

**IUCN - The World Conservation Union**

Eastern Africa Regional Office  
PO Box 68200  
Nairobi, KENYA

Tel: ++254 2 890 605-12

Fax: ++ 254 2 890 615

**UGANDA BIODIVERSITY:  
Economic Assessment**

A report prepared for  
National Environment  
Management Authority  
as part of the  
*Uganda National  
Biodiversity Strategy  
and Action Plan*

**Lucy Emerton  
&  
Eugene Muramira**

**Feb 1999**

# CONTENTS

---

<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Background to the assessment.....	1
1.2 Structure of the assessment.....	2
1.3 Available information on biodiversity economics.....	3
<b>2. ECONOMIC STRUCTURE, POLICY AND BIODIVERSITY</b> .....	<b>5</b>
2.1 Overview of the Uganda economy.....	5
2.2 Phases of economic structure and activity .....	5
2.3 Economic structure and composition.....	7
2.4 Current economic strategies and policies.....	7
2.5 Economic and policy impacts on biodiversity .....	10
2.5.1 <i>Impacts of economic activities on biodiversity</i> .....	10
2.5.2 <i>Structural and policy influences on biodiversity</i> .....	11
<b>3. THE ECONOMIC BENEFITS OF BIODIVERSITY</b> .....	<b>13</b>
3.1 Overview of biodiversity economic benefits.....	13
3.2 Direct benefits.....	14
3.2.1 <i>Forest and woodland resources</i> .....	14
3.2.2 <i>Non-forest plant resources</i> .....	15
3.2.3 <i>Wildlife resources</i> .....	16
3.2.4 <i>Inland water system resources</i> .....	16
3.3 Indirect benefits.....	18
3.3.1 <i>Natural vegetation catchment protection and erosion control</i> .....	18
3.3.2 <i>Wetland water retention and purification</i> .....	19
3.3.3 <i>Carbon sequestration</i> .....	20
3.4 Option and existence benefits.....	21
<b>4. THE ECONOMIC COSTS OF BIODIVERSITY</b> .....	<b>22</b>
4.1 Overview of biodiversity economic costs.....	22
4.2 Direct management costs .....	22
4.3 Opportunity costs .....	23
4.4 Costs to other economic activities .....	24
<b>5. CONCLUSIONS: ECONOMIC ISSUES IN BIODIVERSITY CONSERVATION</b> .....	<b>25</b>
5.1 Overview of economic issues in biodiversity conservation.....	25
5.2 Economic benefits as a justification for biodiversity conservation .....	25
5.3 The distribution of biodiversity economic benefits and costs between groups.....	28
5.4 The economic causes of biodiversity degradation and loss .....	29
5.5 Implications for biodiversity conservation .....	29
<b>6. RECOMMENDATIONS: ECONOMIC MEASURES FOR UGANDA'S NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN</b> .....	<b>30</b>
6.1 Overview of economic measures for biodiversity conservation.....	30
6.2 The role of economics in the Convention on Biological Diversity .....	30
6.3 Economic measures for the NBSAP .....	31
6.3.1 <i>Economic instruments to encourage commercial and industrial biodiversity conservation</i> .....	31
6.3.2 <i>Community economic incentives and benefit-sharing measures</i> .....	34
6.3.3 <i>Financing mechanisms for biodiversity conservation</i> .....	35
6.4 Integrating economic measures into the NBSAP .....	37
<b>7. REFERENCES</b> .....	<b>38</b>
<b>8. DATA ANNEX</b> .....	<b>41</b>



## FIGURES AND TABLES

---

Figure 1: Economic steps in the biodiversity strategy and action plan.....	3
Figure 2: Phases of economic structure and activity .....	5
Figure 3: Key economic indicators 1982-1997 .....	6
Figure 4: Composition of GDP at Factor Cost.....	7
Figure 5: Summary of the quantified economic benefits of biodiversity .....	13
Figure 6: Summary of the quantified economic costs of biodiversity .....	22
Figure 7: Summary of the distribution of biodiversity economic values .....	28
Figure 8: The role of economics in the Convention on Biological Diversity.....	30
Table 1: Summary of biodiversity direct benefits.....	14
Table 2: Value of wood products 1997.....	14
Table 3: Tourist revenues from Forest Reserves 1997.....	15
Table 4: Value of natural vegetation for livestock 1998 .....	15
Table 5: Tourist revenues from National Parks 1998.....	16
Table 6: Value of fisheries 1998 .....	16
Table 7: Value of papyrus utilisation 1998.....	17
Table 8: Value of wetlands for livestock 1998 .....	17
Table 9: Summary of biodiversity indirect benefits.....	18
Table 10: Value of highland forest soil and water conservation 1998 .....	18
Table 11: Value of grassland and bushland vegetation rangeland conservation 1998.....	19
Table 12: Value of wetlands agricultural production 1998 .....	19
Table 13: Carbon sequestration by forests, woodlands and grasslands.....	20
Table 14: Government annual development and recurrent expenditures on biodiversity conservation 1998 .....	23
Table 15: Opportunity costs of protected areas 1998 .....	23
Table 16: Wildlife crop damage costs 1998.....	24
Table 17: Population by District 1998.....	41
Table 18: Vegetation types by District 1998.....	42
Table 19: Forest Protected Areas by District 1998.....	43
Table 20: Wildlife Protected Areas by District 1998 .....	44
Table 21: Wetland areas by District 1998 .....	45
Table 22: Production systems and returns to agriculture by District 1998.....	46
Table 23: Contribution of natural vegetation to livestock production .....	47
Table 24: Costs of soil and conservation works by District 1998.....	48
Table 25: Opportunity costs of protected areas by District 1998 .....	49
Table 26: Wildlife crop damage costs by District 1998.....	50

## SUMMARY

---

# 1. INTRODUCTION

---

## 1.1 Background to the assessment

Economic aspects of Uganda's National Biodiversity Strategy and Action Plan (NBSAP) comprise three stages – training and awareness creation, assessment and the formulation of economic measures for biodiversity conservation, sustainable use and equitable benefit-sharing.

A first, and on-going, stage of economic aspects of the NBSAP process is awareness creation and training in biodiversity economics for the Biodiversity Economics Core Planning Team and Sectoral Task Forces members, including:

- Training and guidance on biodiversity economics;
- Provision of basic training materials, including a manual of economic tools for biodiversity planning.

A manual *A Guide to the Use of Economics for Biodiversity Strategies and Action Plans for Eastern Africa* has been produced.

A second stage of economic aspects of the NBSAP is to assess the economic status of biodiversity in Uganda, as presented in this report. This assessment was carried out in February 1999. Its terms of reference were to assess:

- Major impacts of current and planned national economic policies and programmes on biological resource use and conservation;
- Economic value of biodiversity in major economic sectors;
- Economic impacts of biodiversity loss including consideration of national and sectoral income, income distribution, foreign exchange earnings and employment;
- Economic impacts of improved biodiversity conservation.

Information from the biodiversity economics assessment, together with other technical assessments, provide background information which will form the basis for developing a series of programmes, projects and activities for biodiversity conservation in Uganda – the NBSAP. A third stage of economic aspects of the NBSAP will include, once a draft strategy and action plan has been prepared, will be to:

- Provide guidance in developing and presenting recommendations for economic measures and instruments which can act as incentives for the conservation and sustainable use of biodiversity, to be included in the NBSAP;
- Provide recommendations for measures to ensure fair sharing of benefits arising from the exploitation of biological resources;
- Assist in identifying mechanisms for financing future activities identified in the NBSAP;
- Participate in reviewing draft documents and ensure integration of environmental economic concerns into the NBSAP.

Economic aspects of the NBSAP were carried out by IUCN Eastern Africa Regional Office for the National Environment Management Authority, Uganda.

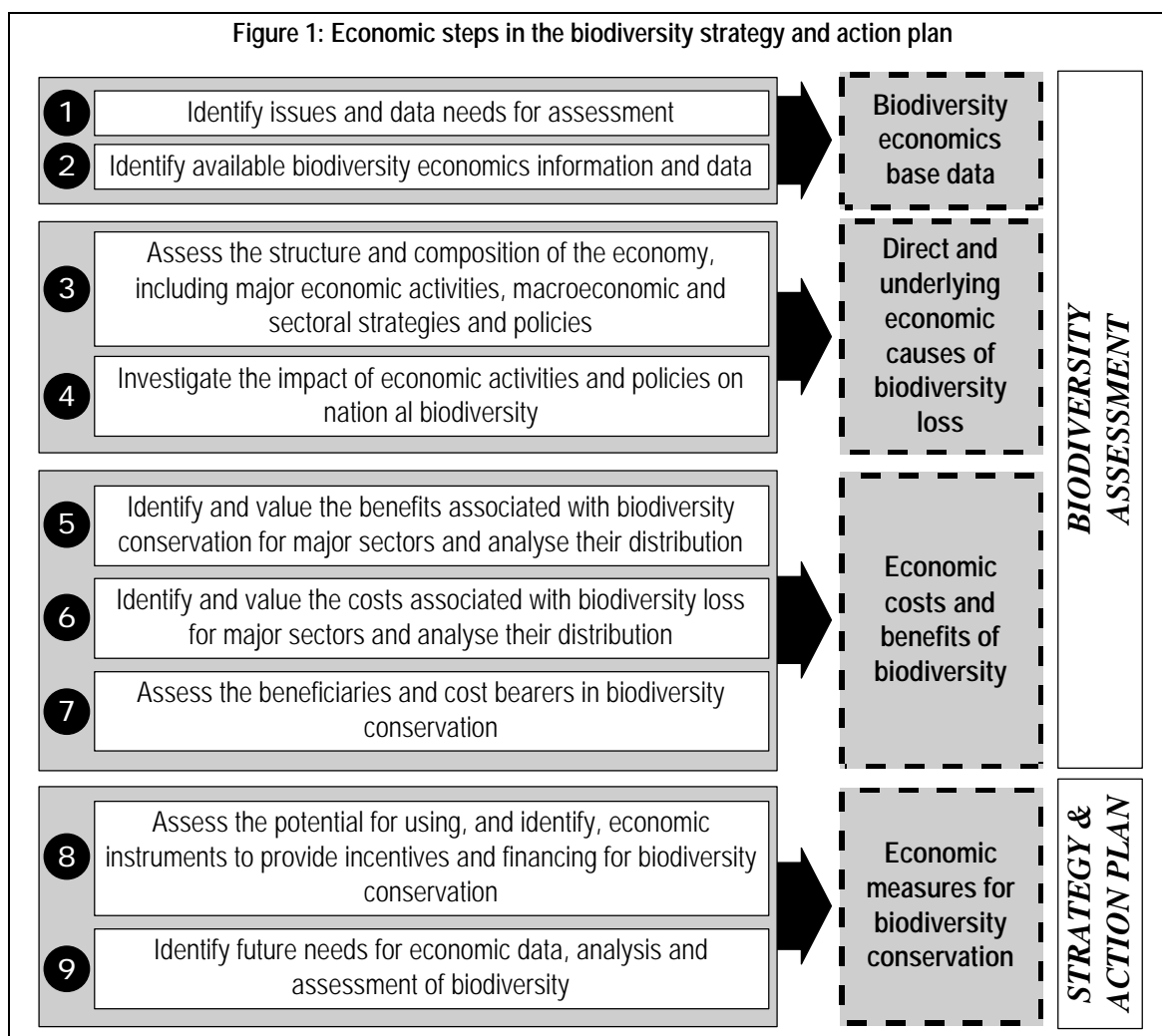
## 1.2 Structure of the assessment

Economic aspects of the NBSAP follow 9 steps (Figure 1), including:

- **Step 1 - Identify issues and data needs; Step 2 - Identify available biodiversity economics information and data:** Up-to-date biodiversity information is scarce in Uganda, and especially little is known about the economics of biodiversity. A first step in the assessment process is to identify the issues which will be dealt with in the economic assessment of biodiversity and to then find out what data and information exist, or can be used, to address these concerns.
- **Step 3 - Assess the structure and composition of the economy; Step 4 - Investigate the impacts of economic activities and policies on biodiversity:** Analysing the economic conditions which prevail and the economic activities which currently take place in Uganda, and understanding the policy frameworks within which they are set provides information about national development aims and strategies for future economic growth. Assessing the macroeconomic and sectoral economic context of Uganda, and its impacts on biodiversity, helps to isolate the root economic causes of biodiversity loss as well as to identify ways in which on-going policies, economic instruments and growth strategies can be used to enhance national biodiversity conservation.
- **Step 5 - Identify and value biodiversity benefits and their distribution; Step 6 - Identify biodiversity costs and their distribution; Step 7 - Identify the beneficiaries, cost-bearers and financing needs for biodiversity conservation:** In order to justify biodiversity conservation and to assess how biodiversity can be sustainably used and its benefits equitably distributed it is necessary to identify and value both its benefits and costs, and to see how they are distributed among different sectors of the Ugandan population.
- **Step 8 - Assess the potential for using economic instruments for biodiversity conservation; Step 9 - Identify future needs for economic assessment of biodiversity:** The ultimate aim of economic assessment is to see how biodiversity can be conserved in Uganda at the same time as economic growth and social equity goals are achieved. The last steps in the economic assessment of Uganda's biodiversity are to identify economic tools and instruments which can be used to finance biodiversity conservation, ensure its benefits are equitably distributed and provide incentives for people to sustainably use and conserve biodiversity in the course of their economic activities so that these measures can be incorporated into national biodiversity conservation planning and practice and made a part of strategies for future national economic growth.

The economic assessment presented in this report includes Steps 1-7 of this process. Steps 8 and 9, the identification of specific economic measures and tools for biodiversity conservation, will be carried out once a draft NBSAP has been prepared. The aim of

economic assessment is both to highlight the underlying root causes of biodiversity degradation and loss as well as to point to economic tools and measures which can strengthen attempts at national biodiversity conservation. By analysing the value of biodiversity, the costs of its degradation and loss, and the distribution of these values between different people, sectors and areas of, the economic assessment also provides important information for justifying biodiversity conservation, and for making sure that biodiversity can be used to enhance national economic growth.



### 1.3 Available information on biodiversity economics

This report documents the economic status of biodiversity in Uganda. Although little detailed analytical work has been carried out on the economics of biodiversity, there have been several attempts to describe the links between economic activities, policies and the environment. The Biodiversity Country Study (NBU 1992), National Environmental Action Plan (NEAP 1995) and State of the Environment Report (NEMA 1996) all contain sections on economics and the environment. A number of research papers and project reports on environmental economics have also been produced by Ugandan institutions, including Makerere University Institute of Environment and Natural Resources, National Environment Authority and Sustainable Development Centre. Reference materials on the economics of biodiversity are also available from GEF/FAO/UNDP projects *Institutional*



*Support for the Protection of East African Biodiversity and East Africa Cross-Border Biodiversity Conservation Project.* Detailed biodiversity assessments have been carried out under the NBSAP in aquatic, wildlife, forest, wetlands, livestock, soil, plant genetic resources, legal and policy, biotechnology and biosafety aspects of biodiversity by sectoral task forces.

Detailed information on biodiversity and economic aspects of environmental management are available in these reports, and is not repeated here. This report summarises available information and assesses the current economic status of biodiversity in Uganda. All data in this report refer to gross values at point of sale expressed at current prices unless otherwise indicated. At the time of writing US\$ 1 was equivalent to 1,300 Uganda Shillings (USh).

## 2. ECONOMIC STRUCTURE, POLICY AND BIODIVERSITY

### 2.1 Overview of the Uganda economy

Uganda covers a land area of some 241,500 km<sup>2</sup>, of which between 17% (Ogutu-Ohwayo *et al* 1998) and 27% (Kigenyi *et al* 1998) is comprised of lakes, rivers and swamps. It has an estimated population of just over 21 million people (MFEP 1998), of which 90% live in rural areas and the majority are concentrated in the more fertile lands of the southern, central and western parts of the country. The Ugandan economy is based on agriculture, which contributes over half of GDP and forms the major livelihood of over 90% of the population (NEMA 1996). Since the early 1990s, after widespread civil unrest, economic stagnation and breakdown of basic infrastructure, industry and commercial production over much of the 1970s and 1980s, the country has been undergoing a period of economic adjustment and reconstruction, and rapid urban, industrial and infrastructural development has taken place.

