

BIODIVERSITY –ITS VALUES AND IMPORTANCE

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INTRODUCTION

Life originated on earth almost 3.6 billion years ago and nature more than one billion years to develop this wide and complex spectrum of life on earth. Scientists believe that the total number of species on earth is in between 10-80 million (Wilson, 1988) of which 1.4 million species have been enlisted so far. Of these, there are 3, 60,000 microbes, 3, 00,000 flowering plants, 8, 00,000 insects and 4, 00,000 vertebrates. However, we are losing this heritage of millions of years at a very fast rate. The reduction in diversity in life forms is bound to have grave consequences for the entire living world. It has become extremely important to study the various life forms on earth and causes of their destruction. Biodiversity is the total variety of life on our planet. The total number of races, varieties or species i.e., the sum total of various types of microbes, plants and animals present in a system is referred to as biodiversity.

CONCEPT BIODIVERSITY

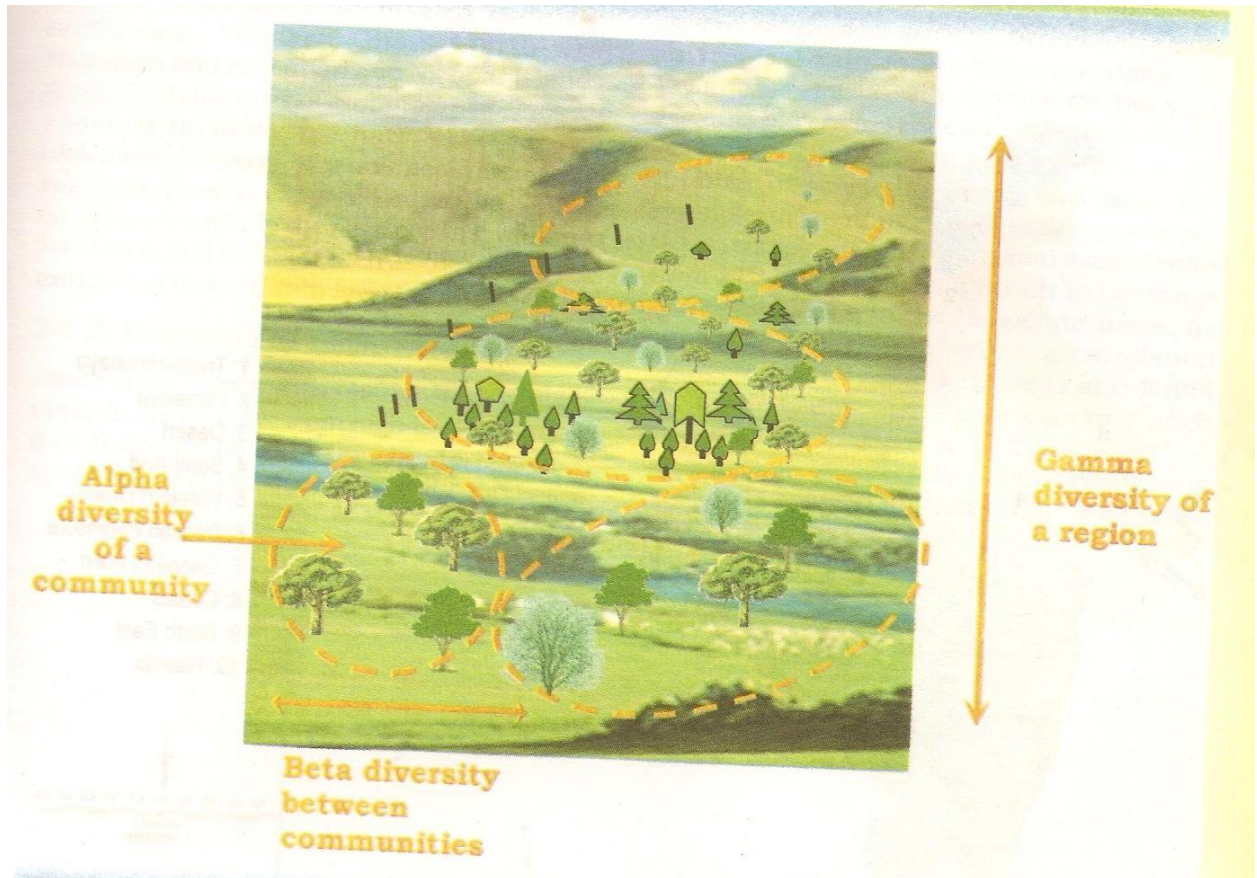
'Biodiversity' is a contraction of 'Biological diversity' and came into common usage following the signing in 1992 of the Convention on Biological Diversity at the United Nations Conference on Environment & Development held in Rio de Janeiro, Brazil. The convention defined biodiversity as 'the variability of all life forms from all sources and ecological complexes of which they are a part. This includes diversity within species, between species and of ecosystems'. The term biodiversity was coined by Walter and Rosen (1985).

