

I KENYA : FIRST NATIONAL REPORT

# Republic of Kenya

## DRAFT FIRST NATIONAL REPORT to the conference of parties (COP)

### National Biodiversity Strategy and Action Plan

Ministry of Environmental Conservation  
P.O. Box 67839  
NAIROBI

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### Acronyms

AAS	African Academy of Science
ACC	African Conservation Centre
ACTS	African Centre For Technology Studies
AFRENA	Agro-Forestry Research Network for Africa
ASAL	Arid and Semi Arid Lands
AWF	African Wildlife Foundation
BDM	Biodiversity Data Management
CBD	Convention on Biological Diversity
CIFOR	Centre for International Forestry Research - Indonesia
CGIAR	Consortative Group on International Agriculture Research
CIAT	Centro Internacional de Agricultura Tropical, Colombia - CGIAR
CIMMYT	Centro Intemacional de Mejoramiento de Maizy Tri, Mexico CGIAR
CIP	Centro Intemacional de la Papa, Peru - CGIAR
CITES	Convention on International Trade on Endangered Species
CMO's	Genetically Modified Organisms
COMESA	Common Market for Eastern and Southern Africa
COMIFOR	Indeginous Forest Conservation and Management Project
DRSRS	Department of Resource Surveys and Remote Sensing
EARRNET	East African Root Crops Research Network for Africa
EAWS	East African Wildlife Society
FAO	Food and Agriculture Organisation of the United Nations
FINNIDA	Finish International Development Agency
GATT	General Agreements on Trade Tariffs
GEF	Global Environment Facility
GOK	Government of Kenya
GTZ	German Agency for technical cooperation
ICIPE	International Centre for Insect Physiology and Ecology
ICRAF	International Centre for Research on Agro-Forestry
ICRISAT	International Centre for Research on Tropical Regumes
IGAD	Inter-Governmental Authority on Development
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IMCE	Inter-Ministerial Committee on Environment
InaReMac	Intergrated Natural Resource Management and Conservation
IPGRI	International Plant Genetic Research Institute
IRRI	International Rice Research Institute
NCN	The World Conservation Union
JICA	Japan International Cooperation Agency
KARI	Kenya Agricultural Research Institute
KEFRI	Kenya Forestry Research Institute
KEMFRI	Kenya Marine and Fisheries Research Institute
KENRI	Kenya Resource Centre For Indigenous Knowledge
KFDP	Kenya Forestry Development Project
KFFP	Kenya Finland Forestry Program
KFMP	Kenya Forestry Master Plan
KIFCON	Kenya Indigenous Forest Conservation Programme
KIPO	Kenya Industrial Property Office
KWAP0	Kenya Woodfuel and Agroforestry Programme
KWS	Kenya Wildlife Service

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MIRCEN	Microbiological Resources Centre
MoU	Memorandum of Understanding
MSDN	Microbial Strain Data Network
NBSAP	National Biodiversity Strategy and Action Plan
NES	National Environment Secretariat
NGO	Non-Governmental Organization
NMK	National Museums of Kenya
NTFPS	Non-Timber Forest Products
ODA	Overseas Development Organization
PCPU	Plant Conservation and Propagation Unit (of NMK)
PGR	Plant Genetic Resources
PRAPACE	Regional Research Centres on Sweet Potato Improvement for Central and Eastern Africa
SIDA	Sweden International Development Agency
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
WTO	World Trade Organisation
WWF	World Wide Fund for Nature

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### I. EXECUTIVE SUMMARY

Since independence in 1963, Kenya has over the years consistently stressed the need to live in harmony with the environment by not exerting excessive pressures on our natural resources. For example, over 30 years ago, a key government pronouncement, Sessional Paper No.10 of 1965 noted that "...outmoded farming techniques may result in erosion; the cutting of wind-breaks and the burning of vegetation may turn fertile acres into desert; and the destruction of forests may eliminate important water supplies; practices tending to harm rather than conserve our physical environment..."

In response to the United Nations General Assembly Resolution No. 2393 (XXIII) of 1971, Kenya joined the world community in the search for a global approach to the protection of the environment by participating in the first United Nations on Human Environment in Stockholm, Sweden, in June 1972. This conference led to the birth of the United Nations Environment Programme (UNEP), now headquartered in Nairobi.

In 1974, the Kenya government founded the National Environment Secretariat (NES) as the lead environment agency to coordinate and oversee environmental activities in the country. From that point on, the country witnessed a remarkable rise in environmental awareness as evidenced by the phenomenal growth of relevant institutional and sectoral activities.

Globally, the value of biodiversity as a key component of the environment was recognized during the build-up to the UN Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. During the occasion, Kenya endorsed and adopted Agenda 21, and also signed the Convention on Biological Diversity (CBD) as a demonstration of the country's commitment to reinforce and consolidate national and international goals for the conservation and sustainable use of biodiversity. Since then, Kenya has ratified the Convention and participated in its Conferences of Parties (COP) which manage it. In the same spirit, Kenya has continued to promote and support biodiversity conservation in partnership with other players in the global community, and in the interests of the guiding principles of the Convention. The purpose of this report is to address the requirements of the of the CBD, particularly the provisions of Article 26.

Kenya covers an area of approximately 587,900 km<sup>2</sup> of which 576,700 km<sup>2</sup> are covered by land surface while the rest (11,200 km<sup>2</sup>) are covered by inland waters (GOK, 1994). Kenya's biodiversity is closely related to the country's unique topography. The most noticeable feature is the Great Rift Valley, which runs the length of the country from Lake Turkana in the north to Lake Natron at the Tanzania border. The land generally rises from sea level in a series of plateaux, culminating in the highest point of 5200m on Mt. Kenya. The central highlands form the highest plateau, with the Rift Valley cutting through the middle. Major rivers flow radially from this plateau or from the foothills of the Ethiopian highlands. Drainage is generally westwards into Lake Victoria or eastwards into the Indian Ocean.

The basic land form substantially influences the climatic pattern, with inland rainfall and temperatures generally relating to changes in altitude. High rainfalls are normally associated with the Indian Ocean coastal belt, the central highlands, and areas to the north and east of Lake Victoria. Rainfall is seasonal, the pattern being predominantly bimodal to the east of the Rift Valley, and unimodal to the west and along the coast. The rest of the country is generally arid or semi-arid and annual temperature patterns are similarly closely linked to the altitude. Highest temperatures are recorded in the arid regions to the Northeast and Northwest, where annual mean temperatures are above 34°C. The coastal belt and the lake basin are hot and humid, while the highlands are generally cool, with the coldest areas atop the major mountains where night frost occurs above 3000m. Permanent ice and snow is found above 4800m on Mt. Kenya. The majority of the land area of the country, covering most of the North, East, South and sections of the Rift Valley is usually classified as semi-arid to desert.

Most of the closed canopy forests are in the areas of high or medium potential land, where over 80% of the human

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population and agricultural production are also concentrated. Closed forests in the extensive arid and semi arid lands (ASALs) are found mainly on isolated mountains, and in discontinuous narrow bands along permanent or seasonal rivers, while along the coastal belt are found remnants of forests and extensive mangrove forests. In addition, the ASALs which cover approximately 80% of the total land area contain most of the woodlands, bushlands and wooded grasslands.

The area under woody vegetation has decreased mainly due to legal excision for agriculture and to a smaller extent to settlement. Since the commencement of gazettelement, official records of degazettelement total 390,000 ha amounting to 13% the total gazetted area (1.7 million ha). At present the average annual loss of forests is approximately 5,000 ha per year, while that of woodlands, bushlands and wooded grasslands is decreasing at an estimated rate of 50,000 ha.

Furthermore, there is pressure on forest land by forest adjacent communities and small or large scale commercial users. The place of forests, trees and forest products in the rural economy has gained recognition more in response to environmental and socio-economic problems arising from declining forest and tree cover, over-exploitation for existing resource, scarcity of tree and forest based products and market development for commodities that were traditionally free and abundant commodities.

The semi-pastoral and pastoral communities in Kenya which are found mainly in the ASAL areas, constitute a very important component of the Kenyan rural community. For those districts with up to 20 persons/km<sup>2</sup> in 1979 and using the 1989 census provisional results, some 13 districts in the ASALs accounted for 14.26% of the total population and occupied 81.6% of the land at an average population density of 6.63 persons/km<sup>2</sup>. This is, where most of the meat produced in Kenya Comes from. It is a fragile environment much dependent on sound management for the survival of the people and their animals. Availability of tree fodder such as seed pods, tender branches, leaves, etc. during the dry season determines the survival of the livestock. The carrying capacity of these areas is very low. The communities have therefore to keep on moving from place to place in search of animal feed and of course water. Land tenure in these areas is still under customary law and mainly under communal custody.

The agricultural sector is the hub of Kenya's economy. The sector contributes 28% of the Gross Domestic Product (GDP), generates over 60% of foreign exchange earnings and employs 70% of the population. The sector provides food to the ever increasing population and provides raw materials to the agro-based industries which account for 70% of all the industries in the country. The sector is characterized by smallholder farmers, 80% of whom own and utilize less than 2 hectares of land but account for 75% of the marketed surplus in both crop and livestock.

Thus, with agriculture being the mainstay of the Kenyan economy, national development policy guidelines tie up closely with the rural economy. This is clearly seen in the development trends in post independence economy.

A land tenure policy that encouraged land sub-division, registration and privatization gave farmers the security, confidence and incentive to devote their time, labour and capital to agriculture expecting to reap the benefits there-off. This worked well while population pressure was still low but now this is leading to land fragmentation below economically viable units. This calls for further policy intervention on land issues.

The overall government policy still remains the up-grading of living standards for the people of Kenya. To this effect, various structural changes have been initiated based on recommendations documented in the Sessional Paper No. 1 of 1986 - (pg. 104-116). Of special relevance in socio-economic terms for the rural economy is "provision of basic needs for all Kenyans, firmly based on rising employment, productivity and incomes so that private households can provide for themselves most of the food, shelter and clothing, and even part of the water, education and health needs of the country".

## II. GOALS AND OBJECTIVES

### GOALS

The national goals of Kenya's strategic action plan for biodiversity conservation are :

1. To ensure and maintain a high quality environment that permits a life of dignity and well-being for Kenyans
2. To achieve sustainable utilization of resources and ecosystem for the benefit of the present generations, while ensuring their potential to meet the demands of future generations;
3. To maintain ecosystems and ecological processes essential for the functioning of the biosphere; and
4. To preserve genetic resources and biological diversity in the nations ecosystems and to preserve their cultural value.

### OBJECTIVES

The realization of these goals will be dependent on how vigorously we pursue the overall objectives of the CBD, which are " the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies and by appropriate funding".

Specifically, the national objectives are :

#### 1. To promote the sustainable utilization of biodiversity products.

This will be achieved by:

- Neutralizing the overexploitation of biodiversity resources by, for example, controlling charcoal burning, overgrazing of pastures, and limiting stock herds;
  - Adopting appropriate land use and agricultural practices by, for example, promoting efficient farming techniques and conserving wetlands;
  - Creating alternative products and sources of alternative income; and
  - Controlling the introduction of substitute germplasm in forests, food crops and livestock.
2. To create an enabling environment for biodiversity conservation by improving national capacity and strengthening regulatory mechanisms.

This will be achieved by:

- **Strengthening the** institutional technical capacity by improving the technical infrastructure and strengthening the manpower base;
  - Strengthening the. capacity of biodiversity managers through improved resource allocations and training;
  - Enacting a comprehensive and effective biodiversity conservation policy that addresses, among other things, emerging issues such as human vs. wildlife conflicts, illegal timber trade and land tenure;
  - Promoting political goodwill in the interests of biodiversity conservation; and
  - Availing incentives to stakeholders.
3. To promote awareness in biodiversity conservation

This will be achieved by:

- Informing the public by providing adequate information through improved extension services and networks;
- Evaluating and utilizing traditional conservation systems;
- Involving local communities and other stakeholders in conservation activities; and

Assigning real economic and other values to biodiversity products.

4. To promote and enhance the conservation of biodiversity through in-situ, ex-situ and restorative procedures.
5. To strengthen research and monitoring activities by improving inventories, databases and documentation.
6. To promote environment-friendly activities like ecotourism and **upfront** preventive activities like environmental impact assessments.

#### INTERNATIONAL AGREEMENTS AND PROGRAMMES

Kenya has signed and ratified the following international conventions which relate to the goals of the NBSAP:

Convention on International Trade in Endangered Species of Wild Fauna and Flora;  
Convention on the Conservation of Migratory Species of Wild Animals;  
Ramsar Convention on Wetlands of International Importance especially as Waterfowl habitats;  
Framework Convention on Climate Change;  
Vienna Convention on the Protection of the Ozone Layer  
Convention on desertification

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### III. BACKGROUND

#### (a) THE STATUS OF BIODIVERSITY CONSERVATION

- ◆ Agricultural Biodiversity  
Plant genetic resources (PGR)

##### *Indigenous PGR*

Kenya lies at the intersection of four major zones of plant species diversity:

- **Guineo-Congolian:** Kenya possesses the easternmost fragments of the Guineo-Congolian region, now restricted to the degraded forests of Kakamega and the adjacent Bologale forest. Although not rich in national endemics, this region is the only remaining patch of one of Kenya's more species rich biotic communities. The entire area remains under intense pressure from encroachment and unsustainable extractive use.
- **Zanzibar-Inhambane Mosaic:** Along the coast, Kenya once possessed a narrow strip of vegetation (50-200km wide) belonging to the Zanzibar-Inhambane Regional Mosaic. Due to population pressure and changes in land use, the forest component of this vegetation is now highly fragmented. Each surviving region shows a high level of endemism and all remaining patches are under threat. Only two (Shimba Hills and Arabuko-Sokoke) currently receive any protection.
- **Somali-Maasai Region:** These upland dry-evergreen forests now occur only as relic stands along the eastern edges of the Rift Valley of Kenya and N. Tanzania. The most important protected areas are Ol Doinyo Sabuk and Nairobi Forest Reserve. Small parts of the latter lie within Nairobi (80ha), the City Park and Arboretum (100ha).
- **Afro-Montane Region:** This is the best studied forest type in Kenya, growing on the higher reaches of the Rift Escarpment and Central Highlands. These forests all serve important watershed functions, in addition to providing sites for high plant and animal biodiversity. Although some high altitude montane forests are well protected by isolated position and protected area status, others are being eroded at increasingly rapid rates. There are several prime areas for increased protection including, for example, Mau forest (30% degraded in the last 10 years) and Mt. Kenya (lower slope threatened by encroachment by small-farm agriculture and illegal logging).