### 2.2 Phases of economic structure and activity

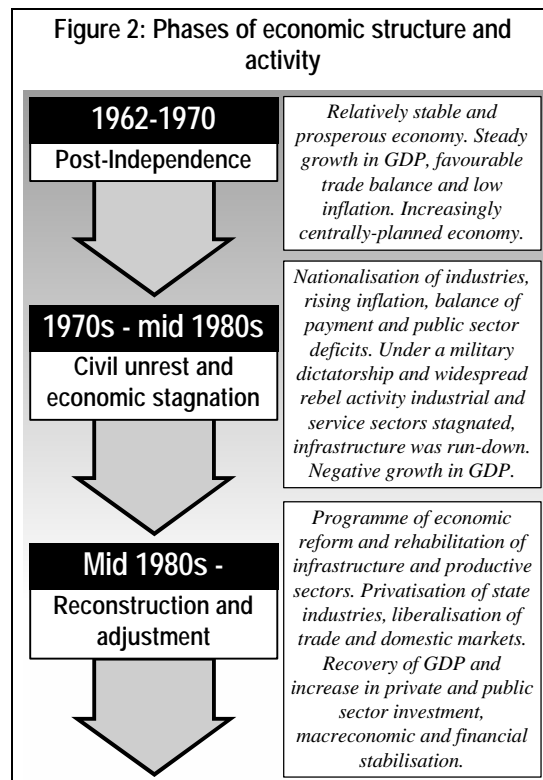
Three clear phases of strategy and activity have characterised the Ugandan economy over the last four decades (Figure 2), including initial economic growth and prosperity, subsequent widespread civil unrest and economic stagnation and recent political and economic reconstruction and adjustment:

- **1960s: post-Independence**

Uganda gained Independence in 1962 under a federal constitution and in 1966 became a republic. With high agricultural potential, well-developed infrastructure and commercial sector and a steady source of foreign exchange earnings from coffee, cotton and tourism, the already stable national economy grew steadily. Between 1961 and 1970 annual growth in GDP averaged more than 5% (NEAP 1995), the trade balance was favourable, and domestic inflation remained low. Until 1970 Uganda possessed a relatively stable, prosperous and well-functioning economy.

- **1970s to mid 1980s: civil unrest and economic stagnation**

From 1971, under the Amin regime, the government increased its control over private industry, commerce and financial dealings. Most industries were expropriated and taken over by the state, and a large number of parastatals formed to oversee these operations. The 1970s were characterised by heavy state



intervention in the economy, widespread civil rights abuses, high levels of corruption and extreme economic stagnation and collapse.

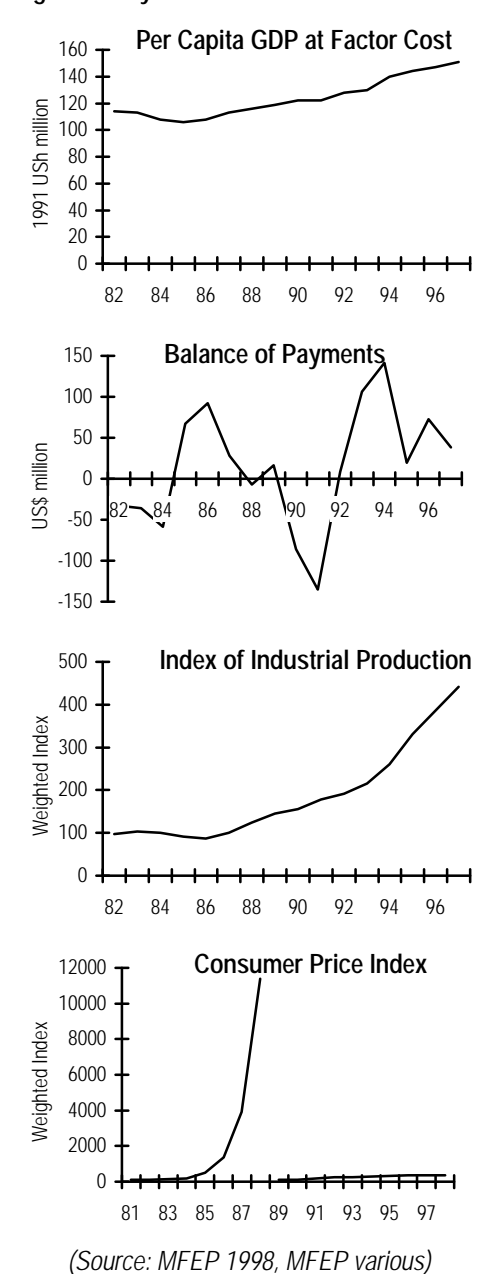
During this period per capita income fell by more than 40%, reaching negative levels from the mid-1970s. The volume of exports decreased by more than 60%, while Uganda's import bill doubled (Slade and Weitz 1991). Shortage of foreign exchange and a falling trade balance was exacerbated by the slump in world coffee prices, the break up of the East African Community and oil price rises. Although there was high government spending on security and significant public sector deficits, few development projects were implemented, the industrial and service sectors stagnated and infrastructure was steadily run down (NEAP 1995). Over this period subsistence agriculture formed the basis of people's survival.

In 1979 the Amin government was overthrown and Uganda entered a further period of civil unrest as law and order once again broke down. Growth in GDP continued to fall, and negative levels were maintained during the first half of the 1980s. By 1985 inflation was running at over 125%. The national economy continued to stagnate.

- Mid 1980s onwards: Economic reconstruction and adjustment**  
 In 1986 the National Resistance Movement government took control of Uganda. Since 1987 the government has pursued a programme of economic reform and rehabilitation, first under the National Economic Recovery Plan 1987-1990. To 1990 national economic efforts focused on rehabilitating and improving the domestic and export agricultural sector, while simultaneously devaluing and stabilising the exchange rate, increasing producer prices and rehabilitating physical infrastructure.

From 1990, under the macroeconomic policy statement *The Way Forward*, stabilisation and adjustment measures have been continued, including market

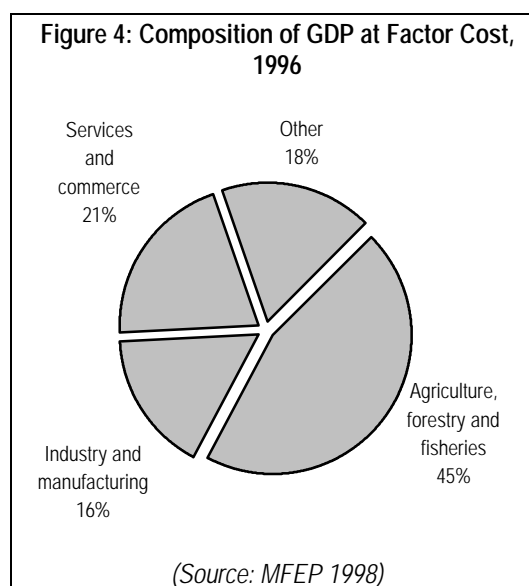
Figure 3: Key economic indicators 1982-1997



reforms and trade liberalisation, lowering of the inflation rate, reducing external account balances, instilling financial discipline and stability and public sector reform. Over this period there has been economic recovery and rapid growth (World Bank 1993). Inflation fell from 200% in 1987 to about 5% in 1996, and both macroeconomic stability and investment have increased. The industrial sector has grown by an average of 12% a year since 1986 (NEMA 1996) and infrastructure has been widely rehabilitated. While government revenues have increased, the role of the public sector in economic activity has decreased substantially and national industries have been steadily privatised. Dependence on coffee exports as a sole source of foreign exchange has declined, and both balance of payments surplus and foreign exchange reserves have improved.

### 2.3 Economic structure and composition

The economic situation in Uganda has continued to improve, and today the country is characterised by a relatively liberal, open and market driven economy. In 1997 Uganda had a GDP of US\$ 6,550 billion and a per capita income of US\$ 323,000 or some US\$ 250 (MFEP 1998). National income continues to be dominated by agriculture, with crops, livestock, fisheries and forestry together contributing just under half of GDP (Figure 4). The agricultural sector is still dominated by smallholder production, and food crops contribute over 85% of the total value of arable output. Industrial and service sectors have however grown substantially, and are playing an increasingly important role in the national economy, with construction, manufacturing and commerce registering especially high growth rates over the last five years.



Despite an overall positive and much improved situation, the national economy faces structural problems. Domestic savings are still low and there is a negative real interest rate, Uganda continues to rely heavily on external borrowing and foreign debt has increased substantially. Rates of urban and rural poverty are high and many areas of the country and sectors of the population lack access to basic services and infrastructure.

### 2.4 Current economic strategies and policies

Macroeconomic and sectoral policies, by setting the overall goals, context and framework within which economic activities take place in Uganda, have a number implications for biodiversity. Key policies and strategies which impact on biodiversity include:

- **The Constitution:** A new constitution for Uganda was set in place in 1995. It contains direct reference to environmental conservation and sustainable development, seeing access to good environmental quality and health as a basic human right for all Ugandans. The constitution includes, as national objectives and

directing principles of state policy, the duty to promote sustainable development and public awareness of the need for environmental conservation. It also mandates the state to protect and conserve important natural resources including biodiversity, land, water, wetlands, fauna and flora on behalf of the people of Uganda.

- **Macroeconomic and development strategy:** Uganda's medium-term economic objectives, as laid out in national development and macroeconomic statements, are to ensure social and economic equity and stability at the same time as promoting rapid growth and development (MFEP 1995, 1996). Development policy focuses on the key sectors of agriculture and industry. Adjustment continues to form a basis of macroeconomic strategy, with aims to further liberalise prices and markets, rationalise public sector expenditure, divest public enterprises and reduce subsidies. Poverty alleviation is also a major goal, to be achieved through basic infrastructural development, increased access to productive assets and credit, human resource development and the promotion of both agricultural and non-agricultural growth, income and employment. Within macroeconomic and development strategy, the environment is explicitly targeted as a cross-cutting issue in all sectors of the economy.
- **Environment:** In 1994 an Environment Policy was adopted in Uganda and in 1995 an Environmental Statute put in place. Prior to this environmental policy and legislation were fragmented, poorly co-ordinated, outmoded and sometimes contradictory. More than 60 pieces of legislation governed various aspects of natural resources management and environmental protection, enforced both at the sectoral level and as by-laws.

The Environment Policy has the overall goal of promoting sustainable social and economic development based on maintaining or enhancing environmental quality. It is basically concerned with setting out objectives and principles for environmental management, and provides a framework for co-ordinating sectoral development objectives under the overall aim of environmental conservation. As well as dealing with urban and industrial environmental quality, the policy contains consideration of all natural resources including water, wetlands, flora, fauna, air and soil.

Similarly, the National Environment Statute provides framework legislation, bringing together sectoral concerns under the umbrella of environmental management. As well as establishing NEMA as the national body mandated to formulate policy and co-ordinate matters pertaining to environmental management the statute is concerned with setting environmental standards and procedures, and specifying penalties for their enforcement. It provides that all existing laws relating to the environment, except for the constitution, shall have effect subject to modifications required to bring them in line with the National Environment Statute, and overrides any conflicting provisions in existing law. By empowering the Minister to give legal effect to any convention or treaty which Uganda has signed or ratified, it also gives legal effect to the Convention on Biological Diversity (NEMA 1996).

- **Wildlife:** A new Wildlife Policy was adopted in 1995, enacted in 1996. These aim to conserve wildlife for the benefit of all the population of Uganda. They are based on a move away from former strategies of strict state protection and control of all wildlife and wildlife areas and place a strong emphasis on community and private participation and economic gain from wildlife. Although establishing the parastatal UWA (Uganda Wildlife Authority) and maintaining the protected area system, wildlife policy and legislation allow for the establishment of communal wildlife areas within which local communities are empowered to benefit economically from wildlife, and grant some degree of management and use rights to landowners over wildlife outside protected areas.
- **Forests:** Although a new Forest Policy was adopted in 1988, the Forests Act of 1964 still provides the main legal instrument through which forests are managed and utilised in Uganda. While the Forest Policy emphasises broad conservation and sustainable development goals, includes consideration of biodiversity and stresses community and private sector involvement in forest management, the Forests Act is geared much more towards production and forest industry, and is mainly concerned with the creation, control and management of Forest Reserves. Both largely omit consideration of forests and trees outside protected areas.
- **Fisheries:** The Fisheries Policy aims to regulate, protect, promote, conserve, develop and sustainably exploit fish and fish products so as to provide food, income, employment and foreign exchange earnings. Although recognising the important role of artisanal fishermen, it excludes consideration of industrial fisheries. While mentioning sustainable development and conservation, the policy is geared mainly towards increasing fish production wherever possible. Similarly the Fish and Crocodiles Act of 1964 focuses on the control and regulation of fishing, purchasing, marketing and processing rather than on sustainable management goals. Standards for the maintenance of fishing grounds are mainly set in the National Environment Statute rather than in sectoral fisheries legislation.
- **Wetlands:** In 1995 Uganda became the first African country to adopt a National Wetlands Policy. This policy aims to establish principles by which wetlands can be optimally used, to conserve and maintain biodiversity and ecological functions and to integrate wetlands concerns into planning and decisions of other sectors. It calls for an end to the draining of wetlands, for the promotion of sustainable use and equal distribution of the benefits of wetland areas and products, and requires that environmental impact assessments are carried out for all developments in wetland areas. The National Environment Statute provides the main legal instrument through which wetlands conservation is enforced.
- **Water:** A revised Water Policy was adopted in 1995 and enacted as a statute in same year. These aim to manage and develop water resources in a sustainable manner so as to provide water of an adequate quality and quantity for all users, currently and in the future. Both introduce a multi-sectoral approach to water resources management and emphasise environmental and economic aspects of water resources and their use, giving emphasis to the market determination of

water allocation and recognition that water is a finite resource.

- **Agriculture:** There is no single piece of legislation governing agriculture in Uganda. Relevant statutes are mainly concerned with regulating agricultural inputs, processing and marketing, with poor consideration of environmental sustainability or biodiversity conservation goals. Only the Cattle Grazing Act of 1964 makes some attempt to control soil erosion through regulating the number of animals which can be grazed in a given area. Agricultural policy has the overriding aim of encouraging increased crop production through the intensification, modernisation and expansion of agriculture.
- **Land and land use:** The Land Act of 1998, overriding the 1975 Land Reform Decree which vested all land in the state and transformed former categories of mailo and freehold tenure into leases, allows private ownership of land. Its main purpose is to provide for land tenure, ownership and management and, together with the Local Government Act of 1997, permits a high degree of decentralisation in decision-making, land allocation and management. Although containing little overt reference to conservation, the Act states that land should be used in accordance with Forests Act, Water Statute, National Environment Statute and Wildlife Statute. It also empowers government and local government to hold land in trust and protect water bodies, forests, wildlife areas and other important natural resources. There is as yet no comprehensive land use policy for Uganda.

## 2.5 Economic and policy impacts on biodiversity

The economic structure, activities and policies described in this chapter are all linked to the status and integrity of biodiversity in Uganda. Two major levels of economic impacts on biodiversity can be identified – the direct, on-site, effects of economic activities on biodiversity, and the indirect or underlying policy forces determining economic activity and driving biodiversity conservation and loss. These are described in the paragraphs below.

### 2.5.1 Impacts of economic activities on biodiversity

Direct economic impacts on biodiversity in Uganda include:

- **Economic activities which utilise biological resources as primary inputs:** Economic activities impact directly on biodiversity when they consume biological resources as their primary inputs. In Uganda four major sets of economic activities rely on the consumption of biological resources as raw materials – rural livelihoods (utilising wild plant and animal products for household income and subsistence, including the use of natural vegetation for pasture and fodder); fisheries; forest industry (including both timber and non-timber products); and commercial trade in wild plant and animal products.

