarcity (Gichuki, 1992). Since then, wetlands in the Central Province of Kenya have been reclaimed for the growing of arrow roots and other crops.

Loss of wetlands in the study area is not unique, it is associated with food scarcity and the need for national food self sufficiency. Reclamation of wetlands by individual farmers started in the late fifties and was aggravated by the inception of the Kisii Valley Development Programme (KVDP) of early 1980s. The KVDP's main objective was to assist the farmers with technical advice on wetland drainage for agricultural production. This led to extensive drainage of the wetlands in the study area.

Loss of wetlands in the study area has resulted into a number of problems such as inadequate clean water, lack of thatching grass and oxidation of peat soils (Nyamwaya and Were, 1986; Muya, 1985). This situation calls for wetland conservation, especially because wetlands are sources of clean water and thatching grass as many people cannot afford piped water and iron sheets for building respectively.

2.3: Human Perception and its Implication on Wetland Conservation.

Wetlands are often protected via legislative declaration as protected areas and through environmental impact assessment regulation. However, it is obvious that a coercive attitude or prohibition is ineffective if it is not accompanied by a positive attitude in the general public (Cone and Hayes, 1980 quoted in Bernaldez *et, al* 1989). It is not enough to tell people that exploitation of a resource is illegal as the people need to understand why this is so; hence the need to make people aware of the ecological significance of wetlands. This awareness is the base for the conservation of wetland resources. Awareness of wetland functions coupled with tangible benefits from the wetland resource may create a positive attitude among the wetland adjacent-dwellers important for their conservation.

Conservation of the existing wetlands in the District is possible if the peoples' attitude towards them is understood. Utilization of a resource is governed by the attitude of the users. To understand why a wetland resource is utilized in a specific way, knowledge of the level of awareness of the non-economic functions of the ecosystem is also necessary. The assumption is that if the people are aware of such functions they could conserve the resource for future use.

Decisions and actions concerning the environment are based on both objective and subjective factors. This is the basis of environmental perception studies. Hence, man shapes the environment through choice and behaviour in man-environment relations. Further, perception is a factor in all human activity and can markedly affect both the appearance of the landscape and the individuals operating on that landscape (Wood, 1970 quoted by Sindiga, 1981).

The activities that are carried out in wetlands therefore, have a direct bearing on a peoples' perception of the ecosystem. This scenario calls for knowledge of perception towards wetlands among adjacent-dwellers. As observed by Sindiga (1981) human beings form views about the environment in which they live. These views influence their behaviour on the landscape and dictate the way they use it. Conservation of a wetland resource therefore depends on the perception of the community surrounding it. Three perceptions are clear in utilization of wetland areas; viz: ecological, economic and socio-cultural perception(See Fig 3).

2.3.1 Ecological Perception.

Ecologists recognise different functions of wetlands depending on the locality and physical conditions. Referring to the hydrologic functions, Krhoda (1992) and Balek (1983) demonstrate that wetlands are important in the discharge of headwater into rivers and lakes. The discharge of water is less peaked and has a longer duration in basins with wetlands than those without and are crucial for recharge to ground water storage (Denny, 1995). Amboseli Swamp, for instance, recharges the shallow wells that have been dug around it (Krhoda, 1992). This natural practise has now been adopted to artificially recharge ground water in many parts of the world.

Mitsch and Gosselink (1993) observed that wetlands influence water flow regimes by intercepting storm run off and storing storm waters thereby changing sharp runoff peaks to spread discharge over a longer period of time. The wetland areas therefore reduce the danger of flooding. Denny (1995 :255) writing on the ecological perception of wetlands states that:

...one of the most important functions of wetlands is to act as a sponge, thus trapping and holding water rather than allowing it

to rush downstream and into the ocean.

The floodplain wetlands of The Charles river in Massachussets, for instance, were deemed so effective for flood control by the U.S. corps of engineers that they purchased them rather than build expensive control structures to protect Boston (UNEP, 1993).

Wetlands play a unique role in pollution control. Williams (1991), Krhoda (1992) and Denny (1995) demonstrate that wetlands are often used as sinks for wastes and pollution. Rural communities obtain pure water supply because wetland plants have the capacity to take out impurities from water passing through them. Wetlands also trap and extract nutrients from running water. Denny (1995: 255) supports this view by observing that:

...the water quality functions of wetlands are perhaps some of the least appreciated. Wetlands reduce water flow and hydraulic conductivity such that sediment burdens carried by the rivers and streams are precipitated. Thus muddy and turbid waters flowing into wetlands become clear. The precipitation of organic and inorganic particulates also facilitates the deposition of nutrients (particularly phosphates) and other compounds.

The ecological perception of wetlands is further explained in their role in stabilizing local climatic conditions particularly rainfall and temperature. The presence of water and vegetation moderates temperature and increases rainfall effectiveness. This in turn has an influence on any agricultural or resource-based activities as well as the stability of natural ecosystems and the wetland itself. In 1986, local concerns for the effect of wetland loss upon local micro-climates in the valley of South West Uganda led to the ban on wetland drainage (Kamugisha, 1993; Denny, 1995). Denny (1995) explains that the Sudd swamp in Southern Sudan and Okavango

delta in Botswana have a moderating effect and increase rainfall in a desert area. If the total evaporative loss is reduced, the surrounding areas of arid land would receive a reduced rainfall and the desert would spread.

Perhaps the most widely known and generally appreciated ecological perception of wetlands is their provision of habitat for a variety of plants and animals. Some animals are entirely wetland dependent while others are only partially so. This is true of large antelopes such as sitatunga (*Tragelphus spekei*), hippopotamus (*Hippopotamus amphibious*) and crocodile (*Crocodilus niloticus*) that are obligate wetland dwellers. Most *avifaunas* are spasmodic visitors (Gichuki, 1992).

Wetlands play a special role for water birds. They are vital transient feeding and resting areas or seasonal over wintering and breeding sites (Williams, 1991; Denny, 1995). Gichuki and Gichuki (1992) show that wetlands are year round breeding habitats and wintering sites for migratory birds. Indeed, it is this function that was responsible for the heightening of awareness on wetland values and the initial impetus to the conservation of wetlands in many parts of the world. The game birds or wetland fowl include ducks, geese and swans (Williams, 1991). According to Gichuki and Gichuki (1992) approximately 25% of Kenya's *avifauna* are supported by wetlands.

Harper (1987) and Mavuti (1989) describe wetlands as unique habitats for fish and other aquatic animals distinct from large water bodies. Njuguna and Muthuri (1989) point out that

about 36% of the total African fresh water catch is from swamps and floodplains. Hence the need for wetland conservation for the provision of habitat for aquatic life.

2.3.2 Economic Perception.

Wetlands have also been perceived on economic terms, as sources of medicinal products, food, fuelwood, fodder and raw materials for building and handicrafts (Darkoh, 1990; Mavuti, 1992). Communities around wetlands are usually the beneficiaries of these resources. Evidence from Southeast Asia reveal that residents use up to 80% of the region's wetland species (Russel, 1993). Here wetlands serve as a source of food, medicine, construction materials for both boats and houses and ingredients for a whole range of products including dyes and fish poisons. This shows that properly managed wetlands can be a critical life supporting habitat for millions of people throughout the world. Kareri (1992), for example, found that wetland adjacent groups draw economic benefits such as fishing for domestic consumption and local sales, (see also Ochumba, 1990). Okeyo (1992) identifies wetlands as the home of certain species of fish such as mudfish. He advocates for knowledge of scientific aspects of wetlands balanced with legal, institutional and economic realities to ensure protection of these valuable resources.

Gichuki (1992) emphasises the economic role of wetlands by arguing that self-sufficiency in food and improved living standards of the rural people have been the main reasons for increased government and donor support for irrigation and drainage development. He asserts that the scarcity of high potential land and the rapidly increasing population have been the main forces behind utilization of wetlands.

Mungai (1992) notes that wetlands are potentially attractive well watered and fertile land apparently waiting to be reclaimed and converted into farmland. This perception has led to little regard for the crucial ecological role played by wetlands. He notes that due to population pressure, land use conflicts, changes in tenure and loss of livestock, in drylands, pastoralists such as the Pokomos have resorted to crop farming on wetlands, contributing to loss of the wetlands in the ASALS. To sustain dry land livestock economy both the general landscape and the wetlands therein must be at the disposal of the pastoralists. For this reason, conversion of ASAL wetlands into crop land threatens livestock and wildlife industries. However, this particular case indicates that perception on wetlands changes with time in response to wider societal discourse.

The economic perception of wetland resources has led to encroachment of human activities into them. Gitonga (1992), notes that cases of pollution have been reported in Lake Naivasha wetlands which is surrounded by rich farmlands under intensive cultivation for production of vegetable and cut flowers. This is periodically invaded by floating masses of *salvinia molesta* that could threaten the survival of the flora and fauna of the lake. The Yala river in South Nyanza is also likely to carry an appreciable amount of agricultural chemicals which could cause eutrophication of the Yala wetland. This is because the river drains extensive agricultural lands which are extensively cultivated. In some cases, wetlands are perceived to be economically less significant therefore serve as pools for refuse disposal (Gitonga, 1992). Thus economic perception can easily lead to wetland loss.

In the recent past, wetlands have been drained for agriculture, this is in response to

increasing population pressure on scarce land resources and the farmers' realization of the potential of wetlands for increasing agricultural production. During the colonial era in Kenya, cultivation was confined to the good lands and wetlands were generally used as water sources and dry season grazing areas (Gichuki, 1992). Drainage of wetlands started in the late 1950s when white settlers made raised beds which enabled them to avoid water logging for wheat growing in the poorly drained areas of Nyandarua District.

In the late 1970s many large-scale cooperative and settlement farms were sub-divided often without adequate consideration of alternative land-use and carrying capacity or environmental degradation hazards. In 1982, for instance, Lelemolok swamp was subdivided and approximately 70 families were each allocated 2 hectares of poorly drained land (Michiemo and Mugwanja 1987). Drainage activities in Kisii for agriculture began in the 1970s (Muya 1985).

Draining of wetlands has involved different actors who include individual farmers, Non-Governmental Organizations (NGO) and the Kenya government. The main reason for increased government and donor support for improvement and drainage development include the need for self-sufficiency in food and improved living standards of the rural people. Projects under this category are mainly geared towards economic advancement (Gichuki 1992).

Ogutu and Khayesi (1994) show that residents adjacent Saiwa Swamp carry out economic related activities such as drawing water, digging up clay, poaching tree barks and collecting

firewood. Further, they observe that traditional perception toward wetlands is, however, being distorted by the changing land sizes. Farmers with small plots, for example, regard wetlands as agricultural frontiers, even when they seem to get little economic return from activities therein.

Gichuki *et al* (1992), on the other hand demonstrate that residents of Cherengani division attach more importance to wetlands than the rest of their land. They value wetlands, for instance, as sources of water and for horticultural activities. Thus, wetland conservation depends on the economic value attached to it.

2.3.3 Socio-cultural Perception.

Previous studies have also indicated that wetlands are perceived on socio-cultural terms. Among the Luhya, for example, wetlands are sites of special cultural value, being used for circumcision, sedentary hunting and gathering. They were also sites where the Luo and Luyha women gathered wild vegetables (Ogutu, 1987, as quoted by Kareri, 1992).

Different cultures such as that of the Luo have depended on wetland fish for food in the past. This culture has been threatened, since the mid-1960s with dwindling fish numbers and species following wetland loss. People living along Nzoia, Yala, Nyando, Sondu and Sio rivers and their tributaries have been involved in fishing for domestic consumption and local sales thus earning a living from wetlands (Okeyo 1992).

The residents of Loboï and Kesubo swamps, perceive wetlands as features of social significance, being sources of water and dry season grazing . Also adjacent communities obtain a pure supply of water because wetland vegetation has the capacity to take out impurities from the water passing past them (Kareri, 1992). This shows that wetlands are very important as far as the social life of the people in dry lands is concerned, and therefore need to be sustainably managed.

Culturally, wetlands are a source of building materials for traditional houses and artifacts (Kareri, 1992; Muthuri, 1989; Darkoh, 1990). Different countries extract plant products such as papyrus for thatching, making of mats and baskets. This perception is displayed in the study area as most people cannot afford iron sheets for building (Nyamwaya and Were, 1986) and even those who can, prefer using *Echinochica pyramidalis* for their granaries. The loss of wetland areas to agricultural land is therefore a matter of concern.

