

Biodiversity



Biodiversity

What does “Bio” mean?

Bio = 

What does “Diversity” mean?

Diversity = Variety

What is biodiversity?

- Biodiversity: “variability among living organisms”
- Variety and variability of genus, species and ecosystem between and within
- *Number of different organisms & their relative frequency in an ecosystem*
- Assemblage of different life forms
- Term coined by Walter Rosen, 1985

What is biodiversity?

- About 50 million sps. of plants, animals & microbes are existing in the world
- Among that only 2 million are identified so far

✓ A wide variety of living organisms including plants, animals and micro-organisms with whom we share this planet earth makes the world a beautiful place to live in.

✓ Living organisms exist almost everywhere from mountain peaks to the ocean depths; from deserts to the rainforests.

✓ They vary in their habit and behaviour, shapes, sizes and colour.
✓ The remarkable diversity of living organisms form an inseparable and significant parts of our planet
✓ however, the ever increasing human population is posing serious threats to bio-diversity.



CONCEPT AND TYPES OF BIODIVERSITY

- Biodiversity is the variety of life forms on earth and the essential interdependence of all living things.
- According to IUCN in 1998, “the variety and variability of species of their population, the variety of species of their life forms, the diversity of the complex association with species with their interaction and their ecological process which influences perform.”
* Biodiversity increases the stability of an ecosystem and contributes to the health of the biosphere.

Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play.

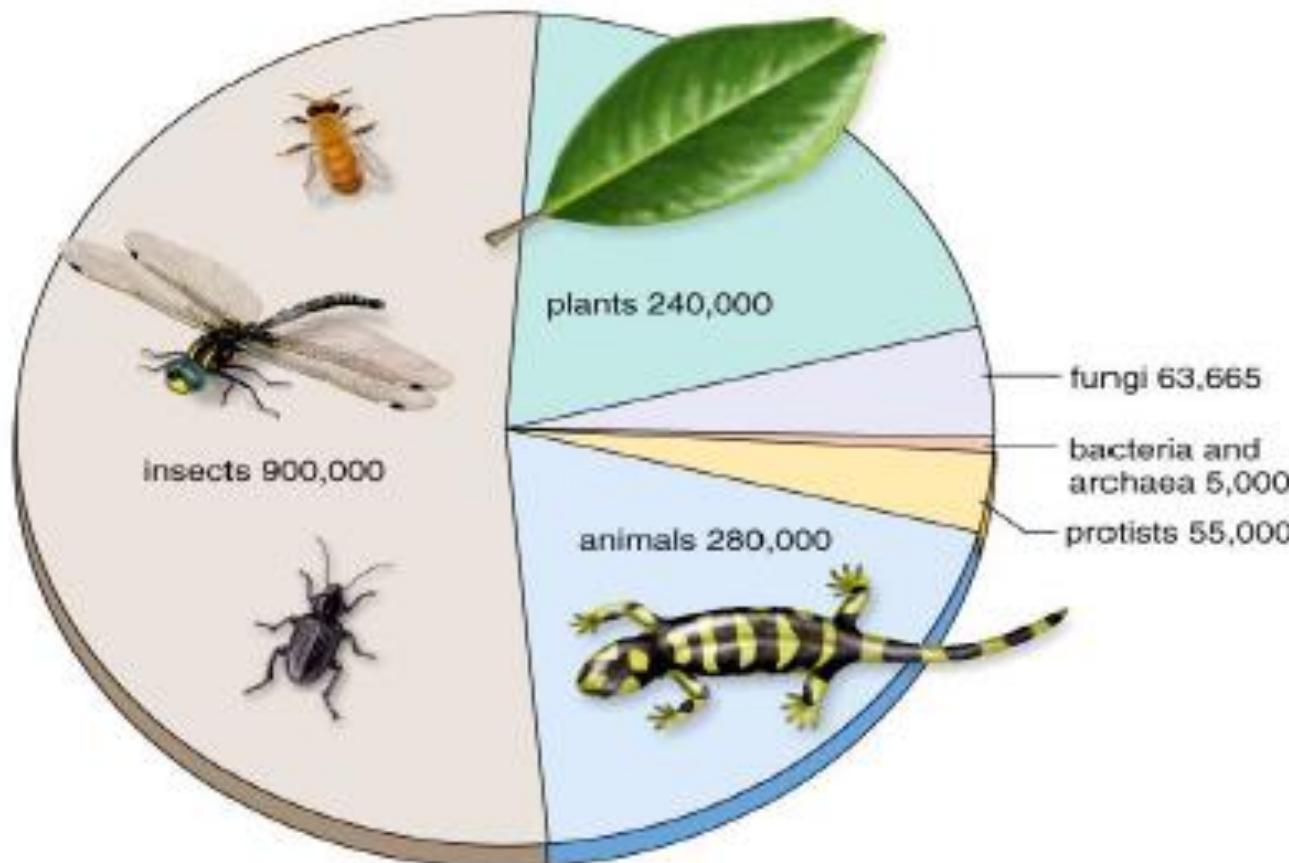
For example, A larger number of plant species means a greater variety of crops. Greater species diversity ensures natural sustainability for all life forms.

The word biodiversity itself was coined by W. G. Rosen in 1985

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This slide is just for your information

Biodiversity of the Earth



***There are 3 components of biodiversity:**

Genetic
Diversity

Species
Diversity

Ecosystem
Diversity

Genetic Diversity

1. ***Genetic Diversity- the variety of genes or inheritable characteristics present in a population**

- ★ It describes the variation in the number and types of genes as well as chromosomes present in different species. The magnitude of variation in genes of a species increases with increase in size and environmental parameters of the habitat.
- ★ The genetic variation arises by gene and chromosome mutation in individuals and in sexually reproducing organisms and it is spread in the population by recombination of genetic materials during cell division after sexual reproduction.
- ⇒ It is important for agricultural productivity and development.

No need to memorize line by line, but go through it twice

Chihuahuas, beagles, and Rottweiler's are all dogs—but they're not the same because their genes are different.