LEVELS OF BIODIVERSITY

It is usually studied at three different levels: species diversity, genetic diversity, and ecosystem diversity.

1. Species diversity:

- i. It refers to the variety of species within a region.
- ii. This diversity could be measured on the basis of number of species in a region. It actually refers to a). Species richness: the total number of species in a site or habitat, b). Species evenness: the relative abundance of species, c). Species dominance: the most abundant species.
- iii. Species diversity, again, is studied at three levels: a). alpha diversity (number of species coexisting at a site), b). beta diversity (differences in species complement between patches), c). gamma diversity (number of species in a large area, e.g., a country).



2. Genetic Diversity:

- i. Within a species there are a number of subspecies, varieties (subspecies and varieties are recognizable morphological variations within a species), forms (form is generally used to recognize and describe sporadic variations in a single morphological feature) or strains which slightly differ from each other. These differences are due to slight variations in their genetic organization. This diversity in the genetic make up of a species is referred to as genetic diversity.
- ii. A species with a large number of varieties or strains is considered to be rich and diverse in its genetic organization.
- iii. Genetic variations arise in individuals of a species by gene or chromosomal mutations. Genetic variations can be measured by different recent techniques such as allozyme analysis, DNA fingerprinting, PCR, restriction site mapping and DNA sequencing.

3. Ecosystem diversity:

- i. It relates to the variety of habitats, biotic communities, and ecological processes in the biosphere, as well as the tremendous diversity within ecosystem in terms of habitat differences and the variety of ecological processes. Ecosystem cycle nutrients (from production to consumption to decomposition), water, oxygen, methane, and CO₂ (thereby affecting the climate), and other chemicals such as sulphur, nitrogen, and carbon.
- ii. It is in contrast to genetic and species diversity is difficult to measure since the boundaries of the communities which constitute the various sub ecosystems are not distinct. It could best be measured if one studies the communities in various

ecological niches within the given ecosystem, each community is associated with definite complexes. These complexes are related to composition and structure of biodiversity.

BIODIVERSITY VALUES

The convention on biological diversity, signed at Rio de Janeiro by 157 nations, emphasized the values of biodiversity in the environmental, genetic, social, economic, scientific, cultural, recreational and aesthetic contexts. The values of biodiversity are:

1. Total Environmental Value (TEV):
UNEP (1995) defined this as a function of primary value and total economic value. Scientists and economists working together arrived at a surrogate evaluation of all environmental goods and services. In other words, global natural resources are more valuable than global national products.
2. Primary Value(PV):
This is defined as the value of ecosystem characteristics upon which all ecosystem functions depend (UNEP, 1995). It is called primary value because the structured ecosystem produces functions that have secondary value. The secondary value will exist as long as the ecosystem retains its health, existence, homeostasis, operation and maintenance.
3. Total Economic Value(TEV):
TEV denotes the sum total of all kinds of values attached to biodiversity minus the primary value. It is the function of use and non-use values. Total economic value by itself will underestimate the true value of ecosystem. It has to be considered along with the primary value.
4. Use Value (UV):
This represents the value arising from an actual use made of a given component of biodiversity. It is often a function of Direct and Indirect Use Values.
5. Direct Use Value (DUV):
It is defined as actual uses especially in consumption. It represents the economic values derived from direct use or interaction with a biological resource or resource system. DUV is relatively easily measured by assigning market prices.
6. Indirect Use Value (IUV):
It is defined as benefits arising from an ecosystem function. Biogeochemical cycles, photosynthesis, climate regulation, prevention of soil erosion, pollutant degradation are the phenomena which contribute indirectly to biodiversity.
7. Ethical and Aesthetic Value:

Peoples with good cultural background have deep concern for biodiversity. They derive ethical benefit from biodiversity. Ethical values differ from place to place, culture to culture, time to time and differ between different components of biodiversity. Most people react more aesthetically towards plants that are appealing, visually or otherwise. Most cultured societies have attached great value to the effect that plant and animal beauty have on human mind and emotions.