Although there is little detailed information about the level at which these activities are being carried out, many are known to be unsustainable both in their overall volume and in terms of the species and ecosystems they exploit. Grazing pressure (Mbuza *et al* 1998a, NEAP 1995, NEMA 1996), over-exploitation of fisheries (Ogutu-Ohwayo *et al* 1998), uncontrolled harvesting of forest and plant products

(Kigenyi *et al* 1998, Wasswa *et al* 1998) and unsustainable utilisation of wetlands products (Mafabi *et al* 1998) are all widely cited as major causes of biodiversity loss in Uganda.

- ***Economic activities which impact on biodiversity through their production processes:*** Economic activities also impact on biodiversity as indirect or knock-on effects when they employ destructive or damaging methods to utilise biological resources, convert or modify ecosystems or introduce wastes, effluents and pollutants into the natural environment. Five major sets of economic activities in Uganda impact on biodiversity through their production processes – agriculture, fisheries, forestry, urban and industrial production.

Loss of natural vegetation and conversion of ecosystems to agriculture is one of the most pervasive causes of biodiversity depletion in Uganda (Howard 1995, NEAP 1995, NEMA 1996). In both high potential and marginal areas, as well as in wetlands, biodiversity is also being degraded as a result of the increased use of agro-chemicals and poor agricultural practices (Rwakaikara and Nkwiine 1998). Both forestry and fisheries activities impact on biodiversity because they use damaging harvesting methods and production technologies. There is widespread concern about the impact of small mesh nets and other destructive fishing practices on the resource base (Ogutu-Ohwayo *et al* 1998) and the effects of damaging harvesting techniques on forest biodiversity (Kigenyi *et al* 1998, Rwakaikara and Nkwiine 1998). Rapid industrial and urban development, often implemented in the absence of proper planning and controls, have all introduced sewage, solid wastes, pollutants and other untreated effluents into land and water ecosystems (Mugoya *et al* 1998, NEAP 1995, NEMA 1996)

## 2.5.2 Structural and policy influences on biodiversity

Although economic production and consumption activities impact directly on biodiversity, it is the structure and policies of the Ugandan economy which drive these activities and encourage them to take place in damaging ways and at unsustainable levels. Economic structural and policy factors constitute the underlying root causes of biodiversity conservation and loss, and include:

- ***Economic dependence on biodiversity-impacting activities:*** The bulk of economic activity in Uganda has the potential to impact negatively on biodiversity. In rural areas, livelihoods have long been based on agriculture and on the utilisation of biological resources. Already high levels of dependence on biodiversity and natural ecosystems, and their unsustainable utilisation, are exacerbated by the limited and insecure nature of rural livelihood bases, the absence of accessible or affordable alternative sources of income and subsistence, widespread poverty and severe land pressure. Urban and industrial activities also impact on biodiversity because they require biological resources as raw materials and have secondary and knock-on effects on environmental quality and ecosystem integrity. Pressing needs for development and growth, and a development imperative which favours short-term economic gain over long-term sustainability, drives these negative biodiversity impacts.



- **Poor consideration of biodiversity issues in economic policies and strategies:** Although macroeconomic strategy, and many sectoral policies, make some mention of environmental issues, they are primarily concerned with stimulating economic activity and development. Little attention is paid to the incorporation of biodiversity conservation into development planning and practice. At best policies in economic sectors such as fisheries, water and agriculture make passing reference to sustainability concerns, and at worst policies such as industry, mining and urban settlement contain no consideration at all of biodiversity issues. The way in which the policies in these sectors aim to maximise economic production – for example through the intensification and expansion of arable production and fisheries, the rapid development of industry and urban settlement and the low pricing of raw materials such as timber – often actually present direct disincentives to biodiversity conservation because they encourage the over-consumption of biological resources, conversion of natural habitats and implementation of poorly planned developments.
- **Incomplete biodiversity-related policies:** Although environmental policies have the overall goal of conservation, sustainable use and benefit-sharing, they often lack adequate consideration of the means by which these goals will be achieved. Environment, wetlands, wildlife and forestry policy are all primarily concerned with the establishment of government institutions, reservation of biodiversity areas and regulation of biological resource use. They fail to present concrete incentives for people to conserve biodiversity in the course of their economic activity. Of particular concern is the low level to which private and community rights to resource ownership, use and management are covered by environmental policies (Kigenyi *et al* 1998, Ogutu-Ohwayo *et al* 1998). In some areas vital to biodiversity conservation, most notably land use and biodiversity itself, no policies at all exist.

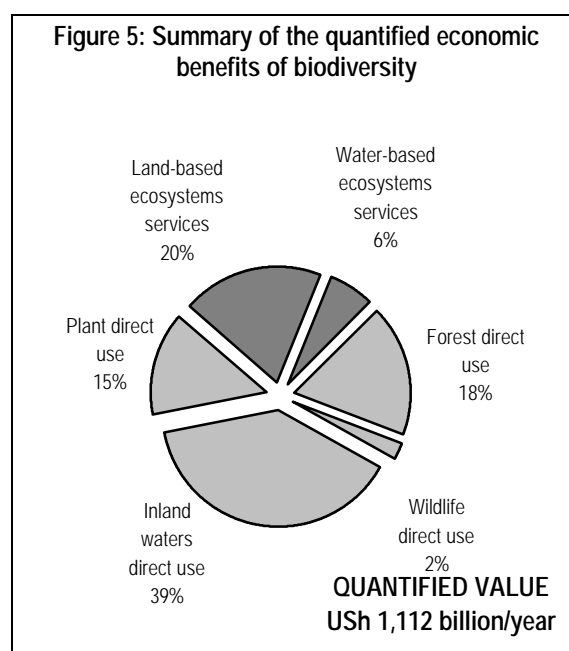
### 3. THE ECONOMIC BENEFITS OF BIODIVERSITY

#### 3.1 Overview of biodiversity economic benefits

Uganda's biodiversity has a high economic value. Biological resources supply goods for consumption and production, as well as providing ecosystem services which support human populations and economic activities. Maintaining biodiversity also allows for the possibility carrying out new economic activities in the future, and has an intrinsic value irrespective of its current or potential uses. These economic benefits can be at least partially valued. Based on available data, the quantifiable economic benefit of Uganda's biodiversity can be calculated to have a value of at least US\$ 1,112 billion a year (Figure 5). Including the unquantifiable benefits of biodiversity – which are likely to be worth at least as much as this figure – the total economic value of biodiversity is far in excess of this, including:

- **Direct benefits**, reflected in production and consumption activities based on the use of forest, plant, wetland and water biodiversity as raw materials or physical inputs. These activities provide subsistence and earnings to rural and urban households as well as contributing resources, employment and income to the national economy. The quantified value of these activities is in excess of US\$ 820 billion a year.

- **Indirect benefits** accrue from the ecosystem services and environmental functions associated with biodiversity which support both on and off-site economic activities. Major terrestrial ecosystem services include watershed catchment protection, erosion control and carbon sequestration, while water-based ecosystems support water purification, retention and regulation functions. The quantified value of these services is just under US\$ 300 billion a year.



- Although the **option and existence benefits** associated with Uganda's biological resources and their diversity are likely to have an extremely high economic value, they are unquantifiable on the basis of available information.

### 3.2 Direct benefits

The presence of indigenous biological resources and their diversity provide a wide range of direct economic benefits because they generate products which are used for subsistence, income and employment purposes. The quantified value of the direct economic benefits of Uganda's biodiversity is more than US\$ 823 billion a year (Table 1), and is described in the following paragraphs. As available data only permits a small proportion of biological resource utilisation to be valued, this figure represents a minimum estimate of the total direct value of Uganda's biodiversity.

	US\$ mill/yr	% of total
Wood forest products	137,856	17%
Non-wood forest products	66,249	8%
Tourism	25,886	3%
Fisheries	407,063	49%
Wetlands plants	24,037	3%
Plant resources	162,211	20%
<b>TOTAL</b>	<b>823,301</b>	<b>100%</b>

#### 3.2.1 Forest and woodland resources

Uganda's natural forests and woodlands together cover an area of nearly 50,000 km<sup>2</sup>, of which approximately a quarter are protected as Central or Local Forest Reserves and the remainder lie in wildlife protected areas or on private and communally used lands (Tables xxx and xxx in Data Annex). These forest and woodland resources yield a wide range of direct benefits to both domestic and commercial consumers, including woodfuel, timber, poles and non-wood forest products such as fibres, honey, fodder, medicines and wild foods. Utilisation of Central Forest Reserves also generates income for the government Forest Department.

The consumption of non-wood forest products, including medicines, bamboo shoots, wild foods, shea butter oil, honey, gum arabic, curios and weaving materials, has been estimated to be worth some US\$ 2,100 per capita at the household level and US\$ 1,050 per capita for commercial products for the whole of Uganda (NEMA 1996, updated to 1998 prices). At current population levels this equates to a total value of some US\$ 66 billion a year.

The market value of wood products was in 1997 estimated to be US\$ 173 billion of which some 80% or US\$ 138 billion may be accounted for by indigenous forest resources (Table 2<sup>1</sup>). Over the same period, timber royalties and fees for the use of forest products and lands earned income of over US\$ 797.5 million for the Forest Department.

Table 2: Value of wood products 1997

	Total consumption ('000 tonnes)*	Total value (US\$ mill)*	Assumed % indigenous	Indigenous value (US\$ mill)
<b>Monetary</b>				
Sawn timber	541	18,925	67%	17,979
Poles	182	2,947	50%	1,474

<sup>1</sup> It is worth noting that there is considerable variation between different estimates of wood consumption and value in Uganda. For example the volume of woodfuel use presented in Table xxx is almost twice as high as estimates made elsewhere (NEMA 1996), while the total value of exotic and indigenous wood consumption from the same data source is more than a third higher than that presented here.

*Uganda Biodiversity: Economic Assessment*

Household fuelwood	598	3,727	100%	3,727
Commercial fuelwood	475	2,959	50%	1,480
Industrial fuelwood	830	5,171	50%	2,586
Charcoal	3,536	79,465 <sup>+</sup>	75%	59,599 <sup>+</sup>
<b>Non monetary</b>				
Poles	399	6,454	50%	3,227
Household fuelwood	13,596	42,356	100%	42,356
Commercial fuelwood	1,559	9,714	50%	4,857
Industrial fuelwood	184	1,145	50%	573
<b>TOTAL</b>	<b>21,900</b>	<b>172,863</b>		<b>137,856</b>

(Source: \* MFEP 1998. <sup>+</sup>Manufactured charcoal)

Uganda's forests support a low level of tourist activities, and recreational facilities have been developed in at least two Forest Reserves. In 1997 Budongo and Mabira Forest Reserves generated over US\$ 23 million income for the Forest Department from entry fees (Table 3). Assuming that additional expenditures made by visitors to these forests – including travel, accommodation and other miscellaneous purchases within Uganda – is worth at least 10 times this amount, forest tourism may have a total annual direct value of over US\$ 255 million.

Table 3: Tourist revenues from Forest Reserves 1997

	Revenues (US\$)
Budongo	11,538,500
Mabira	11,666,189
<b>TOTAL</b>	<b>23,204,689</b>

(Source: Forest Department records)

### 3.2.2 Non-forest plant resources

Plants outside forest and woodland areas in bushland and grassland zones yield a variety of raw materials and physical products including building materials, fibres, honey, pasture, fodder, forage, medicines, wild foods and other utility items. Although no reliable data exist about the level or value of human consumption of plant resources, it is possible to at least partially value the use of wild plant resources for livestock pasture, fodder and forage.

Livestock form an important component of rural livelihood systems in Uganda, and natural vegetation accounts for a high proportion of their annual food needs. Taking into account differences in herd management systems, livestock productivity and intake of natural vegetation<sup>2</sup> (Tables xxx and xxx in Data Annex), indigenous plant-based resources may have an annual value of some US\$ 163 billion calculated in terms of their contribution to pasture, fodder and forage (Table 4).

Table 4: Value of natural vegetation for livestock 1998

<sup>2</sup> In this report it is assumed that natural vegetation accounts for 0% of pasture, fodder and forage intake livestock herds in Banana Coffee systems, 50% in Montane systems, 75% in Banana Coffee/Northern/Teso/West Nile systems, and 100% in Pastoralist systems. Vegetation from land-based ecosystems is assumed to contribute 90% of this intake, while wetland resources contribute 10%.

Region	Livestock population (TLUs)	Total value of production (USh mill)	Value of natural vegetation (USh mill)
Central	1,090,510	74,043	15,726
Eastern	940,837	55,509	19,853
Northern	1,185,889	65,922	50,570
Western	2,087,854	169,925	76,878
<b>TOTAL</b>	<b>5,305,090</b>	<b>365,399</b>	<b>163,027</b>

### 3.2.3 Wildlife resources

Uganda's wildlife resources yield direct benefits because they provide a source of bushmeat and trophies, and support tourism activities. There are no quantitative data on the level or value of wildlife hunting, cropping or ranching in Uganda. Tourism currently represents the major legitimate value accruing from wildlife resources.

Tourism is focused in the approximately 21,000 km<sup>2</sup> of gazetted wildlife protected areas in Uganda (Table xxx in Data Annex). In 1998 more than US\$ 2.3 billion was generated by UWA from entry fees and charges for other recreational activities in National Parks (Table 5). Assuming that additional expenditures made by visitors to National Parks – including travel, accommodation and other miscellaneous purchases within Uganda – is worth at least 10 times this amount, wildlife tourism may have a total annual value in excess of US\$ 26 billion.

Table 5: Tourist revenues from National Parks 1998

	Revenues (US\$)
Queen Elizabeth	370,830,235
Bwindi Impenetrable	261,404,585
Kibale	68,164,192
Murchison Falls	346,032,798
Kidepo Valley	26,998,255
Mount Elgon	103,731,709
Lake Mburo	62,929,800
Mgahinga Gorilla	306,028,473
Headquarters	783,905,876
<b>TOTAL</b>	<b>2,330,025,923</b>

(Source: UWA records)

### 3.2.4 Inland water system resources

Resources in inland water systems – including lakes, rivers, wetlands and floodplains – support a broad range of direct uses including fishing, hunting, wild plant harvesting, livestock production, recreation and tourism. In 1998 it was estimated that over 217,000 tonnes of fish were caught in Uganda's major lakes with a landed value of nearly US\$ 326 billion (Table 6). Including other lakes, wetlands and rivers, estimated to together add at least a quarter to lake fisheries catch and value, the annual market value of fisheries activities may be in excess of US\$ 407 billion.

Table 6: Value of fisheries 1998

	Production (’000 Tonnes)	Value (US\$ mill) <sup>3</sup>
Lake Victoria*	105	157,800
Lake Albert*	19	28,650
Lake Kyoga*	80	120,300
Lakes Edward, George and Kazinga Channel*	6	8,400
Albert Nile*	4	5,250
Other waters*	4	5,250
<b>TOTAL MAJOR LAKES</b>	<b>217</b>	<b>325,650</b>
<b>MINOR LAKES, WETLANDS AND RIVERS<sup>4</sup></b>	<b>54</b>	<b>81,413</b>
<b>TOTAL ALL</b>	<b>271</b>	<b>407,063</b>

(Source: \*Fisheries Department Data)

Over 30,000 km<sup>2</sup> of Uganda is under seasonal or permanent wetlands (Table xxx in Data Annex). A wide variety of wetland plant species are harvested by adjacent human populations for food, medicine, construction material and handicraft production. Available data permit some of this use to be valued. Accessible areas of at least a quarter of the 4,395 km<sup>2</sup> of papyrus swamps in Uganda (MFEP 1998, Table xxx in Data Annex) may be utilised by adjacent human populations<sup>5</sup>. Each hectare of papyrus swamp yields 20 tonnes of dry papyrus culm a year (Craddock-Williams 1996) with a market price for construction materials of US\$ 54/kg, giving a minimum value of papyrus utilisation for Uganda of just under US\$ 6 billion a year (Table 7).