Chihuahua



Beagle



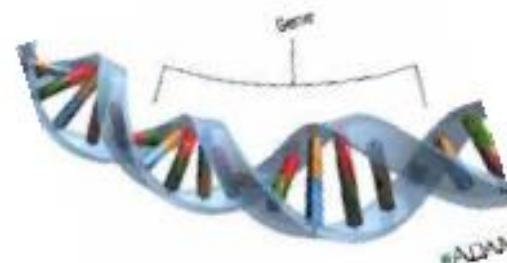
Rottweilers



Genetic Diversity
within the humans



diversity found
in native
chickens



Genetic diversity in the
bambara
groundnut

Species Diversity

2. ***Species Diversity**- the number of different species and the relative abundance of each species in a biological community. It describes the variety in the number and richness of the species within a region. The species richness may be defined as the number of species per unit area.

For example, monkeys, dragonflies, and meadow beauties are all different species in the same community.

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Saki Monkey



Golden Skimmer



Meadow Beauty



Sample Area A



Sample Area C



Sample Area B

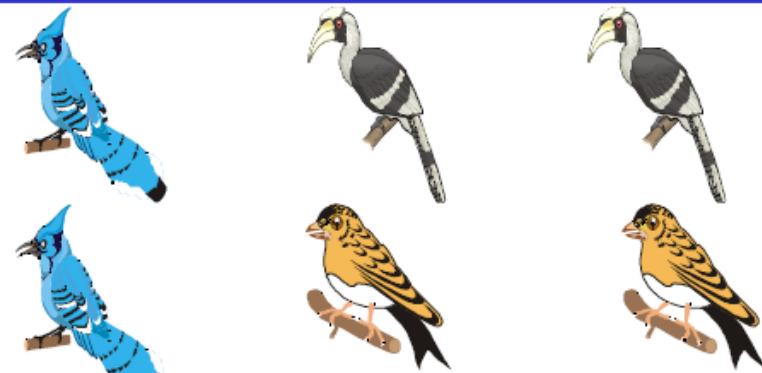
The different sample areas showing species diversity.

- Know that all the three sample areas are represented by three kinds of species. (species richness is same).
- However they vary in species abundance varying number of individuals per species and in taxonomic diversity.
- Observe that sample C has the highest species diversity as it is represented by taxonomically unrelated species}

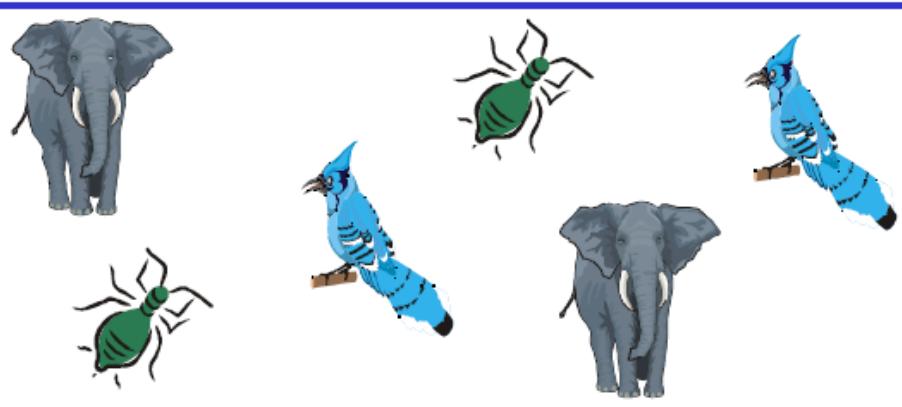
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Sample area 1



Sample area 2



Sample area 3

- The different sample areas showing species richness (sample area 1),
- species evenness (sample area 2) and
- diversity due to unrelated species (sample area 3).

No need to memorize line by line, this slide is for your understanding

- At the global level, an estimated 1.7 million species of living organisms have been described to date and many more are yet to be discovered.
- The overall richness of species is concentrated in equatorial regions and tends to decrease as one moves from equatorial to polar regions.
- In addition, biodiversity in land ecosystems generally decreases with increasing altitude.
- In marine ecosystems, species richness tends to be much higher in continental shelves.
- India is a country of vast diversity and it is among the 12 “mega-diversity” countries in the world.

No need to memorize line by line, but go through it twice

3. Ecosystem Diversity

3. Ecosystem Diversity- the variety of ecosystems that are present in the biosphere. Grass lands, deserts, mountains

- ⇒ It describes the assemblage and interaction of species living together and the physical environment a given area.
- ⇒ It relates varieties of habitats, biotic communities ecological processes in biosphere.
- ⇒ It also tells about the diversity within the ecosystem. It is referred as Land escape diversity because it includes placement and size of various ecosystems.



Paines Prairie



Rain Forest



Sand hill Pond

• 3. Ecosystem diversity

- It refers to the presence of different types of ecosystems.
- For instance, the tropical south India with rich species diversity will have altogether different structure compared to the desert ecosystem which has far less number of plant and animal species.
- Likewise, the marine ecosystem although has many types of fishes, yet it differs from the freshwater ecosystem of rivers and lakes in terms of its characteristics.
- So such variations at ecosystem level are termed as *ecosystem diversity*.
- *India has very diverse terrestrial and aquatic ecosystems ranging from ice-capped Himalayas to deserts, from arid scrub to grassland to wetlands and tropical rainforests, from coral reefs to the deep sea.*
- *Each of these comprises a great variety of habitats and interactions between and within biotic and abiotic components.*
- *The most diversity-rich are western-ghats and the north-eastern region.*

No need to memorize line by line, but go through it twice

The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions.

Such type of diversity can generate more productive and stable ecosystems or communities capable of tolerating various types of stresses e.g. drought, flood etc.



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According to Whittaker (1965), the community diversities are of three types:

Measuring biodiversity:

- At simplest level: biodiversity is the **species richness**
- Various levels of measuring the biodiversity are:
 1. *Alpha diversity*
 2. *Beta diversity*
 3. *Gamma diversity*

(i) α -Diversity:

It tells the species diversity in a given community.