Wetlands also play a significant socio-cultural role in recreation and tourism as they are rich in biodiversity, which people visit for viewing. Further, they act as areas for educational research and training. They are also a source of herbal medicine and genetic resources.

2.4 Government efforts and approaches towards conservation of wetlands.

Governments throughout the world have recognized the value of wetlands. The governments of Denmark, Germany and the Netherlands, for example, have set up an international programme to manage coastal wetlands of the Wadden sea which they share. The

management strategy is based on transitional protected area system. This strategy does not allow people to use the resource in wetland areas referred to as the 'zero-use' zones. Outside these areas, people are supposed to use natural resources sustainably. As part of the programme, WWF monitors broad-scale events such as levels of pollution entering the Wadden sea, and supports smaller projects which include setting up information centres and campaigning on harbour developments (Russel, 1993).

In Africa, various strategies of wetland management have been attempted. To protect the Kafue wetlands which have been the focus of major developments, for instance, the government of Zambia, made the area a National Park though poaching and overgrazing persisted. The department of National Parks, with the help of WWF, launched a scheme known as Administrative Management Design for Game Management Areas (ADMAGE) which used a people participatory approach. This led to the training of the villagers as scouts to monitor wildlife numbers and report on poaching incidents. As a result, lechwe numbers have risen to a level at which they can be hunted on a sustained yield basis (Russel, 1993).

Enactment of the Ramsar Convention is a major step towards wetland conservation. The convention was first drawn up at Ramsar, Iran, in 1971 to protect vital wetlands of the world such as marshes, tidal flats, lakes and mangrove swamps. These are important for migrating and breeding birds, plants and fish as well as for regulating the water level in surrounding areas. Each country which signs the Ramsar convention must designate at least one suitable wetland within its' territory for inclusion in the list of wetlands of international importance. The

Convention is one of the first attempts to impose external obligations on land use decisions of sovereign states. It relies on persuasion and moral pressure rather than legal powers. By March 1993 there were seventy contracting parties throughout the world (Mireille, 1994).

Uganda is the first African country to adopt a policy on wetlands. In 1986, the government issued a ban on all large scale drainage of wetlands until an adequate policy was put in place to lay the basis for environmentally sound and harmonious management of wetland resources. The Uganda wetland policy focuses on protection from drainage, sustainable use, environmental sound management, development dependent on environmental impact assessment and diversification of uses and users (Howard, 1995).

The importance of wetlands and their conservation in Kenya was first stated by the Kenya Government in its 1963 manifesto on conservation of natural resources. KWS is in charge of translating this, it has the overall legal mandate to conserve and manage wild animals, it also has the sole jurisdiction over national parks and game reserves. Its role encompasses the conservation of biodiversity. It is increasingly involved in wetland issues beyond its protected area scheme. Through KWS new policy on partnership, the full participation of local communities in management planning is pursued. Also at the coast the Coastal Development Authority is in the process of developing integrated coastal zone management in which KWS plays an important role. Kenya ratified the Ramsar convention in 1990. Since then it has designated Lakes Nakuru and Naivasha for the Ramsar list (Mireille, 1994; KWS, 1996).

In yet another effort to conserve wetlands, the Kenya Wetland Working Group (KWWG) was formed in June 1991 at the National Museums of Kenya. The organization's membership includes conservationists, wetland scientists and representatives of appropriate governmental and non-governmental organizations in Kenya. Its aims are to monitor the status of wetlands in Kenya, encourage research, compile inventories of important wetlands, undertake public education and awareness of wetland values and issues and advocate review of policies that threaten the wetlands and environmental assessment (Gichuki, 1995).

One of the achievements of KWWG was the 'Wetlands of Kenya' seminar of July 1991 where scientists and conservationists discussed the unsustainable nature of agriculture on land reclaimed from swamps, such as the Kisii valley bottom wetlands in the 1970s and Yala swamp and Lake Naivasha in the 1980s. The principle challenges that the seminar identified were the need to generate awareness on the importance of wetlands to Kenya's long-term economic growth and to evolve development activities that meet human needs without destroying wetlands (Gichuki, 1995).

KWWG also undertakes continuous wetland inventory, involving several wetlands in Central Kenya and computerizing of wetland information database. KWWG participates in community wetland conservation and makes contributions to environmental policy formulation and regional co-operation in wetland management. This is done through giving ideas and information on issues pertaining to wetlands and water resources (Gichuki, 1995). This study aimed at enhancing the objectives of this group by examining the impact of local perception

of wetlands on their conservation.

In Kisii, wetlands management is a complicated issue involving the County Council, individual farmers, the Ministry of Agriculture, Livestock Development and Marketing, and LBDA. The County Council took over wetland ownership with the intention of reducing human interference as much as possible. Despite different interventions farmers still drain wetlands for crop growing. Associated problems include soil erosion and degradation of water systems. This has prompted the establishment of the Valley Reclamation and Rehabilitation Unit, under the Ministry of Agriculture, Livestock Development and Marketing which is charged with the responsibility of advising and extending technical assistance on the drainage problem (Muya 1985; Nyamwaya and Were, 1986). The swamp reserves are therefore threatened with drainage, overgrazing and brick making activities that may lead to wetland loss.

Although the government is trying to conserve these areas, human encroachment still persists. This trend invites for a non-policing approach. Kiss (1991) and Kareri (1992) point out that current policies for the management of wetlands appear not to work because they offer inappropriate options to affected households. This is either because of lack of knowledge of how the people perceive and interact with the wetland resource or because of poor sources of livelihood that force adjacent households to turn to wetlands or simply because the policies are wrong. There is need for a national wetlands policy that takes into account interests of the local people and, one which is geared towards wise use of wetland resource. Such policy calls for reconciliation of different interested parties. It therefore requires a set of management

procedures to fulfil the aspirations of all sectors and peoples who look to wetlands for products and services (Howard, 1995). This requires a National Wetland Policy that caters for the local people's needs, and this can be achieved through sound database including knowledge of the people's perception of the ecosystem. Development of such policy is currently being undertaken by the National Wetlands Standing Committee which is chaired by KWS, while the National Environment Secretariat is the committee's secretary.

2.5 Conceptual Framework

The conceptual model used to explain wetland utilization is human perception of wetlands. For long, wetlands were regarded as wastelands and owing to their remote locations and low pressure on land, they were least utilized. Recently there has been an increase in their use posing a threat to their very existence. This move has been as a result of change of perception from that of an area of wilderness that was not touched to that of a valuable resource. Depending on the perception of the people in a given area, an ecosystem may be utilized sustainably or unsustainably. People's perception of wetlands is reflected in the actual activities that are carried out within them. Although the perception may overlap, there is one that is more important in an area than the rest.

In cases where economic perception dominates human activities will include agriculture, commercial, industrial and settlement as shown in the model. Where socio-cultural perception dominates human activities will include recreational and ceremonial activities. While where ecological perception prevails the activities will include educational research and conservation

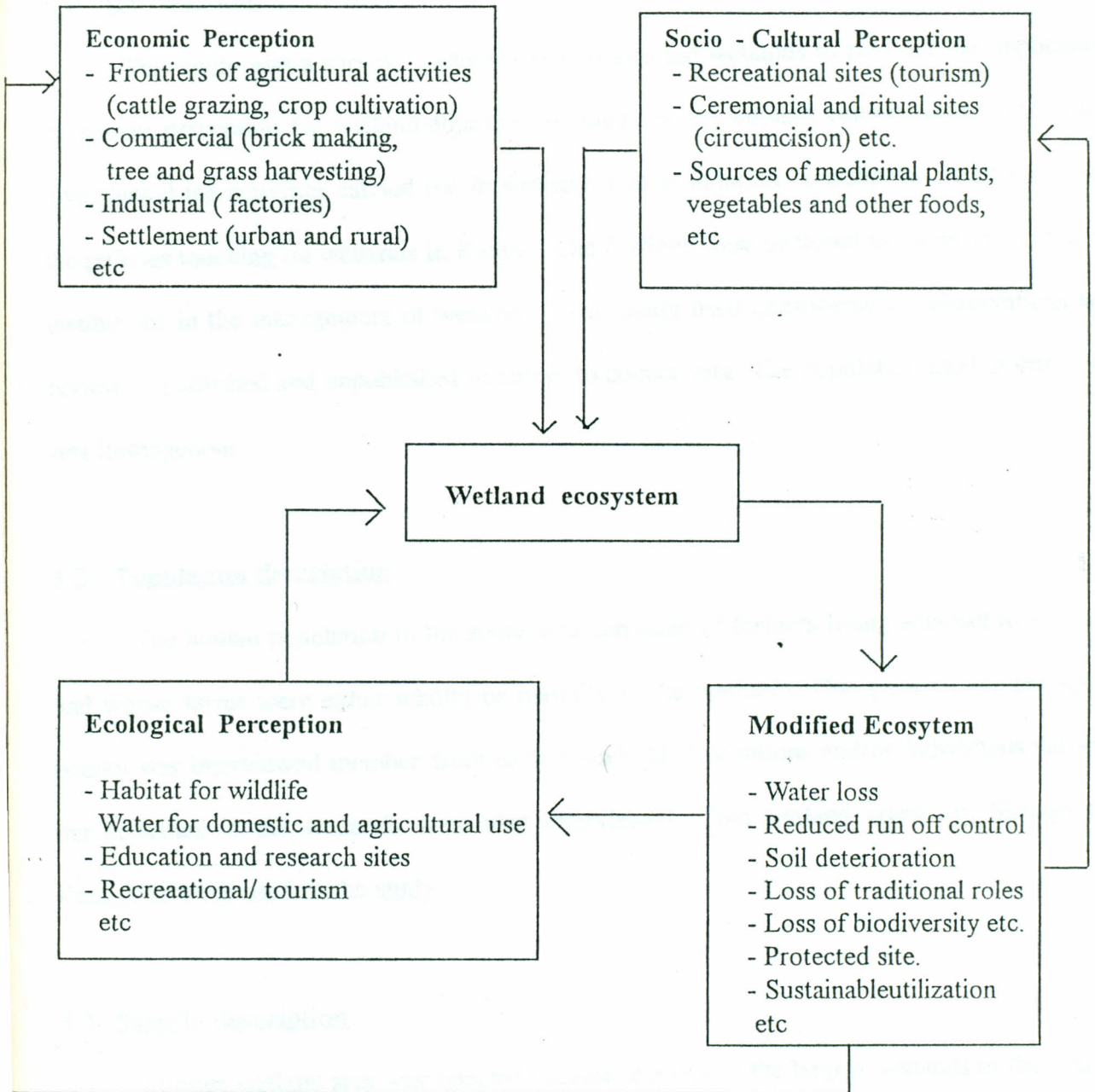
of habitat for fauna and flora. These perceptions will impact on the wetland either positively or negatively. Thus, the results may be loss, degradation or conservation of these ecosystem. Once the ecosystem has been modified it will receive various reactions or attention.

When the wetlands are perceived as of socio-cultural importance, the activities carried out therein will include communal grazing, sedentary hunting and gathering, and collection of building material for traditional houses and artifacts. These activities may lead to either sustainable utilization or over exploitation of wetlands.

Wetlands, when perceived as areas of ecological significance such as hydrologic and micro-climate controls, nutrient dynamics and important habitats for different biota, they will be conserved for research, recreation (e.g eco-tourism) and education. This perception will lead to wetland conservation.

In cases where wetlands are perceived as wastelands, they will be transformed for utilization of economic gains such as drainage for crop cultivation. This is the case with the study area. This affects wetlands negatively and contributes to the degradation and loss of the ecosystem.

Fig 3: Conceptual Model: Various Human Perception of Wetland Resources



Source: Author, (1995)

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1: Introduction.

This study was a survey conducted in two selected wetlands to find out the implication of human perception by wetland-adjacent communities on wetland conservation. The study investigated the activities carried out in wetlands and in adjacent households. It also assessed the policies touching on wetlands in Kenya. The findings were analysed to establish the role of institutions in the management of wetlands. This study used questionnaires, observations and review of published and unpublished literature to collect data. The population used in this study was homogenous.