Table 7: Value of papyrus utilisation 1998

Region	Area under papyrus (km <sup>2</sup> )	Value of papyrus utilisation (US\$ mill)
Central	1,400	1,887
Eastern	1,531	2,064
Northern	542	731
Western	922	1,242
<b>TOTAL</b>	<b>4,395</b>	<b>5,923</b>

Natural vegetation in wetlands and floodplains also provide an important source of dry season grazing for livestock. Assuming that 10% of off-farm pasture, fodder and forage intake is accounted for by wetlands vegetation, dry-season grazing may have a total value in excess of US\$ 18 billion a year in terms of contribution to livestock production (Table 8, Tables xxx and xxx in Data Annex).

Table 8: Value of wetlands for livestock 1998

Region	Livestock population (TLUs)	Total value of production (US\$ mill)	Value of wetlands (US\$ mill)
--------	--------------------------------	--	----------------------------------

<sup>3</sup> National fisheries data record a total value of fisheries for major lakes of some US\$ 74 million, equating to an average fish price of US\$ 0.34/kg. This price is unrealistically low. This study has therefore used the average market price of US\$ 1,500/kg to calculate the value of fisheries.

<sup>4</sup> National fisheries data refer only to major lakes. It is assumed that minor lakes, rivers and wetlands contribute at least an additional 25% to production.

<sup>5</sup> It is assumed that 5% of the area of papyrus swamps are accessible for harvesting.

Central	1,090,510	74,043	1,747
Eastern	940,837	55,509	2,206
Northern	1,185,889	65,922	5,619
Western	2,087,854	169,925	8,542
<b>TOTAL</b>	<b>5,305,090</b>	<b>365,399</b>	<b>18,114</b>

### 3.3 Indirect benefits

Ecosystems, their component species and diversity, generate a wide range of economic benefits aside from their direct utilisation because they indirectly support and maintain production and consumption activities.

Available data permits only a small proportion of the value of these indirect benefits to be valued – including partial estimates of the erosion control, catchment protection and carbon sequestration functions of natural forests, woodlands, bushlands and

grasslands and of the water retention and purification functions of wetlands. While the quantified value of these services is almost US\$ 300 billion a year (Table 9), the total indirect value of Uganda’s biodiversity is likely to be far higher than this.

	US\$ mill/yr	% of total
Erosion control	69,642	24%
Water retention	148,519	51%
Water purification	65,962	23%
Carbon sequestration	5,311	2%
<b>TOTAL</b>	<b>289,434</b>	<b>100%</b>

#### 3.3.1 Natural vegetation catchment protection and erosion control

Areas of natural vegetation, including forests, woodlands, bushlands and grasslands, play an important role in helping to avoid or mitigate soil erosion. By providing ground cover they control excessive runoff, minimise topsoil loss and decrease downstream sedimentation and siltation and thereby maintain on-site soil fertility and land productivity, regulate water quality and flow and prevent the siltation of downstream watercourses and dams.

The downstream benefits of upland closed forest areas in providing catchment protection and guarding against soil erosion can be quantified by looking at the costs of replacing these services by artificial means. This represents a minimum estimate of the value of these functions in terms of alternative expenditures avoided. In the absence of forest cover and under the next most likely land use – mixed subsistence agriculture – it would be necessary to control erosion by constructing on-farm soil and water conservation measures. Taking into account differences in topography and farming systems in Uganda, and including the costs of labour, other inputs and land taken out of production, on-farm soil and water conservation incur expenditures ranging between US\$ 70,000 and almost US\$ 250,000 per hectare per year (Table xxx in Data Annex). In total, for the 12,727 km<sup>2</sup> of land under Central Forest Reserves, the benefit of forest catchment protection and erosion control services in terms of replacement costs avoided is nearly US\$ 148 billion a year (Table 10, Table xxx in Data Annex). This figure accords well with estimates of the total avoided costs of soil erosion measured in terms of effects on crop production, valued at between US\$ 132-396 million in 1991 or between US\$ 70-208 billion at 1998 prices (Slade and Weitz 1991).

Table 10: Value of highland forest soil and water conservation 1998

Region	Central Forest Reserve area (ha)	Value of S&WC (USh mill)
Central	303,358	49,339
Eastern	56,479	7,953
Northern	558,765	23,913
Western	354,097	66,499
<b>TOTAL</b>	<b>1,272,699</b>	<b>147,704</b>

Erosion control functions of natural vegetation also maintain on-site soil fertility and land productivity. Studies carried out in similar areas of Eastern Africa have estimated that soil erosion arising from the loss of vegetative cover in rangelands may lead to annual declines in livestock productivity of up to 0.5% (Emerton 1997). For herds grazed in grassland and bushland areas of Uganda, erosion control services provided by natural vegetation may therefore have a quantifiable benefit of up to USh 815 million in terms of losses to livestock production avoided (Table 11, Table xxx in Data Annex).

**Table 11: Value of grassland and bushland vegetation rangeland conservation 1998**

Region	Livestock population (TLUs)	Value of natural vegetation (USh mill)	Value of rangeland conservation (USh mill)
Central	1,090,510	15,726	78.63
Eastern	940,837	19,853	99.27
Northern	1,185,889	50,570	252.85
Western	2,087,854	76,878	384.39
<b>TOTAL</b>	<b>5,305,090</b>	<b>163,027</b>	<b>815.13</b>

### 3.3.2 Wetland water retention and purification

Wetlands generate a wide range of indirect benefits through their water recharge and storage, sediment trapping, nutrient cycling and water purification functions. Many of these benefits contribute towards on-site productivity and direct use values, including fishing, wild plant utilisation and dry-season grazing. They also maintain and support off-site water-dependent consumption and production activities, including downstream resource utilisation, industry and urban settlement.

Wetlands water recharge, storage and productivity services permit on-site economic activities in addition to those which depend directly on the harvesting of wild resources, most importantly crop production. Assuming that 15% of converted wetlands are used for rice production<sup>6</sup>, accounting for just over half of the total area under rice in Uganda, the value of wetlands ecosystem functions as reflected in agricultural production is worth some USh 66 million<sup>7</sup> (Table 12).

**Table 12: Value of wetlands agricultural production 1998**

<sup>6</sup> Although it has been estimated that 90% of converted wetlands in Uganda are used for rice cultivation (NWCMP 1996), the total area under rice for the whole country is recorded as only 63,000 ha (MFEP 1998) – less than a third of this figure.

<sup>7</sup> Gross returns to rice production are estimated at USh 1.85 million/year (from NWCMP 1996, adjusted to 1999 prices), for 15% of the total area of converted wetlands of 237,640 ha (Table xxx in Data Annex).



	Converted wetlands (km <sup>2</sup> )	Value of rice production (US\$ mill)
Central	251	6,967
Eastern	1,752	48,639
Northern	172	4,774
Western	201	5,582
<b>TOTAL</b>	<b>2,376</b>	<b>65,962</b>

Wetlands also provide important water purification services. Most urban populations in Uganda lack water-borne sewage systems, and domestic wastes flow directly into swamps and wetlands. It is estimated that at least 725,000 people rely on wetlands for waste retention and purification, including populations in Kampala, Bushenyi and Masaka Towns wetlands (Mafabi *et al* 1998, NEMA 1996). The value of these waste treatment services can be at least partially valued by looking at their replacement by other means. The costs of establishing and maintaining a 4,000 m<sup>3</sup> sewage treatment pond, serving some 25,000 people – the easiest and cheapest technology – is some US\$ 195 million a year. This translates into a total annual value for wetlands water purification services in terms of replacement cost avoided of some US\$ 5.3 billion a year.

### 3.3.3 Carbon sequestration

Natural vegetation – including forest, woodland, bushland and grassland – acts as a carbon sink, thereby helping to mitigate the effects of global warming. Estimates of carbon sequestration range between 10 tonnes of carbon per hectare of bushland or grassland to 210 tonnes of carbon per hectare of closed canopy primary forest (Myers 1997, Sala and Paruelo 1997). As illustrated in Table 6 Uganda’s natural vegetation is estimated to cover a surface area of almost 11.5 million ha. With the economic costs avoided of carbon sequestration valued at between \$1-100/tonne (Alexander *et al* 1997) and on average \$20/tonne (Myers 1997) forests, woodlands, bushlands and grasslands in Uganda may together provide economic benefits through mitigating the effects of global warming to a value of nearly US\$ 70 billion a year<sup>8</sup> (Table 13).

Table 13: Carbon sequestration by forests, woodlands and grasslands

Vegetation	Area (ha)	Carbon sequestered (Tonnes/ha)	Carbon sequestered (Tonnes)	Value (US\$ mill total)	Value (US\$ mill/ year) <sup>9</sup>
Primary indigenous forest	603,880	210	126,814,800	3,297,185	33,008
Degraded indigenous forest	280,780	125	35,097,500	912,535	9,136
Woodland, bushland, grassland	10,564,450	10	105,644,500	2,746,757	27,498
<b>TOTAL</b>	<b>11,449,110</b>		<b>267,556,800</b>	<b>6,956,477</b>	<b>69,642</b>

(Source: Forest areas from MFEP 1998)

<sup>8</sup> Allowing for carbon fixation rates of subsequent land use.

<sup>9</sup> Overall value converted to average annual amount using  $\frac{1}{T} \sum_{t=1}^T \frac{V}{T} (1 + r^{(T-t)})$ , where T = overall period (100 years), V = overall value of carbon, r = discount rate (10%), t = year.

### **3.4 Option and existence benefits**

Although none of the option and existence benefits associated with Uganda's biodiversity can be quantified on the basis of available data, their value is likely to be extremely large. Maintaining a diverse range of biological resources and ecosystems allows for possible future uses and developments for recreational, pharmaceutical, industrial and agricultural purposes and is thus likely to have a high commercial option value. The local option value of biodiversity is also great in terms of the contribution of wild resources, and their diversity, to livelihood choice and security in times of stress and uncertainty. Existence values include both the local cultural values associated with indigenous biological resources and their diversity and the value of biodiversity in terms of national heritage and bequest for future generations of Ugandans, as well as global appreciation and interest in Uganda's biodiversity.

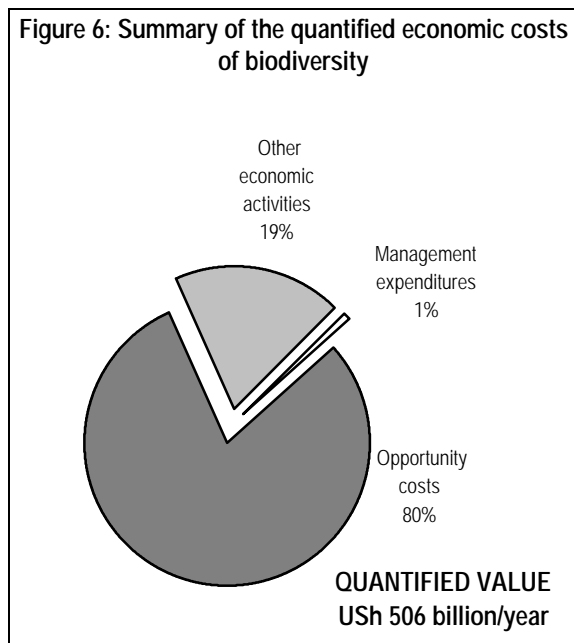
## 4. THE ECONOMIC COSTS OF BIODIVERSITY

### 4.1 Overview of biodiversity economic costs

Despite its high value, Uganda's biodiversity also gives rise to economic costs. As well as requiring expenditures on the physical inputs associated with resource and ecosystem management and conservation, biodiversity incurs costs because it precludes or interferes with other economic activities. Most of these economic costs can be at least partially valued. Based on available data, the total quantifiable economic cost associated with Uganda's biodiversity is some US\$ 422 billion a year (Figure xxx) and includes:

- **Management expenditures** include the staff, equipment, infrastructure, running costs and other physical inputs associated with managing biodiversity. They are incurred to government agencies, non-governmental organisations, community members and external donors. For the Ugandan government alone, the quantified value of these costs is in excess of US\$ 4 billion a year.

- **Opportunity costs** represent the income and other benefits foregone from land use, investment and development opportunities precluded or diminished by the need to maintain biodiversity. These include unsustainable resource and land utilisation activities, production processes and technologies which harm or deplete biodiversity and alternative investments of funds allocated to biodiversity management. The quantified value of the opportunity costs of biodiversity in terms of agricultural production foregone in protected areas is in excess of US\$ 404 billion a year.



- **Losses to other economic activities** represent the damage caused by biodiversity to human populations, production and consumption. They include damage, death and injury to humans, crops and livestock from wild animals, disease and other components of biodiversity which are harmful to or interfere with production and consumption processes. The quantified value of wild animal damage to crops and livestock is more than US\$ 97 million a year.

### 4.2 Direct management costs

Various national agencies incur biodiversity conservation costs, including government, non-governmental, community organisations and external donors. Although no data are available as to these expenditures, it is possible to estimate government expenditures on

biodiversity conservation. The main government agencies responsible for biodiversity conservation in Uganda are the Ministries of Agriculture, Natural Resources, Water, Lands and Environment and Makerere University. It has been estimated that 7% of these Ministries' total annual budgets are allocated to biodiversity (NBU 1992). The Uganda Wildlife Authority is responsible for wildlife and protected areas management, and can be considered to allocate its total budget to biodiversity (NBU 1992). At 1998 levels, this translates into an annual government expenditure on biodiversity conservation direct management costs of some US\$ 4.25 billion a year (Table 14).

**Table 14: Government annual development and recurrent expenditures on biodiversity conservation 1998**

Sector	Total (US\$ bill)*	% allocated to biodiversity+	Biodiversity (US\$ mill)
Agriculture, Animal Industries and Fisheries	8.02	7	561.4
National Agricultural Research	3.16	7	221.2
Natural Resources	7.23	7	506.1
Water, Lands and Environment	1.77	7	123.9
Makerere University	19.08	7	1,335.6
Wildlife and protected areas	1.51#	100	1,508.5
<b>TOTAL</b>			<b>4,256.7</b>

(Source: \*MFEP 1997, +NBU 1992, # 1998 data unavailable, figures based on Howard 1995, adjusted to 1998 prices)

### 4.3 Opportunity costs

Maintaining Uganda's biodiversity gives rise to two major categories of opportunity cost – the reduction of land and resource uses which are incompatible with biodiversity conservation because they deplete species and convert natural habitats, and the control of industrial and urban development technologies and processes which pollute, degrade or otherwise harm biological resources and ecosystems. The former can be at least partially valued by looking at economic losses arising from the reservation of lands and species in protected areas. The latter is unquantifiable on the basis of available data.

The establishment of protected areas precludes land and resource uses. National Parks, Forest Reserves, Wildlife Reserves and Wildlife Sanctuaries permit restricted resource utilisation, and wholly prevent cultivation and grazing. Either of these losses represents the opportunity cost of biodiversity conservation in protected areas in terms of economic activities foregone. For the 3.35 million ha of strict protected areas in Uganda where such controls apply (Table xxx, Table xxx in Data Annex), the opportunity costs of agricultural production foregone are more than US\$ 404 billion a year<sup>10</sup> (Table 15).

**Table 15: Opportunity costs of protected areas 1998**

	Area (km <sup>2</sup> )	Opportunity cost (US\$ mill/year)
Forest protected areas	12,777	169,914
Wildlife protected areas	20,769	234,380
<b>TOTAL</b>	<b>33,546</b>	<b>404,294</b>

<sup>10</sup> Assumes that an average of 25% of protected areas are suitable for cultivation and 30% for grazing, using protected areas and average returns to crops and livestock for different Districts and production systems (Table xxx in Data Annex).

#### 4.4 Costs to other economic activities

Damage caused to agriculture from wild animals comprises a major economic cost associated with Uganda's biodiversity. Crop damage rates attributed to wildlife have been estimated to average some US\$ 116 million per km of boundary for major protected areas in Uganda (Howard 1995, updated to 1998 prices), giving a total economic cost in excess of US\$ 97 billion a year (Table 16, Table xxx in Data Annex).