It depends upon species richness and evenness.

(ii) β -Diversity:

It describes a range of communities due to replacement of species which arises due to the presence of different microhabitats, niches and environmental conditions.

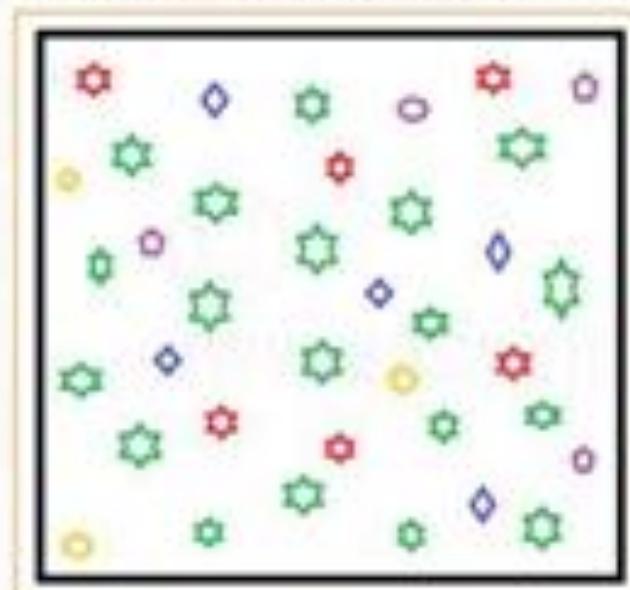
(iii) γ -Diversity:

It describes diversity of habitat over a total land escape or geographical area.

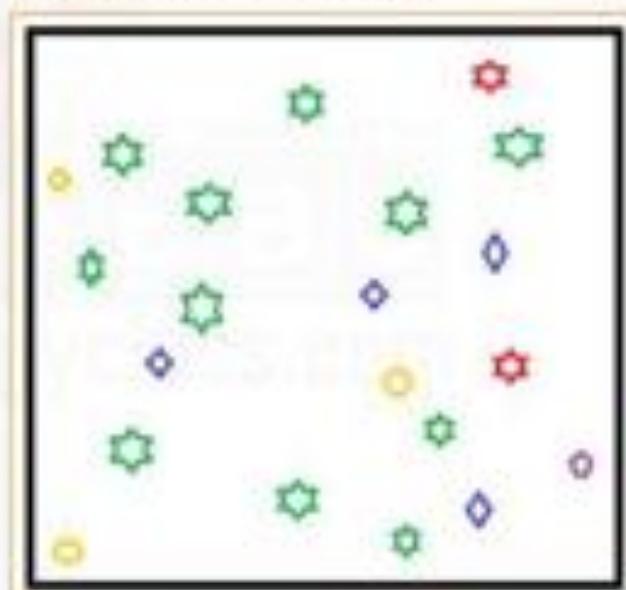
Measuring biodiversity:

1. Alpha diversity:

- Refers to **number of species** in a single community
- It is better called as species richness
- Used to **compare number of species** in different communities



Community I



Community II

Measuring biodiversity:

2. Beta diversity:

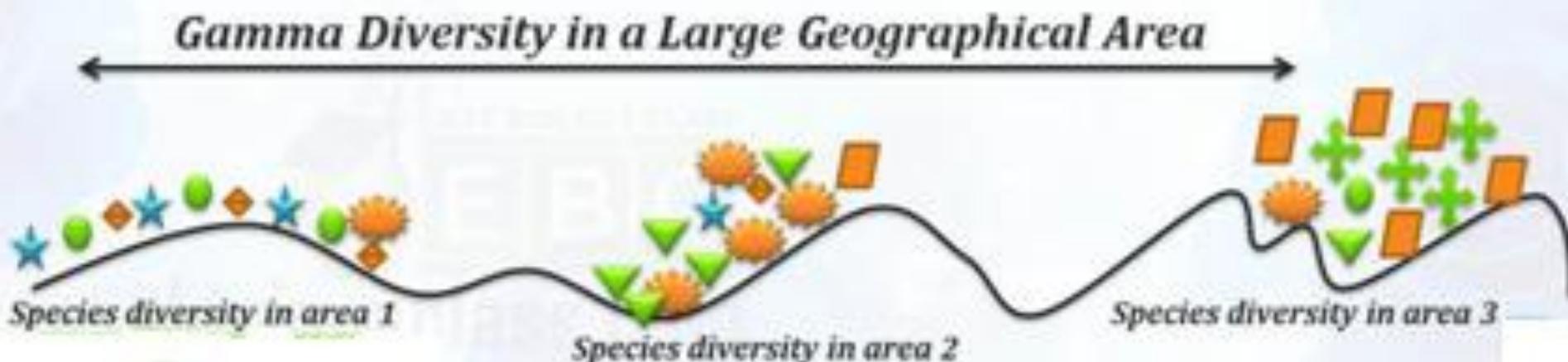
- Degree of **change in species composition** along an environmental gradient
- *Example:* Beta diversity is high, if the species composition of moss communities changes successively at higher elevations on a mountain slope
- Beta diversity is low if same species of moss occupy the whole mountain side