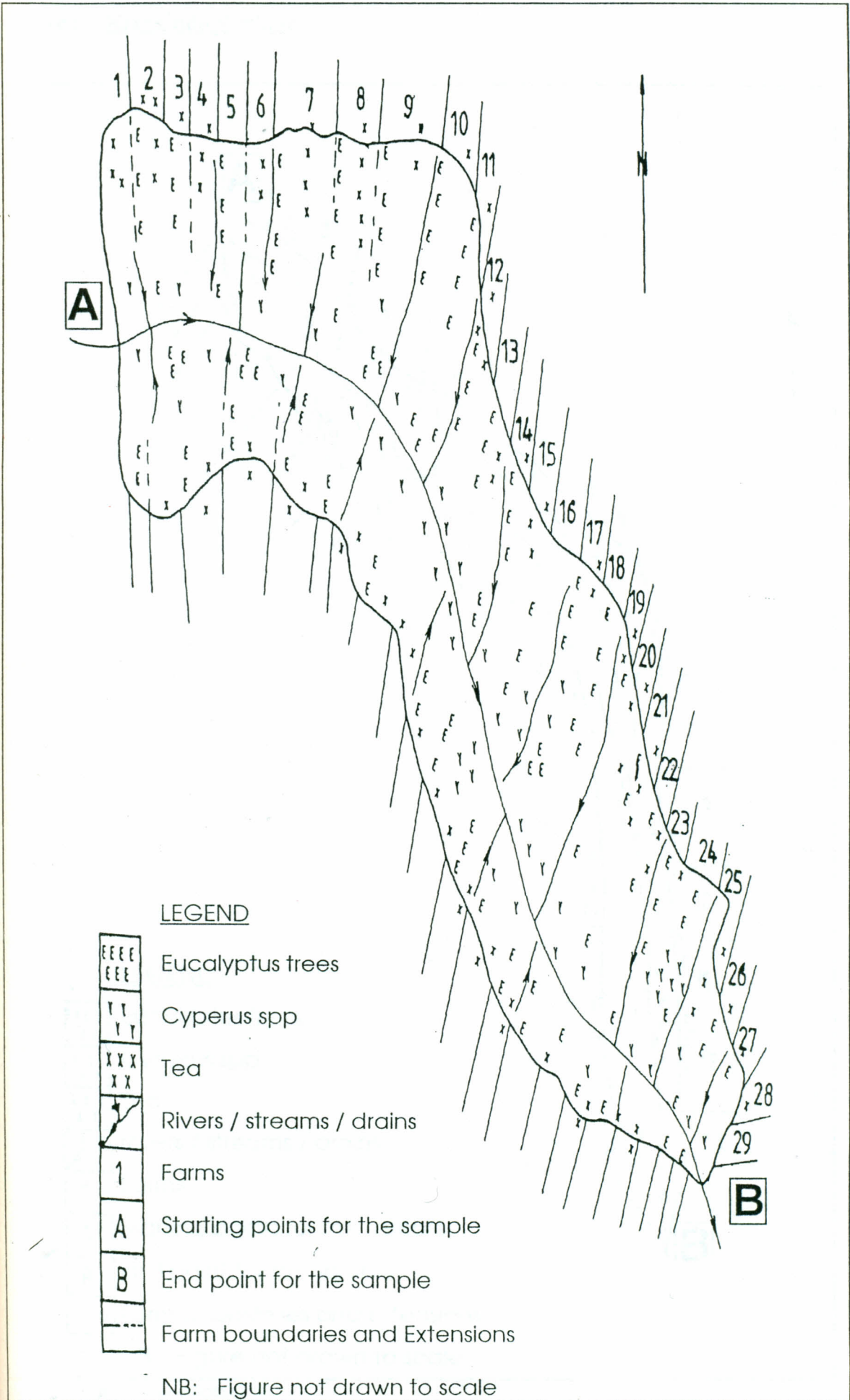
3.2: Population description

The human population in the study area consisted of farmers living adjacent to wetlands and whose farms were either wholly or partially in the wetlands. One person over the age of twenty was interviewed member from each household. Institutions and/or individuals carrying out activities in the wetlands were also interviewed. Two wetland areas i.e, Sironga and Kianginda were used in the study.

3.3 Sample description.

Sironga wetland area was selected because it is one of the largest wetlands in the district, and it has had interference from different actors since late 1970s such that it has been degraded. Whereas Kianginda wetland area was selected because it has had least interference from outside (see section 1.6) and findings from it were used to compare perception of residents of Sironga, an area that has had outside actors.

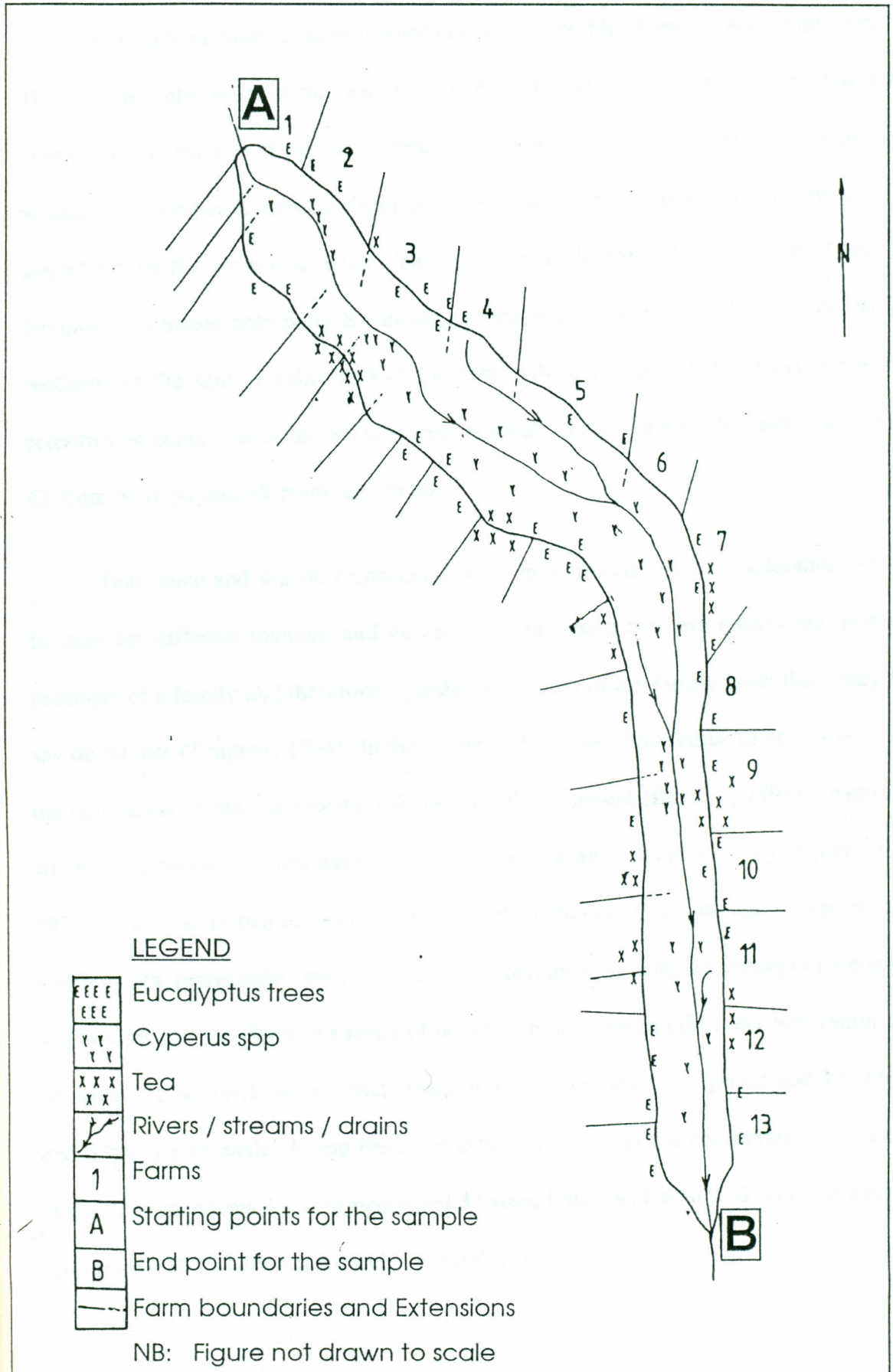
Figure 4 : Sironga Wetland



Source : Author (1996)

Researcher's impression of the spatial distribution of plants and farms at Sironga wetland

Figure 5 : Kianginda Wetland



Source : Author (1996)

Researcher's impression of the spartial distribution of plants and farms at Kianginda wetland.

For each wetland, a starting point marked A (see Figs 4 and 5) was subjectively selected. This was the entry point of the main river within the wetland. Sampling started at point A and continued upto the exit of the river identified as point B. A list of farms fully or partially in the wetland was prepared starting from point A and ending at point B. At point A the first household, on the left was selected. The next selected household was the fifth farm on the list. Sampling continued upto point B running on one side of the wetland because the study was on wetlands in the same locality and of the same ethnic group. It was therefore assumed that activities on either side of the wetland were similar. A total of 85 individuals were interviewed: 42 from Sironga and 43 from Kianginda.

Both male and female respondents were interviewed. Sex consideration was necessary to cater for different interests and viewpoints. In Kenya men are considered most influential members of a family and therefore regarded as owners of the family land; thus, they have more say on its' use (Tengnas, 1994). In the recent past, women have come to be respected following the realization of their increasing role in rural development (Bradley, 1991). Among men and women different age groups were interviewed because age affects ones way of perception (Groot, 1992). There were two diverse age groups; the between 20 and 40 age group and between 41 and 75 years, representing the group of people that grew up with the concept of wetland drainage which started in the 1950s as a result of population pressure and the older generation which grew up when the wetlands were intact, respectively. The latter age group had knowledge of the traditional use of wetlands and therefore different views on the conservation of wetlands. Out of the 85 respondents 48 were males and 37 were females of which 47 were between 20 and 40 age group and 35 between 41 and 75 years (Table 3).

Table 3 : Demographic characteristics of respondents.

Variable	Categories	Number of respondents	Percentage
Sex	male	48	57
	female	37	43
Age	below 40	47	55
	above 40	35	41
Occupation	-civilservants/teachers	11	13
	-farmers	56	66
	-wage earner	9	11
Educational level	-university\college	3	9
	-High\sec. School	30	35
	- Primary	27	32
	- no formal education	20	24

A total of 8 institutions carrying out activities in the wetlands was interviewed. These were all at Sironga wetland (Table 12). There were no institutions at Kianginda as the activities were limited mainly to individual farmers. The affected institutions completed a questionnaire.

3.4 Methods of data collection

Various methods were used to collect data required for the objectives as stated in chapter one. These are the methods that were used: questionnaires, informal interviews, observations and review of published and unpublished works.

3.4.1: Questionnaire Administration.

Both primary and secondary data were collected. Primary data were gathered using two categories of questionnaires. The first category of questionnaires was administered to wetland-

adjacent farmers. The questionnaire was designed to assess local perception of wetlands by adjacent farmers. Various activities were assessed with intentions to establish ecological, economic and socio-cultural perception of the wetlands. It consisted of 39 general items and an attitude test which had 9 items (Appendix 1).

The second category of questionnaires was administered to the institutions carrying out activities within the wetland. The questionnaire was designed to assess the activities carried out by the institutions, and had a total of 7 items (Appendix 2).

Questionnaire methodology was chosen for use because it is easy to follow, administer and provide stimulus to all the subjects (Walker 1985, cited by Kerich, 1990). Further, it allows for an individual to give information independently without any influence from the researcher. The questionnaire method has also been successfully used by Ogutu and Khayesi (1994).

3.4.2: Informal interviews.

Informal interviews were conducted for the affected parties so as to obtain more information through free discussion. Informal interviews allowed the researcher to explain clearly to the respondents the subject of discussion. They also allowed both the literate and illiterate persons to respond to questions directly (Johari, 1988).

3.4.3: Observation

Apart from questionnaires and informal interviews, data were also derived through

observation, where information observed was listed in observation sheet (Appendix 3). Consequently, the activities carried out in the wetlands were noted. Interesting features and activities that were being carried out were captured using a camera (see Plate 1 - 13).