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Overall knowledge about higher plant genetic resources and/or threatened species records 392 national endemics, a further 336 regional endemics, 6 known extinctions and at least 258 species are threatened *Aloe* sp., *Dalbergia melanoxyton*, *Juniperus procera*, *Melicia exelsa*, *Vitex keniensis*, *Olea africana* and *Ocotea usambarensis* all have presidential protection. Additionally there are 45 known wild vegetable species and 200 wild fruit species in Kenya. There are also 110 species of multipurpose (including medicinal) forest species all with modest economic promise.

### Other wild species and wild relatives of crop plants

Kenya is endowed with a unique heritage of diverse germplasm of forages (grasses, legumes & browse plants), cereals (sorghum & millets), pulses (pigeon peas & cowpeas), tuber crops (cassava, yams & sweet potatoes), oil crops (castor, sesame & vernonia), fruit trees (tropical fruit plants) and vegetables (*Amaranthus*, *Gynandropsis*, *Cucumis* etc). Table 1 is a summary of some of these materials that still occur in the wild.

Table 1: Some of the crop plant genetic resources that still occur in Kenya

Forage grasses	<i>Chloris</i> spp <i>Eragrostis</i> spp <i>Panicum</i> spp	<i>Digitaria</i> spp <i>Hyperrhenia</i> spp <i>Pennisetum</i> spp	<i>Echinochloa</i> spp <i>Lolium</i> spp <i>Cenchrus</i> spp
Forage legumes	<i>Centrosema</i> spp <i>Desmodium</i> spp <i>Neonotonia</i> spp <i>Vigna</i> spp	<i>Clitoria</i> spp <i>Lathyrus</i> spp <i>Stylosanthes</i> spp	<i>Crotalaria</i> spp <i>Macroptilium</i> spp <i>Trifolium</i> spp
Browse plants	<i>Acacia</i> spp <i>Sesbania</i> spp	<i>Cassia</i> spp	<i>Crotalaria</i> spp
Cereals	<i>Eleusine</i> spp	<i>Sorghum</i> spp	
Pulses	<i>Vigna</i> spp		
Oil crops	<i>Racinus cummunii</i>	<i>Vernonia galamensis</i>	
Vegetables	<i>Amaranthus</i> spp <i>Solanum</i> spp	<i>Cleome</i> spp	<i>Citrullus</i> spp
Fruits	<i>Adansonia digitata</i>	<i>Codia sinensis</i>	<i>Carissa edulis</i>

Most of these genetic resources are in imminent danger of genetic erosion as stated above. By discouraging deforestation and protecting areas with high genetic diversity, the government tries to check the erosion rate. However, factors like drought and desertification are natural catastrophes that normally require enormous investment. Effects of the current high populations shall be felt despite the present population control measures that are being undertaken.

With the recent influx of refugees together with their livestock to the Northern parts of Kenya, it has been a double blow, in the sense that the area normally experiences long spells of dry seasons. There is an urgent need for funds to assist in conducting emergent collection expeditions in this region. Outside help is definitely imperative.

Parts of Eastern and North Eastern Kenya are believed to have wild relatives of coffee. Given the arid nature of this region, these species are bound to be drought tolerant. Also in the wild are a number of plant species that have not been developed commercially. This category comprises of indigenous vegetables, indigenous fruit plants and oil crops (Table 1). *Vernonia galamensis*, for example, is a wild plant with unique oil suitable for industrial use. It is yet to be developed as a commercial crop.

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### *Landraces ("Farmers' varieties") and old cultivars*

For most indigenous crops, farmers mainly use traditional varieties, e.g. millets, sorghum, pigeon peas etc. For others like maize (*Zea mays*), use of traditional varieties is only to a limited extent. This is also true for crops that are basically commercial and/or are staple food.

The Government normally encourages use of improved varieties whenever available. This policy is meant to ensure sufficiency in food products. But in cases where farmers feel that the traditional variety is superior to the improved variety for one reason or another, they insist on using that traditional variety, either due to palatability, pest susceptibility or plant genetic diversity. Although undocumented, there are a number of ways in which they conserve diversity. Multicropping and growing of diverse genotypes of a given species in the same field is a common practice of many small scale farmers. Farmers also use various traditional seed storage techniques to preserve their materials. An example is conserving of seed over the fire place.

At the National Museums of Kenya (NMK), indigenous plant genetic resources are conserved through the indigenous food plant programme that has assisted to develop kitchen gardens with a central garden at the National Museums of Kenya grounds for related research.

This has been strengthened through the NMK indigenous knowledge centre which focuses on ethnobotanical value of existing NMK collections in relation to past and present cultural changes. Key PGR accessions in the indigenous food plant garden are:

- *Amaranthus graecizans* L.
- *Carrissa edulis* Forsk Vahl
- *Vangueria infausta* Burch. ssp. *Infausta*
- *Azanza garkeana* F. Hoffm Excell & Hillcoat

Other indigenous PGR (ornamentals) in ex-situ cultivation are:

- *Saintpaulia rupicola* - L. Burtt.
- *Ansellia africana* Lindl.

However, such plant genetic resources are in severe threat in the wild, through deforestation and other environmental degradation process (e.g. fuelwood harvesting).

## 2. Conservation Activities

### *In-situ conservation activities*

The Forest Department which falls under the Ministry of Natural Resources is the main agency concerned with the in-situ conservation and management of indigenous forests. The other key players are the National Museums of Kenya, National Genebank of Kenya, and Kenya Wildlife Service.

Programmes and projects on conservation of PGR have tended to be uncoordinated and specific rather than addressing conservation as a whole. Most of them have also not lasted long enough to have a meaningful impact. On-going and completed assistance include that from the World Bank IV Project for plantation forestry (Kenya Forestry Development Project, KFDP); (Finnish Agency for International Development, FINNIDA) for the Kenya Forestry Master Plan and forest extension service for on-farm forestry, ODA which funded the Kenya Indigenous Forest Conservation Programme (KIFCON) and the coastal programme for biodiversity surveys of selected forests; European Community that funded the Indigenous Forest Conservation and Management Project (COMIFOR) which extends and compliments the work of KIFCON and the German Development Agency (GTZ) for training and management.

In addition, the Permanent Presidential Commission for Soil Conservation and Afforestation advises the government on policy; The Ministry of Agriculture Livestock Development and Marketing has an active and wide-reaching extension programmes that includes farm forestry. There is also a very strong NGO movement which is involved directly or indirectly in forest conservation. Unfortunately, NGO work has not been well documented.

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Other in-situ sites on protected areas exist (e.g. those protected under the Kenya Wildlife Service & Forestry Department). The NMK undertakes inventories on rare, threatened and endemic PGR even when the plants are under protection. For example, rare endemics such as *Millettia leucantha* Vatke and *Baphia keniensis* Brummit have been monitored by the Plant Conservation and Propagation Unit (PCPU) in Tsavo and Meru national parks, respectively. Both seed germplasm and a replicate plant stock have been acquired at the NMK seed bank and plant nursery display garden, respectively.

The PCPU has a field team that targets sensitive areas for conservation. Through undertaking field studies on the ecological status of such habitats, appropriate actions are normally undertaken. For example, the team has undertaken such work on Saiwa swamp near Kitale in collaboration with the Kenya Wildlife Services, where some rare plants were identified as deserving both in-situ and *ex-situ* conservation. Similar work is also being undertaken in wetlands and other threatened habitats by other NMK departments working under the Centre for Biodiversity.

### *Ex-situ conservation*

The National Genebank of Kenya is responsible for *ex-situ* conservation of crop plant germplasm. The herbarium section of the NMK & the Seed Centre of the Kenya Forestry Research Institute (KEFRI) collect & conserve forestry genetic resources. The Genebank was established in 1983 and became fully operational in 1988.

The establishment was financed both by the Kenya Government and the Federal Republic of Germany through GTZ. The activities to date have remained mainly donor funded. The government has continued to offer personnel support in addition to provision of land. Besides GTZ, other donors that have supported the project include SIDA & FAO.

The conserved materials are held at the Central Genebank for long term storage. The active collections are held at the commodity research centres. The Genebank also has a network of field genebanks located in various parts of the country where materials that cannot be conserved as seed are maintained. They include those species that have either recalcitrant seeded and/or do not produce viable seed. These field genebanks are far from being complete as a number of species are yet to be addressed. The major bottleneck has been the availability of funds.

Several genera are currently being held at the Genebank. They comprise mainly indigenous material with a few global and regional collections namely: sorghum, sesame etc. These materials have not been replicated elsewhere.

On average, 1500 accessions are donated to users each year. This figure can be higher if one also considers utilization of active collections held at the research centres in the country. The main users include: breeders and other researchers in national programmes. Materials are also donated for use in other national and international institutions.

For the taxa and regions that have been covered so far, collections at the Genebank represent the diversity existing in the field. They are within the capacity of the Genebank to maintain, according to the acceptable standards provided continued financial assistance is available. Financial r-arid areas) that have not been covered yet.

The collecting policy is mission oriented. Normally specific regions of the country are targeted. Remote localities are priority. Random sampling techniques are used in all collection missions. In each mission, any taxon that is considered to be potentially valuable is collected.

### *Storage facilities*

The storage facilities are about three quarters full. It is estimated that they will take 15 or more years to be full. The Genebank does store materials for other national and international genebanks. Materials for other countries could also be stored as long as space is available. These countries should however be ready to share the multiplication and regeneration costs. They should also be ready to allow for free exchange of the material.

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### *Documentation*

Collection at the Genebank is fairly well documented with a complete computerized database. Both morphological characterization and agronomic evaluation are integrated into the documentation system. The information that accompany the samples include passport, characterization, evaluation, seed testing and storage data. In some cases indigenous knowledge, data and breeders records are included. The documentation is about one hundred per cent. This is very important as quality documentation enhances utilization of samples. Information is normally made available to users through computer print outs. A major problem in documenting samples of wild relatives is verifying the naming. Assistance in taxonomic expertise is crucial. Documentation records are fully duplicated but the duplication is within the same building. Arrangements are underway to have them documented elsewhere in the country.

### *Evaluation and characterization*

It is the policy of the Genebank that both preliminary evaluation and characterization be carried out together in a single cycle. Secondary evaluation should be the role of plant breeders and other germplasm users. However, the secondary evaluation data collected stion

Materials held at the genebank are regenerated whenever viability falls below a given percentage. For most species, it is recommended that 85% is the bare minimum. For other species e.g. the grass species, this requirement is a bit lax. Whereas land and personnel have never been a constraint in so far as undertaking regeneration is concerned, the finances normally are. Regeneration of some accessions has sometimes been deferred owing to unavailability of funds. Under such circumstances; an appeal is given to the international community for assistance.

### 3. In Country Uses of Plant Genetic Resources

Kenya's own plant genetic resources, notably crop plants, are used as cultivars per se by farmers and for research (breeding and crop management and protection) by scientists. Exotic accessions are used largely as gene pools for agronomically desirable traits harnessed in the crops improvement programmes.

#### *Use of PGR Collections/Accessions*

Crop species most frequently used in national projects, the number of scientists involved in research on them, and the percentages of accessions used are as follows:

Crop species	Number of scientists	Percentages of accessions used in the past three years
Maize	20	80
Wheat	40	75
Rice	15	20
Sorghum and millet	20	55
Roots and tubers (eg. cassava and sweet and Irish potatoes)	35	80
Grain legumes	20	65
Vegetables and fruits	20	
Oil seed crops	8	50
Pvrethrum	4	
Sugarcane	8	
Macadamia nuts	2	
Flowers		
Herbs and spices	4	

Some 70-90% of all the accessions used commercially are of "local" origin, although most of them originated from outside Kenya in the distant past. The major external sources are: CIMMYT (maize and wheat), IRRI (rice), ICRISAT (sorghum and millet), IITA (cassava), CIP (Irish potatoes), JICA (nuts) and CIAT (grain legumes). Approximately 1100

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plant species are maintained by the National Genebank of Kenya. Of these, some 400 are of micro-commercial type (home garden), 100 are macro-commercial and 600 species are, so far, never used in in-country projects on a commercial basis. This is a potential for break through in future research/commercial endeavors.

Both material from within and outside the country held at the Genebank are mainly used in crop improvement research. Users include plant breeders and other scientists from relevant disciplines namely agronomists; pathologists, entomologists etc. Table 2 gives a list of materials commonly utilized.

Table 2: Some of the PGR materials commonly utilized in agricultural research. There are more but the list gives only 11 genera

Genus	Number of time requested	Access (%)
Sorghum	9	60
Stylosantehs	5	60
Macroptilium	8	50
Cucurbita	8	72
Phaseolus	8	65
Centrosema	7	50
Zea	7	80
Mucuna	7	70
Panicum	6	45
Triticum	6	75
Eleusine	5	55

#### (a) The recipient organizations.

The recipient organizations of most of the accessions are:

- Kenya Agricultural Research Institute
- National Universities
- International Centre for Research in Agroforestry (ICRAF)
- Russian Embassy
- Bangladesh
- Ben Gurion University
- UNESCO
- B.A.T (British American Tobacco)
- Laikipia Research Project

#### (b) Benefits derived from the use of plant genetic resources

Materials maintained at the Genebank are mainly for local use although some have been donated to foreign users. The major benefit has been the utilization of the improved varieties normally developed from these plant genetic resources. Some plant genetic resources have been utilized in land stabilization projects (control of soil erosion).

