



# Trade Notes

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This paper discusses the broad concept of biodiversity as it supports human development. First the paper defines biodiversity in the widest sense as the basis for life on earth, the context notwithstanding. Second, the paper expounds on the obvious and not so obvious relevance and importance of biodiversity to human existence development. Third, the paper discusses the status of Kenya's biodiversity, presenting numbers of species, the ecosystems in which they are found, their status and condition and effects of human activities on them. Further, the paper discusses some current efforts and strategies being employed in biodiversity conservation. In the last section, the paper presents policies and practices that support biodiversity conservation in Kenya.

## Biodiversity Conservation in Kenya

By Agnes M. Lusweti

### Definition of Biodiversity

The Encarta World English dictionary simply defines biodiversity as the range of organisms present in a particular ecological community or system. According to the Convention on Biological Diversity (CBD), the most comprehensive global framework for conservation of biodiversity, the word was coined from the words 'biology' and 'diversity' and is defined as the totality of genes, species and ecosystems. It is thus distinguished into genetic diversity, species diversity and ecosystem diversity. It also refers to the degree of variation among these life forms within a given ecosystem, biome, and on the entire planet. At species level, it is construed to include plants, animals and micro-organisms that are and form the life support system of the earth. It can be measured by the types of different species, or the genetic variations within and between them and how they interact with each other. Biodiversity is thus

widely applied in different contexts encompassing all life on earth and the contexts may overlap depending on legal, political, social, economic or cultural contexts. In this paper, biodiversity will be discussed as is relevant for conservation and its application in human development.

Biodiversity is neither uniform nor equally distributed on Earth. However, it is often used as a measure of the health of ecosystems. It is richer in the tropical countries such as Kenya, as conditions are conducive for more species to flourish and to form meaningful ecological relationships. It is lower in polar, extremely cold, dry and hot regions where conditions support less biomass and fewer life forms. Since the emergence of humans and human civilizations, biodiversity has been declining around the world. This reduction is caused primarily by human impacts, particularly the destruction of plant and animal habitats. In addition, human practices are responsible for the loss of genetic diversity within and among these species.



An emerging subset of biodiversity is referred to as Agrobiodiversity. As implied, the word has been coined from 'Agricultural' and 'biodiversity'. This is an old and widely practiced concept that exhibits spatial, temporal and scale dimensions. It is generated by human innovation, the environment and interaction among genetic resources. It encompasses all forms of life that are directly relevant to agriculture (crops and livestock) and also includes many other organisms such as soil fauna, weeds, pests and predators and their interactions in the agricultural production systems. Crop varieties and crop wild relatives predominate the discussions of Agrobiodiversity. Cultivated varieties, also abbreviated as 'cultivars' are further classified into 'modern varieties' and 'farmers' or 'traditional varieties'. The modern varieties are characterized as high yielding varieties of formal breeding available in seed outlets. On the other hand, the farmers' varieties have been selected and bred by farmers, for particular taste or traits and are exchanged locally, within range. Agrobiodiversity represents high levels of genetic diversity and is therefore the focus of crop genetic resources conservation efforts. It is safeguarded through gene banks and by farmers, breeders, forest workers, fishermen and indigenous peoples around the world.

## Relevance and Importance of Biodiversity

Biodiversity directly and indirectly affects human development even though it is rarely directly linked to the development index of human populations. According to some reports, 40% of the global market of goods and services are sustained by biodiversity. The World Commission on Forests and Sustainable Development views the continued focus on short term economic growth at the expense of longterm sustainability to be a futile exercise. This is because biodiversity underpins human development. It impacts natural processes thereby impacting human life in different ways. In deed, all people somehow depend on biodiversity components for their food, shelter and clothing. Further, biodiversity provides intangible benefits, among them: spiritual and aesthetic values, supporting knowledge systems, education, industrial raw materials and processes and innovation. Biodiversity plays a major role in human health, as it influences the environment and provides raw materials for human

and animal medicines. Therefore, biodiversity impacts human livelihoods and lifestyles. Kenya's vision 2030 hinges heavily on 3 pillars of economic, social and cultural diversity. Biodiversity has been identified as one of the important resources in attaining this vision.