3.5: Review of documented information.

Secondary data were gathered mainly from District Development Plans, (such as Kenya*, 1994-96) and included information on population, land use and development strategies; District Profile Reports (e.g MAL&M, 1995) which had information on irrigation and drainage activities in the district. Technical reports (e.g Irrigation and Drainage Research Project 1979; Kisii Valley Bottom Development Programme Project Proposal (Republic of Kenya, 1980); Kisii Valley-Bottom Development Programme, Interim Report No.1, 1986) which had information on the status and the prospects of wetland drainage in the district. These data was used to establish the trend of change of wetlands.

Survey maps were used to help locate the wetlands and identify the physical features and population dynamics in the study area. Information on wetland policy was gathered from secondary sources. These were, mainly, documents obtained various Ministries whose activities touch on wetlands. They included the Ministry of Land Reclamation, Regional and Water Development, the Ministry of Environment and Natural Resources, the Ministry of Tourism and Wildlife and the Ministry of Agriculture, Livestock Development and Marketing.

3.6 Methods of data analysis.

Various techniques were used to analyze the data collected. Simple descriptive methods, mainly, frequencies and percentages were used to summarize the data. Percentages, for example, were calculated using the following formulae:

$$P = \frac{x}{N} \times 100\%$$

Where:

P = percentage

X = the number of respondents

N = the total population

The likert scale, (Johari, 1988; Churchill 1991; Luck and Rubin, 1987) was used to establish peoples' perception and attitude towards wetlands because this scale yields a total score for each respondent enabling one to calculate the percentage opinion. The method was preferred because it is easier to construct and the answers given express definite favourableness or unfavourableness of a given point of view. The likert scale assigns a scale value ranging from 1 to 5 depending on the type of study. For this study the scaling had three categories: agree for strongly agree and agree, undecided and disagree for strongly disagree and disagree. Percentages were calculated using the above formula and interpretations made.

Photographs were taken in the field and interpreted by deducing information from them. Photographs are important because they show activities in an area at the time the photograph was taken. They are particularly important because they show reality to those who are not in a position to visit a particular area.

CHAPTER 4

RESEARCH FINDINGS AND INTERPRETATION:

4.1: Introduction

The perception by wetland adjacent communities of Sironga and Kianginda wetlands in Nyamira district and its effect on wetland use were noted. The latter involved analyses of the activities carried out in these wetlands and their environmental implications on the ecosystem. Policies touching on the development and use of wetlands are discussed with the intention to establish their influence on the conservation of Sironga and Kianginda wetlands. Analyses of data collected showed that various perceptions existed, including ; economic, socio-cultural and ecological (Table 4).

Table 4: General use and perception of wetlands in the study area.

Activity	Sironga household (%)	Kianginda household (%)	Average household(%)
Economic	69	79	74
Socio- cultural	12	5	8
Ecological	17	7	12
No response	2	9	6
Total	100	100	100

PLATE 3



A section at Sironga showing multiple activities i.e crop farming (bananas, sugarcane) agroforestry on the right hand side, cattle grazing, fish farming and brick making.

PLATE 4



A section at Kianginda showing various human activities. Tea and eucalyptus trees are seen at the background, cattle grazing and use of the wetland water for domestic purpose.

4.2: Economic Perception

Objective one of the study was to assess human perception of wetlands among the residents within Sironga and Kianginda wetlands. Field results indicated that various economic activities were carried out in both Sironga and Kianginda wetlands demonstrating the weight of economic perception by wetland-adjacent dwellers. Table 5 is a summary of the economic activities that were recorded during this study. Agroforestry was the most popular activity in the two wetlands. This was followed by brick making and food crop cultivation while livestock farming, nappier grass, cash crops (tea, coffee, pyrethrum, sugarcane etc), fish farming and clay harvesting were least(see also PLATES 3 and 4).

Table 5: Economic activities in the wetlands

Activity	No of households	Percentage
Brick making	43	51
Livestock rearing	33	39
Agroforestry	45	53
Food crop farming	35	41
Nappier grass growing	19	22
Fish farming	5	6
Clay mining	8	9
Cash crop farming	12	14

4.2.1: Agroforestry

Agroforestry was carried out in the wetlands by 53% of the households. Although the respondents indicated that they grew different tree species, it was observed that, *Eucalyptus* species were popular, having been grown by virtually all respondents.

This species was preferred, firstly, because it grows much faster compared to most species and it quickly drains wetlands and therefore it served people's intention of quickly establishing cropland and grazing fields on wetlands. Secondly, *Eucalyptus* matures faster explaining why it was planted for income generation. The respondents indicated that the prices of each trees varied between KES 300 and 1,000, depending on the size. *Eucalyptus* trees were used by the family to meet domestic needs of wood resources, and were also a major source of woodfuel in the brick making industry that was flourishing in Sironga wetland. The kilning or brick making requires a lot of fuel and as a result, most of the vegetation around wetlands had been cleared to provide for fuel in the industry. The Lake Basin Development Authority which makes bricks has about five acres of *Eucalyptus* plantation set for fuelwood in brick making. Livestock were allowed to graze these plantations freely. Although controlled growing of *Eucalyptus* trees in swampy areas could provide the desired drainage effect on the soil as suggested by Nyamwaya and Were (1986) the same activity may lead to reduction of water in the catchment area.

4.2.2: Crop cultivation

Chapter One showed that the study area is endowed with sufficient amount of rainfall and fertile soils. Field results also indicated that the two wetlands were locally perceived as important agricultural frontiers. As a result of this, a greater percentage of arable land was under cultivation and portions of the wetlands once referred to as "wastelands" (Table 1) had been converted to some beneficial activity such as crop cultivation. Table 13 shows that 79% and 52% households at Sironga and Kianginda, respectively, supported the use of wetlands for agriculture. This gives an indication that local farmers derived their livelihood from the resource by draining wetlands for agricultural activities. Crop cultivation was an important activity particularly at Sironga wetland. As observed during this study large areas had been drained for cultivation of different crops (see PLATES 7 and 8).

Although crop diversification was a common phenomenon, most households (64% at Sironga and 53% at Kianginda) specialised in maize growing. Although maize yields were reported to be dropping each year, the respondents confirmed that they keep trying because maize is their staple food. Beans were grown together with maize, but this was a rare practice as only 40% and 19% of the households at Sironga and Kianginda, respectively, were involved (Table 6).

Apart from maize and beans, finger millet was reported to be an important food crop grown in both wetlands. It is one of the traditional food crops cherished, as an important dish during weddings, child naming and circumcision. In preparing local brew, finger millet was and still is used. This has made it marketable in the area, hence, generating income to local farmers. Besides, its yields were reported to be better compared to that of most other crops grown in the wetlands. Thus, most people preferred planting it in the wetlands due to decreasing farm land. High demand for the crop made it very expensive in the area.

Sugarcane was also important, particularly at Sironga because of its monetary value. There were more respondents growing sugarcane at Sironga (26%) because of the availability of market, locally and in towns outside the district, and the good road network compared to Kianginda (12%). The different institutions (Table 12) carrying out activities at Sironga also provided ready market for sugarcane.

Tea was the main cash crop grown, but it was confined to wetland periphery (see PLATES 5 and 6) purposely, to check soil erosion. In some cases, the people are trying to grow tea further into the wetland although one could observe obvious failures of the crop. The increasing realization that the conversion of the natural wetland to other uses was not as profitable as imagined had not made the people stop persisting on with crop cultivation.

PLATE 5



A section at Sironga wetland showing tea on the wetland periphery. In the foreground there are brick debris indicating that the area was earlier used for making bricks.

PLATE 6



A section of Kianginda showing tea on the periphery, at the background there are hut thatched with *Echinochica pyramidalis* at the middle part of the photograph there are cranes. At the foreground there is *Echinochica pyramidalis*.

Table 6: The type of crops grown in Sironga and Kianginda wetlands.

	Sironga		Kianginda	
Types of crops	Number of households	(%)	Number of households	(%)
Maize	27	64	23	53
Beans	17	40	8	19
Potatoes	19	45	6	14
Finger millet	11	26	5	12
Sugar cane	11	26	5	12
Bananas	9	21	2	5
Tea	11	26	3	10

In most densely populated rural areas, wetlands are seen as the only areas for the expansion of crop cultivation. Indeed, most farmers had resorted to the cultivation of wetlands due to inadequate land and for the fact that there is need for food security both for the wetland families and the country at large (Chitechi, 1996). Gichuki *et al* (1992), established that farmers in Trans Nzoia relied heavily on wetlands for horticulture. They further observed that the farmers were strongly attached to the wetland ecosystem. In the study area, the conversion of wetlands into croplands had its origin with Kisii Valleybottom Development Programme in the early 1980s. The aim of KVDP was determined by national policy to increase food production in the district and indeed the country at large. Draining techniques that were introduced by the KVDP, changed the perception of local people on wetlands. The latter were now to be perceived as useful and not wasteland, idle and unpenetrable land. Since then, many people have turned into the wetlands for food crop production to support their families and occasionally sell the surplus. Other factors that contributed to wetland encroachment for economic use included: large family sizes, small

farm sizes and access to the wetland. More than half (53%) of the households interviewed had a family size of 5-9 members this gives an average family size of 7 members (Table 7). This is a large family size as compared to the average Kenya family of 5.6 (Kenya, 1994-1996). The large family sizes require large quantities of food and, hence, the need for more farm land. This causes stress on the available land making encroachment into wetland areas inevitable. A similar observation is reported for Mumias division (Chitechi, 1996) and, Trans Nzoia District where wetlands are being degraded following encroachment by near landless squatter settlers (Ogutu and Khayesi, 1994).

Table 7: Family sizes for the surveyed households at Sironga and Kianginda wetlands.

Categories	Sironga		Kianginda	
	No. of households	Percentage (%)	No. of households	Percentage (%)
1-4	7	17	1	2
5-9	24	57	21	50
10-14	9	21	17	40
> 14	2	5	4	9
Total	42	100	43	100

Small farm sizes and the way they are demarcated also contributes to wetland loss or wetland encroachment. Farm subdivisions ran from the hills down into the valley bottoms (see PLATES 7 and 8). Wetlands were therefore utilized mainly by those households whose land reached the valley bottoms. There were no boundaries that showed how far one went into wetlands or the extent of trust land. Some distant households (23%), however, had acquired wetland portions through hire or purchase (Table 8). On average, 68% of the households had inherited the wetland portions. Only 12% had bought portions in wetlands while 11% were renting. Further analysis reveals that at Sironga 76% of the households had inherited, 10% had bought and 12% were renting the wetland, compared to 61%, 14% and

PLATE 7



A section at Sironga showing subdivision of land which run from the hills to the wetlands.

PLATE 8



A section of Sironga wetland with newly dug drains in preparation for crop cultivation. At the background individuals have fenced the wetland.

9%, respectively, at Kianginda (Table 8). Whatever the method of acquisition, the affected households put the wetland into mainly economic uses.

Cases of land renting and buying were generally unpopular, firstly, because most people were not willing to sell land because it is the only property that their livelihood depend. Therefore they attached great value to it. Secondly, it was reported that potential buyers were afraid of purchasing land because of its sensitivity in the area and the district at large.

The desire to retain land for heirs and the reluctance to sacrifice the family livelihood are among the reasons preventing outright sale of land. Despite the fact that a person is the absolute owner of a parcel of land, he uses it subject to the desires and wishes of the family and clan members. In view of this, it is quite rare currently for a person to buy land in a different clan. Legally one can purchase it, but socially he is unlikely to settle on it peacefully and utilize it as he expects. This is because the customary principle that land belongs to the tribe, clan and family still prevails in the minds of people in Gusii. Land transactions can take place at ones own risk. This factor has affected the land market in Gusii as the would be buyers are discouraged (Nyamwaya and Were, 1986). This is a rare scenario among other ethnic groups such as the Maasai where land value is not understood in the capitalistic sense (Juma and Ojwang, 1996).

Inheritance of land therefore means continued subdivision of family land among the

members resulting in continued encroachment of wetlands as the farms become progressively smaller. Different studies (e.g Chitechi, 1991) have illustrated that land inheritance leads to land sub-divisions which is often agriculturally uneconomical (MAL&M, 1995). Given the current trend, wetland areas have to be subdivided to cater for the growing population. This scenario will lead to overuse of the wetland areas and thus its degradation (Chitechi, 1996).