Table 16: Wildlife crop damage costs 1998

Region	Boundary (km)	Crop losses (US\$ mill)
Central	167	33,633
Eastern	309	17,546
Northern	95	12,217
Western	270	33,803
<b>TOTAL</b>	<b>841</b>	<b>97,199</b>

## 5. CONCLUSIONS: ECONOMIC ISSUES IN BIODIVERSITY CONSERVATION

---

### 5.1 Overview of economic issues in biodiversity conservation

Analysis of the benefits and costs associated with Uganda's biodiversity highlights a number of important economic issues in biodiversity conservation, and identifies areas which must be addressed in the course of the Biodiversity Strategy and Action Plan. These issues are described in the paragraphs below, and include:

- The economic benefits associated with biodiversity are high, and accrue throughout the Ugandan economy and society. They provide a strong, and much needed, ***economic justification for biodiversity conservation***, demonstrating that both local and national level economic activities depend heavily on biological resources, ecosystems and their diversity, and cannot afford to bear the long-term economic costs associated with their degradation and loss.
- ***Biodiversity economic benefits and costs are unequally distributed*** in Uganda. While conservation undoubtedly leads to a net economic gain at the whole-country level, under the *status quo* certain groups incur economic losses from biodiversity. These imbalances undoubtedly act as a constraint to biodiversity conservation, sustainable use and equitable benefit-sharing.
- ***Multiple economic forces drive biodiversity degradation and loss*** in Uganda. Economic activities which deplete, convert or otherwise degrade biodiversity are permitted or encouraged to occur as a result of broader institutional, policy and market factors. Biodiversity conservation involves taking steps to ensure that the full economic benefits of biodiversity conservation and the full economic costs associated with its degradation and loss are reflected both people's day-to-day economic activities and profits as well as into the policies, laws, institutions and markets which impact on biodiversity.

### 5.2 Economic benefits as a justification for biodiversity conservation

The significant and wide-ranging benefits associated with Uganda's biodiversity (*Chapter 3*), and the accordingly high economic costs associated with its degradation and loss, together present a strong economic justification for conservation:

- ***Biological resources and their diversity make an important contribution to national economic activity and growth***. Biodiversity plays a major role in national economic activity and growth in Uganda. Official development statistics hugely under-represent this role both because they ignore subsistence-level activities, ecosystem functions and indirect contributions to economic activity and also because they omit any consideration of biodiversity degradation and loss as an economic cost. For example in 1998, directly biodiversity-dependent sectors of the economy, forestry and fisheries, were formally recorded as contributing only 4% to GDP (MFEP 1998). The direct contribution of biodiversity to livelihoods and economic activity is far higher than this. Gross economic output attributable to biological resource use in forestry, fisheries, tourism, livestock production and rural livelihoods is in excess of US\$ 820 billion a year. Biodiversity also supports

economic activity indirectly, because it provides secondary inputs, ecosystem services and functions which support and maintain off-site production and consumption in urban, industrial, agricultural, electricity and water sectors. These indirect benefits are worth at least US\$ 300 billion a year, a minimum figure which largely excludes their contribution to physical output and consumption.

As well as sectoral income, production and consumption, the value of biodiversity is also reflected in other national economic indicators. Biological resources contribute to exports and foreign exchange earnings, both directly and as secondary inputs into industrial and manufacturing processes. For example, fish earned US\$ 40 million in export earnings in 1995 (Ogutu-Ohwayo *et al* 1998) and protected area tourism may have been worth some US\$ 20 million in 1998. Electricity from hydropower sources, depending heavily on the status and integrity of upstream forest ecosystems, generated over US\$ 9.5 million in export earnings during 1997 (UEB 1997).

Biodiversity also makes a significant contribution to national employment. As well as the estimated 90% of the Ugandan population who depend on agriculture as a primary source of livelihood, biological resource utilisation provides a large number of other employment opportunities. It is estimated that the fishing industry provides employment for between 0.5-1 million people (Ogutu-Ohwayo *et al* 1998), that woodfuel production employs more than 200,000 people full time and almost a similar number on a part-time basis (Kigenyi *et al* 1998) and that employment in wildlife-related tourism and industry estimated at some 21,500 (Muhimbura *et al* 1998). Together the impact of these directly biodiversity-related employment opportunities is significant, as they are sufficient to provide jobs for one third of rural households in Uganda. Other biodiversity-related employment opportunities, including subsistence activities, informal and casual employment and secondary production and processing, increase this figure still further.

Biodiversity degradation and loss would be reflected in a fall in all of these economic indicators, leading to an erosion of the economic production base and slowed economic growth. Already vulnerable and with limited sources of income, employment and foreign exchange, this is an economic cost that the Ugandan economy can ill afford to bear.

- ***Biodiversity contributes to government revenues and minimises public sector expenditures.*** The Ugandan government benefits from biodiversity both through the income, royalties and other fiscal revenues earned from biological resource use and because biodiversity conservation implies substantial savings in public expenditure. Royalties and revenues from biological resource use are worth nearly US\$ 4 billion a year to the Ugandan government, including US\$ 2.2 billion earned from forests, US\$ 821 million from wildlife and at least US\$ 677 million from fishing licences. Other taxes and earnings related biodiversity – for example including trade, income, value-added and export taxes – increase this value still further.

The government also gains economically in terms of expenditures saved by the

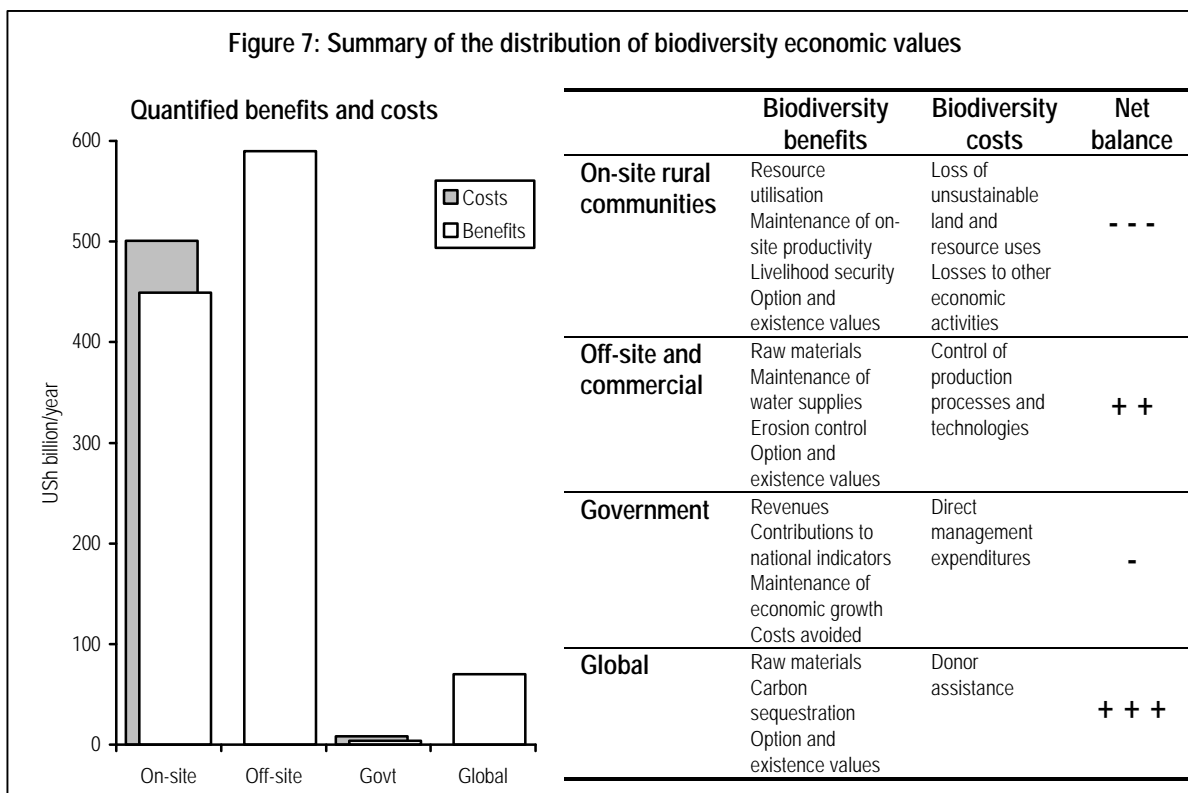
conservation of biodiversity. The government, because it is responsible for maintaining the basic living standards and security of Uganda's population, would be forced to deal with many of the social and economic effects of biodiversity degradation and loss – such as falling income, declining production and livelihood insecurity. It would also be largely responsible for investing in the infrastructure and equipment necessary to mitigate or offset the effects of degradation or loss of ecosystem functions – such as the purification and de-silting of watercourses and bodies, reforestation, erosion control, waste control and treatment. Although unquantifiable on the basis of available information, these benefits are substantial and accrue throughout different sectors and line ministries.

- ***Biodiversity plays an important role in supporting urban and commercial production and consumption.*** Urban and commercial activities depend heavily on biodiversity, through the consumption of biological resources as raw materials or primary inputs as well as through the basic support of ecosystem services and functions. Partial quantification of the gross value of biological resource use at point of first sale or consumption shows that they provide consumption and production goods to a minimum of US\$ 450 billion a year for urban and commercial consumers. Including their secondary uses and value-added activities would increase this figure still higher. Urban and industrial consumers also benefit from the conservation of ecosystems and their related functions, including erosion control, water control and purification, which in turn contribute to electricity generation, water quality and flow and protection of settlements and infrastructure. These services are worth at least US\$ 150 billion a year to urban and industrial consumers and producers. In turn, biodiversity degradation and loss would be reflected in a decline in commercial production possibilities and profits, and a loss of urban consumption opportunities.
- ***Biodiversity forms an integral part of rural livelihoods.*** The direct use of biological resources by rural populations in Uganda is worth at least US\$ 400 million a year, or an average of US\$ 123,000 per household. This biological resource use, and the contribution of ecosystem services to agricultural production and household consumption, forms a central part of local livelihoods. In many areas of Uganda there are no available or affordable alternatives to biological resources as source of subsistence and income, especially for more remote, vulnerable and poorer sectors of the population and in times of drought and stress. Biodiversity conservation is of central importance to rural livelihoods because it provides a flow of goods and services, and maintains other production and consumption activities. Accordingly, biodiversity degradation and loss would have devastating impacts at the local level, reflected in falling income and subsistence and severely weakened livelihoods. These effects would impact most on poorer and more vulnerable sectors of the population, whose livelihood bases are already limited and insecure, who lack alternative sources of income and subsistence, and who are least able to bear these social and economic costs.



### 5.3 The distribution of biodiversity economic benefits and costs between groups

Despite the overall high economic value of biodiversity, benefits and costs are unequally distributed between different groups in Uganda. Under the *status quo* some groups lose out from the presence of biodiversity. Although they are impossible to quantify fully, the partial values presented in this report (*Chapters 3 and 4*) provide a good indication of the way in which biodiversity benefits and costs are distributed, and highlights the groups who gain and lose as a result of biodiversity conservation (Figure 7).



It is clear that the groups to whom the greatest benefits associated with biodiversity accrue – off-site urban, commercial and global consumers – bear few, if any, of the costs associated with its conservation. Simultaneously the groups who bear the costs associated with conservation – local communities and government, benefit from biodiversity to an insufficient level to balance these costs. These imbalances are particularly pronounced for communities living around protected areas, who bear the major proportion of biodiversity opportunity costs and interference with other economic activities. The government line ministries mandated with conservation, although responsible for covering most of the expenditures required to pay for biodiversity management, generate only low revenues and retain only a small proportion of this income.

This distribution of biodiversity benefits and costs is inequitable – the groups who bear the major costs associated with biodiversity conservation are frequently those who are least able to afford it, while the groups who gain from biodiversity are often in a position to pay for the goods and services they consume or degrade. It also undoubtedly hinders conservation. Under the *status quo*, groups who lose out from biodiversity have few

economic incentives to support conservation, and the groups who benefit freely or at low cost have little motivation either to regulate their use or impacts on biodiversity or to contribute towards the costs of conservation.

#### **5.4 The economic causes of biodiversity degradation and loss**

Economic activities are directly causing biodiversity to be degraded in Uganda because they deplete, convert and pollute biological resources and ecosystems (*Chapter 2*). Direct economic causes of biodiversity loss result from activities in most sectors of the Ugandan economy, including forestry, fisheries, agriculture, water, industry and urban settlement. It is however also clear that these activities are permitted or encouraged to occur as a result of wider policy, institutional and market failures which lead to a situation where biodiversity issues are inadequately considered in macroeconomic and sectoral economic policies and by the institutions who are responsible for implementing them, the benefits of biodiversity conservation and costs of its loss are poorly reflected in markets, and there is little incorporation of biodiversity economic values into the prices and profits that producers and consumers face in their day-to-day economic activities.

#### **5.5 Implications for biodiversity conservation**

Analysis of biodiversity issues highlights areas which must be addressed through the NBSAP. Biodiversity conservation competes against other productive uses of scarce land, natural resources and funds in Uganda. Unless it can be demonstrated that biodiversity conservation is socially and developmentally worthwhile, at the community, private and national economic levels, it is unlikely to gain government or public support. A first step is to underline the high economic value of biodiversity, and the significant and wide-ranging economic costs associated with its degradation and loss, so as to justify the NBSAP as a desirable and necessary activity that is in the interests of both the Ugandan national economy and people.

It is also clear that the NBSAP must attempt to address and overcome the direct and underlying economic causes of biodiversity degradation and loss, and to redress current imbalances and inequities in the distribution of biodiversity benefits and costs. As well as requiring action at the level of specific economic activities which impact negatively on biodiversity, this will involve structural and policy changes.

If the NBSAP is to be an effective means of conservation it must seek to provide, overall and within each of its component programmes and projects, sufficient incentives and finance for the groups who bear the costs associated with biodiversity. If particular groups perceive themselves to lose out as a result of biodiversity conservation, or conservation activities cannot be funded to an adequate level, the NBSAP stands little chance of success and will be unsustainable over the long-term. In particular the NBSAP must consider funding and incentive systems at the government, private sector and local community level, and investigate mechanisms for raising finance from groups who can afford to contribute to conservation and who currently benefit from biodiversity freely or at low cost.

## 6. RECOMMENDATIONS: ECONOMIC MEASURES FOR UGANDA'S NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

### 6.1 Overview of economic measures for biodiversity conservation

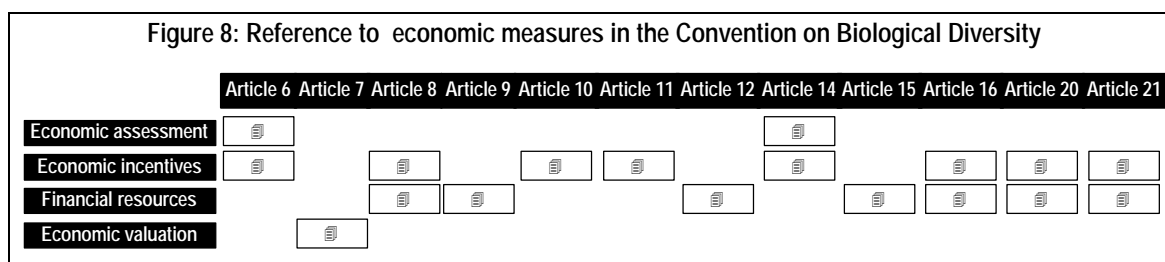
The economic assessment, and issues arising from it, highlight the need to incorporate economic considerations into Uganda's NBSAP. Biodiversity conservation is an economic concern, both due to the fact that biological resources and their diversity provide the basis for much economic activity in Uganda and because economic activities, structures and policies provide the direct and underlying root causes of biodiversity degradation and loss.

It is clear that economic measures form a necessary part of the NBSAP, its component programmes and projects. The overall aim of these measures is to make it economically worthwhile and profitable for people to conserve biodiversity in the course of their economic activity, to provide incentives and generate finance for biodiversity conservation. Without such measures, it is unlikely that the NBSAP will be politically and socially acceptable, economically viable or financially sustainable over the long-term.