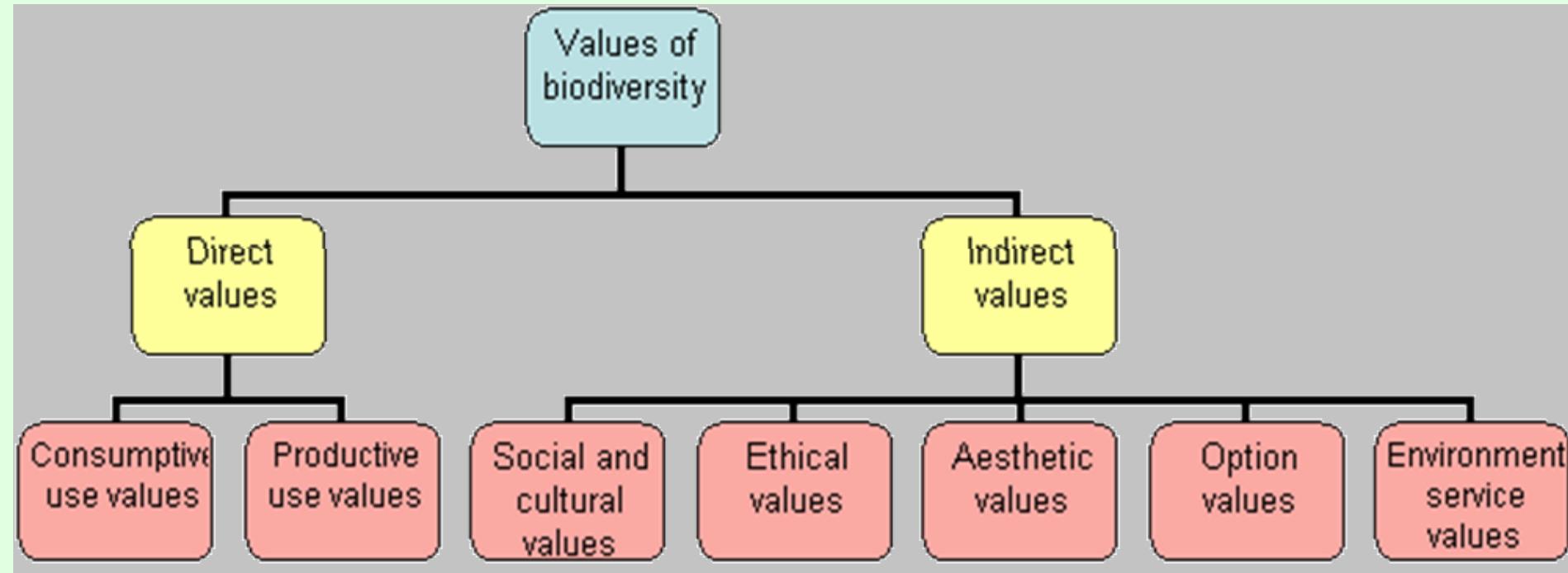
Measuring biodiversity:

3. Gamma diversity:

- Gamma diversity applies to large geographic scale
- "The rate at which additional species are encountered as geographical replacements within a habitat type in different localities"
- "Gamma diversity is a species turnover rate with distance between sites of similar habitat or with expanding geographic areas"



- ❖ *Why are there so many species?*
- ❖ *Did such great diversity exist throughout earth's history?*
- ❖ *How did this diversification come about?*
- ❖ *How and why is this diversity important to the biosphere?*
- ❖ *Would it function any differently if the diversity was much less?*
- ❖ *How do humans benefit from the diversity of life?*



- Biodiversity also provides critical indirect benefits to humans that are difficult to quantify because we have never had to put a price tag on them.
- *These benefits encompass ecosystem services , such as air and water purification, climate regulation, and the generation of moisture and oxygen.*
- *A group of ecologists who recently attempted to quantify the price of replacing these ecosystem services calculated that they would cost over \$3 trillion. That's greater than the entire global GNP!*
- *In other words, the world cannot afford to replace these services, therefore we must work to protect our ecosystems.*
- Natural communities maintain proper gaseous concentrations in the atmosphere and prevent rapid climate changes.

No need to memorize line by line, only for your information

Uses of biodiversity:

1. Productive use:

- Products commercially harvested for exchange in market
- This value of biodiversity is concerned with national income
- Biodiversity provides: fuel, timber, fish, fodder, fruits, cereals, medicinal plants etc.
- In India, income from biodiversity is nearly 30% (736.88 billion rupees, 1994-95)

- They provide timber for house-building, ship-building, bridges, railway carriages, furniture's etc.
- They supply fire wood and charcoal for fuel in homes and in industries.
- They provide wood pulp for the paper and rayon industries.
- They provide honey for food and medicines.

Uses of biodiversity:

2. Consumptive use:

- Deals with natural products that are consumed directly
- They are goods which do not come under normal circulation of trade
- Example: non timber forest products, Honey collected from forests



Natural Beehive

At least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources.



Rubber



Vegetables

Spices



Fruits

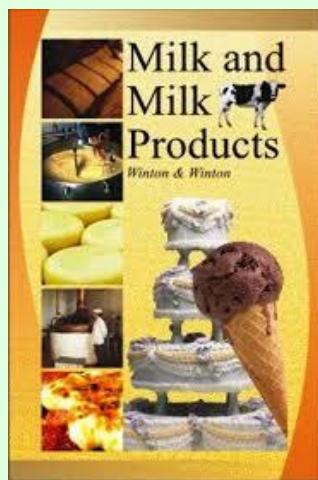
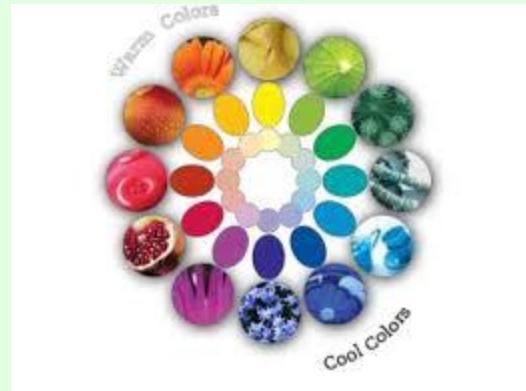


Several
types of
oils





Leather industry



Milk products

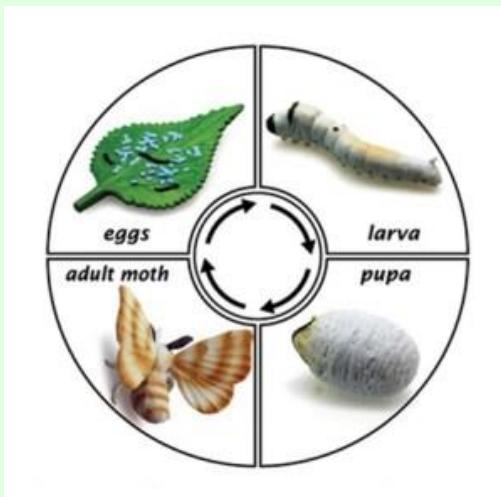


Dye industry

Textile Industry



Cotton fiber



Like wool silk is also a protein fiber

The silk worm which feeds on mulberry leaves forms a covering around it by secreting a protein like substance from salivary gland.