A similar observation has been reported on Tanzania's wetlands. Land where family members have been cultivating for along time is passed on to the next generation (Omari, 1991).

Table 8: Forms of Wetland acquisition

		Sironga		Kianginda	
form of acquisition	Both areas (%)	No. Of households	Percentage (%)	No. of households	Percentage (%)
Inherited	68	32	76	26	61
Bought	12	4	10	6	14
Rent	11	5	12	4	9
No response	9	1	2	7	16
Total	100	42	100	43	100

Acquisition of land through inheritance has led to small farm holdings. 46% respondents at Sironga and 47% at Kianginda had holdings ranging between 1 and 4 acres. 21% of the holdings were between 4 and 6 acres. There were only 7% of the holdings with more than 6 acres (Table 9). The effect of land inheritance can be detrimental especially because the farm sizes affect the use and intensity of exploitation. The smaller the farm the more intensively it is used and the higher the need for extra land for farming, suggesting the

need to encroach wetlands.

Table 9: Farm sizes for interviewed households.

	Sironga		Kianginda	
Holding Categories (acres)	Frequency	Percentage (%)	Frequency	Percentage (%)
Less than 1	8	19	10	23
1.1- 4	19	46	20	47
4.1- 6	11	26	7	16
more than 6	3	7	3	7
no response	1	2	3	7
Total	42	100	43	100

4.2.3: Brick making

Economic perception of wetlands was also exhibited through brick making. It was a major economic activity in the study areas (see PLATE 9).

PLATE 9



Brick making activity at Sironga. *Eucalyptus* trees are used in the kiln as fuel.

Through this industry wetlands provided 56% of the households with income ranging between Kshs. 2,000 and 10,000 per month. There were 56% households who made bricks for sale. It was only a small percentage (7%) that made bricks for its own use. The remaining 19% of the households made bricks for both home use and sale (Table 10).

Table 10: Reasons for making bricks at Sironga and Kianginda.

Reasons for making bricks	Number of households	Percentage
Sale	47	56
Domestic	6	7
Sale and domestic use	16	18.8
No Response	16	18.8

Other than directly being a source of livelihood to the households involved, brick making was a source of employment. It absorbed various categories of household members (Table, 11) who include school leavers who are jobless and view wetlands on economic terms particularly as a source of income. Brick making is a booming business, particularly at Sironga which serves both Nyamira and Kisii Districts with bricks for building. The brick making industry has expanded rapidly since 1990 when operations were started by LBDA. The LBDA has encouraged many people to start their own brick making industries by providing them with the required skills. The authority through its brick making industries employs 50% of the people from the vicinity and other parts of the country while 50% is self-employed in the industry.

A number of people worked in the brick making industry (Table 11). This is the category of people that would have been jobless had they not encroached on wetlands. When interviewed both the youth and adults noted that wetland exhaustion will deny them a source

of livelihood. Some expressed fear that the quality of bricks from Sironga had deteriorated due to overuse and thus some people had already moved to other virgin wetlands in the district for the same activity.

Table 11: **People involved in brickmaking industries and their level of education.**

Level of education	Kianginda no. of people	Kianginda %	Sironga no. of people	Sironga%
University/college	2	5	4	10
High school/secondary	8	19	10	23
Primary	5	11	16	38
No formal education	3	7	8	19
Not making bricks	23	53	4	10
Total	43	100	42	100

Brick making was reported to be carried out throughout the year and the bricks made per month per household ranged between 1000 and 4000. The number of bricks made depended on the availability of labour, fuelwood and market. Thus, more bricks were made during school holidays when the school-going children provided the necessary labour. This coincided with the highest demand for bricks as most farmers had less to spend especially those educating children. The cost of a brick varied between Kshs.2 and 5 depending on the size and quality. All the affected households reported that they planted *eucalyptus* trees in the excavated areas to provide for the required fuel for brick processing. These trees were also important for draining of wetlands (see section 4.2.1).

There were various institutions carrying out activities in the wetlands. Draining and brick making were common while wetland suitable activities such as fishing was least popular (Table 12). Kianginda did not have any institution because it is narrow and has poor terrain, lying along river Gesiaga. On the contrary, Sironga occupies a wider flat bottomed valley, a phenomenon that encourages a lot of activities. Sironga is also easily accessible having comparatively better infrastructure.

Five out of the eight institutions interviewed reported that they were using their wetland areas for brick making. This is a clear indication of the economic perception of the resource. All the activities carried out by the institutions were economic related and included draining for crop cultivation, tree planting and brick making. Only one institution reported that it was using the wetland area for fish farming.

Table 12: **Institutions carrying out activities at Sironga wetland.**

Name of institution	Year started	Activities
Ministry of Agriculture Livestock & Marketing .	1979	Draining
LBDA	1990	Brick making, tree planting
Ministry of Home Affairs	1994	Prisons, draining, tree planting, brick making
Ibucha Women Group	1995	Brick making
Ibucha Primary School	1983	School site, draining tree planting, brickmaking
Sironga Primary School	1950	School site, draining tree planting, brickmaking
Botangwa self help group	1993	Brick making, fish farming
Sironga Secondary School	1972	School site, draining, tree planting

4.2.4: Livestock Farming

Whereas some households utilized wetlands for crop farming and brick making, others used them as areas for grazing and browsing (see Table 5 and PLATES 10 and 11). The households interviewed reported that they kept cattle mainly for the provision of milk for consumption and sale and, also for farm power (ploughing). Zero grazing was at its initial stage, with only 21% of the households practicing it.

Due to decreasing land size (Table 9) wetland areas are a major or supplementary source of grazing resources to adjacent households. The households drove animals for drinking water in wetlands or freely grazed them in wetlands. Free range grazing was becoming restricted as a number of people had fenced out wetland areas claiming ownership (see PLATES 8, 10 and 12). For some families, scarcity of grazing resources on arable land has led to the keeping of livestock on the wetlands throughout the year.

To cope with the increasing demand for fodder, 22% of the respondents had resorted to growing nappier grass to supplement natural pastures. Nappier grass was grown mainly in the drained sites of wetlands and was an important activity as some was sold to the farmers practising zero grazing but had no access to wetlands. This option may turn out to be very important as land sub-division among siblings continue (Table 8). In other wetlands such as Saiwa swamp, wetland grazing involves harvesting of natural vegetation (Gichuki *et al*, 1992). The vegetation is extracted to supplement on-farm grazing resources for zero grazing.

PLATE 10



A section at Kianginda wetland showing subdivision and fencing of the area for grazing this shows wetland degradation. At the background there is tea and *Eucalyptus* trees.

PLATE 11



A section of Sironga showing livestock farming and brick making at the background.

4.3: Socio-cultural Perception.

This study also established that the interviewed households perceived wetlands as significant socio-cultural resources. This observation was exhibited by different socio-cultural activities carried out in the wetlands as discussed below.

4.3.1: Collection of building materials

Different households extracted wetland materials for social activities such as construction. These were bricks, clay and thatching grass. The permanent houses were made of mainly clay bricks that was mined in wetlands. The affected households reported that bricks were cheaper and readily available compared to building stones. Transportation cost, for instance, was not needed. There were more permanent houses at Sironga than Kianginda, this was because brick making started earlier at Sironga and the people have taken advantage of the easily accessible material. This industry (brick making), however, had played a significant role in changing peoples' perception of wetlands from socio-cultural to economic (section 4.2.3).

The community collected grass (*Echinochica pyramidalis*) from wetlands to thatch houses with. This grass was reported to be cheaper compared to the grass obtained from hill tops. Some households confirmed that they will continue using *Echinochica pyramidalis* as they could not afford iron sheets. The affected households were not on salaried jobs (Table 3) and due to unfavourable economic trends, particularly in the agricultural sector, these households are unlikely to afford iron sheets.

Clay was another important building material that was obtained from wetlands. Majority (100%) reported wetlands as the main source of clay. This study observed that some households used clay for plastering their huts. The households without access to wetlands bought the clay from those farms bordering wetlands. At Kianginda 21% of the respondents reported that plastering clay mined from their section of wetlands was sold while 28% of the respondents indicated that plastering clay was mined free of charge. At Sironga these figures were 62% and 5%, respectively.

Wetlands were also important sources of timber for construction. It was noted that large areas were covered by *Eucalyptus* trees species which supplied wood products that were preferred for construction. Studies in other parts of the country also support the use of wetland materials for construction. Among the Luo and Luyha wetlands provide good materials for construction of houses (Kareri, 1992; Chitechi, 1996). Further wetland reeds are important for weaving mats and baskets (Otieno, 1993).

4.3.2: Recreational activities.

Field results also indicated that wetland areas were used as recreational sites. Part of Sironga wetland, for example, served as a major sports ground for various local institutions. This preference was based on the flat topography and the lack of large areas in the vicinity to serve as ideal grounds for recreational activities.

Although there were still a number of wetland birds in the wetlands, bird watching for

leisure was not significant. This is perhaps because the study area falls outside the local tourist zone (Kenya, 1995-1996). Further, the district is not endowed with features which can attract tourists (Nyamwaya and Were, 1986). Otherwise, in wetland areas such as Lake Nakuru and Amboseli National Parks, bird watching is an important leisure activity.

The study area was also used for meetings such as public 'barazas'. Due to land pressure, open areas were limited as such, various meetings such as chiefs' administrative meetings and annual Christian Camp meetings were conducted on well drained parts of Sironga wetland. This wetland also housed religious institutions such as Sironga Seventh Day Adventist church and Sironga Pentecostal Church.

The Ministry of Home Affairs and National Heritage also carried out different recreational activities. The prisons department, for instance, has excised a ten acre land for construction of administration units which they use to rehabilitate prisoners, especially imparting them with skills like brick making and crop farming. These activities enabled prisoners to become useful citizens. Thus, the art and skills they acquire could be used later for income generation to better their lives.

4.3.3: Sites for educational and cultural institutions.

In this study wetlands appeared to be the only areas available for the establishment of educational sites. This was due to lack of land in the district following rapid population growth in the recent past (MAL&M, 1995), and demarcation of most of the land to

individual land holdings. Unlike most previous studies on wetlands (e.g. Otieno, 1993; Chitechi, 1996) Sironga and Kianginda wetlands are not used as research sites. However, in this study area, there are sites set aside for construction of educational institutions.

As pressure intensifies, people are not willing to part with any piece of their land for public development. Thus the government is forced to excise part of the wetlands for communal or public use. This explains why a number of schools had been located on the wetland areas (Table 12). Primary schools cater for the local children, while the secondary schools cater for both local and children from outside the district.

Field results also indicated that Wetlands were important sites for circumcision, extraction of medicinal plants and a source of domestic water. Although traditional circumcision ceremonies are dying, a number of households reported that it still persisted in some areas. *Sagittarius* grass for example was extracted for initiation rites. More people opted for modern circumcision where initiation rites are not performed. This indicates that the significance of wetlands as circumcision ritual sites is reducing.

The importance of wetlands for male circumcision has also been reported among the Luhya (Kareri, 1992). Here the initiates are taken to a sacred site in a wetland where they smear themselves with mud and then walk naked back home. There are two symbolic meanings attached to this: firstly the soil gives protection similar to that of the mothers womb keeping the young man warm as he undergoes the ceremony; secondly this is the last time that the young man is expected by the society ever to go naked as he has been initiated into responsible manhood. The traditional beliefs about wetland circumcision sites is in line with the traditional needs for their conservation, in that they should never be allowed to dry up or

lose their basic characteristics. If the site dries up, it is believed that the generation of young men who 'bathed' at this site may not survive to fulfill their biological and societal duties of child-bearing and development of a family unit.

Wetlands were also an important source of medicinal plants. 100% of the respondents reported that they were aware of the availability of medicinal plants in the wetlands. Table 14 is a summary of some of the plants collected and identified from the study area. It is clear that the different plants are used not only for medicinal purpose but also for construction, fuel, food, rope- making and thatching. Similar observations have been reported in other parts of the country. Studies by Kareri (1992), Otieno (1993) and Chitechi (1996) have underscored the role of wetlands as a source of herbal medicine to adjacent dwellers. This popular perception may help in wetland conservation since conventional medicines are out of reach for most people in the rural areas.