### 6.2 The role of economics in the Convention on Biological Diversity

The development and implementation of a NBSAP is being carried out as part of Uganda's obligations as a signatory to the Convention on Biological Diversity. The need and role for economic measures in biodiversity conservation generally, and NBSAPs specifically, is identified and elaborated in various parts of the Convention on Biological Diversity.

The three major objectives of the Convention on Biological Diversity – conservation, sustainable use and benefit sharing – all require the understanding and use of economics for their implementation. Throughout the Convention on Biological Diversity there is reference to the use of economics (Figure 8). Article 11 calls for Contracting Parties to “... as far as possible adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity ...”. Article 20 again mentions the use of economic incentives to achieve the objectives of the Convention. Incentive measures are also central – although implicit – to the implementation of other parts of the Convention including Articles 6 (general measures for the conservation and sustainable use of biological diversity), 8 (*in situ* conservation), 10 (sustainable use of the components of biological diversity), 14 (impact assessment and minimising adverse impacts) and 16 (access to and transfer of technology).



Both Articles 20 (financial resources) and 21 (financial mechanisms) explicitly underline the need to provide financial support to national activities intending to achieve the

objectives of the Convention, from within countries and via new financial mechanisms and global transfers. It also calls for financial support for biodiversity conservation elsewhere – including Article 8 (*in situ* conservation), Article 9 (*ex situ* conservation), Article 12 (education and training), Article 15 (access to genetic resources) and Article 16 (access to and transfer of technology).

The development of new procedures for biodiversity impact assessment is called for in Article 14 (impact assessment and minimising adverse impacts) and by implication in Article 6 of the Convention, which calls upon its contracting parties to develop – in accordance with their specific national interests and conditions – strategies, plans and programmes for the conservation of biodiversity and sustainable use of its components. The Convention also calls for them to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and policies. It implies the importance of economic valuation in Article 7 (identification and monitoring) of components of biological diversity important for its conservation and sustainable use.

It is clear that economics forms a cross cutting issue in the Articles of the Convention on Biological Diversity, a role recognised by the signatories and advisers to the Convention, the Conference of the Parties and the Subsidiary Body on Scientific, Technical and Technological Advice. Implementation of the provisions of the Convention on Biological Diversity by countries who have signed and ratified it – including the adoption of appropriate incentive measures, financing mechanisms and the development of strategies, plans and programmes for the conservation of biodiversity and sustainable use of its components – requires an understanding of economic issues relating to biodiversity conservation, and its degradation and loss and the incorporation of economic tools and measures for biodiversity conservation.

### **6.3 Economic measures for the NBSAP**

The aim of integrating economic measures into the NBSAP is to set in place the conditions under which it is economically worthwhile for people to conserve biodiversity, rather than to degrade it, in the course of their production and consumption activities. Three main sets of economic measures have particular relevance to biodiversity conservation in Uganda, and are considered below – economic instruments to encourage biodiversity conservation and discourage its degradation and loss among commercial and industrial consumers, community economic incentives and benefit-sharing measures, and financing mechanisms for biodiversity conservation.

#### **6.3.1 Economic instruments to encourage biodiversity conservation in commercial and industrial sectors**

Economic instruments include such measures as taxes, subsidies, property rights, loans, price manipulation, grants, deposits and bonds. They aim to influence people's economic behaviour, and promote particular sectors or economic activities, by making it more or less profitable for them to produce or consume particular goods. Economic instruments have long been used by the Ugandan government as tools for broad macroeconomic management and to pursue sectoral economic strategies.

Despite their potential to promote environmental goals, and their particular suitability for use in commercial and industrial sectors, economic instruments have rarely been used for biodiversity conservation in Uganda. Working primarily through market and price mechanisms, economic instruments aim to overcome the market, policy and institutional failures which constitute the underlying root economic causes of biodiversity loss and to ensure that the full benefits of conservation and costs of degradation are reflected in economic decisions and activities. They aim to make it more profitable for commercial and industrial producers and consumers to conserve biodiversity in the course of their economic activity than to degrade it. A wide range of economic instruments have relevance for commercial and industrial sector biodiversity conservation within the context of the NBSAP, including:

- ***Market creation and charge systems:*** A major reason why biodiversity is over-consumed, depleted and converted is that it is free or cheap to use, and that the people who degrade it bear few private costs as a result of their actions. For example industrial polluters do not have to bear the costs that their activities cause, the royalties that commercial loggers pay to obtain timber are well below market prices, agricultural producers gain little by employing sustainable land use and cultivation practices, landholders gain little from conserving wildlife and many ecosystem services can be enjoyed at zero charge.

One way to overcome this problem is to establish, or improve, markets in biodiversity goods and services and ensure that people pay the full price of the biodiversity goods and services they consume, are charged for any biodiversity damage they cause and can benefit from conserving biodiversity. Creating or developing markets also means that biodiversity goods and services are allocated efficiently and according to their relative scarcity and value.

Market creation and charge systems can provide important tools for biodiversity conservation in Uganda. There is great potential for establishing prices and markets for biodiversity goods, or rationalising existing charges, as a means of regulating their use and allocating them efficiently. Many existing extraction and use fees – including commercial water charges, biological resource royalties, tourism charges and land development permits – are underpriced or not priced at all. Other markets do not allocate biological resources in the most efficient, equitable or sustainable way – for example the allocation of fishing licences, timber concessions and ~~xxx~~. These charges could be improved so as to reflect the full values associated with the consumption of biodiversity, and products allocated in ways which would incorporate scarcity and sustainability concerns – for example through auctions, bidding and tradable permits. There is also potential for charging for damage caused to biodiversity and ecosystem services, for example through pollution and waste clean-up charges. All of these economic instruments provide a means of making sure that commercial and industrial producers and consumers take the full value of biodiversity into account when they make economic decisions.

- ***Fiscal instruments:*** Another way of overcoming market distortions which make biodiversity-depleting technologies and products cheap to consume and easy to degrade is through the use of fiscal instruments such as differential taxes and

subsidies. These can be used to raise the relative price of biodiversity-degrading technologies and products in line with the costs of the damage they cause and discourage people from using them, and to lower the relative price of biodiversity-conserving products and technologies in line with the benefits of conservation, and encourage people to use them.

Tax and subsidy systems are already used in Uganda as economic tools to encourage the consumption or production of certain products or to stimulate investment in particular sectors and activities. The manipulation of these existing fiscal instruments have great potential as tools for biodiversity conservation. For example measures such as relatively higher product taxes on indigenous timber, and tax relief or reductions on sustainable land uses or sustainably-harvested products, clean technologies, efficient product processing equipment and water and energy-saving production processes all make it more profitable for commercial and industrial consumers to conserve biodiversity than to degrade it. They promote switching away from biodiversity-depleting production and consumption and encourage the use of biodiversity-conserving products and processes.

- **Financial instruments:** Few funds are available to commercial and industrial producers for investing in biodiversity-conserving equipment, technologies and production processes. Financial instruments provide a means of mobilising and channelling funds, and include loans, grants and investment facilities earmarked specifically for biodiversity conservation.

The provision of credit and loans on easy terms is already used by the Ugandan government as an incentive for industrial investment. Such arrangements could, by targeting particular industrial processes and commercial activities which currently harm biodiversity, be used as an effective tool for biodiversity conservation.

- **Bonds and deposits:** Commercial and industrial producers have no incentive to minimise harm to biodiversity in the course of developments and economic activities because they incur no cost, and may even be able to generate more profits, by doing so. Bonds and deposits are product surcharges which shift the responsibility for biodiversity conservation to private producers, consumers and developers. They are levied on processes or products which run the risk of degrading biodiversity, and require the person carrying out these activities to pay a bond or deposit against the possibility of this harm occurring. They mean that the costs of biodiversity degradation appears as a private cost to commercial and industrial producers, and also present incentives for them to avoid any damage and reclaim their deposit or bond.

Bonds and deposits are already specified as tools for environmental management in the National Environment Statute, and many potential applications to biodiversity conservation. Opportunities for their use are wide-ranging, and include resoration and damage avoidance deposits set on industrial and urban developments in ecologically-sensitive areas, clean-up and disposal bonds levied on the use or production of dangerous or hazardous chemicals and wastes and forward payments made against the harvesting and exploitation of biological resources.

### 6.3.2 Community economic incentives and benefit-sharing measures

The residents of biodiversity areas bear the major responsibility, and costs, of conservation. They also have the potential to impact most on biodiversity through their economic activities. Because they typically benefit little from biodiversity and face multiple livelihood constraints, local communities are often unwilling and economically unable to support conservation through limiting existing economic activities, finding alternative sources of income and subsistence or bearing opportunity costs and losses to other economic activities. The aim of enabling biodiversity conservation through the provision of local economic incentives must form a central strategy of Uganda's NBSAP. A range of economic measures and instruments can be used to help address these concerns, including:

- **Property rights:** An important reason why local communities are often unwilling to conserve biodiversity, and fail to benefit from it, is because they are excluded from using or managing land and biological resources. Property rights address this problem and include the whole or partial transfer of ownership, tenure, management or use over biological resources, areas and aspects of conservation. They deal with the fact that market failures – lack of consideration of the value of biodiversity in prices, markets and economic decisions – is due in part to the absence of transferable, well-defined and secure rights over land and biological resources. When property rights are established, biodiversity markets and scarcity prices should emerge, permitting the owners and users of biological resources to benefit from conservation or be forced to bear the implications of degradation.

Local communities have traditionally had little control or participation in biodiversity use and management in Uganda. Over recent years this situation has been undergoing change in key biodiversity sectors – including forests, wildlife and wetlands. Extending these existing joint management, utilisation and partnership arrangements could provide a powerful economic tool for biodiversity conservation.

- **Market creation:** Establishing and developing markets provides an important tool for increasing community economic gain and control over biodiversity. The creation of new markets in biodiversity products and improvement of value-added and processing activities can simultaneously strengthen local livelihoods and provide strong incentives for conservation. Development of markets and products which are based on alternatives to biodiversity-depleting sources of income and subsistence can also enable local-level biodiversity conservation at the same time as increasing **xxx**.

**XXX**

- **Financial instruments:** Even when they are willing to participate in biodiversity conservation activities or invest in alternative to biodiversity-depleting activities and products, local communities often lack sufficient funds to do so. Financial instruments, targeted specifically at the residents of biodiversity areas,

*include benefit-sharing (the Lucy blah on this). Providing people with alternative income and subsistence generating activities to biodiversity depleting ones.*

### 6.3.3 Financing mechanisms for biodiversity conservation

Biodiversity conservation activities are not cost-free, and require funds to cover the expenditures and economic losses they incur. Four main sources of finance are available for biodiversity conservation in Uganda, including:

- **Conventional financing mechanisms:** Conventional financing mechanisms include central government budget allocations and subventions and donor grants and loans. They already form a major part of development assistance to Uganda, and contribute substantially towards biodiversity conservation.

Although having important potential for funding NBSAP activities, conventional financing mechanisms are unlikely to be sufficient to cover the full costs associated with biodiversity conservation in Uganda. Both donor and central government funds are extremely limited in their quantity and scope, and under heavy pressure from other sectors of the economy. They are also not always sustainable, and in many cases diminish national or private control over the choice and implementation of biodiversity projects and programmes. Uganda is already heavily dependent on foreign aid, and many activities rely primarily on government support. It is important that mechanisms for funding NBSAP activities do not increase national indebtedness unduly, or place additional pressure on already strained public sector budgets.

- **Domestic economic instruments:** Although the primary goal of economic instruments is to change incentive structures and encourage people to conserve biodiversity in the course of their economic activity, some have the additional advantage of raising and allocating revenues. Fiscal instruments, market creation and charges, bonds and deposits all generate income, property rights and financial instruments provide a means of ensuring that these funds accrue to particular sectors, economic activities or stakeholder groups. They are a particularly effective way of making sure that government, the private sector and local communities both generate and receive finance for biodiversity conservation.
- **Private investment and co-management:** There is no reason why the state, or external donors, should have a monopoly on financing and managing NBSAP activities. Uganda has an efficient and rapidly-expanding private sector, including large-scale commercial concerns as well as small-scale and community-level groups. There is great potential for encouraging private, community and non-governmental investment in biodiversity. This can not only generate funds but can also increase public participation in biodiversity conservation and transfer some of its cost burden away from government.

There are many different levels of private investment in biodiversity conservation. The establishment and improvement of markets, along with appropriate property rights, provides one means of devolving some of the responsibility for managing



and using biodiversity. Examples include the joint management of biodiversity areas, the allocation of management and utilisation leases and franchises and the development of value-added biodiversity utilisation industries and markets in areas such as tourism, products harvesting and processing. Private investment can also be encouraged aside from commercial investments, direct use and management. Efforts can be made to attract charitable contributions and donations through such mechanisms as trusts, endowments and foundations.

For the private sector to be more fully engaged in financing and management in Uganda, biodiversity must be made into an attractive investment opportunity. Most importantly this requires that opportunities are created for investment, both in terms of devolution of the ownership, use and control of biological resources and biodiversity areas as well as through support to the development of sustainable biodiversity-based enterprises. Support can also be provided to the entry of the private sector into biodiversity conservation in other ways, including research and development into new biodiversity products and markets, the elimination of barriers to trade and business, the allocation of concessions, franchises, sponsorship and advertising deals, the allocation of credit on favourable terms and the provision of tax relief on investment and contributions. Many of these forms of support can be made under joint arrangements and partnerships between the public, commercial and community sectors.

- **International financial transfers:** Donor arrangements are not the only means of funding biodiversity conservation from international sources. Multiple possibilities exist for attracting international finance to biodiversity conservation, including those which encourage the transfer of private financial resources as well as the more innovative use of donor funds:
  - A range of **international funds** can be used to finance biodiversity conservation. These include trust funds, foundations, endowments, revolving funds, green funds and other grant or loan-making entities. These funds can both be used as a means of raising money from international sources as well as channelling money to biodiversity conservation. International funds have particular potential for financing conservation for Uganda's biodiversity areas, or species, which have a high global profile and perceived value – for example the existing trust fund operating in Bwindi Impenetrable National Park.
  - Various approaches to **debt relief** such as debt rescheduling, debt forgiveness, debt-for-equity and debt-for-nature swaps can be used as a means of simultaneously generating funds, increasing private and NGO participation in biodiversity conservation and reducing national indebtedness. Some kind of debt relief arrangement may be a way of reducing Uganda's large external debt and providing targeted funds for biodiversity conservation.
  - **Offsets and credits** can generate flows of funds from international industries to biodiversity conservation. For example under carbon offset and credit arrangements, developed country power utilities finance the operations of a developing country Forest Department, in exchange for credit for the amount of

carbon saved or sequestered. Although existing experience in Uganda of such arrangements implemented under the FACE agreement has had mixed impacts, offsets and credits – if properly planned and managed – have some potential for expansion and application to other aspects of biodiversity conservation financing.

- **International compacts** are voluntary agreements made by developing countries to engage in policy reforms and biodiversity conservation in exchange for the transfer of financial or technological resources from international sources to support these reforms. Uganda is in the process of undergoing major reforms in environmental policy and legislation, and it is possible that these on-going processes could be used to bargain some kind of international compact agreement.
- **Concessions or prospecting rights** can be offered in biodiversity areas and species to companies interested in their possible future uses – for example agricultural, industrial and pharmaceutical applications – of biodiversity and genetic resources. Uganda is a country with high and extensive biodiversity. If properly planned and managed, the potential for instigating biodiversity prospecting arrangements could be high.

#### 6.4 Integrating economic measures into the NBSAP

Economic measures will form a central component of Uganda's NBSAP, and will provide an important means of ensuring that it is both financially and economically sustainable, equitable and efficient. There will be a need to develop an overall strategy for the provision of economic incentives and financing mechanisms for the NBSAP. It will also be necessary to integrate supportive economic measures into its programme and project components. It is not yet possible to identify the most appropriate and effective economic measures for the NBSAP, as these will be largely determined by its exact nature and activities. Once a draft NBSAP has been developed, it will be possible to formulate specific economic strategies and actions for its support.