Biodiversity resources and the associated processes support sectors such as energy, food, fibres, drinks, medicines, industry, fishery and agriculture on which human lives depend. Biodiversity also ensures air and water purification, pollination, seed dispersal, climate modification, soil stabilization, drought and flood control, recycling of nutrients and habitats. Biodiversity also forms the basis for national and regional tourism. A source of genetic resources, it supports the biotechnology sector. Scientists and environmentalists agree that biodiversity conservation particularly in primary forests is necessary to stem further loss of species and to avert economic downturns in tropical countries. The conservation and sustainable use of biodiversity is important to the survival of both humans and the environment.

The green revolution, that continues to happen in agriculture through biotechnology, is directly supported by biodiversity. Improvements in crop cultivars and varieties are made possible by harnessing genes from wild species and known varieties. By re-combining genes for different traits, plant and animal breeders develop new varieties for specific conditions. In deed, interbreeding crops strains with different beneficial traits has resulted in more than doubling crop production around the world in the last 50 years. Maintaining some level of crop diversity is important in wading off emerging diseases and crop pests and is instrumental in adapting to climate change. Therefore, biodiversity, the natural reservoir of genetic traits in cultivars and traditional landraces is important in improving agricultural crops and animal breeds.

Kenya mainly exploits her biodiversity through primary industry including food, tourism and ecosystem services. It supports many livelihoods and lifestyles as it provides genetic reserves and sustains ecosystems upon which the said livelihoods and lifestyles depend. There is still great potential for further application of local biodiversity through industrial processes led by further research in bioprospecting. Therefore, in addition to current applications for the use of biodiversity, Kenya has wide latitude to exploit it profitably in future.



## The Status of Biodiversity in Kenya

Kenya is a mega bio-diverse country with over 35,000 species of flora and fauna. The species diversity is dominated by insects. This diversity is served by the variable ecosystems ranging from marine, mountains, tropical, dry lands, forests and arid lands. In addition to these are some 467 inland lake and wetland habitats covering about 2.5% of the total area. Kenyan forests are endowed with a rich array of plant and animal life. Some of the species endemic to the forest habitats are found nowhere else in the world. Since species richness tends to correlate with the annual amount of rainfall, wetter forests are richer in species. Consequently, Kakamega Forest has the richest plant diversity in Kenya. However, coastal forests have more values as centers of endemism with many plant and animal species found nowhere else in the world.

Biodiversity is mainly in forests and wildlife parks and reserves. According to reports, about 10-12 percent of Kenya's land area is designated protected area and the Kenya Wildlife Services (KWS) manages about 8% of this area. 20% of the land area is under agriculture and also simultaneously supports most of the human population. The remaining 70% of the land area is mostly rangeland. In spite of these traditional land-uses, there is realization that a lot of wild species are found and may even thrive better outside designated protected areas. Also, that all management actions including the decision not to take any action can affect biodiversity at the different scales. Biodiversity conservation is fast evolving from the narrow focus on habitat preservation to integrated landscape development and management. As such, managers of these areas are currently conscious of both positive and negative impacts of their management activities on biodiversity. For example, when introducing species to an area, they consider their effects on local biodiversity since they realize that increased number of species or production is not necessarily better, particularly if it is at the expense of local biodiversity. The management objective of these areas recognizes and aims to maintain functional components of biodiversity rather than total numbers and recognizes that biodiversity has great scope. Particularly since the CBD, the active management of these protected areas continues to focus on biodiversity. For Kenya, the protection of wild lands, the integration of compatible land-uses systems and creation of protected areas will ensure biodiversity conservation.

The CBD also urges parties to put in place measures to conserve threatened species of biodiversity Ex-situ (off-site) to support biodiversity conservation. In Kenya, these facilities cater for endangered species and manage small numbers of species for posterity. Ex-situ conservation aims to maximize a species chance of survival by relocating part of the population to a less threatened location. However, even the species conserved offsite face some challenges. For instance, it is extremely difficult to re-create the environment of the original location of the species. It is challenging to move the species without causing some harm to the species and it is expensive to maintain these species off site. Some of these facilities include the National Genebank, Zoos, Arboreta, Parks and Parklands, Botanic Gardens, and the Seed Centre at the Kenya Forestry Research Institute (KEFRI) and private lands. Sources of collections for ex-situ facilities include field collection, donations, transfer and exchange materials from other research institutions or private collectors, farmers's fields and stores particularly for cultivated crops. To increase the efficiency of ex-situ conservation facilities, there is need to assure reasonable permanence of collections, support these collections with research and sound management and to increase the number of these facilities around the country.