Vegetation from the wetlands also provided residents with fuelwood. Large areas were covered with *Eucalyptus* trees, planted mainly for brickmaking industry. The LBDA had five acres of *Eucalyptus* trees specifically meant for brick kilning. This was an indication that wetland trees were important for fuelwood. Unlike Chitechi's (1996) study in Mumias division where people used small twigs for woodfuel, trees at Sironga and Kianginda wetlands were mainly for the kilning of bricks.

Unlike wetlands in other locations such as Sondu-Miriu (Otieno, 1993) Mumias

division (Chitechi, 1996) and Naivasha (Muthuri, 1985) Sironga and Kianginda wetlands did not have weaving materials such as *cyperus papyrus*. Geographically the two wetlands are located on a highland and perhaps, they do not have conditions suitable for the growth of reeds. The later requires warm conditions. *Abutition mayritianum* is the only plant that is suitable for handicraft and is being exploited for rope making.

4.4: Ecological Perception.

A study conducted at Kalimantan, in Southeast Asia established that residents use up to 80% of the region's wetland species. Thus, they depend on wetlands in their natural status, suggesting the significance of ecological perception of wetlands (Russels, 1993). A study on Sondu-Miriu by Otieno (1993) further demonstrated that, wetlands are important in their natural state because of the materials that are extracted from them by the local people.

Although literature review has exhibited a great deal of ecological perception of wetlands (see Section 2.3.1), the findings from this study showed that only 19% of the respondents conserved wetlands for their ecological role. More than half of the respondents (69%) indicated that they would rather use wetlands for economic activities, (see section 4.2). However, the ecological significance of wetlands was implicated in a number of activities including source of water, building materials and medicinal plants.

4.4.1: Water quality and quantity.

Field study found out that the community conserve wetlands as they purified water

used to meet the country's various needs (see PLATE 12).

PLATE 12



A section of Kianginda showing clear water and *Echinochloa pyramidalis*

In the study area, for example, majority (93%) of respondents indicated that wetlands were a source of clean water. Thus, they got water for domestic use from wetlands. All the respondents (100%) reported that they used wetlands as watering points for their livestock. Only 7% of the respondents indicated that they supplemented wetland water with either rain, well or piped water for their livestock.

More than half of the respondents (70%) reported that the quantity and quality of water had changed. They attributed loss in the amount of water with wetland degradation. The quality of the water had deteriorated compared to what it was in the 60s and 70s, an observation associated with loss of wetland vegetation. The latter holds and sieves the water before it filters through a wetland (see section 2.3.1). The population had no solutions to combating the problem of decreased water level and the deteriorating quality. Wetlands were also perceived as habitat for micro-organisms. Accordingly, most people reported that they could not use the water for drinking without treatment for fear of contamination.

An attitude test carried out on the ecological perception of the residents indicate that 65% and 72% of the respondents at Sironga and Kianginda, respectively (Table 13) demonstrated awareness that their activities were a threat to the welfare of wetland resources. However, 81% of the respondents at Sironga were not aware of the fact that draining of wetlands affected users downstream. Either the respondents failed to realise that there were users downstream or they simply did not care about them. This is a situation that has affected many water bodies on shared catchment areas, necessitating some form of bilateral agreements among the affected parties. Thus, there have been treaties on water that is shared by different nations.

Only 16% of the respondents (Table 13) demonstrated ignorance of downstream users at Kianginda. 12% and 68% of the respondents at Sironga and Kianginda, respectively, (Table 13) were aware that draining of wetlands affected users downstream. The large

responses on the impact of draining wetlands on downstream users suggest that adjacent dwellers at Kianginda were more aware of the impacts on downstream users than those at Sironga. The differences could probably be explained by the fact that the people at Sironga have for a long time been exposed to economic exploitation of the wetlands and are therefore more concerned about economic rather than ecological benefits. The water from both areas has far reaching impacts on the Lake Victoria basin, as it drains into Sondu-miriu and finally Lake Victoria.

4.4.2: **Habitat for biodiversity.**

81% and 82% of the respondents at Sironga and Kianginda, respectively, (Table 13) confirmed that wetlands were a home to a variety of species. They noted that the species found in wetlands were less valuable suggesting why they had done nothing to help conserve the wetlands for biodiversity.

A greater percentage of respondents, 79% and 52% (Table 13) at Sironga and Kianginda, respectively, rejected the suggestion that wetlands had no ecological functions. This further suggests that they were somewhat aware of the ecological significance of these ecosystems. Despite this observation, (55%) of respondents at Sironga did not support the idea of conserving the resource for wildlife. However, the idea of conservation of wetlands for wildlife was supported by 59% of the respondents at Kianginda although wildlife in this particular wetland was limited. This shows that wetlands are valued in their natural state at Kianginda compared to Sironga. Reacting to whether wetlands should be left in their natural state for their ecological functions, 60% of the respondents at Sironga were opposed while

there were mixed feelings at Kianginda with 40% supporting and 48% opposed to the idea.

Table 13: Responses to attitude statements

Opinion	Response	Both wetlands		Sironga		Kianginda	
		No.	%	No.	%	No.	%
Wetlands are unique and support a variety of species	Agree*	69	81	34	81	35	82
	Undecided**	9	11	3	7	6	13
	Disagree***	7	8	5	12	2	5
Human activities are a treat to wetlands.	Agree	58	68	27	65	31	72
	Undecided	6	7	1	2	5	12
	Disagree	21	25	14	33	7	16
Draining affects users downstream.	Agree	35	41	5	12	30	68
	Undecided	10	12	3	7	7	16
	Disagree	40	47	34	81	6	16
They should be drained for agriculture.	Agree	55	65	33	79	22	52
	Undecided	14	16	4	9	10	23
	Disagree	16	19	5	12	11	25
They do not serve any ecological functions.	Agree	41	48	16	38	25	59
	Undecided	10	12	3	7	7	16
	Disagree	34	40	23	55	11	25
They should not be drained because they are important for wildlife.	Agree	41	48	16	38	25	59
	Undecided	10	12	3	7	7	16
	Disagree	34	40	23	55	11	25
They should be left natural for their ecological roles.	Agree	33	39	16	38	17	40
	Undecided	6	7	1	2	5	12
	Disagree	46	54	25	60	21	48
Wetland loss has not affected wildlife.	Agree	29	34	15	36	14	33
	Undecided	11	13	3	7	3	19
	Disagree	45	53	24	15	24	48
Wetland are important sources of building materials	Agree	76	89	39	93	37	86
	Undecided	4	5	0	0	4	9
	Disagree	5	6	3	7	2	5

* represents strongly agree and agree

** represents those who were undecided only

*** represents those who strongly disagreed and disagreed.

Apart from wildlife, a variety of plants were reported to be found in the wetland areas. Table 14 is a summary of plants reported to be found in the wetlands.

The respondents demonstrated sound knowledge of plants in wetlands both in the past and present time. A number of valuable plants however, were reported to have disappeared as a result of wetland drainage. These included medicinal plants which have now to be obtained from distant areas. 100% of the respondents reported that they knew wetland plants that were important medicinal plants. Surprisingly, despite this knowledge, they did not stop draining wetlands for economic gains.

Table 14: A list of Wetland plants

Kisii	Botanical name	Family name	Uses
<i>Esasati</i>	<i>Echinochica pyramidalis</i>	<i>Cyperaceae</i>	Covering bricks and thatching.
<i>Chinunda</i>	<i>Fungus spp</i>	<i>Funceae</i>	Making belts by traditional women
<i>Enderema ya roche</i>	<i>Ophioglossium spp</i>	<i>cyatheaceae</i>	Medicine for livestock & food for fish
<i>Omonyasabuni</i>	<i>Microglossa pyrifolia</i>	<i>Compositae</i>	Traditionally used as soap.
<i>Omomiso</i>	<i>Triumfetta macr</i>	<i>Tiliaceae</i>	Ropes for making baskets.
<i>Omokonga</i>	<i>Polygonum afromontanum</i>	<i>Polygonaceae</i>	Medicinal herbs
<i>Ekenene</i>	<i>Rubus opetatus</i>	<i>Rosaceae</i>	Fruit eaten/used to make jam
<i>Omomiso</i>	<i>Triumfetta flarescens</i>	<i>Tiliaceae</i>	Ropes for making baskets

The areas covered by sedges (*Echinochica pyramidalis*) was reported to have decreased. At Sironga 74% of the respondents reported that *Echinochica pyramidalis* had decreased compared with 54% of the respondents at Kianginda. It was particularly observed that there were more wetland sedges at Kianginda than Sironga (also see PLATES 1 and 2). This situation at Sironga can be explained by the high demand of *cyperus sp* in the brick making

industry. This grass is used to cover the bricks when they are spread out to dry and also used in thatching structures where bricks are stored to avoid destruction by cattle direct sunlight and rain.

4.4.3: Protection measures.

To find out whether the people were rehabilitating degraded wetlands an open ended question was presented. Different rehabilitation and/or conservation procedures were listed. From the responses which were later categorized into four, (Table 15), (41% at Sironga and 44% at Kianginda) of the respondents indicated that they had not tried any method to conserve the wetlands. In any case some of them indicated that they were draining the wetlands to improve them, that is, make them economically productive and therefore did not perceive their effects detrimental.

The results indicated that wetland conservation was not taken seriously and the people felt that the wetland areas should be converted so that they can be used more economically. The term conservation was equivalent to draining which was seen as a way of improving the wetlands for use. The suggestions given on protection did not seem to auger well with the peoples' feelings.

Due to the monetary value attached to nappier grass and trees, 22% of the respondents at Sironga and 24% at Kianginda indicated that they planted nappier grass and trees which do not drain a lot of water, to help protect wetlands.

Table 15 Conservation measures

Protection measures	Sironga respondents	%	Kianginda respondents	%
No protection measure	17	41	19	44
Planted trees & nappier grass	9	21	10	23
Left natural	3	7	10	23
Improved soil nutrient	13	31	4	10
Total	42	100	43	100

4.5: Policies on wetland conservation in Kenya.

The third objective of this study was to assess government policies on the conservation of wetlands. Analysis of existing documents indicated that Kenya does not have a wetland policy *per se* but the different regulations existing in various government departments and organisations governing wetland conservation. Below is a brief summary of government Ministries whose activities affect wetlands.

The Ministry of Agriculture, Livestock Development and Marketing plays a significant role in wetland management in Nyamira District. This Ministry, through the National Irrigation Boards (N/B) policy discourages draining of wetlands and only in exceptional cases is drainage allowed to assist farmers in agricultural production. The Ministry of Planning and National Development policy on wetlands, on the other hand, is rather general, falling under preservation of ecosystems and habitats. It caters for the conservation of wetlands for provision of water to provide water in sufficient quantity and good quality for human consumption, livestock, agriculture and agroforestry.

The Ministry of Land Reclamation, Regional and Water Development Policy emphasises conservation of water and catchment areas for purposes of protecting water obtained therefrom and prohibits drainage of wetland areas. The Ministry of Environment and Natural Resources policies, on the other hand, encourages preservation of wetlands for the purpose of protecting biodiversity, conservation of soils, and water.

The above analysis shows that wetlands are under various sectoral policies whose mandate are varied. This leads to overlapping of responsibilities, it was observed, for instance, that various Ministries were involved in wetland development in the area of study. The Ministry of Agriculture, Livestock Development and Marketing plays a significant role in draining of wetlands for crop cultivation. As such, farmers had constructed drains in wetland areas to enable them utilize the area for agriculture. This had been done with the technical assistance from this Ministry. The Ministry of Environment and Natural Resources, on the other hand, was involved in tree planting, hence, playing conflicting roles in wetland conservation. These two Ministries were working in the same area and dealing with the same farmers, a situation that is likely to give farmers different signals on wetland utilization.

The Lake Basin Development Authority under the Ministry of Land Reclamation, Regional and Water Development was making bricks. This activity has been taken up by most farmers (see Section 4.2.1). Given the above scenario, it is up to the farmer to make a decision on how to utilize the wetland and in most cases the activity that gives the highest benefits will prevail.