Linen is made from the fibre bundles in the stem of the *Flax plant*



Hemp plant

- Well known for thousands of years for making paper, canvas, cloth and building materials.
- Hemp is the strongest and most durable of all



Jute plant

WELCOME TO THE WORLD OF MEDICINAL HERBS

- ❖ Plant produce a primary metabolites and secondary metabolites.
- ❖ Primary metabolites include carbohydrate, lipids, proteins. Primary metabolites used for growth and metabolism. This can be produced by photosynthesis and cell component synthesis.
- ❖ Secondary metabolites is a natural products derived from primary metabolites.
- ❖ Plant produce a wide array of bio active molecule via secondary metabolic pathways.
- ❖ Secondary metabolites is the major source for pharmaceuticals, food additives, and pesticides.
- ❖ While some medicinal substances continue to be directly extracted from plant material, plant derived drugs can be manufactured.

Plant and plant extracts extensively used in medicines (life saving drugs)

Penicillin	⇒	Penicillium (fungi)
Tetracyclin	⇒	Actinomycetes (bacterium)
Marial drugs	⇒	Cinchona tree
Anticancer drugs	⇒	Vinblastin & Vincristine (flower of <i>Cantharanthus</i> plant)

Fuel

Fossil fuels ⇒ Coal, fossil fuel, natural gas

No need to memorize scientific names, for your information only

- Alkaloids found mainly in plants. Over 6000 different alkaloids have been extracted. They are especially abundant in flowering plants particularly LUPINS, POPPIES, TOBACCO and POTATOES. This is also used as sedative, antispasmodic, insecticide.

ALKALOID BASED DRUG

- Atropine
- Scopolamine
- Morphine



LUPINS



POPPIES



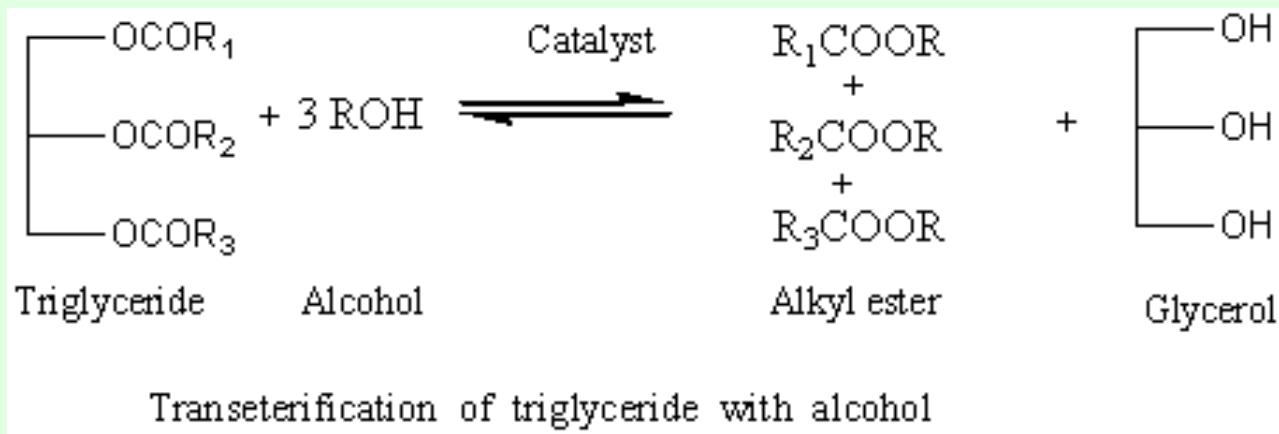
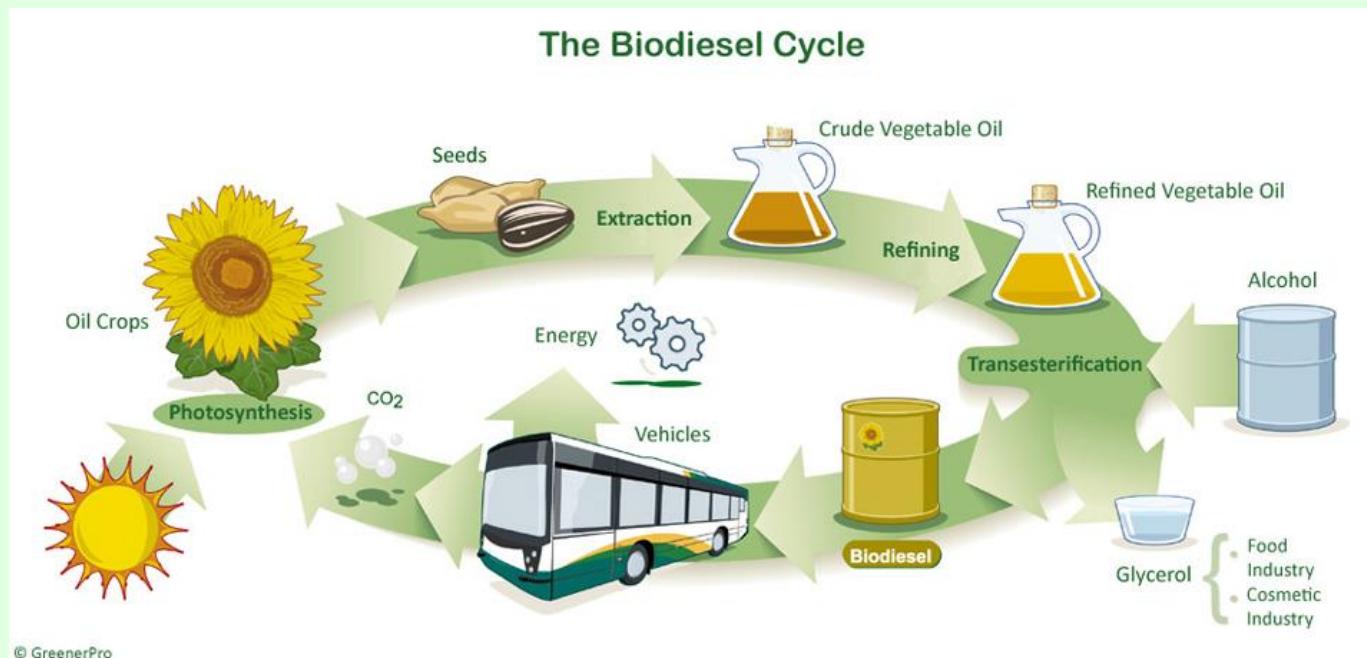
TOBACCO