Rapid human population growth and the subsequent forest degradation threaten biodiversity and may cause habitat fragmentation or in extreme cases, species extinction. Habitat fragmentation is the process where large continuous areas are reduced in size and divided into two or more patches. It alters habitats from a previous state of greater continuity, stability and harmony. The resultant patches or populations are eventually isolated from one another by highly modified or degraded landscape, thus disrupting populations. Many plant and animal species populations have suffered due to this, and unless urgent measures are taken to restore ecological stability, extinctions will occur. Besides, converting former wild lands to human settlements mining, lumbering and agriculture and grazing areas or other land-use affects biodiversity directly by displacing species in the landscape. Besides, converted lands are disturbed repeatedly by human activities. Biodiversity in Kenya also suffers indirect effects of agricultural management practices such as irrigation and drainage, soil erosion, and sedimentation. Further, fertilizer application, weed and pest control all result in elevated nutrient and pollutant discharges into the environment. Biopiracy and poaching are



also challenges facing biodiversity in Kenya. Since all land-use management actions affect biodiversity, they should be employed cautiously and their effects, if not yet understood, be anticipated and studied to support decision-making.

## Conservation Efforts and Strategies in Kenya

Kenya is putting in place interventions to tackle biodiversity loss. They range from environmental policies and legislation, community involvement, national biodiversity assessment and documentation, sustainable management and conservation of biodiversity including fair and equitable benefit-sharing. Also, technical and scientific research support, information dissemination, and capacity-building and integrated national planning for development. The efforts and strategies employed to preserve the threatened areas, human livelihoods and the threatened species and to reverse the loss of biodiversity, indirectly address challenges that result from human activities responsible for biodiversity loss and environmental change. These may also support sustainable development and protect bio-resources, their habitats and ecosystems, while simultaneously supporting bio-entrepreneurship. These are informed and reinforced by environmental impact assessments before implementation of major land-use change projects, species and habitat studies, and direct management of Kenya's biodiversity, and integrated development planning. Also, there are a few restoration projects for declining species, ruined habitats and landscapes. In the subsequent section, the paper provides some detailed discussion on specific strategies and efforts in use.

### ***In-situ* conservation efforts and strategies**

Kenya's protected area system includes National Parks, National Reserves, Sanctuaries, Marine Reserves And Forest Reserves managed in-situ by the Kenya Wildlife Service or Kenya Forest Service or conjointly with communities. Their primary goal is to protect wildlife as defined in the broadest sense by the proposed Wildlife Bill 2009. In addition, there are private ranches in marginal areas such as Samburu and Laikipia counties, licensed to ranch wildlife. The protected areas support biodiversity conservation ranging from protection of single species such as the white rhino to full scale biodiversity protection programmes. Marine reserves are spaces either in the sea or inland water bodies in

which fishing is banned or restricted, to protect plants, animals and habitats, ultimately conserving biodiversity. Protected areas, reserves and ranches also serve as facilities for education, recreation and tourism. These areas also provide populations that support restoration efforts.

### ***Ex-Situ* Conservation Efforts and Strategies**

Ex-situ conservation facilities in Kenya are mainly for plant species conservation. The National Genebank undertakes ex-situ conservation of cultivated species and wild species of economic value such as medicinal plants and wild relatives of crops. The Genebank collects materials and distributes for use, research and crop improvement programmes.

The Kenya Forestry Research Institute (KEFRI) supports forestry research and also maintains ex-situ seed collections at the Seed Centre in Muguga and live plants at the Nairobi Arboretum. The Institute also manages in-situ populations of trees for seed production.

### ***Botanical and Zoological Gardens***

The Nairobi Botanic Garden at the Nairobi National Museum holds plants collections for research, education, conservation and recreation. Some public universities and schools have established or are in the process of setting up botanical gardens or arboreta to support plant conservation and plant sciences. They include Nairobi University, Moi University, Egerton University and Maseno University to mention a few. Other public or private plant collections include Mazeras botanical garden at the Coast and Brackenhurst arboretum in Limuru.