Although the Ministry of Land Reclamation, Regional and Water Development would like to conserve wetlands as water catchment areas, the Ministry of Agriculture, Livestock Development and Marketing gives emphasis on food security necessitating draining of wetlands. Emphasis on food will obviously take precedence because agriculture is the mainstay of the area. Even the local institutions in the area are concerned with the economic activities which have little to do with conservation (Table 12).

4.6: Implications of human perception on wetland conservation.

This section attempts to examine the implications of varied perceptions on wetlands. Economic perception (section 4.2) was found to be the most prevalent while socio-cultural and ecological perceptions (section 4.3 and 4.4, respectively) were less important. This observation has different implications that are herein discussed.

4.6.1: Implications of economic perception on wetland conservation.

Economic perception was found out to be a response to the resident's need for land due to high population pressure on surrounding arable land. Before the 1950s, wetlands in the study area were not utilized for economic activities but a source of water for domestic use, clays for plastering, medicinal plants and grass for thatching as well as habitats for wildlife.

Wetland encroachment was accelerated by government policy on land demarcation during the 1950s whereby wetlands were acquired for individual gains and community

projects such as schools and the brick industry. Encroachment into wetland for economic use was further accelerated in the 1970s due to government emphasis on self-sufficiency in food production (Gichuki, 1992). As arable land was already decreasing, wetlands were then viewed as important areas for agricultural expansion and funds were given out for wetland reclamation. In Kisii the wetland drainage became acute in the 1980s necessitating handing over of wetlands to the Gusii Country Council in a bid to conserve them because of the important role they play in the environment (Nyamwaya and Were, 1986). This move, however, did not halt wetland encroachment for crop cultivation. Where cultivation failed, the area was put into brick making and growing of eucalyptus trees.

Though the economic perception of wetlands is to reduce pressure on the available arable land, contribute to food self-sufficiency and improve the standard of living of the people around them, it has led to degradation of wetlands as more and more soil washed downslope from the farms is deposited in wetlands. Soil erosion affects wetlands through eutrophication of water bodies as the fertilizers used in the farms are swept downstream through leaching or runoff (Gitonga, 1992). Crop cultivation also leads to wetland degradation as peat soils are quickly oxidized and thus become less productive with time. The soils also contract and form cracks which renders them unproductive and prone to erosion (see PLATE 13).

A similar observation is reported in Gesusu swamp in Kisii where, Muya (1985) found that peat soils once drained were subject to continuous oxidation resulting in carbon

dioxide and water leaving the system. This study demonstrated that peat soil can disappear after some years of drainage or exposure reducing the productivity of reclaimed areas.

Cattle grazing in wetlands leads to overgrazing as the cattle were kept in the wetlands all the year round. Overgrazing of wetlands leads to soil compaction and erosion, particularly when the animals are confined to small surface area (see PLATE, 11). The wetland grass is short and soil exposed in some areas. A sign of wetland degradation.

Although brick making benefit people immensely (as outlined in section 4.2.3), it is generally not sustainable. The kilning of bricks leads to de-vegetation of the area, as large areas are cleared of vegetation for the brick making industry or dug to provide for the required soils. In a bid to get firewood, exotic tree species, such as, *Eucalyptus* are planted in the excavated wetlands (see Plate 1). This species is believed to further drain the affected sites contributing to further wetland loss (Chitechi, 1996). The dug out areas are often left hollow and therefore pose danger to animals and man.

Tree planting in wetlands has a number of effects on wetland hydrology. Trees may reduce the flow of water, and generally the amount of available water through evapotranspiration. The planting of *Eucalyptus* trees in the wetlands also contributes to wetland drainage. This will in the long run contribute to drying up of the resource and as a result lower the water table which will in turn affect the extent of the wetlands. It will also reduce the amount of water in the area as well as downstream, an effect which will

PLATE 13



Soil cracks due to loss of water.

ultimately affect water in the lake Victoria basin.

4.6.2: Implications of socio-cultural perception

In the traditional Gusii society, wetlands were important for their socio-cultural values such as communal grazing, materials for cultural ceremonies such as circumcision, water for domestic use, building materials and sources for traditional herbs. The findings of this study suggests that this perception has given way to economic perception. With time, traditional

activities which were highly valued such as circumcision ceremonies have become less important. From this study it was found that socio-cultural perception has been overtaken by technology. Wetlands as a source of grass for construction, for example, has become less significant as more and more people use iron sheets. Plastering houses with clays has become increasingly rare as most households have started constructing permanent houses using bricks and stone. Further, the availability of wetland materials for construction such as clay and *Echinochica pyramidalis* has been commercialized. Thus, wetlands are viewed in terms of their monetary rather than social benefits. This threatens their future.

In areas where wetlands are still perceived as socio-cultural assets, however, they are being conserved. Among the Luyha's of western Kenya, for instance, male circumcision is very important, therefore wetland areas are conserved for this ceremony (Kareri, 1992). Wetlands along river Sondu-Miriu are being protected since they provide reeds and fish to the local communities (Otieno, 1993).

In the study area, privatisation of land and population growth leaves no land for social projects therefore the only areas that could be used for this are the wetlands. There are various institutions such as churches and schools (Table 12) and these have reduced the size of wetlands. Sironga wetland, for instance, is almost gone as most of it has been allocated to construction of institutions in it and as a result there is a growing market centre which with time may eventually become a town and thus leading to loss of the wetland.

4.6.3: Implications of Ecological perception.

The findings of this study have largely indicated that ecological perception was least important among the interviewed households (see Section 4.4). Although the respondents had knowledge of wetland plants and animals, they were not in favour of conserving them because of the availability of attractive (modern) resources. Instead, wetlands were being drained for economic uses such as crop cultivation, planting of trees and brick making. Although majority of households at Kianginda indicated that they would like to conserve the wetlands for wildlife there was no evidence in the field to support this feeling. Most people had planted *Eucalyptus* trees to drain the wetland. *Eucalyptus* trees exclude most undergrowths reducing the flora *in situ*.

In some areas various plants were obtained from wetlands for various uses. This perception leads to wetland conservations. However, the practice of collecting medicinal plants is quickly dying out as more people are turning to conventional medicine. This factor threatens any attempts to conserve the wetlands for medicinal plants.

All the respondents (100%) indicated that they use water from wetlands thus they will conserve them for the provision of clean water. This is an indication that in those areas where ecological perception prevails conservation results. The people will utilize wetlands in such a way that they do not jeopardize the use of the resource for future generations. Kianginda wetland is much more intact than Sironga where economic perception prevails.

4.7: Implications of Government policies on wetland conservation.

Section 4.5, showed that Policies of various ministries towards wetlands are sectoral and often conflicting with wetland conservation principles. The Ministry of Agriculture, Livestock Development and Marketing policies, for example, encourage draining of wetlands for food production, contributing to extensive damage of wetlands. This policy conflicts with the management of wetlands for biodiversity and water quality in the catchment areas emphasized by the Ministry of Environment and Natural Resources.

CHAPTER FIVE.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS.

5.1: Introduction

The purpose of this study was to investigate the implication of human perception on wetland conservation. This chapter is a summary of the findings, conclusions and recommendations.

5.2: Summary of findings

The first objective of this study was to assess perception of wetland resources by adjacent households. It was established that: Differences exist in wetland perception among the local community. Wetlands were perceived as either economic, socio-cultural or ecological assets. Majority of the households perceived wetlands predominantly as an economic resource and therefore exploited them for economic gains. This perception was attributed to increasing human population on available land with wetlands becoming the last frontiers for agricultural expansion and commercial exploitation. The socio-cultural perception on wetlands had become less important due to social changes and modernization processes; such as, change in cultural practices and introduction of new technology. Wetlands, however, served as sites for the construction of schools, churches and other government institutions, and were important sites for sports grounds for various local institutions and source of construction materials and herbal medicines.

Although wetlands were important for ecological functions, such purification of water

for domestic use, this perception was not supported by existing activities. Majority of the people concentrated on activities which promoted their economic well-being. Except for water filtration of wetlands other ecological perception was least important among the households. Although the respondents demonstrated knowledge of wetlands flora and fauna they were not in favour of conservation for biodiversity. This was so because the monetary value of economic activities outweighed the ecological values which are for the common good.

The second objective was to examine activities arising from human perception and their impact on sustainable management of wetlands. It was established that there are various economic, socio-cultural and ecological activities. Economic activities prevailed, they were: tree planting, brick making, crop cultivation and livestock farming. It was established that Sironga had the greatest number of people making bricks. The activity is carried out by both individuals and institutions. Brick making is highly commercialised in the area unlike Kianginda wetland, where it is on individual basis.

Agroforestry was important in both wetlands as the trees were important for both draining and providing fuelwood in brick making. Crop cultivation and livestock farming in wetlands were also becoming increasingly important due to population pressure and economic perception.

Socio-cultural activities were: collection of building materials, recreational, and sites for educational and cultural institutions. It was established that some of the building materials that were earlier obtained for free from wetlands, such as clay, were now sold. These

findings somewhat suggests increasing change in perception of items extracted from the wetlands from social to economic. Ecological perception was exhibited by activities such as, collection of water for domestic use and the use of wetland plants. These activities have various implications on wetlands, economic activities lead to wetland degradation and reduction while socio-cultural and ecological activities lead to wetland conservation (See Section 4.5).

The third objective was to outline government policies touching on conservation of wetlands in the study area. It was established that there were various approaches used by various ministries which affected management of wetlands. These approaches were conflicting and overlapping. There were various departments in various Ministries that were engaged in wetland development. This had contributed to the multiple use of the wetlands. For instance, the Irrigation and Drainage Board in the Ministry of Agriculture Livestock Development and Marketing, was involved in draining of the wetlands for agricultural activities while at the same time the Lake Basin Development Authority was making bricks and planting trees. The forestry department of the Ministry of Environment and Natural Resources was also planting trees. This left the farmer to decide on the activity to carry out in the wetlands. Also it was observed that there were no clear boundaries on the section that was trust land and therefore buffer zone, rather all those adjacent the wetlands acquired and used the land for their own economic gains. This was made worse by the fear that the government may claim the portions that they were already under public projects.

5.3: **Conclusions**

This study has demonstrated that local perception of wetlands is predominantly

economic. As a result most activities are exploitative in nature and hardly give any consideration to conservation of wetland resource. If this trend continues wetland resource will be a thing of the past. Therefore there is need to revitalise socio-cultural and ecological significance of wetlands for their wise use. This move doesn't whatsoever prohibit use of wetlands for economic gains. On the contrary, it calls for integration of economic, socio-cultural and ecological roles of the resource.

5.4: Recommendations for wetland users.

Most communities around wetlands perceive them as land that should be used for activities that benefit them economically. This perception has led to individual or group benefits that are short-lived and to the disadvantage of future generations and wetland users downstream. To address this problem, there is need to educate different actors, especially on the ecological significance of wetlands. There is also need to introduce alternative economic sources which will include conservative farming and brickmaking on the available farms other than on wetlands to off-set increasing pressure on wetlands. If bricks must be made in wetlands, then necessary land rehabilitation measures must be legislated. It will also be important to leave the areas that have been used for brick making to regenerate.

5.5: Recommendations for policy makers.

The policies governing conservation of wetlands are in various ministries and organisations with different approaches for wetland conservation this leads to sectoral and conflicting interests, paving way to abuse of wetland resources. Given this confusion, there is urgent need for guidelines on wetlands, especially to reconcile the conflicting interests.

5.6: Areas for further research.

Although the present study concentrated on wetland perception, it may be necessary to establish the impact of wetlands loss on water resources. There is also need to establish local perception of the loss of wetlands.

Women are the majority in rural areas and play a significant role in the development of rural areas in Kenya, there is need to find out how their perception of wetlands could be useful in wetland management. Similar studies need to be conducted to establish national image of the role of perception and wetland conservation. The findings will be useful, especially for the formulation of a national wetlands policy.

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APPENDIX (I)QUESTIONNAIREPart i: Background information of the wetland user.