POTATOES

*only
for your information*

PRODUCTION OF BIODIESEL



Biodiversity and agriculture are strongly interdependent

- Biodiversity is the origin of all species of crops and domesticated livestock and the variety within them.
- Biodiversity is the basis of agriculture. It has enabled farming systems to evolve ever since agriculture was first developed some 10,000 years ago.
- Today's crop and livestock biodiversity are the result of many thousands years of human intervention.
- Biodiversity and agriculture are strongly interrelated. Maintenance of this biodiversity is essential for the sustainable production of food and other agricultural products and the benefits these provide to humanity, including food security, nutrition and livelihoods.

No need to memorize line by line, but go through it twice

Destruction of India's environment



- 50% forest disappeared in last 200 years
- 70% waterbodies polluted or drained out
- 40% mangroves destroyed
- Some of the world's most polluted cities and coasts
- Nearly 10% wildlife threatened with extinction

No need to memorize the data, but go through it twice

The social context

- **Ecosystem-dependent people (60-70% of India's population):** food, medicine, livelihoods, fuel, shelter, clothing, culture
- **Environmental destruction** = livelihood, cultural, and physical displacement...for tens of millions of people

Only for your information



Traditional varieties, Wild species –
Ecosystem people's survival base



Pottery



Agriculture is one of the Primary Occupation

Uses of biodiversity:

3. Indirect use:

- Most significant
- This value is related primarily with **functions of ecosystem**
- Biodiversity is very essential for:
 - Ecological balance
 - Constancy of climatic features
 - Soil maintenance

The Importance of Biodiversity

*Indirect Economic Value: a healthy biosphere provides many services to humans and other organisms that live on Earth.

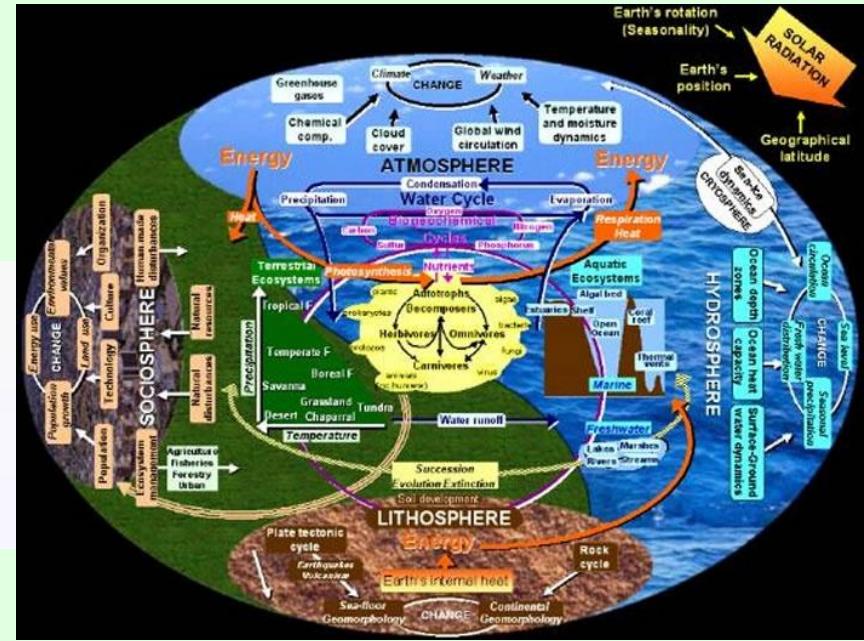
Examples:

- ⇒ Green plants provide oxygen
- ⇒ Water cycle provides clean water

- Biodiversity indicates variations of life forms (species, ecosystem, biome)
- Biodiversity indicate the **health of ecosystem**
- Biodiversity is in part a **functioning of climate**
- Biodiversity provides services like:
 - Air quality and purity
 - Climate and seasons
 - Water purification
 - Pollination and seed dispersal
 - Prevention of erosion



Deep Forest Biodiversity



Biodiversity has the following uses :

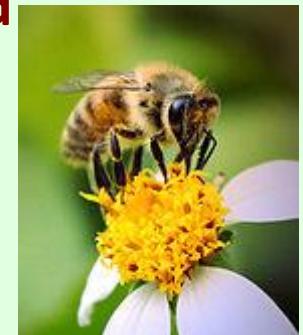
- (i) It provides food of all types.
- (ii) It provides fibers, sources for the preparation of clothes.
- (iii) It provides different types of oil seeds for the preparation of oils.
- (iv) It provides new varieties of rice, potato etc. through the process of hybridization.
- (v) It provides different drugs and medicines which are based on different plant products.
- (vi) It is very essential for natural pest control, maintenance of population of various species, pollination by insects and birds,
- (vii) For nutrient cycling,
- (viii) For conservation and purification of water,
- (ix) For formation of soil etc.

All these services together are valued 16.54 trillion dollars per year.