### ***Arboreta and Parks***

Urban centres and Municipalities are also served by gardens and parks. These include Nairobi City with Uhuru Gardens and Uhuru Park, Jamhuri and City Park. Kericho with Kericho Arboretum, Kakamega with Muliro gardens among others.

## Integrated Agricultural Development

Mosaics of pasturelands, cropland, woodlands and wetlands are typical of agricultural ecosystems and this patchiness benefits some wild species. Compared to extensively modified urban and suburban lands,



agricultural lands provide more suitable lands for non-domesticated species. For agricultural development, to benefit biodiversity, it is important to consider their compatibility, particularly habitat availability for species at risk as well as potential for economic damage to agriculture emanating from human-wildlife conflict. At the landscape level, agriculture best preserves biodiversity when it is incorporated as wildlife corridors or part of the matrix that connects natural areas.

## Rangeland Management

Rangelands are marginal areas dominated by grass and grass-like species, with or without interspersed woody species. In Kenya, rangelands occupy about 70% of the land area and are home to large populations of wild animals and plants. Rangelands have a high value for leisure, pastoral livelihoods and scientific studies. They present a paradox for biodiversity conservation because they are threatened and continuously changing under the influence of pastoralism and now increasingly under subsistence agriculture. Most rangeland and grazing management techniques were designed to increase and sustain livestock production by decreasing rangeland diversity, in favor of grassland communities. This approach is obviously contrary with biodiversity management and conservation but can be moderated for the benefit of biodiversity. For example, in riparian and aquatic habitats, surrounded by dry lands, ranching practices that protect water quality are applicable to habitat protection and biodiversity conservation. This is achieved by excluding livestock through creation of buffer zones and by providing alternate water supplies. Prescribed grazing, livestock exclusion and creation of paddocks are common ranching practices that support and conserve local biodiversity. Also, adhering to proper stocking rates and continuous monitoring and adjustment are beneficial to biodiversity conservation.

## Integrated Land-Use Planning

Sustainable resource use does not necessarily contradict biodiversity conservation. This is mainly because most biodiversity is higher on marginally productive land that is not ideal for agriculture. Land-use planning as proposed in the New Land Policy and the new constitution can ensure that each part of the landscape is used for those purposes for which it is best suited

including multiple use. Biodiversity can benefit if it is considered in the initial planning for the land. On protected areas and public land held in trust, including heritage sites, biodiversity conservation can be achieved by improving visitor experience, protecting natural and historic lands, heritage sites and monuments and land around them. Where it is known, land with natural and cultural values, should be acquired, available activities expanded, educational opportunities increased, outreach and interpretive programmes started, coupled with appropriate resource management. Further, there is need to adopt a landscape approach to the management of land resources and further investments on land. These can take the form of encouraging private landowners to conserve their lands and create recreational and educational opportunities. Further, by providing information and technical advice on habitat management, through incentives for similar investments or through government intervention.

## Continuing Research

Given the current state of biodiversity, there is need for longterm research at different ecological scales including monitoring to support biodiversity conservation both in-situ and ex-situ. Research that could support biodiversity conservation includes but is not limited to:

- Identification of high-priority sites for habitat monitoring based on species composition, size, human activities, water resource protection and the value of restored habitats to biodiversity and agriculture.
- Conducting site surveys and monitoring species populations.
- Identification and demarcation of key habitat areas for the protection of endangered biodiversity as well as buffer zones for stationary species like plants and or corridors for species that move about.
- Recognition of the ecological value and likely permanence of certain introduced species and habitats and incorporating these into biodiversity planning efforts.

## Specialized Programmes

These programmes are mainly centered on large, critical ecosystems or specific groups of critically endangered species. Such programmes are large scale with long-



term impacts on biodiversity conservation. Examples include the KWS programmes for biodiversity audits, fencing off wildlife parks and reserves to stem human-wildlife conflict, the Save the Mau integrated project for catchments protection, the Lake Victoria Ecosystem Management Program that addresses challenges of dwindling inland fisheries among others.

## Public Awareness

Increasing public awareness is one of the most important steps in biodiversity conservation. This can be achieved through educational programmes, incentive programmes, and voluntary programmes. Some notable initiatives include the Save the Rhino and the Lewa Marathon among others.

