

# Biodiversity loss in Ghana: The human factor

S. O. BENNETT-LARTEY & H. ADU-DAPAAH

(S. O. B.-L.: *Department of Science Education, University of Education, Winneba, Ghana;*

*H. A.-D.: CSIR-Crops Research Institute, P. O. Box 3785, Kumasi, Ghana)*

## ABSTRACT

Biodiversity is the total variability observed in species of all living organisms in relation to their habitats. It deals with all microorganisms, plants and animals. Loss of biodiversity in Ghana is due to human activities and other environmental factors. The country loses a great proportion of its biodiversity, due mainly to unacceptable practices like slash and burn agriculture, surface mining, construction activities and bushfires. Various conservation measures practiced in Ghana have been discussed. These include forest reserves, botanical gardens, arboreta, gene banks, home gardens and wildlife protected areas. The educational and environmental significance of these conservation strategies have been discussed.

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## Introduction

Biodiversity is the total variability observed in species of all living organisms in relation to their habitats, and deals with all microorganisms, plant and animals (Raven, 1992). The earth's biodiversity supplies food raw materials for industry, energy and many of the traditional medicines for human beings (Zedan, 1992). Plant biodiversity is fundamental in stabilising climate change, and protection of watersheds and soils. There is, therefore, the need for concerted efforts to conserve biodiversity globally, and to ensure sustainable use at all levels with the objective of maximum utilisation for the benefit of all, now and in the future. Biodiversity constitutes the variability among all living systems from all sources, including terrestrial and aquatic (marine and fresh water), and ecological ecosystems (UN Report, 1992).

Three hierarchical categories of biodiversity that describe distinctively different aspects of living systems are genes, species and ecosystems (Raven, 1992; Tufour, 1997). Species diversity refers to the variety of organisms within a region, and is regarded as the currency of biological diversity (Tufour, 1992). Ecosystem diversity refers to the many different types of plant and animal communities and the relationships among them and their environments. Hence, biodiversity exists in a wide range of environments namely forest, savanna, desert, aquatic, soil, freshwater, marine, brackish water and mangrove swamp.

Biodiversity is being lost at a very fast rate due to human activities and other environmental factors. The various aspects of environments are being disturbed very rapidly leading to rapid loss of biodiversity. It

is, therefore, necessary to adopt measures to minimize and or control the loss of biodiversity. The significance of biodiversity in Ghana is discussed as well as the various factors leading to their loss. Some conservation strategies aimed at sustainable utilisation of biodiversity are also discussed.

#### **Significance of biodiversity**

Humans derive several benefits from biodiversity. These include food, medicines, shelter, industrial raw materials, artifacts, plants for beautification of the environment, and useful wild and domesticated animals. There are several plants known for their medicinal properties, and have been used as such by a large proportion of the population as traditional medicine, and encouraged by the World Health Organization (Raven, 1992). Several modern pharmaceuticals dispensed in the country currently contain active ingredients extracted from plants, whilst several antibiotics, including penicillin and tetracycline are derived from microorganisms.

Biotic resources also serve aesthetic, recreational, educational and tourism purposes in Ghana. Conserved biodiversity is found in several places in the country where visitors frequent for the above purposes. These facilities include botanical gardens, arboreta, forest reserves and protected areas.

Biodiversity is useful for plant and animal improvement. The genetic diversity in plants and animals is used by breeders in creating new and improved plants and animal cultivars for food and other purposes. The Council for Scientific and Industrial Research (CSIR), the universities and other research institutions have over the years released a number of improved crop varieties

for increased agricultural outputs (CSIR, 1998). Some of the varieties released by the Crops Research Institute (CSIR-CRI) include: Cowpea (Ayiyi, Asontem, Bengpla, Amantin and Adom), maize (CSIR-Golden Jubilee, CRI-Aziga, CRI-Etubi and CRI-Akposoe) released in 2007, rice (Wakatsuki, Amankwatia, CRI-Bodia and CRI-Sakai), soybean (CRI-Ahoto, CRI-Nangbaare, CRI-Bengbie and CRI-Anidaso), groundnut (CRI-Azivivi, CRI-Adepa, CRI-Nkosour, and CRI-Jenkarr), cassava (CSIR-Ampong, CSIR-Bironibankye, CSIR-Sikabankye and CSIR-Otuhia), yam (CRI-Krukrupe, CRI-Pona and CRI-MankrongPona), sweet potato (CRI-Apomden, CRI-Otoo, CRI-Hih Starch and CRI-Ogyefo), banana (Kwadubempa) and plantain (Apemhema) (CRI, 2011).