The values of biodiversity can be summarized as into two groups:

- A. ACADEMIC VALUES: these include systematic, ecology, evolution and genetics
 - B. APPLIED VALUE these include economic values such as biotechnology, industry, agriculture and aquaculture and ecological values such as biogeochemical energy fixation, Decom , Environmental , EIA ,Bio-remediation cycle etc.
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IMPORTANCE OF BIODIVERSITY

1. Biodiversity provides the natural resource.

Wood, the natural source of timber, is one of the most utilized plant products throughout the world. A number of species like cotton, jute, coconut, hemp, sisal, linen etc yield fibres of great value for cloth and other industrial purposes. Plants are very efficient resources of renewable energy, good source of fuel. Microbes are of immense importance in the pharmaceutical industry. Bacteria and Cyanobacteria are highly useful in the agriculture industry.

2. Biodiversity provides the genetic resource.

Due to drastic global climate change it is urgent need to protect genetic resources of food plants to maintain crop productivity in different climatic conditions. There are many instances when useful genes in wild species or in old traditional varieties were used to improve the strains we cultivate today.

3. Biodiversity maintains a stable ecosystem.

Biodiversity is essential for the maintenance and sustainable utilization of goods and services from ecological systems, as well as from the individual species. These services include maintenance of gaseous composition of the atmosphere, climate control by forests and oceanic systems, natural pest control, pollination of plants by insects and birds, formation and protection of soil, conservation and purification of water and nutrient cycling etc. Biodiversity ensures optimum utilization and conservation of abiotic resources in an ecosystem.

4. Biodiversity provides source of food

All of our food comes from many wild plants. Myers estimates that as many as 80,000 edible wild plant species could be utilized by man for food, medicine and other valuable products. Mangosteens from Indonesia have been called the world's best-tasting fruit, but they are

practically unknown beyond the tropical countries where they grow naturally. They may be thousands of other traditional crops and world food resources that could be equally valuable but are threatened by extinction.



Fig. Mangosteens

5. Biodiversity provides source of improved varieties.

Biodiversity is of use to modern agriculture in three ways: as a source of new crops, as a source of material for breeding improved varieties, and as a source of new biodegradable pesticides.

6. Biodiversity provides source of drugs and medicines.

Living organisms provide us with many useful drugs and medicines. More than half of all prescriptions contain some natural products. Currently, 25% of the drugs in the pharmacy are derived from a mere 120 species of plant. The plant and animal derived substances developed into valuable drugs are:

Product	Source	Use
Penicillin	Fungus	Antibiotic
Bacitracin	Bacterium	Antibiotic
Tetracycline	Bacterium	Antibiotic
Erythromycin	Bacterium	Antibiotic
Quinine	Chincona bark	Malaria treatment
cytarabine	Sponge	Leukemia cure
Bee venom	Bee	Arthritis relief
Allantoin	Blowfly larva	Wound healer
Reserpine	Rauwolfia	Hypertension drug
Vinblastine	Periwinkle plant	Anticancer drug

7. Biodiversity provides aesthetic and cultural benefits.

Millions of people enjoy hunting, fishing, camping, hiking, wildlife watching and other nature based activities. These contribute more money to nation each year. Today, we continue to recognize plants and animals as symbols on national pride and cultural heritage.

Conclusion

Lastly I would like to mention that we must create awareness about the crucial importance of biodiversity to society. We must communicate the message of human costs of biodiversity loss and to enthuse people, particularly youth, throughout our society in the fight to protect all life on earth.

References

Myers, N. 1988. Global biodiversity priorities and expanded conservation policies. In: Conservation in a changing world, pp 273-285, Cambridge University Press.

Ghosh, A.K. and Bhoumick, T. 2001. Biodiversity, Biosafety and Bioethics. In. ASC working paper, pp 1-3, Dept. of Chem.Eng, J.U.

Wilson, E. O. 1988. The current state of biological diversity. In: Biodiversity, pp. 3-18, National Academy Press. Washington.

DR. Zoology, PKC Contai