#### Crop improvement programmes and seed distribution

The main functions of Kenya's national plant breeding programmes are to:

- evaluate exotic germplasm for adaptation to the local conditions and needs;
- improve the adapted germplasm accessions for high food, feed, fibre yield and quality; and
- introduce desirable agronomic characteristics into high yielding cultivars to stabilize yield.

The ultimate objectives of the plant breeding programmes are to:

- widen the genetic base of crop and thereby reduce vulnerability to biotic stresses;

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- **increase crop** production vertically and horizontally;
- diversify production systems and thereby spread crop production risks; and
- address consumer demands, such as palatability and grain milling quality of cereal crops.

The national plant breeding activities are primarily focused on three goals:

- achieving **internal** self sufficiency in food and **fibre** production;
- maintaining adequate levels of strategic cereal food reserves;
- increasing export opportunities of industrial crops such as tea, coffee and pyrethrum as well as, whenever possible, food crops such as maize.

Scientific research currently undertaken by Kenya Agriculture Research Institute is adequate to meet national needs for most major crops, at least in **terms** of conventional breeding and adaptive research. However, crop **protection** areas such as plant pathology, virology, entomology and **nematology** need strengthening. Furthermore, repackaging of new technology into packages which are agronomically acceptable by farmers needs polishing. The major constraint to effective research in Kenya today is the inadequate and unsustainable funding opportunities. Adequate funding of research **programmes** from **both** internal and external sources and ensuring **smooth financial** flow would **overcome** the problem.

Plant breeding activities in Kenya are currently conducted by government and donor funded **programmes** as well as by local and foreign private companies. The products of crop improvement are made available to farmers easily through the Kenya Seed Company stockists and research **centres** making available propagules other than seed. Varieties developed through national effort are valuable to all categories of farmers in the order: commercial farmers (hybrids), semi-commercial farmers (composites) and subsistence farmers (land races and advanced generations of improved varieties). Farmers are involved in plant breeding activities through representations in research **centres** advisory committee meetings, (maize) seed allocation panels and in variety evaluation as active participants in off-station and on-farm research trails. Improved varieties of crop plants are available to all types of farmers as long as the variety fits the ecological niche where the farmer lives. The main constraint to better seed production is genetic quality control aggravated by isolation and **some** man-made problems which adversely affect the distribution of quality seed.

### *Improving plant genetic resources utilization*

The **main** achievement of Kenya's plant genetic resources activities with regard to improving both the commercial and traditional plant production are:

- conservation of reservoirs of genes for further improvement of crop yield per se, resistance to biotic stresses and quality;
- documentation/description to familiarize scientists with the range of genetic materials available for utilization; and
- establishment of working groups to identify areas where exchange of PGR can be facilitated to enhance utilization.

However, funds are required to mount local and external collection missions. Adequate timing of focused research **programmes** should in future serve to improve the utilization of plant genetic materials directly or indirectly by supporting biotechnology in novel techniques, e.g.

- using **RFLPs** (restriction fragment length polymorphism) for mapping **genomes** of all important plant species and determining genetic distances between accessions of a given plant species;
- using cell and tissue culture methods for rapid multiplication of propagules and to incorporate resistance to **abiotic** stresses such as metal toxicity; and
- using **MAS** (Marker Assisted Selection) and **QTLs** (quantitative trait loci) identification of facilitate selection on **PGRs**.

The greatest value of plant genetic resources to Kenya is the potential of the **resources** to improve nutritional and health status of communities leading, ultimately, to societal stability in all its three facets (economic, social and political). Sustainable research in a “serene” enabling environment should bring **Kenyans** to this eventuality. The available plant genetic resources are potentially **more** valuable in the long term than they are at present since even the resource already

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in commercial use have not been fully exploited

In the short term, the National Genebank of Kenya activities should be fine-tuned to:

- ensure more complete documentation of PGR materials,
- perform thorough evaluation and characterization of PGR in terms of genome mapping in plant species and determination of genetic distances among accession or ecotypes of the same plant species;
- respond more closely to the needs of the national crop improvement programmes in updating genebank lists with new plant introductions and their characteristics.
- Institute better coordination of national and international policies and planning processes governing germplasm exchange and utilization (to-date, KARI has gone a long way towards achieving this objective, given the extensive linkages so-far set up).

To ensure that the ultimate objective of the national PGR conservation effort is tangible in terms of utilization of the resources, adequate funds are required for rejuvenation of germplasm at the central storage point and of the active collection at the points of utilization in a well organized way, taking cognizance of species longevity in storage and random genetic drift based on sampling size and allelic frequencies in the base population. Efficient cold storage facilities, or efficient maintenance of the available facilities, are required to circumvent the need for too frequent rejuvenation. Donor and local private and public funding and careful planning would meet the objective, with the terms that the local funding sources take up the ultimate responsibility of PGR conservation.

### *Training and capacity building*

The skills that should be available in the national PGR programme include statistical sampling, seed science, agronomic evaluation, taxonomy, data management, plant and tree breeding, social and anthropological techniques, etc. The Gene Bank of Kenya has personnel trained in plant genetic resources management. Training may be offered in all these skills, at national institutions such as Moi, Kenyatta, Egerton and Nairobi Universities; Kenya Forestry Institute, National Museums of Kenya, National Genebank, Department of Resource Surveys and Remote Sensing, Kenya Agricultural Research Institute, and in some NGOs. The training could be offered nationally and regionally at all levels. There is enough demand for viability of such training, but international input in terms of funds would be needed.

The farmers and other users who are the ultimate users of PGR are trained through the extension system methods like individual farm visits, demonstrations, field days and short courses in Farmer Training Centres.

Training and capacity building will require participatory strategy involving government, NGOs, local communities private sector and international community at all levels.

Non environmental management and protection to guide all concerned in a holistic way about proper management of the environment as the existing policies are fragmented and sectoral.

Kenya's environment policy aims at integrating various facets of environment into the national development plan. Laws on environmental conservation whose implementation have often been conflicting are therefore expected to be harmonized.

### *Summary of the Existing Laws and Regulations:*

*Protection of Genetic Resources:* Currently there is no comprehensive and legal provisions focused on the protection of genetic resources.

*Protection of Forest Resources:* Tree germplasm has been under the control of the Seeds and Plant Varieties Act (Cap. 326). This Act was inadequate as it is primarily for agricultural seed. The tree seeds and plant varieties (tree seed) regulations were therefore drafted in 1993 specifically for forest germplasm and should be in effect soon.

Access to Kenya's PGR has been fairly liberal, resulting in various national and international organizations accessing

the resources and depositing them in gene banks abroad. The draft regulations addresses the issues of the tree germplasm, production, quality and import and stresses the need to have more stringent quarantine controls than those that are already in existence. The main objectives of the law is to have stability, and protect the users, producers and dealers in tree germplasm.

There are gaps in the legal framework regarding indigenous knowledge, as it is regarded as a product of nature. Further gaps exist regarding the rights for material found in the wild or being cultivated on a limited scale by the local communities. UNESCO and WIPO are addressing such issues.

*Plant Protection:* Plant protection law is provided by the Seed and Plant Varieties Act (Cap. 320), Grass Fires Act (Cap 327) and Suppression of Noxious Weeds Act (Cap. 325). It is to provide for spread of diseases every member of the real role of providing plant species and their habitats. The introduction of exotic species and their quarantine is addressed by this Act. Thus introduction of plants which are likely to spread diseases or pests is prohibited and penalties are prescribed for offenders. The Act is also concerned with the production and marketing of seed.

#### *Intellectual Property Rights (IPR)*

Kenya has IPR legislation. The Intellectual Property Rights are administered by Kenya Industrial Property Office (KIPO). KIPO administers industrial property rights that include patents, industrial designs, utility model, **technovations** and technology transfers. These are protected under the Industrial Property Act (Cap. 509). Trademarks and service marks are protected under the Trade Marks Act (Cap. 506). KIPO was established in 1989, the same year when relevant act (Industrial Property Act) was enacted. Having been in existence for less than a decade, it is too early to have come across many specific cases or instances to show possible effects of IPR legislation which had not been anticipated. But with time there may be such cases. KIPO protects parts of products of **biotechnological** processes in form of inventions. The Industrial Property Act has a provision for protection for genetic resources or improvements thereof.

The Attorney-General Chambers administering copyrights under the Copyright Act (Cap. 130).

The GOK being a signatory to the GATT negotiations, plans to repeal Industrial Property Act in order to include the compulsory clauses on negotiations. The effects of IPR legislation on genetic resources **programme** is receiving attention and interest from researchers and KIPO itself.

Kenya being a member of FAO, subscribes to the principle of free exchange of genetic **material**. However, there is a standing technical committee which advises the Director of Agriculture on the importation and exportation of PGR. The committee has a mandate to vet certain materials. Authority to collect **germplasm** in Kenya can only be given by the Office of the President which consults with the relevant institutions.

Currently, there is a great need of assistance on legal matters concerning PGR. This could be achieved by training and attachments of patent examiners and legal officers in KIPO to well established patent offices in Europe, USA and Japan to **gain** practical knowledge in handling inventions. FAO can also assist in funding joint seminars or workshops with KIPO and other organizations on themes relating to protection of genetic resources.

#### *(b) Policies*

The government policy as laid out in the Sessional Paper No 2 of 1994 on National Food Policy is to increase food production. The previous policy on subsidies when it existed tended to promote the use of the improved varieties at the expense of traditional varieties of crops. GOK has now liberalized the pricing and marketing of food crops hence farmers can grow what is most profitable. The main aim of the policy on seed is to ensure adequate supplies of high quality seeds of improved varieties of a wide range of crops. However, this policy may also have a negative impact on conservation of PGR due to neglect of traditional varieties.

Improved varieties are bred at research centres are multiplied by farmers. These farmers are provided with free seeds by Kenya Seed Company while the farmer provides all other inputs. One of the major **incentivial** crop.

There are no incentives for the production and marketing of improved varieties in forestry. This has a negative

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influence on the farmers especially from the fact **that** trees have a longer life cycle than crops. Although the farmers realize the importance of trees, they would take option of crop production as it would **earn them** revenue faster.

The national PGR programmes staff and experts were not fully involved in **the planning** of major development projects in the past. This trend is changing rapidly. Previously most of the projects were normally not appraised, monitored **and/or** evaluated for their impact on the conservation and utilization of PGR. Consequently the objectives of the projects were not realized.

### *Trade, commercial and other international agreements*

Policies on both local and foreign **trade in** PGR **are** regulated, monitored and implemented by relevant ministerial legal notices, parliamentary enactment (laws), bilateral, regional and multilateral organizational agreements and memoranda of cooperation in plant genetic resources or products has been largely formulated and implemented by relevant Ministries and **parastatal** bodies. The Ministry of Trade has control through the Acts administered by it.

### *The impact of trade policies on pgr*

Trade policies implemented by various national institutions have generally had a positive impact on PGR development in the country. Imposition of import **and/or** export bans have been instituted whenever food security, national health **and/or** environment are threatened. Although importation and exportation have been liberalized, the requirements of licensing and permits are still in place for **some** items on health, environment and security grounds.

### ◆ Genes and Species

The Country Biodiversity study in 1992 reported **that** Kenya had a total of 34,863 species, of which 1841 were microbes ( **viruses**, bacteria, micro-algae, **microfungi** and protozoa: as there are many gaps in **the** data, **this** number grossly underestimates the **true** microbial biodiversity. ), 6,817 were plant species, and 25,375 were animal species. The species numbers recorded were slightly higher **than** average numbers recorded in world lists, and **this confirms** Kenya's ranking as the most species dense country **in** Africa. Adequate data on geographic distribution of most species is not available.

**The** species list is dominated by insects and flowering plants (61% and 19% of total respectively), despite the incomplete coverage of collections of both groups in Kenya. Experts in most sections consider **that the** totals underestimate true biodiversity, possibly by several orders of magnitude for lower invertebrates and microorganisms.

The species lists for birds and mammals are relatively complete. For many of these species, population distribution and size are known **well** enough for reliable statements to be made about future viability under present, although rapidly changing conditions. Adequate species lists also exist for fish, butterflies, dragon flies and termites, but complete data on distribution is not available for many species in this **taxa**. In **other** animal **taxa**, large gaps exist in knowledge. With regard to microbes, detailed information exists for only a few **taxa**, usually about noxious species.

Although Kenya has a large species diversity **the** trend indicates **that** 263 species are threatened. **The** threatened species include 2 endemic primate species, **the** white rhino, swallow-tail butterfly and some **fish** species.

Out of the plant species recorded, 258 are threatened e.g. cycads. **There** are 6 known local extinctions. Flora in some remote, arid and semi-arid areas of Kenya is still not described and **once** completed it is likely that the number of known plant species will be much more. **There** exists large information gaps about lower plants which form a significant portion of Kenya's total plant species. This is because very little survey work has been done.

A number of small-scale projects working in severely altered habitats such as abandoned quarry sites have shown that ecological restoration is possible given sufficient funding and commitment e.g. **the** Bamburi Project, (Baobab farm Mombasa). But restoration will only be possible if the species diversity originally present in the degraded area is still available for recolonization.

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*Ex-situ* conservation efforts in Kenya include 20 public and 10 botanical garden/arboreta. Most of these sites are poorly maintained and inadequate for the purpose for which they were established. A more practical approach would be to situate the botanical garden within each of the four phytogeographical zones, where suitable sites already exist.