## 7. REFERENCES

---

- Adams, W. and Infield, M., 1998, *Community Conservation at Mgahinga Gorilla National Park, Uganda*, Community Conservation in Africa: Principles and Comparative Practice Working Paper, Institute of Development Policy and Management, University of Manchester
- Alexander, S., Schneider, S., and Lagerquist, K., 1997, 'The interaction of climate and life', in Daily, G., (ed.) *Nature's Services; Societal Dependence on Natural Ecosystems*, Island Press, Washington DC
- Emerton, L., 1995, *Trade Policy and the Horticultural Sector in Kenya: an Economic Analysis of Environmental Impacts*, Policy Research Group, Nairobi
- Emerton, L., 1997, *Eritrea Biodiversity: Economic Assessment*, Report prepared for the Government of the State of Eritrea Department of Environment, Ministry of Land, Water and Environment, Asmara
- FINTEC Consultants, 1998, *Meat Masterplan Study*, Ministry of Agriculture, Animal Industry and Fisheries, Entebbe
- Howard, P., 1995, *The Economics of Protected Areas in Uganda: Costs, Benefits and Policy Issues*, MSc dissertation, University of Edinburgh
- Interministerial Task Force on Resettlement of the Benet, 1996, *Report of the Interministerial Task Force on Resettlement of the Benet*, Report submitted to Ministry of Tourism, Wildlife and Antiquities, Kampala
- Kabananukye, K. and Wily, E., 1996, *Report on a Study of the Abayanda Pygmies of South Western Uganda*, Report submitted to Mgahinga and Bwindi Impenetrable Forest Conservation Trust, Kabale
- Kigenyi, F., Nabanyumya, R., Walugembe, D., Duli, D. and Bishanga, B., 1998, *Strategy for the Management and Conservation of Forest Biodiversity in Uganda*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Mafabi, P., Kakuru, W., Arinaitwe, J. and Kizito Y., 1998, *Uganda's National Biodiversity Strategy and Action Plan: Wetlands Resources Subsector Component, Stocktaking Report*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Mbuza, F., Hoon, J., Tizikara, C and Hashakimana, 1998a, *Current Status of Uganda's Domestic Animal Diversity*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Mbuza, F., Apuuli, M., Ngarukiye, A. and Kajura, S., 1998, *Comparative Analysis of Milk Production Costs Under Different Cattle Management Systems in the Different Agroecological Zones of Uganda*, Department of Animal Production and Marketing, Ministry of Agriculture, Animal Industry and Fisheries, Entebbe
- MFEP, various, *Key Economic Indicators*, Ministry of Finance and Economic Planning, Kampala
- MFEP, 1995, *Background to the Budget 1995-96: Economic Performance 1995-1995 and Medium Term Strategy 1995-96-1997/98*, Ministry of Finance and Economic Planning, Kampala

- MFEP, 1996, *Background to the Budget 1996-97 and National Development Strategy 1996/97-1998/99*, Ministry of Finance and Economic Planning, Kampala
- MFEP, 1997, *Summary of the Estimates of Recurrent and Development Expenditures for 1998/99*, Ministry of Finance and Economic Planning, Kampala
- MFEP, 1998, *Statistical Abstract*, Ministry of Finance and Economic Planning, Kampala
- Mugoya, C., Mworozzi, E., Egwang, T. and Hafashimana, D., 1998, *Biotechnology and Biosafety Sunsector Component for the National Biodiversity Strategy and Action Plan in Uganda*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Muhimbura, A., Buhanga, E., Kahembwe, F., Muwanika, A., Tindigarukayo, J. and Tushabe, J., 1998, *National Biodiversity Strategy and Action Plan: Wildlife Sector Report*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Myers, N., 1997, 'The world's forests and their ecosystem services', in Daily, G., (ed.) *Nature's Services; Societal Dependence on Natural Ecosystems*, Island Press, Washington DC
- NBU, 1992, *Uganda Country Study on Costs, Benefits and Unmet Needs of Biological Diversity Conservation*, National Biodiversity Unit, Department of Environment Protection, Ministry of Natural Resources, Kampala
- NEAP, 1995, *The National Environment Action Plan for Uganda*, NEAP Secretariat, Ministry of Natural Resources, Kampala
- NEMA, 1996, *State of the Environment Report for Uganda*, National Environment Management Authority, Kampala
- NEMA, 1998a, *District Environmental Profiles*, National Environment Management Authority, Kampala
- NEMA, 1998b, *District State of the Environment Reports*, National Environment Management Authority, Kampala
- NWCMP, 1996, *Environmental Assessment of Rice Production in Eastern Uganda*, National Wetlands Conservation and Management Programme, Ministry of Natural Resources, Kampala
- ODA, 1992, *Environmental Synopsis of Uganda*, Report prepared for UK Overseas Development Administration by International Institute for Environment and Development, London
- Ogutuhwayo, R., Mwebaza-Ndawula, S., Wandera, S. and Mugidde, R., 1998, *The Status of Aquatic Biodiversity in Uganda: Towards Sustainable Utilisation and Conservation of Aquatic Resources*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Rwakaikara, M. and Nkwiine, C., 1998, *Soil Biodiversity in Uganda*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- Sala, O., and Paruelo, J., 'Ecosystem services in grasslands', in Daily, G., (ed.) *Nature's Services; Societal Dependence on Natural Ecosystems*, Island Press, Washington DC

- Slade, G., and Weitz, K., 1991, 'Uganda: Environmental issues and options', Center for Resource and Environmental Policy Research Working Paper #91-3, School of Forestry and Environmental Studies, Duke University
- Wasswa, J., Ziraba, B., Apio, S., Male-Kayiwa, B., and Opolot, O., 1998, *Plant Genetic Resources: An Issues Paper for the Preparation of Uganda's Biodiversity Strategy and Action Plan*, Contribution to the Biodiversity Strategy and Action Plan for Uganda, National Environment Management Authority, Kampala
- UEB, 1997, *Annual Report 1997*, Uganda Electricity Board, Kampala
- World Bank, 1993, *Uganda Agriculture*, Country Study, World Bank, Washington DC

## 8. DATA ANNEX

Table 17: Population by District 1998

Region	District	Area (km <sup>2</sup> )	% urban	Population	Density (persons/km <sup>2</sup> )
Central	Kalanga	432	8.4	18,400	43
Central	Kampala	169	100.0	878,600	5,199
Central	Kiboga	3,872	3.7	171,000	44
Central	Luwero	5,360	8.1	476,800	89
Central	Masaka	3,214	10.6	853,200	265
Central	Mpigi	4,514	15.0	1,121,000	248
Central	Mubende	5,949	6.9	596,600	100
Central	Mukono	4,594	12.0	1,063,200	231
Central	Nakasongola	3,179	8.3	117,000	37
Central	Sembabule	2,317	2.4	162,200	70
Central	Rakai	3,889	3.9	448,500	115
Eastern	Bugiri	1,453	1.9	279,000	192
Eastern	Busia	705	17.1	203,900	289
Eastern	Iganga	3,370	5.6	866,700	257
Eastern	Jinja	677	27.9	384,200	568
Eastern	Kamuli	3,332	1.7	611,600	184
Eastern	Kapchorwa	1,738	3.9	145,500	84
Eastern	katakwi	4,647	2.4	225,300	48
Eastern	Kumi	2,457	5.0	333,700	136
Eastern	Mbale	2,504	8.5	905,100	361
Eastern	Pallisa	1,564	0.8	449,000	287
Eastern	Soroti	3,879	15.0	402,800	104
Eastern	Tororo	1,631	9.1	500,500	307
Northern	Adjumani	2,888	2.2	111,600	39
Northern	Apac	5,887	1.3	544,300	92
Northern	Arua	7,595	4.2	798,100	105
Northern	Gulu	11,560	11.3	441,200	38
Northern	Kitgum	16,136	4.3	468,200	29
Northern	Kotido	13,208	4.9	240,100	18
Northern	Lira	6,151	5.5	619,600	101
Northern	Moroto	14,113	7.4	259,000	18
Northern	Moyo	1,780	8.4	100,500	56
Northern	Nebbi	2,781	7.6	409,600	147
Western	Bundibugyo	2,097	7.9	161,800	77
Western	Bushenyi	3,827	2.5	739,800	193
Western	Hoima	3,563	2.3	258,400	73
Western	Kabale	1,695	7.0	582,000	343
Western	Kabarole	8,109	4.9	904,000	111
Western	Kasese	2,724	11.6	425,600	156
Western	Kibale	4,208	1.1	257,100	61
Western	Kisoro	620	4.0	249,900	403
Western	Masindi	8,458	5.5	345,800	41
Western	Mbarara	9,733	5.5	987,400	101
Western	Ntungamo	1,981	0.9	384,900	194
Western	Rukungiri	2,584	3.3	526,300	204
<b>TOTAL</b>		<b>197,144</b>		<b>21,029,000</b>	<b>107</b>

(Source: MFEP 1998)

Table 18: Vegetation types by District 1998

Region	District	Primary indigenous forest (km <sup>2</sup> )	Degraded indigenous forest (km <sup>2</sup> )	Woodland (km <sup>2</sup> )	Bushland (km <sup>2</sup> )	Grassland (km <sup>2</sup> )
Central	Kalanga	222	6	44.9	8.4	106.8
Central	Kampala		5	0.3	7.4	0.2
Central	Kiboga	32	43	1,630.8	109.1	883.3
Central	Luwero	1	61.2	3,608.4	583.4	1,994.8
Central	Masaka	55	100	210.5	622.9	1,740.6
Central	Mpigi	271	421	388.7	154.3	1,060.9
Central	Mubende	65	225	941.7	256.2	986.0
Central	Mukono	501	534	204.8	264.9	586.3
Central	Rakai	184	32	141.1	305.5	1,928.3
Eastern	Iganga	33	161	350.8	137.7	159.3
Eastern	Jinja		0	3.0	26.4	13.1
Eastern	Kamuli			275.8	104.1	330.6
Eastern	Kapchorwa	194	140	277.3	63.7	582.8
Eastern	Kumi			80.6	96.7	771.3
Eastern	Mbale	69	166	271.1	50.3	323.2
Eastern	Pallisa			9.2	4.3	134.5
Eastern	Soroti	5		432.4	55.6	3,306.6
Eastern	Tororo	4	19	104.1	82.5	77.9
Northern	Apac			688.1	100.6	947.5
Northern	Arua			3,150.9	268.9	796.4
Northern	Gulu			4,683.5	358.9	1,626.3
Northern	Kitgum			7,336.8	304.2	2,447.8
Northern	Kotido			2,324.0	2,878.6	6,823.2
Northern	Lira			685.4	79.2	906.5
Northern	Moroto			1,151.7	4,355.5	7,766.7
Northern	Moyo	13	0	2,201.4	63.4	1,001.1
Northern	Nebbi	2		243.5	228.6	627.5
Western	Bundibugyo	375	19	346.8	22.2	849.5
Western	Bushenyi	678	33	173.0	145.1	631.0
Western	Hoima	464	244	899.5	85.1	715.1
Western	Kabale	81	3	4.7	7.6	166.9
Western	Kabarole	717	194	1,574.6	72.6	1,390.8
Western	Kasese	396	22	668.7	182.4	554.2
Western	Kibale	671	343	853.1	23.2	510.8
Western	Kisoro	103	11		0.9	28.3
Western	Masindi	509	20	3,893.4	303.4	2,024.3
Western	Mbarara	37	2	176.5	1,712.4	4,949.0
Western	Ntungamo			19.3	3.1	971.0
Western	Rukungiri	359	3	226.7	69.4	448.3
<b>TOTAL</b>		<b>6,039</b>	<b>2,808</b>	<b>40,277.1</b>	<b>14,198.7</b>	<b>51,168.7</b>

(Source: MFEP 1998)

Table 19: Forest Protected Areas by District 1998

Region	District	Central Forest Reserve (ha)	Local Forest Reserve (ha)	Total (ha)
Central	Kalanga	8,759		8,759
Central	Kampala	8		8
Central	Kiboga	42,083		42,083
Central	Luwero	49,970	182	50,152
Central	Masaka	34,594	228	34,822
Central	Mpigi	36,629	452	37,081
Central	Mubende	34,199	85	34,284
Central	Mukono	59,534	554	60,088
Central	Rakai	37,582	75	37,657
Eastern	Iganga	29,735	165	29,900
Eastern	Jinja	6,201	153	6,354
Eastern	Kamuli	1,060	82	1,142
Eastern	Kapchorwa	5	3	8
Eastern	Kumi	161	189	350
Eastern	Mbale	1,225	188	1,413
Eastern	Pallisa	316	269	585
Eastern	Soroti	13,222	416	13,638
Eastern	Tororo	4,554	66	4,620
Northern	Apac	13,360	100	13,460
Northern	Arua	59,741	684	60,425
Northern	Gulu	30,140	22	30,162
Northern	Kitgum	77,888	88	77,976
Northern	Kotido	213,726	41	213,767
Northern	Lira	9,099	299	9,398
Northern	Moroto	108,443		108,443
Northern	Moyo	34,434	76	34,510
Northern	Nebbi	9,994	137	10,131
Western	Bundibugyo	1,940	41	1,981
Western	Bushenyi	78,641	26	78,667
Western	Hoima	58,738	39	58,777
Western	Kabale	4,891		4,891
Western	Kabarole	39,695	44	39,739
Western	Kasese	5,714	78	5,792
Western	Kibale	25,494	29	25,523
Western	Kisoro	702		702
Western	Masindi	103,027	67	103,094
Western	Mbarara	18,648	59	18,707
Western	Ntungamo	13		13
Western	Rukungiri	18,534	48	18,582
<b>TOTAL</b>		<b>1,272,699</b>	<b>4,985</b>	<b>1,277,684</b>

(Source: MFEP 1998)



**Table 20: Wildlife Protected Areas by District 1998**

	Area Districts (ha)
<b>National Parks</b>	
Bwindi Impenetrable	33,100 Kabale, Kisoro, Rukungiri
Kibale	76,600 Kabarole
Kidepo Valley	144,200 Kotido
Lake Mburo	36,500 Mbarara
Mgahinga Gorilla	2,500 Kisoro
Mount Elgon	117,200 Mbale
Murchison Falls	386,000 Apac, Gulu, Masindi
Queen Elizabeth	197,800 Kasese, Bushenyi, Rukungiri
Rwenzori Mountains	99,600 Kasese
Semliki	22,000 Bundibugyo
<b>Wildlife Reserves</b>	
Ajai	15,600 Arua
Bokora	203,400 Moroto
Bugungu	74,800 Masindi
Karuma	71,300 Masindi
Katonga	20,700 Kabarole
Kigezi	32,800 Rukungiri
Kyambura	15,500 Bushenyi
Matheniko	158,700 Kotido, Moroto
Pian-Upe	228,700 Moroto
Toro	54,900 Bundibugyo
<b>Wildlife Sanctuaries</b>	
Dufule	1,000 Moyo
Entebbe	5,100 Mpigi
Jinja	3,200 Jinja
Kazinga	2,300 Bushenyi, Kasese
Malawi	700 Tororo
Mount Kei	52,300 Moyo
Otze	20,400 Moyo
<b>TOTAL</b>	<b>85,000</b>