1. (i) Name (Optional) _____ Date of interview: _____
 (ii) Sex: Male Female
 (iii) Age: below 40 above 40
 (iv) Village: _____
2. Occupation (Main source of income)
 (i) Civil servant
 (ii) Teacher
 (iii) Farmer
 (iv) Wage earner
 (v) Other (specify) _____
3. What is your educational level?
 (i) University
 (ii) College
 (iii) High school
 (iv) Secondary
 (v) Primary
 (vi) Other (specify) _____
4. What is the size of your farm?
 (i) Below 0.5 Acres
 (ii) 0.5 - 2.1 Acres
 (iii) 2.1 - 4.0 Acres
 (iv) 4.1 - 6.0 Acres
 (v) 6.1 and above
5. What is the average family income?
 (i) Less than Kshs.1000
 (ii) Kshs.1001-3000
 (iii) Kshs.3001-6000
 (iv) Kshs.6001-9000
 (v) Above Kshs.90001
6. Tick the type of land ownership.
 (i) rented
 (ii) freehold
 (iii) temporary lease

7. For how long have you been on this farm?

- (i) 0 - 10 years []
 (ii) 11 - 20 years []
 (iii) 21 - 30 years []
 (iv) 31 - 40 years []
 (v) above 50 years []

8. (a) (i) How many people are in your household? []

(ii) Number of males [] Females []

(iii) Males over 20 [] Females over 20 []

(iv) Number of people dependent on the land []

(v) Is output from your farm sufficient? Yes [] No []

(vi) If no, list supplementary sources. _____

(vii) Do you have another piece of land elsewhere? Yes [] No []

(b) If yes, what type of crops do you grow? _____

(ix) Why did you decide on having another piece of land elsewhere?

10. (a) Name the crops that you grow.

Cash crops (i) _____ (ii) _____ (iii) _____
 Food crops (i) _____ (ii) _____ (iii) _____

(b) Do you apply any agrochemicals on your farm? Yes [] No []

(c) If yes, please list any two. (i) _____ (ii) _____

Part ii: Information on Wetlands

11. (a) Do you have a wetland on your farm? Yes [] No []

(b) What type of wetland appears on your land?

(i) Etente (i.e a permanent waterlogged condition in narrow valley with impeded drainage or in the lowest part of the wide valleys).

describe it _____

(ii) Riranya (i.e riverine swamp, occurring in the floodplains of rivers. It is temporarily flooded during high flow periods.

describe it _____

(iii) Ekerubo (i.e flat or slightly sloping land, temporarily waterlogged, due to seepage from surrounding slopes.

describe it _____

(iv) Other (specify) _____

12. (a) State the approximate size of the wetland. _____

(b) Do you own the wetland? Yes [] No []

(c) If yes, into what uses do you put it?

(i) _____ (ii) _____ (iii) _____

13. (a) If you have no wetland on your land, name the type of wetland that you know elsewhere.

(i) _____ (ii) _____ (iii) _____

(b) Approximately how far is it from your land? _____

(c) Who owns it? _____

(d) For what uses do most people put wetland?

(i) _____ (ii) _____ (iii) _____

14. (a) Have you bought/rented any part of the wetland? Yes [] No []

(b) If yes, for what purpose?

(i) _____ (ii) _____ (iii) _____

15. (a) What time of the year do you use the wetland most?

(i) Rainy season []

(ii) Dry season []

(iii) Throughout []

(b) Give reasons for your answer.

(i) _____ (ii) _____ (iii) _____

16. (a) Have you drained any part of the wetland? Yes [] No []

(b) If yes, state the specific purpose for which you drained the wetland.

(i) _____ (ii) _____ (iii) _____

(c) Do you face any problems in using the wetland e.g waterlogging, (specify)

(d) How have you tried to solve these problems?

- (i) _____
- (ii) _____
- (iii) _____

17. Have you drained the wetland for other uses? Yes [] No []

Name the uses:

- (i) _____
- (ii) _____
- (iii) _____

18. (a) State whether or not the wetland size has shown any change over time.

- (i) Reduced in size _____
- (ii) Size not changed _____
- (iii) Expanded _____

(b) If there has been change, when was it most noticeable (approximate year)?

(c) What could have been the cause for the change?

- (i) _____
- (ii) _____
- (iii) _____

19. (a) Have you taken any action to change the natural state of the wetland? Yes [] No []

(b) If yes, which actions?

- (i) Draining _____
- (ii) Filling of excavated pits _____
- (iii) Clearing the vegetation _____
- (iv) Any other (specify) _____

(c) For what reasons did you take these actions which have changed the natural state of the wetland?

- (i) For agriculture _____
- (ii) For settlement _____
- (iii) For flood protection _____
- (iv) Cultural activities (specify) _____
- (v) Other (specify) _____

(d) How much of the area has been changed?

- (i) Whole []
- (ii) 3/4 []

(iii) 1/2 []

(iv) 1/4 []

(e) (i) Do you intend to continue with the above actions? Yes No

(ii) If yes, for what purpose? _____

Part iii: Economic perception

20. (a) Are you involved in brick making? Yes No

(b) If yes,

(i) Why? _____

(ii) How many bricks does this earn you? _____

(iii) How much do you sell one brick? _____

(iv) Where do you sell the bricks? _____

21. (a) Do other people use your wetland? Yes No

(b) Identify the mode of access.

(i) Rented []

(ii) Bought []

(iii) Free land []

22. List the uses of dug out areas?

(i) _____ (ii) _____ (iii) _____

23. (a) Is clay mined from your section of the wetland? Yes No

(b) If yes, is it sold or mined for free?

Sold []

Mined for free []

(c) If sold, specify how you tag your price? _____

(d) Where do buyers come from? _____

(e) Some clay is mined for free from some sections of the wetland, Who owns these sections? _____

24. (a) Is livestock grazing in wetlands free for everyone? Yes No

(b) If no, specify terms of access. _____

- (c) During which time of the year are the livestock grazed/browsed in the wetlands?
- (i) All seasons []
- (ii) Dry season []
- (iii) Wet season []

25. Wetland areas have potential for different uses. How would you rate the following uses?

- (a) Growing crops []
- (b) Fishing []
- (c) Feeding of livestock []
- (d) Source of building materials []
- (e) Water supply []
- (f) Brick making []
- (g) Making baskets, mats etc []

26. (a) Do you cultivate the wetland? Yes [] No []

(b) If yes, name the crops grown.

Cash crops

Food crops

- (i) _____
- (ii) _____
- (iii) _____

- (i) _____
- (ii) _____
- (iii) _____

(c) Identify the agricultural chemicals used.

- herbicides []
- pesticides []

(d) How would you describe your crop harvest?

- Good []
- Fair []
- Poor []
- Declining []

27. (a) Would you like to continue draining the wetland for crop cultivation?

- Yes [] No []

(b) Give reasons for your answer. _____

28. Do you feel that wetlands contribute more than your other sources of income towards your monthly cash incomes? Yes [] No [] Not sure []

Part iv: Socio-cultural perception.

29. (a) Who owned wetlands in the traditional society?

i) The community []

ii) The family []

iii) The individual []

(b) If owned by an individual, what was his status in the community?

(c) List the uses of wetlands by the traditional community?

(i) _____ (ii) _____ (iii) _____

List the plants you obtain from the wetland and their uses.

Plant	Uses

31. (a) List other materials and their uses that you obtain from the wetland.

Material	Uses

(b) Are there some materials that were obtained before but they are now not available?

Yes [] No []

(c) If yes, please list them below.

(i) _____ (ii) _____ (iii) _____

Part v: Ecological perception.

32. (a) Name the wild animals found in the wetland.

(i) _____ (ii) _____ (iii) _____

(b) Name the wild animals that are hunted.

(i) _____ (ii) _____ (iii) _____

(c) Name the dangerous wild animals found in the wetland.

Present

Past

(d) Are there some wildlife that you know of which were there before but are no longer found? Yes [] No []

(c) If yes, please name them.

(i) _____ (ii) _____ (iii) _____

(e) Why do you think the wildlife have disappeared? (i)

(i) _____ (ii) _____ (iii) _____

(f) Can you remember birds that were found in the wetland before?

(i) _____ (ii) _____ (iii) _____

(g) Name the birds that are found there now.

(i) _____ (ii) _____ (iii) _____

33. (a) Are there some plants that you know of that were there before but are no longer found?

Yes [] No []

(b) If yes, name them.

(i) _____ (ii) _____ (iii) _____

(c) What do you think are the reasons for the loss of the plants named?

(i) _____ (ii) _____ (iii) _____

34. (a) Do you obtain water from the wetland? Yes [] No []
 (b) If yes, is the water you obtain from the wetland clean? Yes [] No []
 (c) If no, was it cleaner before? Yes [] No []
 (d) If your answer is yes, give reasons that has contributed to water uncleanliness.
 (i) _____
 (ii) _____
 (iii) _____
- (e) List the uses of the water on the basis of their important.
 (i) _____ (ii) _____ (iii) _____
35. How is wetland removal at present compared to 30 years ago?
 (i) low [] (ii) high [] (iii) no difference []
36. What in your opinion could be the major causes of wetland removal?
- (a) Thirty years ago
 (i) _____ (ii) _____ (iii) _____
- (b) Present time
 (i) _____ (ii) _____ (iii) _____
37. (a) What do you feel about wetland removal? _____
- (b) Give reasons for your answer above.
 (i) _____ (ii) _____ (iii) _____
- (c) Have you instituted any conservation measures for the wetland? Yes [] No []
 If yes, list them.
 (i) _____ (ii) _____ (iii) _____
38. (i) What do you think is the best use of wetlands?
 (i) _____ (ii) _____ (iii) _____
- (ii) How best can wetlands be improved if they are getting degraded?
 (i) _____ (ii) _____ (iii) _____

Part vi: Attitude test on perception.

NB: The following statements represent opinions. Write the letter which matches your extent of agreement or disagreement with each.

SA: Strongly agree

A: Agree

U: Neutral

SD: Strongly disagree

D: Disagree

39. Swamps are unique and support a wide variety of species. []
40. The greatest threat to swamps is the human activities. []
41. If a swamp is drained it will affect users downstream. []
42. Swamps should be drained for agricultural use. []
43. Swamps do not serve any ecological functions. []
44. Swamps are important habitats for wildlife
and should be conserved for this purpose. []
45. Swamps should be left in their natural
state for their ecological functions e.g provision of water. []
46. Although there is significant reduction of the swamp,
there hasn't been any significant effect on the wildlife. []
47. The swamp is important in the provision of building materials []

Appendix 2

This questionnaire is aimed at finding out the activities carried out by various institutions.

NAME OF INSTITUTION : _____

YEAR STARTED : _____

48. Do you own any part of the wetland? Yes [] No []

49. a) Are you involved in any type of activities in the wetland? Yes [] No []

b) If yes, tick activity from the list given below.

- | | |
|--------------------------|-------|
| (i) Agriculture | [] |
| (ii) Tree planting | [] |
| (iii) Brick making | [] |
| (iv) Fish farming | [] |
| (v) Wetland conservation | [] |
| (vi) Other Specify | _____ |

(c) Briefly describe the purpose/objective of the activity you are undertaking?

(i) _____

(ii) _____

(iii) _____

50. (a) What problems have you encountered in trying to implement these activities? _____

(b) How do you go about solving these problems?

(i) _____

(ii) _____

(iii) _____

51. (a) How would you describe the state of the wetland?

Decreasing [] Expanding [] No change []

(b) What do you think has been the causes of the above changes in the wetland?

52. (a) Have you taken any action to improve the state of the wetland? Yes [] No []

(b) If yes, list the actions and their specific purpose.

(i) _____ (ii) _____ (iii) _____

(c) If no, give reasons? _____

53. (a) What has been the response of the local people in the actions taken in 48(b)

above? _____

(b) If the response is negative, how best can we involve the local people in wise use of the wetland? _____

(c) If the response is positive, how would you describe the success?

Very good [] Good [] Fair [] Poor [].

55. What are your policies on wetlands? _____

Appendix 3

Part I : Observation checklist

The observation sheet will be filled from observations made in the wetland areas. This will give indication of the attitudes and perceptions of the local people.

	No. of Farmers.	Acreage.
(i) Drainage for agriculture.		
(a) cash crops.		
(b) food crops.		
(c) horticultural crops.		
(ii) Brick making.		
(iii) Grazing.		
(iv) Hunting.		
(v) Fishing.		
(vi) Tree planting.		
(vii) Settlement.		
(viii) Waste dumping.		