## The Policies and Practice That Support Biodiversity Conservation

The protection of Kenya's natural landscapes and biodiversity as well as their enhancement continues to be guided by the Environmental Management and Coordination Act (EMCA), 1993. This act stipulates that the National Environmental Management Authority-NEMA coordinates the management of biodiversity resources in Kenya. Lead institutions achieve this through the enactment of their respective acts of parliament. Under the new constitution, the current legislation if found deficient, may be strengthened by policies and guidelines developed by the National and respective County governments.

## National Practice and Policy Framework

In Kenya, there are protected areas to protect specific sites of biodiversity and cultural interest. They range in significance from international to local level, vary in scope, function and extent and may overlap. For example, Nakuru National Park is designated Ramsar Site<sup>1</sup> while most coastal Kaya forests are important cultural sites that are providing eco-tourism facilities.

<sup>1</sup> Ramsar Sites pertain to the Convention of Wetlands of International Importance which is a treaty that aims to conserve wetlands around the world. These sites are included under the Ramsar list of Wetlands of International importance

It is proposed to increase protection of important biomes not currently under the management of protected areas including forests, heritage sites, national parks, game reserves and marine parks and reserves including inland waters. In deed, one national target for biodiversity conservation in the run up to 2010 year of biodiversity was to increase the coverage of protected areas and designating sites that are important for biodiversity conservation. The strategy for forests and forest cover which in Kenya stands at about 2% is to increase it to 10% through community and on-farm forestry. Other sectors that support biodiversity assets have comparable targets.

## International Biodiversity Conservation Frameworks

Kenya ratified the Convention on Biological Diversity (CBD), the negotiated biodiversity agreement, committed to sustainable use of biodiversity. Since then, Kenya has made significant progress in putting in place the proposed measures for biodiversity use and conservation. In addition, Kenya also participates in the CBD's international programmes of work in agricultural biodiversity, dry and sub-humid lands biodiversity, forest biodiversity, inland waters biodiversity, island biodiversity, mountain biodiversity and marine and coastal biodiversity.

## Coordinated Planning and Management

Kenya needs to streamline the mostly sectarian laws enacted since independence to work for rather than against biodiversity conservation. EMCA, 1993 spells out the framework legislation that coordinates environmental management activities including biodiversity conservation, management and utilization. For example, the on-going participatory planning to develop integrated wetlands management led by the National Environment Management Authority in different parts of the country may work well for biodiversity conservation. Also, by laying much emphasis on biodiversity access and utilization through permitting, EMCA embraces the principles of using biodiversity for prosperity.



## Joint Biodiversity Management

Some initiatives for the joint management of biodiversity resources include medicinal plants networks, management of forest reserves, coastal forests and some sacred sites. Benefits from successful joint management ventures include: improved land and biodiversity management; better visitor experience in the national parks or such other areas; social development and economic opportunities and the recognition of indigenous people's rights and interests. A notable Kenyan example is the establishment of conservancies. The conservancies protect important natural places, their ecology and biodiversity, by applying science principles and smart partnerships. Their partners include local communities, businesses, multilateral institutions and not-for-profit organizations. The Laikipia district with its vast number of game ranches and conservancies is one of the few places where wildlife populations are increasing. This area has remarkable integrity of the ecosystem, large wildlife populations and many endangered animal species than anywhere else in Kenya. Laikipia's biodiversity is entirely sustained by the Laikipia community, encompassing the Laikipia Wildlife Forum (LWF), the local community initiatives, private ranches, small scale farmers, cooperatives and tourism ventures.

## Conclusion

Biodiversity and development are intricately intertwined. Biodiversity supports development and development impacts biodiversity. In fact, sustainable development is impossible when biodiversity has been compromised. Biodiversity is central to Kenya's economic development because it provides basic goods and ecosystem services. It is also integral to key development sectors among them tourism, agriculture, livestock, forestry and fishing. Further, it supports the industrial sector through the provision of raw materials. As such, effective biodiversity conservation, proposed management measures and practice must be broad based. This can be achieved through many mechanisms including: sound natural resource management and conservation of critical habitat and outdoor recreation lands. Some work needs to be done to attract significant government funding for biodiversity conservation programmes. This can be done through the public-private partnership, lobby for funding for the acquisition and development of national, county, and community parks, forests, wildlife refuges, heritage sites and open spaces particularly near urban settlements. Also important, is the permanent protection and restoration of important habitats in Kenya.



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