*Ex-situ* propagation of plants for commercial profit is restricted to a few species, mostly of horticultural value. *Ex-situ* conservation of crop and tree genetic resources is centred on two institutions, KEFRI (trees and ornamental plants) and National Gene Bank (KARI) (crop plants). A total of over 80,000 germplasm accessions are held in various local genebanks. Several indigenous trees, notably *Brachylaena hutchinsii* and *Dalbergia melaxylon* which are currently endangered as a result of extensive wood cutting are included in the seed collection, but there are probably several hundred other tree species requiring similar *ex-situ* conservation. KEFRI also maintains tissue culture propagules of 5 important timber species.

*Ex-situ* conservation of microorganisms is carried out by MIRCEN (200 *Rhizobium strains*) KEFRI 75, (Tree *Rhizobium strains*), Kenyatta University (200 bacteria isolates from soda Lakes), ICIPE (200 strain of *Bacillus thuringensis*) KARI (animal & plant pathogens) and University of Nairobi (56 bacteria and microfungi of importance in food industry).

Although Kenya is rich in genetic resources, biotechnology is still underdeveloped. The following are some of the biotechnology research programs in progress:

- In vitro propagation of crop plant such as pyrethrum, citrus and various trees;
- Production of biofertilizer and biopesticides using bacteria by the MIRCEN project and ICIPE respectively;
- Production of bio-engineered vaccines for livestock diseases ( This process use genetically modified organism (GMO's), which are potentially risky and could disrupt ecosystems).

### ◆ Forests

Forests cover 2.4 % (1,400,000 ha ) of the area of Kenya This may be subdivided into:  
1,240,000 ha of indigenous forests; and  
160,000 ha of plantations.

In total there are 1,640,000 ha of gazetted Forest Reserves. This area is permanently changing as there are new gazettelements as well as excisions. Although forests cover a relatively small proportion of the total land area, they contain 50% of the nation's tree species, 40 % of the larger mammals and 30% of birds Kenya's forests are also significant in that they have numerous endemics as well as threatened species. Over 150 internationally recognized woody plants that are threatened with extinction have been identified in the country. In addition, 60 inland forests and 65 coastal forests are known to harbour threatened plant species.

Coastal forests though small in area are rich in plant diversity and endemism. The Shimba Hills are reported to be the richest forest/savanna area for plant species in Kenya. The Arabuko-Sokoke forest contains a large area of *Cynometra* and *Brachylaena*, as well as a mixed *Azelia* forest. These two forests plus those adjacent, account for a large portion of the coastal flora.

Along the altitudinal gradient from the coastal area are the transitional dry forests exemplified by the Taita Hills and Tana River forests. These are important repositories of dryland forest biodiversity. The Taita Hills are part of a series of species-rich Eastern Arc (faulted, block ) mountains stretching from South-Western Kenya through Southern Tanzania. These forests are noted for their high level of species endemism. The Taita Hills forests have increasingly been subjected to extreme degradation by high demand for agricultural land and forest products from adjacent populations to the extent that the once extensive indigenous forests have been reduced to a patchwork mosaic of small forest remnants.

The Kenya montane forests are represented by the Mt. Kenya, which forms the single largest contiguous forest block in the country of over 200,000 ha. Vegetation zones and species distribution in the Mt. Kenya forest are distinguished according to the different climatic zones and altitude levels. In the more moist eastern and southern slopes one moves from the "a Tea Zone" at the reserve boundary through the famous Camphor (*Ocotea usambarensis*) forest (1900 -2400

m) that was once dominated by *Ocotea usambarensis*, *Vitex keniensis*, *Xymalos monospora*, and *Syzygium guineense*, but currently characterized by regeneration of secondary vegetation of *Macaranga kilimandscharica* at the lower and medium altitudes and *Neoboutonia macrocalyx* at higher altitudes. On the south-western slopes the forest is dominated by *Cassipourea malosana*. From the *Ocotea* and *Cassipourea* associated zone one comes to the "Podo" forest (2400 - 2800 m) dominated by *Podocarpus latifolia* and mixed with *Nuxia congesta* at lower altitudes and with Giant heath at higher altitudes. Above the Podo forest way is given to the montane bamboo (2400 - 3000 m) zone which extends to the western slopes, but which is absent in the north. Finally one reaches the alpine zone with alpine vegetation, bare rocks and snow covered peaks all of which are within a National Park. *Juniperus-Olea* forest is found on the more dry western and north-western slopes of the reserve (1950 2250 m), where *Juniperus procera* (cedar) is found mixed with *Podocarpus falcatus* and olive (*Olea capensis* and *O. europea*) at lower altitudes, *Ekbergia capensis* at medium altitudes and *Podocarpus latifolia* at higher altitudes.

On the northern slope of Mt. Kenya Forest Reserve subalpine *Hagenia* forests (Kosso) are dominated by the large, often horizontal growing *Hagenia abyssinica*, mixed with *Juniperus procera* (lower altitudes) and with Giant heath (higher altitudes). *Newtonia* forest occurs on the eastern slopes at lower altitudes (1200.1800 m) near rivers and at lower forest edges, This forest type is rare in Kenya but not uncommon in neighboring countries. About 20,500 ha or 10% of the reserve area has been already converted into fast growing softwood plantations mainly of *Cypressus* spp., *Pinus* spp. and *Eucalyptus* spp. In addition, Mt. Elgon, Aberdares, Mau forest complex and Cherangani forests all of which are rich in biodiversity all suffer heavy exploitation albeit being gazetted forest reserves, and therefore priority areas for conservation. The Mt. Kenya and Aberdares complex contains four threatened species of birds and six mammals.

There are several rare or threatened animal species occurring in Mt. Kenya Forest Reserve which are of particular international conservation interest. The bongo (*Tragelaphus euryceros*) which is very rare in Kenya occurs most likely in the mixed bamboo and bamboo zones. Currently, there are two known populations of the black rhinoceros (*Diceros bicornis*) in the Mt. Kenya area.

In the Western part of the country are the Kakamega and Nandi forests both of which are under immense pressure from the adjoining human populations. They represent an "island in a sea of human population" and therefore pose considerable conservation challenges.

Kenyan forests are largely confined to the higher potential (in terms of mean annual rainfall and productive soils) parts of the country where a very high percentage of the population (over 70%) is concentrated. In terms of protection, Forest Reserves have a lower protection status than the National Parks (mainly confined to the less densely populated dry savannah areas). This means that there has to be a balance between conservation of these vital biodiversity resources and sustainable use by the local populations.

#### ◆ Marine and Inland Waters

The tourist industry, which is the country's second highest foreign exchange is highly dependent on the coastal and marine environment and the associated biological resources. The Kenya coast which stretches for about 608km from its northern border with Somalia to the southern border with Tanzania, is famous for its palm fringed sandy beaches and the colourful diversity of marine life within a unique series of fringe coral reefs.

Marine fisheries are an important source of protein for coastal populations as well as a significant economic activity. The main fishery along the Kenya coast is, however, still artisanal. There are approximately 53,000 hectares of mangrove forests left in the Kenya coast. These provide local communities with timber, tanning and other products. Many fish species spend their larval and sub adult stages in the mangroves where they find shelter, breeding and feeding grounds. The rich diversity of life in the marine and coastal areas of Kenya is composed of over 456 species of fin fish, 169 species of corals, 9 species of mangroves and over 300 species of macroalgae, 11 species of seagrasses, 344 species of mammals, 5 species of reptiles, not to mention the countless numbers of phytoplanktons, zooplanktons and thousands of species not yet described.

Inland water resources support a wide range of socio-economic activities, including a rapidly growing fishing and tourist industry as well as conservation of wildlife. Freshwater and saline ecosystems cover about 8% of Kenya's surface area and include rivers, lakes and wetlands. These are important areas in terms of biodiversity conservation, food production,

hydrological stability, mineral cycling and socioeconomic development.

The waters of the rivers Tana and Turkwell have been dammed to supply hydroelectric power. Lake Victoria basin produces 90% of Kenya's total fish catch and sustains nearly half of the country's population. The alkaline lakes of the Great Rift Valley such as Lake Turkana, Bogoria and Nakuru are important tourist attractions. The biodiversity values of Kenya's inland waters are largely based on their capacity to support fisheries and wildlife, particularly birds. The series of freshwater and saline lakes and the associated wetlands constitute vital stepping stones along the migratory route of thousands of palearctic birds. Fresh water lakes, such as Naivasha, constitute a significant life support for local communities who extract water and fish from the lakes.

Kenya's inland waters are generally poor in fish diversity. Lake Victoria has over 250 fish species, a large number of which are endemic. Lake Turkana, the second largest lake in Kenya, has 48 fish species ten of which are endemic. With the exception of Lake Magadi, which has one endemic fish species, the alkaline Rift Valley lakes are generally poor in fish resources. Kenyan rivers such as Tana, Athi, Uaso Ng'iro (North), Malewa, and Nzoia la&y contain non-endemic fish species. Plants and animal species associated with inland freshwater wetlands are unique and highly specialised. In fact some wetlands, especially in the extensive semi-arid parts of Kenya provide the last refuge to rare and threatened species. Wetlands are breeding grounds for fish and birds, and provide a wide variety of products and environmental services to riparian communities.

#### ◆ ASAL's

Although only 20 % of Kenya's human population (projected at 29 million in 1997) live in rangelands, these areas contribute greatly to Kenya's ecology in terms of livestock production and biodiversity (especially wildlife) conservation. Wildlife forms the backbone of the tourist industry. In addition, income from tourism related activities is an important source of revenue for both the central government and local authorities. Eighty percent of the wildlife and a majority of the country's protected areas are found in the rangelands.

The Kenya rangelands are very fragile and frequently experience mild to severe drought. However they carry a diverse and rich biological diversity which until recently experienced little negative impact as a result of human landuse activities. This was mainly due to their low population and the coexistence between the pastoral communities and their environment that had evolved over many years. This coexistence has contributed to the conservation of biological diversity in these areas.

Plant species and communities in rangelands are diverse with the species ranging from desert to dryland-forest species. The vegetation communities consist of dryland forests, woodlands, shrubs, wooded grasslands and grasslands. All these different vegetation communities comprise of different plant species, many of which are endemic and are under threat of extinction as a result of recent increase in human activities (e.g. clearing of natural vegetation to create space for agriculture, and charcoal burning) in these areas.

The animal diversity consists of a unique assembly of megafauna, with few parallels elsewhere in the world. They include the large herbivores (elephant, buffalo, rhino, giraffe, eland, zebra, etc.); and carnivores (lion, hyena, leopard, cheetah, wild dog). There also occurs a wide variety of small herbivores, carnivores, birds and insects that are dependant on the rangeland habitats for their survival.

The rangeland biodiversity forms the pastoral and other communities that inhabit these areas. The wide and rich wildlife biodiversity found in these areas forms the basis for the tourism industry in Kenya. These biodiversity resources are also important in the maintenance of ecological processes, life supporting systems and the environment.

#### Role of NGO's

In addition to the efforts cited above, several other conservation efforts are being supported through the initiative and collaborative arrangements of international, national and local NGOs operating in the country. This include inter alia:

- World Wide Fund for Nature (WWF)
- Society for the Protection of the Environment in Kenya (SPECK)

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- The Green Belt Movement
- Friends of the Nairobi Arboretum (FONA)
- The Kenya Girl Guides Association
- Bellerive Foundation: Conserving indigenous forest by reducing fuelwood use
- Kenya Energy and Environmental Organizations (KENGO)
- International Union for the Conservation of Nature, now World Conservation Union (IUCN)
- The Wildlife Clubs of Kenya (WCK)
- The African Wildlife Foundation (AWF)
- Forest Action Network (FAN)
- East African Wildlife Society (EAWS)
- Kenya Woodfuel and Agroforestry Program (KWAP)
- African Centre for Technology Studies (ACTS)
- African Academy of Sciences (AAS)

Many of these NGOs are making significant contributions to natural resource conservation not only in Kenya but in the East African region as a whole and contributing to the well being of the local populations. There is, however, the need for a coordinating mechanism to avoid duplication or sometimes triplication! of efforts. Unless these efforts are coordinated, there is even a greater danger of inter-agency competition for scarce resources.

### Participation of local communities *in* forest management

The issue at present is not whether active involvement of rural communities is crucial in successful management of forests both in gazetted and non-gazetted forest areas. There is now wide spread recognition that rural people are key actors in participatory or shared forest management. It is often neither politically feasible nor socially justifiable to exclude poor people - who have only limited access to resources - from parks and forest reserves without providing them with alternative means of livelihood. Various projects and programs are attempting to mitigate this inequity by linking protected-area management with social and economic development in local communities. Like in many other parts of the world collaborative forest management initiatives in East Africa, are still evolving and it will be sometime before concrete models begin to emerge. This evolutionary process faces a number of key impediments-namely bureaucratic rigidity and sectoral nature of government agencies; harmonizing global conservation goals and donor conditionalities vis-a-vis national goals and sovereignty. Whilst there is an appreciable level of understanding and convergence of national and global conservation objectives, the interactive processes at the local level with communities is much less understood.

Virtues of participatory approaches are now clear to most decision makers unlike in the past when conservation projects were designed in most part with little or no real participation of the local people. However, full participation of local communities requires a devolution process which is not always embraced by all stakeholders to the same degree at a given time. Collaborative forest management calls for fundamental institutional changes. A pragmatic approach from conservation stand point, is to strengthen coordination mechanisms at the national level, and more importantly at the local level to avoid conflicts and potential confusion arising from uncoordinated delivery of forest resource conservation and management packages.