The CSIR-Savanna Agricultural Research Institute (CSIR-SARI) also released an improved sorghum variety called Kapaala, suitable for brewing beer. The Cocoa Research Institute of Ghana (CRIG) has also released a high yielding and early maturing cocoa variety named Akwakorabedi.

The livelihood of several individuals and organizations depends on revenue from biodiversity such as timber species, bamboo, chew sticks, cane and rattan among others, which are collected from the wild.

#### **Biodiversity loss in Ghana**

The total land surface area of Ghana is 238,539 km<sup>2</sup>. The area covered by inland water bodies is 11,800 km<sup>2</sup>, including 8,500 km<sup>2</sup> of the Volta lake. The total area covered by high forest zone was 82,200 km<sup>2</sup> at the beginning of the 20th century. This was 34 per cent of the land surface, whilst the remaining 156,200 km<sup>2</sup> was made up of the savanna vegetation. Currently, most of the

original vegetation cover has been removed by human activities and, thereby, destroying the environment and its biodiversity. It was estimated that only about 21,000 km<sup>2</sup> of the high forest and 9,000 km<sup>2</sup> of the savanna forest remained undisturbed by the end of the 1990's (Dwumfour, 1997). Mangabay.com reported that between 1990 and 2000 the average deforestation rate was 1.82 per cent per year, and between 2000 and 2005 the rate of change of the forest cover increased to 1.89 per cent per year. According to FAO (2010) report, Ghana's deforestation rate was 135,395 ha per year. In 2012, it was estimated that Ghana had only 1.7 million hectares of forest left (Agyemang-Badu II, 2012). The annual cost of deforestation and land degradation to the economy ran into several billions of US dollars. (Tutu, *et al.*, 1995).

#### **Causes of biodiversity loss**

*Plant introductions.* The introduction of various plant species into the country is one way by which biodiversity is lost. These introduced species replace indigenous land races, which are crops used by local farmers for long periods, in a subtle way. Farmers adopt the improved materials, either introduced from foreign countries or produced locally, which eventually replace their own local land races. Examples are the improved crops, produced by research institutions.

*Farming practice.* Several farming practices in the country cause the loss of biodiversity. These include the common slash and burn and fallow systems of cultivation practiced in the country, which tend to cause the loss of biodiversity including microorganisms. The extensive system of crop and animal husbandry, therefore, results in the

rapid loss of a large proportion of the biodiversity of the country (Dwumfour, 1997)

*Economic activities.* Several minor forest resources are gathered from the wild for the craft industry without being replaced. Examples of such resources are rattan (*Laccospermum opacum*), cane (*Calamus deerratus*) and raphia palm (*Raphia hookeri*). Other plant species which are harvested from the wild without being replaced include the common chew stick (*Garcinia* spp.), trees used in making fufu pounding pestles and mortars and several wood species used in the craft industry (Dwumfour, 1997).

*Logging.* The extraction of timber species from forests is one destructive way of treating the environment. Several parts of timber, like the branches, are wasted. When the timber is felled, several species around it are destroyed. The forest floor on which the log is dragged is also left with deep trenches. In most cases, timber extracted is not replaced. This has led to the near extinction of some species like odum (*Milicia excelsa*) and *Afromorsia* sp. This has necessitated the banning of export of these species in log form (Tufour, 1997).

*Mining.* Mining, especially surface mining usually referred to as 'galamsey,' causes a great deal of destruction to the environment and the biodiversity in it. Large tracts of land and organisms are destroyed during excavation. In addition, water bodies are polluted in the process with mud and chemicals like mercury, cyanide and arsenic which are used in mining. Rivers are, therefore, unsafe for drinking by humans and livestock. Fishes in rivers and other water bodies end up being killed by these chemicals. In recent years, surface mining has been a great menace due to the enormous environmental

degradation it brings in its wake (Bennett-Lartey & Boateng, 2004).