- Vegetation helps recycle moisture into the atmosphere.
- A single corn plant (1 lb dry weight) can transfer 60 gallons of water from soil to atmosphere in a few months.
- A single rainforest tree, in its 100 year lifespan can transfer approximately 2.5 million gallons from soil to air. Their role in the hydrologic cycle is crucial.
- A multiplicity of organisms is required to create soils and maintain fertility through complex cycles and interactions.
- Plant roots break up rock to create soil particles, small animals like earthworms, mites, insects and millipedes help give soil its texture and fertility and are crucial to its aeration.
- Even tinier soil microorganisms and fungi are responsible for cycling essential nutrients like nitrogen, phosphorus and sulfur and making them available to higher plants.
- A gram of fertile agricultural soil may contain 2.5 billion bacteria, 400 000 fungi, 50 000 algae and 30 000 protozoa. All these organisms have particular functions and interact with each other and with their physical environment to create the fertile soil that humans depend on for agricultural production.

Bees: crucial agricultural workers

“One third of all our food—fruits and vegetables—would not exist without pollinators visiting flowers. But honeybees, the primary species that fertilizes food-producing plants, have suffered dramatic declines in recent years, mostly from afflictions introduced by humans.”



Bees are vital to bio diversity. There are 130,000 plants for example for which bees are essential to pollination, from melons to pumpkins, raspberries and all kind of fruit trees — as well as animal fodder — like clover.

Indirect uses of forest.

- They stop the rain-bearing winds and cause the rainfall.
- They increase the moisture content in the atmosphere and thereby provide additional precipitation(i.e., rainfall) in the locality
- They minimize the extreme variation in climatic condition and make the climate more equable.
- They control floods during heavy rain by absorbing excess rain water.
- They prevent soil erosion by checking the force of flowing of water.
- The thick roots of the trees absorb large quantity of water thus, forest help in the flow of rivers and streams.

No need to memorize line by line, but go through it twice

Biodiversity providing lessons for scientists in engineering

As just one small example, some spiders can produce their silk with a higher tensile strength than many alloys of steel even though it is made of proteins. So biologists are looking at these processes in more depth to see if they can reproduce or enhance such capabilities.

Aesthetic value

- *Aesthetic values such as
- refreshing fragrance of the flowers,
- taste of berries,
- softness of mossed,
- melodious songs of birds, etc. compel the human beings to preserve them.
- The earth's natural beauty with its colour and hues, thick forest, and graceful beasts has inspired the human beings from their date of birth to take necessary steps for its maintenance.
- * Similarly botanical and zoological gardens are the means of biodiversity conservation and are of aesthetic values.

Only for your information

Human beings derive great enjoyment from natural environment. The shapes, structure and colour stimulate our senses. *Eco-tourism (to enjoy the aesthetic value of biodiversity)*

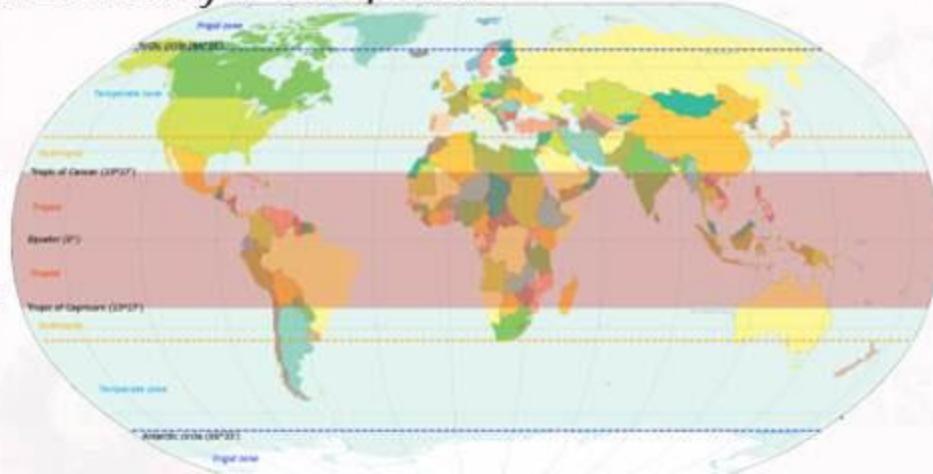


BIODIVERSITY

Why biodiversity is rich in the tropics?

- Tropical regions are rich in biodiversity than temperate region because:
 1. *Warm temperature and high humidity- favourable for most of the species*
 2. *Have more stable climate than temperate*
 3. *Tropical communities are older than temperate communities*
 4. *Thus tropical communities got more time to evolve*
 5. *Thus they have more specializations for adaptions*

Tropical Area [



Remember 2-3 points only

Why biodiversity is rich in the tropics?

- Tropical regions are rich in biodiversity than temperate region because:
 6. *In tropics there is greater pressure from pests, parasites and disease. This does not allow a single species to predominate*
 7. *Tropical areas receive more solar energy over the year than temperate*
 8. *Thus tropical communities are more productive*
 9. *Tropical soil is the most fertile soil*
 10. *Thus this soil supports a wider range of species*



Tropical Rain Forest 19

Should we be concerned about loss of biodiversity?

What we know:

The Earth is losing species at an alarming rate

- In the past 500 years, we know of approximately 1,000 species that have gone extinct

RECENT ISSUES ON BIODIVERSITY

- Some 75 per cent of the genetic diversity of crop plants been lost in the past century.
- Some scientists estimate that as many as 3 species per hour are going extinct and 20,000 extinctions occur each year.
- Roughly one-third of the world's coral reef systems have been destroyed or highly degraded.
- About 24 per cent of mammals and 12 per cent of bird species are currently considered to be globally threatened.
- More than 50 per cent of the world's wetlands have been drained, and populations of inland water and wetland species have declined by 50per cent between 1970 and 1999.

No need to memorize line by line, only for your information

THREATS TO BIODIVERSITY

Natural causes:

- Narrow geographical area
- Low population
- Low breeding rate
- Natural disasters



Anthropogenic causes:

- Habitat modification
- Overexploitation of selected species
- Innovation by exotic species



Contd.....

- **Pollution**
- **Hunting**
- **Global warming and climate change**
- **Agriculture**
- **Domino effect**

Causes of Threat

Over exploitation of selected species

Poaching :Targeting of certain selected species takes place even after legal protection , products from endangered species are traded within and between the nations.