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### (b) LEGAL AND POLICY FRAMEWORK

Currently there are more than 77 statutes which relate to the conservation and management of biodiversity and environment in Kenya. However these laws are not adequately enforced by the relevant authorities and institutions owing to a number of reasons These include:

- Absence of provisions to specify standards of performance;
- Inadequate deterrent and incentives,

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General low level of participative awareness among a majority of the population;  
Preference of short-term gains at the expense of more sustainable alternatives in policy making and planning;  
Gaps and overlaps in the institutional responsibilities making enforcement difficult,  
Poverty which promotes the unsustainable use of resources, and  
Lack of a comprehensive land use policy.

Due to lack of comprehensive land use policy and inadequate land use planning and coordination, inappropriate land use practices are leading to land degradation problems and rapid decline in biodiversity in different ecosystems especially in the rangelands.

Key legal instruments responsible for the conservation and sustainable use of natural resources are:

The Forest Act Cap. 385, 1942 (1982);  
The Wildlife Conservation and Management Act Cap 376, 1976 (1989);  
The Government Fisheries Protection Act Cap 379, 1962;  
The Fish Industry Act Cap 378, 1970 (1983); and  
The Agriculture Act.

### ◆ Genes and Species

Kenya's current biodiversity policy aims at integrating the various facets of conservation into the national development plan. Existing legislation on environmental management has been reviewed and consolidated into a new Environmental Management and Coordination Bill which is due to be tabled in parliament.

Rural populations are increasingly being involved in national planning and policy formulation. The NEAP process, for example, was consultative and involved the stakeholders and the community. It recommended that Kenya should

- Formulate a national environment policy based on interdependence of environment and sustainable economic development.
- Formulate a biodiversity strategy to maintain, use and preserve Kenya's remarkable biological diversity.
- Review agricultural, energy land use and population policy to incorporate biodiversity conservation; and strengthen environmental planning in the ministry responsible for planning and development.
- Involve local communities and local authorities in formulating policy for renewable resource management.
- Require environmental impact assessment and monitoring for all development projects, including agriculture, irrigation, land allocation and tourism.
- Factor the value of standing unexploited resources in terms of watershed protection, influence or climate, cultural and aesthetic value as well as actual genetic value, into development planning.
- Recognize and quantify the local economic value of wild products in development and land use planning.
- Treat biological resources as capital resources and invest accordingly to prevent depletion.
- Review tax laws to incorporate biodiversity conservation. Give tax breaks to industries that clean up waste and impose heavy fines or sanctions on industries that pollute or destroy natural resources.
- Provide a mechanism to compensate local communities for water, land or resources set aside for public use.

## ◆ Forests

*The Kenya Forest Policy*

Forest Policy of Kenya is laid down in the “Sessional Paper No. 1 of 1968: “A Forest Policy for Kenya”. The previous Forest Policy was formulated in White Paper No. 85 of 1957, during the colonial administration. It stresses a central role for government in forestry development and does not recognize the role of rural communities: “In principle the government’s view is that the existence of private rights in the Forest Estate tends to endanger the objects for which the government manages the Estate and such rights are therefore objectionable. The government’s policy is, therefore, firstly to define and limit any existing rights, secondly to negotiate on a just and reasonable basis the final eradication of such rights and, thirdly, to allow no new rights to arise.” The key elements in the current policy have clearly been found to be untenable with global shifts in forest management paradigms where the role of rural populations is central to sustainable forest management. Following the Rio summit in 1992, Kenya has formulated a new forest policy. The objectives of the new policy are to:

- Increase the forest and tree cover of the country to ensure an increasing supply of forest products and services for meeting the basic needs of present and future generations and for enhancing the role of forestry in socioeconomic development;
- Conserve the remaining natural habitats and the wildlife therein, rehabilitate them and conserve their biodiversity;
- Contribute to sustainable agriculture by conserving the soil and water resources by tree planting and appropriate forest management;
- Support the government policy of alleviating poverty and promoting rural development, by income based on forest and tree resources, by providing employment, and by promoting equity and participation by local communities;
- Fulfil the agreed national obligations under international environmental and other forest related conventions and principles;
- Manage the forest resource assigned for productive use efficiently for the maximum sustainable benefit taking into account all direct and indirect economic and environmental impacts; also review the ways in which forests and trees are valued, in order to facilitate management decisions; and
- Recognize and maximize the benefits of a viable and efficient forest industry for the national economy and development.

Furthermore, the policy states that “all gazetted indigenous forests, woodlands, bushlands and mangroves should remain reserved”. In terms of government control, the proposed policy is significantly different from the current (1968) policy. The Kenya Forestry Master Plan of 1995, which is the basis for the new Forest Policy proposes a fundamental departure from the present policy: “The management of the Forest Estate, both for production and conservation, will increasingly be entrusted to private or public enterprises, tree fanners and communities. The Forestry Department - FD (the government agency in charge of the Forest Estate) will concentrate on policy matters, regulations, and monitoring.”

*The Forests Act*

The Forests Act (CAP 385, revised 1982 and 1992) addresses the reservation, protection, management, enforcement and utilization of forests and forest resources on government land. The Forest Act is applicable to gazetted forest areas (Forest Reserves). The Forests Act is more or less a criminal law defining primarily the offenses and the respective prosecution and penalties. The Act specifies that communities living adjacent to Forest Reserves have got special user rights. Beside the Forests Act there are some other Forest Regulations, like The Forest Rules and the Forest Department General Orders which are equally applicable. Due to the limitations of the Forests Act, a new forest legislation has been proposed. This is contained in a Forest Bill. The bill is revolutionarily and is concerned mainly with the possibility of introducing community and private forests, the state forest leaseholds and the participation of communities in conserving state forests.

Other legislations that can be used to enforce forest conservation includes:

*The Chief Authority Act:* This Act is an instrument defining wide ranging powers and responsibilities of an administrative official (these powers have been reduced substantially in a recent bill which went through parliament). The major liabilities of the Chiefs Authority Act are the authoritarian character and use of compulsion and repression as the main techniques in conservation activities. There is no provision for free public participation. Under this act, the chief can issue orders regulating or prohibiting the cutting of timber and /or wasteful destruction of trees, destruction of vegetation cover, the control of forest fires and restriction of grazing. Chiefs can use this Act to control tree fissions that can be enforced by the agricultural officers to promote forest conservation. The Act specifically stipulates that: The Minister of Agriculture with the concurrence of the Central Agriculture Board may make rules:

- prohibiting, regulating or controlling clearing or breaking of land for cultivation, firing ,or destroying vegetation including stubble; and
- requiring, regulating or controlling afforestation or reforestation, protection of slopes or catchment areas.

*The Water Act:* This was enacted to reserve the water catchment areas in perpetuity. The Act protects water catchment areas from deforestation and gives power to allow or prohibit specified activities. A significant conflict with the Forest Act is that the Forest Department has no power to protect catchment areas outside gazetted areas which the Water Department can do.

◆ Marine and Inland Waters

Kenya's aquatic biodiversity is protected by a number of policies and statutes. The Wildlife and Conservation Act (Cap 376 of the Laws of Kenya) mandates Kenya Wildlife Service to protect fauna and flora by creating protected areas. Currently there are four Marine National Parks and five reserves covering about 5% of the total area of the Kenyan reef. The parks and reserves (Malindi, Watamu, Kiunga, Mombasa and Kisit Mpunguti) are however only protected from direct utilisation and not from pollution. There are efforts to expand marine protected areas by gazetting Diani National Park. This act also partially protects a number of inland aquatic biodiversity through national parks and reserves. Lakes Nakuru, Bogoria are protected under national park and national reserve status respectively. Two islands in Lake Turkana are also protected under national park status. In addition, there are wetlands and lakes that are protected within Amboseli, Saiwa and Tsavo west National Parks. The delta of river Nyando in Lake Victoria basin is partially protected as part of Impala Sanctuary near Kisumu. In spite of the high ecological and economic significance of the Tana River and Yala River deltas, they have not been protected under any conservation status as yet.

◆ ASAL's

The policy of wildlife conservation and management is being reviewed to take into account the conservation of biological diversity and representative indigenous ecosystems. The promotion of environmentally sustainable tourism and compatible land use in priority biodiversity areas, and channeling the benefits thereof to the local communities are also being taken into account. Due to this shift in policy a new legislation has been drafted. The Wildlife (Conservation And Management) bill, 1996 is set to repeal (Cap 376 Act No: 16 of 1989), to enact a comprehensive law relating to the protection, conservation and management of biodiversity in Kenya. The Bill provides inter alia that:

- the state holds in trust for present and future generations nationally and globally the biological diversity represented within the country by a variety of animals, plants, land scapes and ecosystems;
- the state should in spite of the limited resources available, should place special emphasis, in the first instance, on conserving the country's assemblage of large mammals and endangered species;
- powers relating to the management and conservation of biodiversity should be placed in a consolidated Government owned body corporate;
- the prime objective of the KWS should be to ensure that biodiversity is managed and conserved so as to yield to the nation in general and to local areas and communities in particular, optimum returns in terms of economic, cultural, recreational, aesthetic, scientific, environmental, security and other

pertinent gains as are incidental and not inimical to proper biodiversity management and conservation; in pursuit proper wildlife management and conservation the KWS should further promote the following objectives:

- securing integrated, co-ordinated and sustainable wildlife conservation and management;
  - ◆ ensuring the highest possible and beneficial participation of local communities in wildlife management and conservation;
  - ◆ striking a balance between protectionism and unregulated wildlife utilization;
  - ◆ promoting wildlife utilization consistent with scientifically and internationally accepted conservation practices;
  - ◆ maximizing biodiversity protection in both protected and non-protected areas;
  - ◆ minimizing human-wildlife conflict to ensure long term harmonious co-existence of people and wildlife;
  - ◆ catalyzing the growth of national conservation constituencies and partnerships within the wildlife sector;
  - ◆ streamlining community based and regulated compensation procedures pursuant to damage caused by wildlife;
  - ◆ strengthening the regulatory, security and enforcement mechanisms;
  - ◆ developing and promoting sustainable nature tourism;
  - ◆ strengthening the commercial activities of the Service;
  - ◆ training of staff and education of the general public on wildlife issues; and
  - ◆ ensuring that all other policies recognized within national and international biodiversity policy framework are enforced:
- ▶ for the achievement of the foregoing objectives, that full account should be taken of the varied forms of land use and the interrelationship between biodiversity conservation and management and other forms of land use so as to ensure multiple land uses and the fair distribution of benefits

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(c) INSTITUTIONAL RESPONSIBILITIES AND CAPACITIES

◆ Genes and Species

The government has over the years set up institutions on environmental matters; such as NES which was established in 1974. With regard to species and genes, most of the work is carried out by various government departments and research institutions, such as NMK (plant insect species), Fisheries Department (fish species), KWS (big mammals), DRSRS (Plant and animal species) Universities (microorganisms and genes). Local and international NGOs have information on species and genes, for example ICIPE (insects) ILRI (protozoa and bacteria), WWF and ACC (Elephant & Rhino), among others.

Majority of these institutions need to improve their capacity to collect information on species and probably expand their research on genetic variability within species. National institutions assigned such tasks have often lacked sufficient human, technical and resources to discharge their mandates.

● Forests

The FD is constrained considerably in terms of resources in meeting the demands of conservation and sustainable use of biodiversity resources. Its capacity to respond to various issues in biodiversity conservation is clearly inadequate. The situation is being addressed through internal reforms and collaborative mechanisms with other national institutions charged with responsibility of conservation and management of biological resources, the key one being the Kenya Wildlife Service, a parastatal organization FD jurisdiction over Forest Reserves and KWS over National Parks and reserves. Since these areas often overlap, and to promote integration in forest/wildlife resource conservation; and efficient use of resources, the two institutions have recently entered into a "Memorandum of Understanding" (MoU) in December 1991. Objectives of the MoU are, among others, the economic and

sustainable exploitation of forests for forest products and tourism, the protection and preservation of selected sites, the minimization of threat to human life, to trees, agricultural crops and livestock, and the generation of revenues that can be reinvested for the conservation management of forest areas. These objectives shall be achieved by setting up detailed management plans for the selected forests. The plans need to be approved by both the Forestry Department and KWS. Further, the two institutions would carry out joint patrols, training for forestry and wildlife staff, protective fencing of areas with threatened species, extension work, joint fire prevention plans and survey and research. Other common activities are mentioned, like controlled exploitation of forest products, careful development of tourism facilities including infrastructure, development of conservation education facilities, coordination of research and erection of wildlife barriers where Human - wildlife conflicts exists..

In March 1996, a Memorandum of Collaboration (an addendum to the MoU) was concluded between the FD, KWS and NMK to “ensure enhanced conservation of the national heritage of natural resources based on sustainable natural resources management that incorporates effective partnership”. This Addendum mentions a series of fields of future cooperation and further holds that “the parties shall jointly develop and formulate a Strategic Plan of Action (SPA) for long-term collaboration and implementation” and “Contractual Service Agreements (CSA) for specific programs and projects”

Kenya Forest Research Institute (KEFRI) has been supported for some years now in research and training in “Social Forestry” by the Japanese government.. KEFRI and other research institutions such as the universities and NMK are actively involved in various aspects of biodiversity conservation. The NMK has a well known “Center for Biodiversity which composes of a herbarium with 750,000 specimens.

The institutional set up in a given area often influences the degree to which forest conservation objectives are achieved. This is because power and authority is not simply confined to the relevant technical departments such as Forest Department or KWS but often dispensed within a complex of institutional interactions

◆ Marine and Inland Waters

Several institutions are currently responsible for the management of aquatic resources. The Fisheries Department is responsible for the conservation and management of fisheries resources while Kenya Wildlife Service is responsible for conservation and use of other biological resources within the aquatic environments. The Water Department is responsible for water development and conservation and therefore has an indirect role of ensuring rational use of water resources and maintaining adequate water for supporting life and natural aquatic processes. Institutions mandated to assess, document and monitor aquatic biodiversity include national research institutions such as Kenya Marine and Fisheries Research Institute, National Museums of Kenya, National Universities and regional authorities such as Lake Basin Development Authority, Coast Development Authority and Tana and Athi River Development Authority. The Planning for biodiversity conservation and use is, therefore, heavily sectoral and so long as this remains the case, the above institutions will continue to have limited capacity to reduce biodiversity loss in aquatic systems.