*Charcoal burning.* Charcoal burning is one activity which is depleting our woodlands, both in the forest and savanna zones, of so much wood that the end result is alarming. Most of the charco used in urban and metropolitan areas of the country are produced in the savanna areas of the Brong Ahafo, Ashanti, Northern, Upper East and Upper West regions. Some amount of charcoal is also produced in the Afram Plains of the Eastern Region and the forest zone of the West Region. Ghana is losing much tree cover through this activity (*Guuroh.com*).

*Construction activities.* Several construction projects carried out for development have led to the destruction of the environment and biodiversity. Some of these projects are roads, dams, and human settlements. Soil excavation during these projects causes the loss of several living organisms, some of which may be endangered. The spilling of water and the flooding which follow construction of dams cause extensive destruction and extinction of several species (Bennett-Lartey & Boateng, 2004).

*Bush burning.* Bushfires have become an annual occurrence throughout the country and pose a great threat to biodiversity. Their devastating nature is destroying the vegetative cover of woodlands and turning it into grassland, together with both flora and fauna living in it. In the history of Ghana, bushfires of March 1983 resulted in the destruction of farms throughout the country, and caused one of the greatest famines in the country in recent times (Acheampong, 1992; Bennett-Lartey & Boateng, 2004).

### **Environmental consequences of human activities on biodiversity**

Due to human activities and several others, the vegetative cover, as well as animal populations have been depleted. Similarly, several water bodies like rivers, lakes and lagoons have been heavily polluted resulting in loss of biodiversity. Very good examples are the Odaw river and Korle lagoon in Accra which used to support tilapia and other species of fish, but are now “dead” and cannot support any fish life.

The depletion of the vegetation, especially, wood from the forests has dire consequences on the environment. This has resulted in low amount of rainfall in several parts of the country and long periods of drought, especially in the northern parts of the country (Bennett-Lartey & Boateng, 2004). The removal of tree cover in several areas has also removed the wind-break effect these trees provided and, thereby, causing very devastating rainstorms. These rainstorms usually result in enormous destruction of human habitation including loss of human life.

Due to human activities like farming and logging along the banks of water bodies, these water bodies are silting up and, therefore, drying up. Recently it has been observed that Lake Bosomtwe in the Ashanti Region and the Akosombo Lake are silting up and need dredging and other remedial measures. Tress have to be planted along the banks of these water bodies to reduce the rate of drying up.

### **Biodiversity conservation strategies**

There are several conservation strategies practiced in the country which could ameliorate some of the harmful effects of envi-

ronmental degradation and, thereby, preserve biodiversity for now and the future. The following are some strategies in use in the country:

*Forest reserves.* The Forest Department manages 280 forest reserves covering 26,700 km<sup>2</sup> (11%) of land of the country. The Wildlife Department also manages 22 protected areas which extend over 13,489.6 km<sup>2</sup> representing 5.7 per cent of land (Adu-Nsiah, 1997; Gyima, 1997). The reserves contain many useful plant life forms which may be used in diverse ways. These include shea butter trees (*Vitellaria paradoxa*), dawadawa (*Parkia biglobosa*), spice plant like calabash nutmeg (*Monodora myristica*), Ethiopian pepper (*Xylopia aethiopica*) and fruits like African star apple (*Chrysophyllum albidum*).

Rear timber and other plant species which are scarce in the open forest are preserved in the forest reserves. Some of these rare timber species are Odum (*Millicia excelsa*), species used in the craft industry like rattan, cane, raphia and chew sticks (Dwumfour, 1997). Forest reserves (such as the Kakum) are used for recreational, aesthetic, educational purposes and as tourist destinations.

However, despite their importance as repository for biodiversity, forest reserves in Ghana have been heavily encroached upon and, therefore, lost some of their rich biodiversity.

*Protected areas.* The Ghana Wildlife Department has an estate of 18 terrestrial sites and five coastal wetlands or RANSAR sites as protected areas for conservation of the biological resources of the country (Adu-Nsiah, 1997). These sites comprise seven national parks, six resource reserves, one strict nature reserve and four wildlife sanctuaries.