*(Source: MFEP 1998)*

Table 21: Wetland areas by District 1998

Region	District	Permanent (km <sup>2</sup> )	Of which papyrus (km <sup>2</sup> )	Of which reeds (km <sup>2</sup> )	Seasonal (km <sup>2</sup> )	Converted (km <sup>2</sup> )
Central	Kalanga	7.1	7.1		32.6	
Central	Kampala	16.3	14.5		16.3	8.0
Central	Kiboga	142.0	122.3		702.0	11.2
Central	Luwero	412.2	398.2		2,009.3	27.7
Central	Masaka	446.3	115.3		978.2	11.9
Central	Mpigi	572.9	148.1		480.1	14.6
Central	Mubende	171.7	159.5		586.4	24.8
Central	Mukono	454.1	346.6	4.4	533.0	109.2
Central	Rakai	225.7	88.3		1,052.3	43.6
Eastern	Iganga	328.0	300.8	4.3	886.9	591.0
Eastern	Jinja	12.5	4.8	7.7	87.1	75.9
Eastern	Kamuli	397.1	376.8	14.1	682.8	316.0
Eastern	Kapchorwa	20.6	10.4		84.6	0.8
Eastern	Kumi	299.3	37.5		689.6	60.7
Eastern	Mbale	57.7	33.3	1.9	297.8	67.7
Eastern	Pallisa	337.6	298.9		373.2	257.8
Eastern	Soroti	842.8	260.2		2,363.0	9.2
Eastern	Tororo	231.5	208.4	0.2	555.0	373.2
Northern	Apac	294.4	93.8		853.0	13.4
Northern	Arua	112.4	101.4	1.1	103.3	
Northern	Gulu	73.7	69.2	2.2	536.2	
Northern	Kitgum	48.2			544.1	
Northern	Kotido	1.2			843.3	
Northern	Lira	297.1	95.8		793.9	37.3
Northern	Moroto	23.8	13.6		2,195.0	120.3
Northern	Moyo	196.0	140.8	50.1	38.2	
Northern	Nebbi	32.7	27.7	4.0	78.6	1.0
Western	Bundibugyo	103.1	3.5	96.7	808.4	10.7
Western	Bushenyi	96.2	89.7		86.3	7.3
Western	Hoima	61.0	57.9		122.0	
Western	Kabale	50.6	15.0		60.2	64.0
Western	Kabarole	218.5	179.2	9.9	727.8	15.7
Western	Kasese	68.8	43.9	22.0	338.4	
Western	Kibale	110.8	106.2		424.2	11.2
Western	Kisoro	21.5	9.8		11.9	22.5
Western	Masindi	195.6	127.4	1.2	787.5	8.3
Western	Mbarara	208.7	202.2	0.8	899.8	15.3
Western	Ntungamo	70.0	70.0		37.6	1.0
Western	Rukungiri	36.3	16.7		109.2	45.1
<b>TOTAL</b>		<b>7,296.0</b>	<b>4,394.8</b>	<b>220.6</b>	<b>22,809.1</b>	<b>2,376.4</b>

(Source: MFEP 1998)

Table 22: Production systems and returns to agriculture by District 1998

Region	District		Gross returns to crops (Ush/ha/yr)	Gross returns to livestock (USh/TLU/yr)
Central	Kalanga	Banana/coffee	568,471	90,317
Central	Kampala	Banana/coffee	568,471	90,317
Central	Kiboga	Banana/coffee	376,589	8,620
		banana/cotton		
Central	Luwero	Banana/coffee	980,563	8,620
		banana/cotton		
Central	Masaka	Banana/coffee	409,235	22,554
		pastoralist		
Central	Mpigi	Banana/coffee	409,235	22,554
		pastoralist		
Central	Mubende	Banana/coffee	568,471	90,317
Central	Mukono	Banana/coffee	898,838	8,620
		banana/cotton		
Central	Rakai	Banana/coffee	437,895	72,580
		pastoralist, montane		
Eastern	Iganga	Banana/coffee	935,637	8,620
		banana/cotton		
Eastern	Jinja	Banana/coffee	568,471	90,317
Eastern	Kamuli	Banana/coffee	1,464,694	8,620
		banana/cotton		
Eastern	Kapchorwa	Montane	653,802	100,051
Eastern	Kumi	Teso	495,215	90,317
Eastern	Mbale	Montane	495,215	100,051
Eastern	Pallisa	Banana/cotton	523,336	17,240
Eastern	Soroti	Teso	495,215	90,317
Eastern	Tororo	Banana/cotton	557,251	17,240
Northern	Apac	Northern	394,236	17,240
Northern	Arua	West Nile	495,215	90,317
Northern	Gulu	Northern	385,507	17,240
Northern	Kitgum	Northern	376,777	17,240
Northern	Kotido	Pastoralist	250,000	45,109
Northern	Lira	Northern	385,507	17,240
Northern	Moroto	Pastoralist	250,000	45,109
Northern	Moyo	West Nile	495,215	90,317
Northern	Nebbi	West Nile	495,215	90,317
Western	Bundibugyo	Banana/cotton	517,754	58,645
		montane		
Western	Bushenyi	Montane	495,215	100,051
Western	Hoima	Banana/coffee	1,075,078	8,620
		banana/cotton		
Western	Kabale	Montane	495,215	100,051
Western	Kabarole	Banana/coffee	531,843	50,025
		montane		
Western	Kasese	Montane	473,693	100,051
Western	Kibale	Banana/coffee	517,673	8,620
		banana/cotton		
Western	Kisoro	Montane	216,981	100,051
Western	Masindi	Banana/coffee	554,382	8,620
		banana/cotton		
Western	Mbarara	Pastoralist	372,608	72,580
		montane		
Western	Ntungamo	Montane	495,215	100,051
Western	Rukungiri	Montane	636,386	100,051

(Source: Production systems from Fintec Consultants 1998. Returns to livestock from Mbuza et al 1998b. Returns to agriculture from NEMA 1998a, b. Gross returns to agriculture include home consumed and marketed crops, and home consumed and marketed milk, meat, manure and animal sales. Where Districts contain more than one production system, average returns from all systems used.)

Table 23: Contribution of natural vegetation to livestock production

Region	District		No. of livestock (TLU)	Total value of production (US\$ mill/yr)	Value of land vegetation (US\$ mill/yr)	Value of wetlands (US\$ mill/yr)
Central	Kalanga	Banana/coffee	4,422	399.38	-	-
Central	Kampala	Banana/coffee	24,456	2,208.80	-	-
Central	Kiboga	Banana/coffee	84,418	4,539.89	491	55
		banana/cotton				
Central	Luwero	Banana/coffee	179,039	9,628.49	1,042	116
		banana/cotton				
Central	Masaka	Banana/coffee	228,560	15,476.47	4,640	516
		pastoralist				
Central	Mpigi	Banana/coffee	140,430	9,508.93	2,851	317
		pastoralist				
Central	Mubende	Banana/coffee	158,063	14,275.81	-	-
Central	Mukono	Banana/coffee	132,556	7,128.69	771	86
		banana/cotton				
Central	Rakai	Banana/coffee	138,566	10,876.34	5,932	659
		pastoralist, montane				
Eastern	Iganga	Banana/coffee	204,053	10,973.71	1,187	132
		banana/cotton				
Eastern	Jinja	Banana/coffee	22,573	2,038.73	-	-
Eastern	Kamuli	Banana/coffee	157,041	8,445.46	914	102
		banana/cotton				
Eastern	Kapchorwa	Montane	52,613	5,263.96	2,369	263
Eastern	Kumi	Teso	21,081	1,903.98	1,285	143
Eastern	Mbale	Montane	179,826	17,991.70	8,096	900
Eastern	Pallisa	Banana/cotton	93,206	1,606.89	1,085	121
Eastern	Soroti	Teso	50,036	4,519.11	3,050	339
Eastern	Tororo	Banana/cotton	160,408	2,765.46	1,867	207
Northern	Apac	Northern	106,611	1,837.99	1,241	138
Northern	Arua	West Nile	190,905	17,242.01	11,638	1,293
Northern	Gulu	Northern	20,264	349.36	236	26
Northern	Kitgum	Northern	23,078	397.87	269	30
Northern	Kotido	Pastoralist	338,458	15,267.38	13,741	1,527
Northern	Lira	Northern	43,489	749.76	506	56
Northern	Moroto	Pastoralist	259,840	11,721.03	10,549	1,172
Northern	Moyo	West Nile	77,242	6,976.28	4,709	523
Northern	Nebbi	West Nile	126,002	11,380.15	7,682	854
Western	Bundibugyo	Banana/cotton	95,332	5,590.78	2,701	300
		montane				
Western	Bushenyi	Montane	196,456	19,655.54	8,845	983
Western	Hoima	Banana/coffee	64,452	3,466.15	375	42
		banana/cotton				
Western	Kabale	Montane	70,510	7,054.57	3,175	353
Western	Kabarole	Banana/coffee	218,490	20,796.73	4,919	547
		montane				
Western	Kasese	Montane	76,910	7,694.89	3,463	385
Western	Kibale	Banana/coffee	67,967	3,655.18	395	44
		banana/cotton				
Western	Kisoro	Montane	17,912	1,792.11	806	90
Western	Masindi	Banana/coffee	89,659	4,821.75	522	58
		banana/cotton				
Western	Mbarara	Pastoralist	861,975	62,561.81	36,901	4,100
		montane				
Western	Ntungamo	Montane	211,935	21,204.22	9,542	1,060
Western	Rukungiri	Montane	116,256	11,631.48	5,234	582
				<b>365,399</b>	<b>163,027</b>	<b>18,114</b>

(Source: Livestock populations from Fintec Consultants 1998. Returns to livestock from Mbuza et al 1998b, include home consumed and marketed milk, meat, manure and animal sales. Where Districts contain more than one production system, average returns used. Natural vegetation assumed to contribute 0% to Banana Coffee systems, 50% to Montane systems, 75% to Banana Coffee/Northern/Teso/West Nile systems, and 100% to Pastoralist systems. Where natural vegetation used for pasture, fodder and forage grasslands assumed to contribute 40% to production and wetlands 10% )

**Table 24: Costs of soil and conservation works by District 1998**

Region	District	S&WC costs (Ush/ha/yr)	Central Forest Reserve (ha)	Total costs of S&WC (USh mill/yr)
Central	Kalanga	241,981	8,759	2,119.51
Central	Kampala	241,981	8	1.94
Central	Kiboga	158,155	42,083	6,655.65
Central	Luwero	158,155	49,970	7,903.02
Central	Masaka	125,216	34,594	4,331.71
Central	Mpigi	125,216	36,629	4,586.52
Central	Mubende	241,981	34,199	8,275.51
Central	Mukono	158,155	59,534	9,415.61
Central	Rakai	160,963	37,582	6,049.31
Eastern	Iganga	158,155	29,735	4,702.75
Eastern	Jinja	241,981	6,201	1,500.53
Eastern	Kamuli	158,155	1,060	167.64
Eastern	Kapchorwa	232,458	5	1.16
Eastern	Kumi	69,822	161	11.24
Eastern	Mbale	232,458	1,225	284.76
Eastern	Pallisa	74,329	316	23.49
Eastern	Soroti	69,822	13,222	923.18
Eastern	Tororo	74,329	4,554	338.50
Northern	Apac	148,476	13,360	1,983.64
Northern	Arua	14,580	59,741	871.05
Northern	Gulu	148,476	30,140	4,475.06
Northern	Kitgum	148,476	77,888	11,564.49
Northern	Kotido	8,450	213,726	1,805.98
Northern	Lira	148,476	9,099	1,350.98
Northern	Moroto	8,450	108,443	916.34
Northern	Moyo	14,580	34,434	502.06
Northern	Nebbi	14,580	9,994	145.72
Western	Bundibugyo	153,394	1,940	297.58
Western	Bushenyi	232,458	78,641	18,280.73
Western	Hoima	158,155	58,738	9,289.72
Western	Kabale	232,458	4,891	1,136.95
Western	Kabarole	237,220	39,695	9,416.43
Western	Kasese	232,458	5,714	1,328.26
Western	Kibale	158,155	25,494	4,032.01
Western	Kisoro	232,458	702	163.19
Western	Masindi	158,155	103,027	16,294.26
Western	Mbarara	120,454	18,648	2,246.23
Western	Ntungamo	232,458	13	3.02
Western	Rukungiri	232,458	18,534	4,308.38
<b>TOTAL</b>			<b>1,272,699</b>	<b>147,704</b>

*(Source: Costs of soil and water conservation measures for different systems from Emerton 1995, calculated for subsistence mixed agriculture. Where Districts contain more than one production system, average costs used.)*

**Table 25: Opportunity costs of protected areas by District 1998**

<b>Region</b>	<b>District</b>	<b>Forest protected areas (USh mill/yr)</b>	<b>Wildlife protected areas (USh mill/yr)</b>
Central	Kalanga	1,245	-
Central	Kampala	1	-
Central	Kiboga	4,044	-
Central	Luwero	12,392	-
Central	Masaka	3,798	-
Central	Mpigi	4,045	556
Central	Mubende	4,872	-
Central	Mukono	13,619	-
Central	Rakai	4,660	-
Eastern	Iganga	7,052	-
Eastern	Jinja	903	455
Eastern	Kamuli	420	-
Eastern	Kapchorwa	1	-
Eastern	Kumi	50	-
Eastern	Mbale	196	16,269
Eastern	Pallisa	79	-
Eastern	Soroti	1,966	-
Eastern	Tororo	662	100
Northern	Apac	1,379	13,180
Northern	Arua	8,709	2,248
Northern	Gulu	3,024	12,900
Northern	Kitgum	7,647	-
Northern	Kotido	16,253	16,997
Northern	Lira	942	-
Northern	Moroto	8,245	38,887
Northern	Moyo	4,974	10,622
Northern	Nebbi	1,460	-
Western	Bundibugyo	275	10,680
Western	Bushenyi	10,920	11,464
Western	Hoima	15,911	-
Western	Kabale	679	1,532
Western	Kabarole	5,582	13,667
Western	Kasese	773	22,241
Western	Kibale	3,353	-
Western	Kisoro	49	937
Western	Masindi	14,488	38,614
Western	Mbarara	2,010	3,921
Western	Ntungamo	2	-
Western	Rukungiri	3,235	19,111
<b>TOTAL</b>		<b>169,914</b>	<b>234,380</b>

*(Assumed that 25% of protected areas suitable for crop production, 30% for livestock production. Opportunity cost valued in terms of gross returns to production foregone. Where wildlife protected areas overlap Districts, total area is divided by number of Districts.)*

Table 26: Wildlife crop damage costs by District 1998

Region	District	Boundary length (km)	Value of crop losses (US\$ mill/km)	Value of crop losses (US\$ mill/yr)
Central	Kalanga	15.5	149	2,310
Central	Kampala	-	-	-
Central	Kiboga	7.5	243	1,825
Central	Luwero	12	152	1,828
Central	Masaka	15.5	149	2,310
Central	Mpigi	45	228	10,272
Central	Mubende	7.5	243	1,825
Central	Mukono	42	250	10,510
Central	Rakai	22	125	2,753
Eastern	Iganga	40	120	4,809
Eastern	Jinja	73	50	3,677
Eastern	Kamuli	29	21	613
Eastern	Kapchorwa	21	47	989
Eastern	Kumi	18	11	205
Eastern	Mbale	72	59	4,269
Eastern	Pallisa	23	44	1,009
Eastern	Soroti	10	97	967
Eastern	Tororo	23	44	1,009
Northern	Apac	17	80	1,367
Northern	Arua	14	179	2,508
Northern	Gulu	6	186	1,116
Northern	Kitgum	4	244	976
Northern	Kotido	3	232	695
Northern	Lira	17	116	1,975
Northern	Moroto	5	268	1,340
Northern	Moyo	8	98	780
Northern	Nebbi	21	69	1,459
Western	Bundibugyo	20	157	3,136
Western	Bushenyi	40	92	3,672
Western	Hoima	6	231	1,384
Western	Kabale	28.5	77	2,188
Western	Kabarole	24	288	6,911
Western	Kasese	52	114	5,935
Western	Kibale	6	231	1,384
Western	Kisoro	28.5	77	2,188
Western	Masindi	13	121	1,578
Western	Mbarara	8.5	95	808
Western	Ntungamo	8.5	95	808
Western	Rukungiri	35	109	3,810
<b>TOTAL</b>		<b>841</b>	<b>116</b>	<b>97,199</b>

(Source: Howard 1995, updated to 1998 prices. Refers to forest and wildlife protected areas larger than 100 km<sup>2</sup> only. Where protected areas overlap Districts, total boundary length is divided by number of Districts)