Co-ordination of sectoral activities relating to aquatic biodiversity assessment, conservation and utilization has , however, considerably increased since 1992 as earlier noted.. NES has gradually taken up the co-ordinatory role through the Inter-Ministerial Committees on Environment. The sub-committee on biodiversity is actively involved in developing policy framework on aquatic sub-sector as well as co-ordinating initiatives on aquatic biodiversity conservation at national and regional levels. Three major initiatives which have been approved for funding by GEF are the Tana River Primate National Reserve, Sustainable Use of Biodiversity in the Gregory Rift Valley Lakes and the on-going Lake Victoria Environment Management Programme.

International and Non-governmental organisations have continued to play a vital role in the development of marine biodiversity conservation initiatives besides local government institutions. Monitoring of the coastal environment and marine resources is currently a major focus of a number of national and regional initiatives. International conservation organisations such as the Worldwide Fund for Nature and World Conservation Union (IUCN) are working with local communities to monitor wetland resources and mitigate against land-based threats to inland and marine aquatic biodiversity National and community-based NGOs play a vital role in conserving aquatic biodiversity in Kenya. Their effectiveness, however, is constrained by lack of adequate technical and financial

resources.

◆ **ASAL's**

The management of Asal areas are the responsibility of several Government Ministries and departments, Regional Development Authorities and parastatals. A number of local, national and international NGO's as well as some bilateral bodies have played an important role in management of biodiversity resources in Kenyan Asals. The bodies involved include inter alia: Ministry of Agriculture and Livestock Development as most of the country's livestock is found here, the Ministry of Water Resources which administers water and its distribution. Water availability in this areas has a marked relationship with the abundance of biodiversity. The Ministries of Tourism, Natural Resources and Environmental Conservation are also pertinently involved especially as regards to policy. The North and South Ewaso Nyiro, Tana and Athi River Development Authorities and Bilateral bodies such as the GTZ impacts have been felt. The KWS being the custodian of wildlife in Kenya, most of which are found in Asals is a major stakeholder. KWS has recently redefined its mission and is currently organised into 8 eco-regional units. KWS mandate as per the new bill will be to inter alia:

- ▶ conserve and manage biodiversity throughout the Republic of Kenya
- ▶ establish conservation priorities to determine the biodiversity required to safeguard life supporting systems and societal needs now and in the future.
- ▶ identify the essential biodiversity necessary to maintain viable. representative biomes, ecosystems, habitats, species populations and their genetic diversity.
- ▶ identify and mobilize competent authorities, stakeholders and partners for sustainable biodiversity conservation
- ▶ take all measures necessary for the mitigation of conflict between people and wildlife through the provision of incentives to conserve biodiversity.
- ▶ undertake all measures deemed necessary by the Service for sustenance of wildlife to meet conservation and management goals;
- ▶ formulate policies regarding the conservation, management and utilization of all types of fauna and flora not being domestic;
- ▶ advise the Government on the establishment of National Parks, National Reserves and other protected wildlife sanctuaries;
- ▶ manage National parks, National Reserves and Sanctuaries;
- ▶ prepare and implement integrated management plans for National parks, National Reserves and Sanctuaries and the display of fauna and flora in their natural or other state for conservation, promotion of tourism and for the benefit and education of the inhabitants of Kenya;
- ▶ provide wildlife conservation education and extension services to create public awareness and support for wildlife policies;
- ▶ conduct and co-ordinate research activities in the field of wildlife conservation and management;
- ▶ provide assistance to the farming and ranching communities in Kenya necessary for the protection of agriculture and animal husbandry against destruction by wildlife.'
- ▶ build and enhance the capacity of competent authorities, stakeholders and partners for biodiversity conservation through training and education
- ▶ collaborate with other national agencies in the formulation and development of policies and plans for biodiversity conservation.
- ▶ undertake and conduct enforcement activities such as anti-poaching operations, wildlife protection, intelligence gathering and investigations for the effective carrying out of the provisions of the Wildlife Act.
- ▶ promote and manage sustainable nature tourism
- ▶ provide security services for visitors to national Parks, National Reserves and Sanctuaries managed by the Service.
- advise the Government on the ratification and implementation of international conventions regarding wildlife in all its aspects;
- ▶ promote or undertake commercial and other activities for the purpose of attaining sustainable biodiversity conservation goals.

KWS is fairly well organized and has the skills and manpower to undertake its mandate. The main problem is the availability of financial resources. Most other National institutions are heavily constrained due to inadequate budgetary allocations but do have fair capacity to deal with conservation issues. Several local, National and International NGO's are active partners in progress in Asal's. This include among others WWF, ACC. and, KENGO.

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**(d) THREATS TO BIODIVERSITY**

◆ Genes and Species

The major threat to genes and species is loss of natural habitats due to changes in land-use patterns and non comprehensive policies. For example reclamation and drainage of wetlands for agriculture leads to loss of genes and species. Development projects which necessitate the disruption of natural habitats lead to enormous losses in biological diversity. Conversely, some introduced species have proliferated and become a threat to indigenous species.

In Kenya, indigenous forest cover comprises coastal forest (82,500 ha) dry forest (211,000 ha) montane forest (748,500 ha) and western rainforest (49,000 ha). Plantations are estimated at 160,000 ha. Apart from invasion of secondary species-usually in the understorey in very low stocking plantations, forest plantations generally represent species-poor ecosystems. Some potentially useful data may be available, but are locked up in unpublished reports which are not readily accessible. Data constraints have greatly hampered the ability to comprehend the magnitude of loss, and to formulate sustainable alternatives to resource depletion. Although interest has focused mainly on the closed canopy moist forests, dry woodlands contain important plant resources both from a conservation stand point as well as from socio-economic, and cultural perspective. For example, the dry mountain forests on the Kenya-Uganda border (Loima hills) represent a unique set of human-forest resource interactions. Plant germplasm has been conserved in these dry mountain forests through strong traditional conservation mechanisms of pastoral communities. Changing lifestyles of the pastoralists will lead to the breakdown of the traditional systems and this may present a threat to biodiversity.

● Forests

Forests in Kenya are under considerable pressure manifested by reduced forest area, over exploitation and attendant degradation.

Some of the main threats responsible for forest loss include:

*High population growth rates*

This factor puts high premium on forest land, short-term economic gains accruing from land cultivation, and infrastructural development often outweigh long term conservation objectives. Unless alternatives are developed that encourage and give incentives to rural farmers to intensify their production systems, and benefit directly from forest conservation and management, this will likely continue to be cause of erosion of plant germplasm.

**Forest Exploitation**

There are very high demands for forest products which far outstrips supply. Demand for forest products is manifested in two forms:

- (i) Subsistence driven exploitation: Rural communities exploit forests in their vicinity for provision of timber and for a wide variety of Non-Timber Forest Products (NTFPS). Although such exploitation is largely for domestic use, some products are exploited by the local people for markets over much larger distances.
- (ii) Commercial logging: Most of the softwood used in construction industry and for joinery purposes comes from timber plantations. Since the ban on felling indigenous trees by a presidential decree in 1986, the vast majority of indigenous timber legally extracted comes from plantations; only a small

amount comes from indigenous forests such as Mt. Elgon ( which is exempted from the timber ban. The demand for indigenous timber is so high especially for construction, furniture and charcoal making such that some illegal felling of indigenous trees still continues. Indigenous species such as *Olea capensis*, *Vitex keniensis*, *Ocotea usamberensis* and *Milicia excelsa* are in very high demand. The lucrative international market for *Prunus africana* (Pygeum) is driving the species exploitation to unsustainable levels. The local carving industry has put a great strain on *Dalbergia melanoxylon*.

#### *Logging methods*

Methods of logging in natural forests have have negative impacts on ecosystem processes and functions and thus contribute to erosion of germplasm

#### *Forest excisions.*

These have taken up an appreciable proportion of the forest area in Kenya. This issue together with enhancing the capacity of the Forest Department and other stakeholders in forest conservation and management are currently being addressed through the new forest policy.

#### ◆ Marine and Inland Waters

The principal threats to Kenya's aquatic biodiversity are basically anthropogenic in nature. The threats can be grouped into five broad categories (i) habitat degradation, (ii) water pollution, (iii) exploitation of resources, (iv) introduction of invasive alien species such as the water hyacinth which has proliferated tremendously over lake victoria to the detriment of other species and (v) lack of comprehensive legal and policy guidance. Water is a prime natural resource that attracts development activities including human settlements and industries. The status of the Kenya's water resources has in the past received greater attention than the biodiversity associated with the water. Conflicting and sometimes competing water issues have put aquatic biodiversity under serious risk.

#### ◆ ASAL's

Over recent years, there has been a continuous increase in human population (the current annual population growth rate is 3.34 % throughout the country. In rangelands, the increase in population is a result of natural population growth and inward movement of people from the densely populated agricultural areas (which occupy only 20 % of the total land cover and carry about 70 % of the population). This increase in human population in rangelands has led to land degradation mainly through the clearing of natural vegetation to provide land for human settlement and agricultural activity. A case in point is what has happened in Narok district, where the agricultural boundary has shifted over 10 Km into the Loita plains which were previously used exclusively for livestock grazing and wildlife. Similar agricultural encroachment has occurred in many other areas of the rangelands ( Laikipia, Kitui, Kajiado, Samburu, and Taita Taveta districts).

The continuous and ever-increasing destruction of rangeland habitats and the illegal exploitation of the resources has led to a drastic decline of wildlife populations in these areas. Over 70 % of wildlife population is found outside the protected areas system. Between 1977 and 1994, wildlife populations outside protected areas have reduced overall by 30 % (Grumbatt, et al., 1996). If the destruction of wildlife habitats in these areas continues unabated, the remaining wildlife is bound to decline further and in some areas may be completely decimated. This destruction of rangeland vegetation may also result in increased land degradation, thus leading to desertification. Another threat to biodiversity is the current and on-going subdivision of land in the rangelands (group ranches) and its allocation to individuals. This presents a serious threat to the long-term conservation of wildlife in these areas as the land is converted to other uses and free movement of wildlife is curtailed.

#### **IV STRATEGY AND ACTION PLAN**

##### **(a) STATUS OF KENYA'S NBSAP PROCESS**

The biodiversity strategy and action plan process for Kenya is already under way, as indicated by the following milestone events :

- |           |   |
|-----------|---|
| 1992      | A national country study to assess biodiversity was carried out.  |
| 1994      | The National Sub-committee on Biodiversity was constituted under the auspices of the Inter-Ministerial Committee on <b>Environment</b> , to coordinate biodiversity matters in the country  |
| 1995      | A Taskforce of the Sub-committee was set up to oversee the development of the NBSAP and develop a proposal to finance the process.  |
| 1996/1997 | The proposal was completed and submitted to the World Bank, and <b>financial support</b> granted. Consequently, a national Planning Team for the process was <b>constituted</b> , including a team of 7 consultants to provide expertise. An implementation schedule was drawn up indicating which activities will take place when, how the process will be initiated, executed and finalized |
| 1998      | The draft <b>first National Report</b> was produced at the end of March   |

##### **(b) OTHER RELEVANT STRATEGIES**

The National Environment Action Plan (**NEAP**)

The NEAP report proposed the following strategic actions to be taken immediately :

- Formulation of a biodiversity strategy to maintain, use **and** preserve Kenya's remarkable biodiversity;
- Treatment of biodiversity conservation and economic development as integral aspects of the same process of sustainable development;
- Measurement of the value of standing, genetic resources and especially biodiversity in economic terms;
- Establishment of a system of incentives and **dis-incentives** so that resource **conservers** are rewarded and resource abusers **penalised**;
- Urgent action taken to conserve areas of outstanding biodiversity value. Of critical importance are sites with unique species of plants, animals and microorganisms, such as L. Magadi, river gorges of **Ndzovuni**, among others; and
- **Incorporation** of traditional values and knowledge systems into biodiversity conservation programs.

The Kenya Forestry Master Plan, 1994 (**KFMP**)

With assistance from Finland (FINNIDA) the then **MENR** drafted the Kenya Forestry Master Plan 1995 - 2020 (KFMP) which can be regarded as very important and success promising for the sustainable management and conservation of Kenya's forests.

The following issues are given particular emphasis in the KFMP:

- **Threats** to indigenous forests and consequently the need to give better protection to their biodiversity.
- The concept of multipurpose management as a general principle, especially in indigenous forests.
- The enhancement of social forestry and farm forestry, including diversification of **farming** by tree planting and to reduce the pressure on indigenous forests.
- Broadening of the institutional framework for forest management, with due regard to the commercial, social and

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environmental aspects, followed by clear definition of **the responsibilities** of the various partners in forestry development.

- Capacity building through education, training and research.
- **The** continuing importance of wood as the predominant rural and urban energy source.
- The need for forest protection, especially against fire.
- Globalization of forestry, especially through implementation of international conventions.

#### Conservation of habitats

**The** strategy recommended the inclusion of representative, viable samples of all habitat types within protected areas, with particular attention to habitats of high biodiversity and endemism. Priority areas for conservation included wetlands (especially seasonal wetlands), forests, highland grasslands and natural areas near large urban **centres**.

**In** Kenya, this strategy has been extensively applied in the conservation of forests and large mammals, but has not been specifically directed to **the** conservation of lower plant and animal **taxa**. Such conservation objectives, however, are often achieved indirectly. For example, the conservation of Lakes **Nakuru** and **Bogoria** has concurrently assured the conservation of unique microorganisms whose survival is guaranteed as long as the lakes remain in **their** current conservation status.