The primary objectives of the protected sites include the preservation of representative viable samples of natural ecosystems in Ghana, and the provision of facilities for research, education, recreation and tourism (Adu-Nsiah, 1997). In addition to these state managed protected areas, large numbers of traditionally managed sacred groves and burial groves exist throughout the country, located in such places as Malshegu and Tali in the Northern Region and Akim Bansa in the Eastern Region (Bennett-Lartey & Boateng, 2004). The sacred groves contain timber species, medicinal plants and other useful plants including edible wild fruits and yams.

*Botanical and zoological gardens.* Botanical and zoological gardens are *ex situ* facilities for the conservation of plant and animal biodiversity, respectively, assembled away from their original sources and intended to be rich sources of diversity (Bennett-Lartey & Boateng, 2004). Typical botanical gardens in Ghana are located at Aburi, the University of Ghana, Legon, the University of Cape Coast and Kwame Nkrumah University of Science and Technology. For worldwide biodiversity conservation, there are other world-renowned botanical gardens like the Kew Gardens in England, Berlin Gardens in Germany, New York Botanic Garden and Missouri Botanic Garden both in the USA, which contain several plant species from all over the world including Ghana (Bennett-Lartey & Boateng, 2004). Similarly, zoological gardens are found all over the world, including Kumasi, Ghana. A wide variety of animal species are preserved in these gardens. Zoological gardens are useful for educational, recreational and tourism purposes.



*Arboreta.* An arboretum is an area for the conservation of tree species, medicinal plants and other non-timber forest species (Bennett-Lartey, 1997). The arboreta at the CSIR-Plant Genetic Research Institute (CSIR-PGRRRI) at Bunso, and the Centre for Scientific Research into Plant Medicine (CSRPM) at Akwapim Mampong, Ayikuma and Begoro contain timber species and many medicinal plant such as *Khaya anthotica* and *Paullinia pinnata* (Bennett-Lartey and Boateng *et al.*, 2004). CSIR-Forestry Research Institute (CSIR-FORIG) also has several arboreta of which the ones at Bobiri and Fumesua are the most functional. Arboreta are usually educational, recreational and tourist destinations.

*Gene banks.* A gene bank is a facility used in conserving the biodiversity of a country (Bennett-Lartey & Boateng, 2004). Various plant species, including food crops, industrial crops, ornamental plants, timber species, and medicinal plants are conserved in a gene bank. The national gene bank of Ghana is the CSIR-PGRRRI at Bunso. The three main methods used in conserving biodiversity at the Ghana gene bank are: The storage of seeds at -20 °C, conservation of living plants in fields, seed gardens and an arboretum, and preserving lining plant *in vitro* (in glass).

*Home gardens.* A home garden is a garden found around homesteads and contains food crops, fruit trees, vegetable crops, medicinal and other useful plants and domestic animals (Bennett-Lartey *et al.*, 2001; Bennett-Lartey *et al.*, 2004). Plants which are conserved in home gardens are mainly food crops and medicinal plants. However, other useful plants like ornamentals (decorative plants, shade trees and plants for fencing),

and industrial crops and domestic animals can also be found in home gardens. Home gardens are sources of plant diversity. They are important self-sustaining agro-ecosystems with dual functions of production and on-farm conservation (Bennett-Lartey *et al.*, 2004). Home gardening involves the management of biodiversity on the same unit of land, or combinations of multipurpose trees, shrubs, annual and perennial crops, herbs, spices, medicinal plants, fish ponds and domestic animals. Home gardens are widespread in Ghana, and can be found in both urban and rural areas. They play a great role in the conservation of biodiversity in Ghana.

### Conclusion

Biodiversity is very essential as a source of food, medicine, timber, non-timber forest resources, economic plants and animals and other resources from which humans derive their source of livelihood. However, biodiversity has been so abused by humans and their activities that they are threatened with extinction. It is only through conservation and sustainable use that these resources can survive for the future. This can be done through sustained education, awareness creation and effective conservation strategies, which will tend to reduce the harmful human activities that degrade the environment and lead to loss of biodiversity.

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