Protection of areas of special environmental importance.

Such areas include unique ecosystem such as indigenous forests, dry mountain and **riverine** forests, lakes, swamps, etc. They provide critical biological resource diversity at many levels, including genetic variability, species richness and overall ecosystem characteristics.

The proposed strategies for protecting these areas included :

- Respect for and incorporation of indigenous knowledge and priorities;
- Involvement of local people **in** management and use of environmental resources.; and
- Control and reversal of environmental degradation.

The strategy seeks to identify the location and management requirements of areas important for genetic variability and the perpetuation of species by:

1. Devising a system to measure in economic terms the value of standing, unexploited natural resources and ecological functions;
2. Recognizing and quantifying the local economic value of wild plants, and microorganisms in development and land-use planning;
3. Providing technical and financial support to compile inventories of plants and animals, especially those **with** social, spiritual, cultural, aesthetic, economic and scientific values, and including indigenous crop diversity, through ecological and ethnobiological surveys;
4. Creating conditions and incentives for effective conservation of biodiversity by local communities, by among other things, recognizing and affirming the value of local knowledge and local communities' rights to genetic **resources** and benefits from tourism in their areas;
5. Estimating sustainable levels of production for economic benefits from biological resources including fish, timber, wildlife, medicinal plants and other goods and services, and placing limits on harvests, including regulatory mechanisms;
6. Supporting projects which provide immediate and sustainable economic **returns** to thk communities concerned;
7. Encouraging users to grow species which are under intense pressure **ex-situ** to provide an alternative source of supply;
8. Encouraging local communities to develop a large market share for wild products harvested sustainably and in so doing develop the role of traditional medicines and ensure their appropriate and sustainable use.
9. Promoting **the** use of indigenous species of plants and animals, by applying the knowledge of local

communities to select them.

At NMK indigenous knowledge is being integrated into conservation and sustainable use of species and genes in Kenya Resource centre for Indigenous Knowledge. (KENRI) project.

#### Botanical garden conservation strategy

This strategy propose the promotion and establishment of botanical gardens in every province and ecological zone, stocked with indigenous plant species, in consultation with institutions which already have botanical gardens or arboreta.

Considerable **progress** has already been made towards the improvement and **maintainance** of the Nairobi Arboretum (mainly through the initiative of the Friends of Nairobi Arboretum) and the **Bamburi Nature** Trail. These gardens provide useful services to local communities mainly in the form of recreation and information, although they also provide **some** training opportunities in conservation.

Expansion of **ex-situ** conservation activities.

This strategy will emphasize the expansion of **ex-situ** conservation efforts through the establishment and proper maintenance of gene banks, zoos, aquaria and sites for the captive breeding of endangered species. This is particularly important for wild plants **unsustainably** harvested for food, medicines, cosmetics, building materials, ornaments, etc. The strategy also applies in cases where plant or animal species are only represented by small, bottleneck populations.

#### Management of introduced species

Information and management strategies are proposed to deal with the threat of introduced species, **particularly** foreign importations that may adversely affect alter our habitats. Harmful alien organisms may also affect biodiversity through species displacement, disease, parasitism, hybridization, and predation .**The** following strategic actions are required:

- Taking all the necessary steps to prevent the introduction of harmful alien organisms and elimination or reduction the adverse effects to acceptable levels; and.
- Ensuring that there is adequate legislation and enforcement to control introductions of alien and genetically modified organisms, improvement of preventive mechanisms such as screening standards and risk assessment procedures.

#### Establishment of biodiversity information databases.

The strategy will establish a biodiversity information database as a central repository of data generated by inventories and surveys. It was, however, recognized that the current state of knowledge of species and genes is inadequate, and that detailed knowledge was lacking on distribution and population sizes. To alleviate this problem, Kenya **has** developed a Kenya **Biodiversity** Data Management Plan which is envisaged to be implemented as a series of short projects as a follow on to the BDM project

#### Biotechnology

The Ministry of Research, Science and Technology has identified policy strategies and action plans on the development of biotechnology in Kenya, which are

1. The development of a comprehensive policy on research and development in biotechnology.
2. Establishment of a National **Biosafety** Committee whose membership is drawn from various stakeholders.

### **International Cooperation**

Strategic planning is essential in order to control the activities of international gene prospectors whose motives may be solely economic, and to the detriment of the country. Kenya has been acknowledged as having a rich pool of **germplasm**. As a result many scientists and commercial entrepreneurs have collected **germplasm** with potential for economic value. This biodiversity prospecting has been done without much economic return to the country. In the past, developing countries have provided genetic **resources** for research to developed countries mainly because they lack the expertise and investments needed to develop biotechnology. They therefore rarely benefit from such research carried out in developed countries. As a result the Convention of Biological Diversity, to which Kenya is a signatory, calls for legislative, administrative or policy measures that would take into consideration the question of sharing of benefits from genetic resources and the transfer of technology.

National strategy in Kenya therefore is designed to :

1. Implement international conventions and protocols dealing with conservation of biodiversity, and champion the need to integrate biodiversity conservation into international economic policy;
2. Strictly regulate the transfer of species and genes and their release into the wild;
3. Support efforts to bring about equitable sharing of benefits derived at international level from the use of genetic resource; and
4. Implement internationally recognized conservation obligations such as the Convention on International Trade in Endangered Species (CITES), Biosphere Reserves, World Heritage Sites, **Ramsar**, and Convention on Biological Diversity.

### **Policy and Legislation**

**Kenya's** environment policy aims at integrating various facets of environment into the national development plan. Existing legislation on environmental management has been reviewed and an integrated bill on environmental law produced and approved. It is expected to be presented to Parliament this year.

**The national biodiversity strategy and action plan process has been initiated, and is now in progress**

#### *Priority activities requiring funding:*

- Survey and document the species composition, distribution, structure and functions, use and value of the genetics **resources** in various ecosystems;
- Assess causes of threats to biodiversity including vulnerability of populations of certain species and introduction of alien species;
- Control and reverse loss of biodiversity, and take measures to protect genes, species, habitats and ecosystems, on site whenever possible and **offsite** where necessary; and
- Promote the use of native species, establish realistic harvest levels of wild species including **ex-situ** plantations and regulatory mechanisms and explore new markets for wild products.

#### *Long term priorities*

- Review agriculture and energy policy to take biodiversity concerns into consideration.
- **Sensitise** people and institutions so **that** they become biodiversity **conservers** not over users.

### **CONSTRAINTS ANTICIPATED**

- Most conservation efforts have focused on a small number of species, mainly mammals, birds, and higher plant species. The lower animals, plants and microorganisms have received low priority.
- There is insufficient knowledge about **many** of the species and genetic variability due to lack of skilled human and technical resources and physical facilities. Research on genes and species is ranked as a

low priority area when allocating funds.

#### **Report on level of involvement of different organizations in implementation of CBD at National level**

Species and genes are building blocks of ecosystems, and often the most obvious indicator of ecosystem health. It is not surprising that some species have received considerable attention from government institutions, NGOs and international agencies.

The basic organizational element, including institutional frame-work, **inter-sectoral** linkages, policy frame-work and National Environment Action Plan (**NEAP**), are already **in** place to facilitate the implementation of the CBD **in** Kenya. The **NEAP** was completed and adopted in 1994. The **NEAP** **recognises** the need for the protection of fragile **zones** and conservation of biodiversity in general.

In 1994 IMCE sub-committee on Biodiversity, composed of relevant government departments and a few NGO's was established under NES. Its mandate includes among others; coordination and implementation of the CBD and the formulation of National Biodiversity Strategy and Action Plans.

Capacity building, including training and institutional support, has been undertaken, largely through FAO/UNDP/GEF Capacity Building for the Protection of East Africa Biodiversity project.

Various NGO's are involved in the implementation of the CBD at national level. These include WWF, ACC, KENGO, ACTS, EAWLS, IUCN. Their activities include protection of sacred sites and species, and rehabilitation of degraded areas. WWF is one of the organizations that is closely collaborating with the Government of Kenya in the implementation of the CBD. Recently, DANIDA funded a project through WWF to promote implementation of the CBD in various countries, **including Kenya**.

Founded in 1987, IPGRI has a regional office in Kenya, and deals with plant **genetic** resources. IPGRI gives technical support to KARI's Gene Bank.

With regard to implementation of different articles of the CBD, the following government agencies, through their mandate, have played **some** role:

- Article 7 (Identification and Monitoring): KARI (**Genebank** of Kenya), NMK (Herbarium), KEFRI (forest species), KEMFRI (marine species) ICIPE (insects), Universities (microorganisms) and KWS (mammals).
- Article 8 (In-situ conservation): NMK, KWS, KEFRI, KEMFRI.
- Article 9 (Genebank) - KARI, KWS, KEFRI.

#### **Report on progress in raising public awareness of the benefits and importance of biological diversity**

- Strengthening national institutional capacity to collect store, **organise**, assess and use data for information and decision making through **programme** like the GEF funded institutional strengthening project and the BDM project.
- Encouraging partnerships among the public, private and communities.
- Enhancing the ability of local communities to participate in project development and management.
- Coordinating research in utilisation of biodiversity at community level.
- Using the media to inform the public about the benefits and importance of biological diversity.
- Using professional societies like the Kenya Society of Microbiology, Wildlife Clubs of Kenya, East African Natural History Society etc. to inform the public about the benefits of and importance of microorganisms and other **taxa**.
- Using public mass media, **e.g** radio programs, workshops and public **barazas**.
- Establishment of thematic education **centres**, **e.g**. Giraffe **Centre**.

### Forests strategy

Considering the proportion of the biological diversity locked up in forest ecosystems, forests form a key component of a national biodiversity conservation strategy. Such a strategy should build and/or improve on the following **sectoral** initiatives:

The Kenya Forestry Master Plan (MENR, 1994)

### Policy and Legal Reforms

Both the forest policy and legislation and the environmental bill are currently at the **final** stages of review. The national biodiversity strategy should be constructed as to take **full** advantage of these policy and legal framework conditions.

### Institutional Collaboration: The Memorandum of Understanding (MoU)

The institutional responsibility and capacity for conservation and sustainable use of biodiversity resources need to be clearly **defined**. Collaborative arrangements for the MoU should comprise detailed descriptions, participants and time frames for:

- the elaboration of conservation and management principles of indigenous forests including wildlife;
- the elaboration of **silvicultural** principles for indigenous forests including plantations;
- the elaboration of a **zonation** map and its actualization;
- the elaboration of partnership and extension programs for forest adjacent populations;
- the elaboration of **participatory** forest and wildlife management plans including plantations, indigenous forests, non-timber forest products, and eco-tourism;
- the elaboration of joint forest and **wildlife** protection programs including the fighting against wildlife and timber poachers and all other forest and wildlife destroying influences;
- the elaboration of a **training** of trainers (ToT) program;

### Forest Sector Donor Funded Projects Relevant to Biodiversity Conservation

#### (i) Kenya Indigenous Forest Conservation (KIFCON)

The KIFCON Program started in 1991. Its parent Ministry was then Ministry of Environment and Natural Resources, and it was sponsored by the British Overseas Development Administration (ODA), now Department for International Development (DFID). It aimed to promote the conservation of Kenya's remaining natural forests, whilst maintaining the living standards of local low-income households hitherto dependent on the forests.

KIFCON's activities included:

- multi-disciplinary forest surveys, including forest inventories and biodiversity and socio-economic studies;
- establishment of forest monitoring systems;
- production of a national profile of Kenya's natural forests and identification of those under critical threat for future conservation action;
- promotion of alternative sources of forest produce for local people and local participation in forest management;
- pilot projects in Arabuko Sokoke, Kakamega and Mau forests to test innovative forest management systems for possible application in other forests;
- production of management guidelines for natural forests, assistance in management planning and ultimately, production of a national indigenous forest conservation plan;
- institutional development for natural forest conservation, including support to Forestry Department, Kenya Wildlife Service and other appropriate bodies, and development of an improved institutional framework;
- raising of public awareness about forest conservation and management issues.

Following the work of KIFCON, considerable baseline data has been generated for future conservation strategies.

(ii) Integrated Natural Resource Management and Conservation (InaReMaC) Project

This is sponsored through a bilateral agreement between the German and Kenya Governments and technically assisted by GTZ. It started in February 1997.

The Project Purpose is: To assist the local communities improved their standard of living through participation in the sustainable management of the National Reserve and Forest Reserve of Shimba Hills together with Forest Department and Kenya Wildlife Service. The planned Project Outputs are:

1. The institutional conditions for the implementation of the cooperation agreement (MoU) between KWS and FD are officially approved and put into practice at a local and a national level.
2. The creation of NGOs by the neighboring communities for the development of the adjacent areas of the National Reserve and Forest Reserve has been supported.
3. Integrated management plan for the Shimba Hills System has been elaborated on a participatory basis, officially approved and its implementation started.

Since this project has as one of its output the strengthening of the MoU (project Output 1) the concerned institutions (FD, KWS, NMK and KEFRI, especially FD and KWS) should demonstrate serious commitment to collaborate by defining a legal basis (legally binding commitments) of the MoU and the means by which such an arrangement can be sustained in the long run. This may be the first significant step towards achieving integrated forest/wildlife resources management.

(iii) Kenya-Finland Forestry Program (KFFP)

KFFP is a Finnish Development Cooperation Support to the Kenya Forestry Master Plan implementation in collaboration with the Government of Kenya. The Kenya-Finland Forestry Program comprises of a number of projects:

- a. Forestry Planning Institutional Strengthening Project (atFD/HQ)
- b. Farm Forestry Project in Nakuru and Nyandarua Districts
- c. Indigenous Forest Conservation Management Project in Kakamega and Nandi Districts

### Marine and Inland Waters Strategy

Given the high ecological and economic significance of marine and inland water ecosystems in Kenya, there is great need to develop and implement appropriate measures to minimize loss of the biodiversity, and deterioration of water quality. Since 1992, Kenya Government has made concerted efforts to protect aquatic biodiversity by among other strategies developing legal and policy guidelines and promoting community participation in the management of their own environment. The Kenya Water Master Plan was initiated by government to ensure rational management of the country's water resources. The country's commitment to safeguard biodiversity, is demonstrated in the on-going process of the development of National Biodiversity Strategy and Action Plan.

### ASAL's Strategy

GOK has made progress towards implementation of CBD and the Convention on desertification by starting to resolve both legal and institutional constraints that hinder integrated biodiversity and environmental conservation and management in the country including the Asals. Some of the steps already taken by the Government include:

- The establishment of an Inter Ministerial Committee on Environment (IMCE) sub-committee on biodiversity to coordinate the implementation of the CBD and the formulation of the National Biodiversity Strategy and Action Plan;
- Prepared and adopted a National Environmental Action Plan (NEAP);
- Prepared the Environmental Management and Coordination Policy Bill;
- Prepared a Kenya Forest Master Plan and a revised forest policy and bill; and
- Prepared a new National Wildlife Policy and Bill.

The preparation of the National Biodiversity Strategy and Action Plan which is in progress will be a further milestone. It is expected to be ready by the end of 1998.

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## **VI. COLLABORATION AND PARTNERSHIP**

### International Collaboration

Kenya became a signatory to the Convention on Biological Diversity at the time of the United Nations Conference on Environment and Development on 1<sup>st</sup> June, 1992. It ratified it on the 26<sup>th</sup> July, 1994 and participated in the First Conference of the Parties (COP) to the Biodiversity that took place in Nassau, Bahamas on 28<sup>th</sup> November to 9<sup>th</sup> December 1994 and in subsequent COP's.

Provision stipulating specific commitments towards achieving these goals are covered in 42 legally binding articles spanning a broad range of areas. Such areas include measures for conservation and sustainable use of biodiversity, financing arrangements, access to genetic resources, transfer of technologies derived from these resources and biosafety related to genetically modified organisms.

Agenda 21, articulates the importance of institutional development and capacity building for effective biodiversity management. It also stresses the importance of institutional coordination within the framework for the convention on biological diversity.

Kenya has articulated a policy on regional cooperation. There are many projects funded by various donors. In particular there are several Global Environmental Facility (GEF) projects on biodiversity which include among others:

- Institutional Support for the Protection of East African Biodiversity" funded through UNDP and executed by FAO, the project started in October 1992 and ended in 1996
- Lake Victoria Environmental Management programme involving Kenya, Uganda and Tanzania.
- Assistance in Building Biodiversity Data Management Capacity and Networking Biodiversity Information in Kenya (BDM) scheduled to end in April 1998
- Reducing Biodiversity Loss at Cross Border Sites
- Support for conservation and local communities in Tana River District
- Several small projects funded by the GEF small grants programme.

A major goal of some of the projects is integrated activity between institutions at both national and regional levels. While most activities are national in nature, the merits of developing and maintaining strong regional ties, through some integration of training and research activity, have been recognized.

The Kenya National Environment Action Plan (NEAP) stresses the need for enhanced collaboration and partnerships. In Kenya, environment and biodiversity concerns and capabilities have been located at the district administration level. This brings environmental capabilities closer to the implementation level. It allows environmental planning to take place close to where local knowledge is available.

### *FAO Global System*

Kenya is a member of the FAO commission and is also signatory of the FAO undertaking on plant genetic resources. Therefore Kenya has formal collaboration with FAO Global System. Kenyan institutions that deal with plant genetic resources work closely with the International Plant Genetic Resources Institute (IPGRI) whose sub-Saharan office is based in Nairobi.

Kenya is also a member of international plant protection convention under FAO.

## Agricultural Research Centres

Kenya collaborates with a number of CGIAR centres in conducting their activities. The following are the centres and areas of collaboration:

Center	Areas of collaboration
IPGRI	-Funding of multiplication and characterization activities. -Short and long term courses. -Development of international linkages. -Provision of publications. -Provision of technical and scientific advisory services
ILRI	-Short term training. -Germplasm exchange. -Germplasm collection and characterization.
ICRISAT	-Germplasm evaluation and characterization. - Germplasm exchange. -Technical personnel exchange visits
ICRAF	-Germplasm collection. -Provision of publications. -Agroforestry.
IITA	-Short term training. -Germplasm exchange.
ICARDA	-Germplasm exchange. -Short term training.
CIMMYT	-Short term training. -Germplasm exchange. -Provision of publications
CIP	-Short term training. -Germplasm exchange. -Provision of publications
IRRI	-Short term training. -Germplasm training. -Germplasm exchange. -Provision of publications
CIAT	-Short term training. -Germplasm exchange. -Provision of publications.
ISNAR	Organization of national agricultural centres

The support received from CGIAR centres is not always adequate. Areas in which their continued financial and technical assistance is particularly imperative include: training germplasm collection, evaluation, characterization and documentation. CGIAR centres should conduct workshops and conferences where progress being made in conservation of plant genetic resources could be discussed and knowledge exchanged.

In the next decade, IPGRI has the task of establishing more efficient coordination mechanisms among the global genebanks. Establishment of standardized germplasm documentation system is necessary to enhance efficient exchange of information. IPGRI should assist in establishing and strengthening national programmes to work towards curbing the high rate of genetic resources.

### Regional Research Centres

Kenya has a good relationship with Regional Research Centres and participates in several African research networks. These include Agro-forestry Research Network for Africa (AFRENA) coordinated by ICRAF; the East African Root Crops Research Network (EARRNET) coordinated by IITA; the Regional Potato and Sweet Potato Improvement Programme for Central and Eastern Africa (PRAPACE) coordinated by CIP and ICRISAT, and the East African Sorghums and millets Network coordinated by ICRISAT. In spite of the existence of these networks, the full benefits have not been realized and there is need to strengthen them for the benefit of the National Agricultural Research System.

### Regional Inter-governmental Initiatives

The only intergovernmental initiatives that Kenya is participating in is IGADD however, other inter-governmental initiatives which are at different stages of formation include ASaRECA, AMCE and SPAAR. IGAD has not been active due to heterogeneity of the member countries and the political and social turmoil that have afflicted the different countries.

### Bilateral Inter-governmental Initiatives

Kenya has got bilateral agreements with the following countries, in support of the various components of plant genetic resources: the Federal Republic of Germany, Britain, Sweden, Canada, Japan, Finland, United States of America and the Netherlands.

On forestry genetic resources work, there are plans to initiate a forestry research network in sub-saharan Africa with the assistance from FAO. There is also interest to involve CIFOR in forest research programmes in Eastern Africa.

### International Trade

The international conventions and agreements that regulate bilateral, regional and multilateral trade in plant genetic resources and which form part of Kenya's trade policy are:

- Regional trade cooperation
- EU-ACP Lome Convention
- World Trade and Environment (WTO)
- COMESA (Former PTA)

### International Organizations that affect Kenya trade policy on PGR

- International Sugar Organization
- Intergovernmental Group on Tea Organization
- International Tropical Timber Organization
- International Group on bananas
- Intergovernmental Group on oil seeds, fats and oils.

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## VII. RESOURCE AVAILABILITY

**Summary analysis of budget requirements for the implementation of strategies and action plans, and the available funds for achieving implementation.**

The following items require a budget for:

1. Survey, inventory, identification and authentication of biodiversity in the following categories of species

- Animals
  - Plants
  - Microbes
2. Research, Training, Education and public awareness
  3. Preparation and implementation of conservation management strategies and plans, e.g. ex-situ facilities :
    - Animals (Ex-situ facility and Breeding costs).
    - Plants (Cost Herbarium and Botanical Garden).
    - Microbes (microbial culture collection Centre).
  4. Monitoring of the status of Kenya species.
    - Genetic variability.
    - Threatened and rare species.
    - Biotechnology.

So far the GOK budgetary allocation for these activities is far below what would be required for the implementation of the CBD. Some of the money for these activities has come from multilateral donors like GEF, UNEP among others. The GOK contribution was minimal.

*Summary of Analysis of Manpower and skills required for implementation of the strategies and action plans, compared with the available resources.*

Although Kenya has produced a good number of scientists and wildlife managers, many more are needed to assess, manage, utilise and conserve the country's biodiversity. The number of specialists working on species and genes is inadequate to meet the country's collective needs.

Kenya requires taxonomists, especially for the lower forms of life (algae, fungi, bacteria) who will implement the strategies by carrying out detailed inventories. There is also a need to train more molecular biologists who can study the genetic variability within species. Currently, research in biological diversity (taxonomy, inventory, etc) tends to be ranked very low in the list of priorities, thereby suffering neglect.

The following skills are required for implementation of the strategies and action plans dealing with genes and species.

- Increase the number and/or make more efficient use of trained personnel in scientific and technological fields. In particular, invest in education of microbiologists and related areas of study.
- Maintain or develop programs for scientific and technical education and training of managers and professional, especially in the fields of taxonomy, conservation of biological diversity and sustainable use of biological resources. Develop training materials that are appropriate to the Kenyan situation.
- Train in biotechnology to facilitate adoption, application and development of biotechnology.

## VIII. SCHEDULE

In general Kenya has endeavoured to develop action plans and implement the decisions of COP as per the time tables proposed. However, this has not been easy due to a number of problems which include inter alia:

- There have been several bottlenecks in the flow of funds from the donor community and/or implementing agencies even when all the necessary agreements have been completed. This severely affected smooth and

*timely* implementation of projects;

- Organizational difficulties. The field of biodiversity involves very many stakeholder groups **from** every sector of society which must be involved in drawing up the action plans and their subsequent implementation. It therefore takes time to reach a consensus; and
- Heavy **financial** burdens visited on the country by Natural catastrophes e.g drought and famine, the ravages of El Nino related rains and the **influx** of refugees have affected the countries ability to follow tight work programmes.

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## (IX) MONITORING AND EVALUATION

*The status of national efforts to monitor and evaluate status and trends in Kenya's biodiversity and threats to that biodiversity.*

In general, biodiversity conservation projects should monitor ecosystems, habitats, populations, species, and genetic variability. The issue of genetic variability is frequently overlooked in monitoring, yet should be given attention. In Kenya, KWS, DRSRS, NMK and the Universities, due to the nature of their mandates, are routinely monitoring changes in ecosystems. Some baseline data on some ecosystems is already in GIS. Using the information generated permits the rapid and accurate assessment of alternative development scenarios and comparison of trends.

Monitoring and Evaluation can also be achieved by using indicator species, such as birds or mammals. The disappearance of an indicator species does not, however in every case signal a decline in the rest of the ecosystem's biodiversity. Nevertheless, indicator species may be used for monitoring biological conditions, with one or more needed for each ecosystem. In Lake Nakuru, the flamingo population is an indication of biological- chemical changes in the lake. For plants, the presence of exotic, pioneer or invasive species can be **useful** measures.

Monitoring and evaluation of biodiversity status and trends is implemented by various government institutions such as KWS, NES, Forest Department, NMK and DRSRS, private **organisations** such as AWF, ACC, SPARVS, KENGO, individuals and local communities. For example ACC has trained some local people as **parataxonomists** in Kajiado who participate in collection of species information.

Responsibilities. for monitoring, evaluation and research can be distributed at different levels, and training and technical assistance is necessary to strengthen capacity and provide coordination.

**Currently**, foreign **firms** undertaking major projects are encouraged to implement independent environmental impact assessments with an in built aspect of monitoring biodiversity trends at a later stage. **Environmental** assessment prior to project planning and subsequent monitoring can also be done by private enterprises, NGOs, research institutions and consulting firms.

Local residents can also contribute to the monitoring process. Because of the closeness of the community to nature, local people are more likely to be aware of species and habitats and can recognize changes in efforts to harvest a product, changes in habitat boundaries, disappearance of formerly common plant, animal or **funga**l species, and arrival of alien invading species.

Key targets and Indicators

Indicators

- Species richness (number per unit area, number per habitat type)
- Species threatened **with** extinction (% number)
- Endemic species (% , number)
- Species threatened with extinction (% , number)
- Species risk index
- Species with increased or stable populations
- Species. with decreasing populations
- Threatened species in protected areas.

#### 4.2 **KENYA** : FIRST NATIONAL REPORT

- Threatened species in **ex-situ** conservation.
  - Develop and use biodiversity indication **that** are meaningful, scientifically defensible, practical.
  - Identify appropriate locations to establish base monitoring sites.
  - Target monitoring programs on species and populations **that** are currently under the most stress.
  - Develop and implement **measures** to monitor ex-situ collection of biological **resources**.
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### **(X). SHARING NATIONAL EXPERIENCE**

#### *Thematic Contributions and access to national metadatabases.*

*Various thematic* databases have recently been developed by a number of **institutions**. The Biodiversity Database at NMK has data sets on plant species and animal species. At DRSRS there **are datasets** on plant and animal species. KWS has data sets on specific species like elephants and rhino, while ICIPE and NMK have data sets on insects.

The databases on microbes are few and maintained by individual researchers or departments in Universities. Currently, with funds from Microbial Strain Data Network (**MSDN**) a pilot project has **been** started at NMK to create a Database for microbial resources.

The Kenyan BDM project has developed a **metadatabase** for data on species, genes and **ecosystems**. NES is proposed as the hub for a proposed database network, which will involve all institutions and stakeholders interested in biodiversity. The Kenya Biodiversity Data Management Plan, details how information and data will be shared within and among institutions national and how that data and information will be shared **with the** international community through the Clearing House Mechanism.

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