Animals are killed for their skin, teeth, horn bones, medicinal use, research and educational purpose etc.





Poaching of wildlife



What is Poaching ?

Poaching is the hunting and harvesting wild plants or animals

Poaching is done for large profits gained by illegal sale or trade of animal parts ,meat and skin.

only for your information



Poaching is not limited to animals ,its also for plants too.....!!

only for your information

Three of the most often poached species in the park are galax ,black cahosh and ginsang.



How does poaching affect the environment ?

- *Poaching or illegal hunting causes animals endangered of being extinct. If more animals becomes extinct there's a disruption in the food chain, and that will cause major problems in our ecosystem, resulting eventually in new adaptations of animals, and or species beyond human control.*
- *Poaching results in animals being hunted too soon for them to have time to reproduce and repopulate.*

Stop Poaching.!!



Habitat loss

Reason of habitat loss :

- agriculture, farming, deforestation.
- harvesting natural resources for personal use
- for industrial and urbanization development
- Even there are natural causes also such as forest fire, volcanism, climate change etc.

Habitat destruction is currently ranked as the primary causes of species extinction world wide...!!!



Solutions :

- We should protect remaining intact section of natural habitat.
- Control on human population and control over expansion of urbanisation and industries.
- Educating the public about the importance of natural habitat and bio diversity.
- We should start planting at home itself, planting at home gardens so as to reduce need for man to have large lands for agricultural farms which lead to habitat loss.

No need to memorize line by line, but go through it twice

Man – Wildlife Conflicts

Some photographs showing the problem of man-animal conflict:



A man killed by leopard near Umarzari



A woman killed by tiger



A woman injured by wild pig



A cattle killed by tiger



Paddy crop damaged by wild pig



Sugarcane crop damaged by wild pig

Causes of Man-Animal Conflicts:

i. Habitat fragmentation and shrinking of habitat give rise to shrinking of space, food etc in the forest result in animals stray out of habitat in search of *food, water or shelter*.

This habitat fragmentation may be result of many reasons, for example, construction of roads especially *big Highways and canals passing through dense jungles and the big mines*.

Animals cannot pass these canals and roads easily and they are localized and their natural balance is disturbed.

ii. *Encroachment in the forest lands by local people* has resulted in shrinkage of wildlife habitats especially on the fringes which has increased the pressure on the limited natural resources in the forest areas.

iii. Most incidences of man-animal conflicts are noticed *during summer when water becomes scarce. The livestock and wild animals have to share the limited water sources on the fringes or inside forest but go through it twice to remember the points*



Only for your information

- The wild animals involved in these conflicts in this area are mostly Tiger, Leopard, Wild boar, Bear, Hyena, Blue bull, Chital, Sambar, Monkeys etc.
- The crops like paddy, sugarcane, banana, pulses and vegetables etc are badly damaged mostly by wild boars, deer and blue bulls in this area which raid into the crops frequently leaving the owner farmers crying and cursing.



No need to memorize line by line neither the data

- In India, wild elephants probably kill far more people than tiger, leopard or lion.
- Damage to agricultural crops and property, killing of livestock and human beings are some of the worst forms of man-animal conflict.
- Farmers sometimes poison and shoot wild animals as they damage their crops, but this can be prevented by taking certain measures

After 250 nilgai or blue bulls were shot in Bihar on 9th June, 2016 because acres of crops were being destroyed in areas where they exist in large numbers and regularly stray onto farms growing crops like wheat and pulses. is found in small patches around the villages



Ways to reduce the conflicts..!

- Training forest staff and police to tackle these situations and creating awareness among the people about the Do's and Don'ts to minimize conflicts
- construction of boundary walls and solar fences around the sensitive areas to prevent the wild animal attacks.
- Some devices of Information Technology, viz., radio collars with Very High Frequency, Global Positioning System and Satellite uplink facilities can be used to track the movements of wild animals .

Extinct Species

- *The current loss of biodiversity and the related changes in the environment are now faster than ever before in human history* and there
- is no sign of this process slowing down. Many animal and plant population have declined in numbers, geographical spread, or both.
- Species *extinction is a natural part of Earth's history. Human activity has increased the extinction rate by at least 100 times compared to the natural rate.*
- Extinct species- are plants or animals that once lived on Earth that have completely disappeared.

No need to memorize line by line,

- *The dodo was a bird endemic to the Indian Ocean island of Mauritius.*
- *It stood about a metre (3.3 feet) tall, weighing about 20 kilograms (44 lb).*
- *The dodo was first mentioned by Dutch sailors in 1598. By 1681, all dodos had been killed by hungry sailors or their domesticated animals.*
- *The extinction of the bird, within 80 years of its discovery, made people realize for the first time that humans could induce the extinction of plants and animals.--- ...<http://en.wikipedia.org/wiki/Dodo>*





Endangered Species



- An Endangered Species- is a plant or animal that is in danger of becoming extinct.
- <http://www.fws.gov/endangered/>



- List of endangered species
- A Threatened Species- plants or animals that may become endangered in the near future



BIODIVERSITY IN INDIA

Categories	No. of Indian Species	% of Indian species Evaluated	Species Threatened In India
Mammals	386	59	41%
Birds	1219	—	7%
Reptiles	495	73	46%
Amphibians	207	79	57%
Freshwater Fish	700	46	70%

Source- Based on Kumar et.al 2000

No need to memorize the data, only for your information

How can we conserve biodiversity ?

- Restoration of Biodiversity
- Imparting Environmental Education
- Population Control
- Reviewing the agriculture practice
- Controlling Urbanization
- Control over pollution.
- Conservation through Biotechnology

CONSERVATION OF BIODIVERSITY

- Biodiversity inventories
- Conserving Biodiversity in protected Habitats-
- *In situ* conservation
- *Ex situ* conservation
- Seed Bank, Gene Bank, Pollen Bank, DNA Bank



Gene Bank



ZOO



Bandhavgarh National Park

Conservation measures of biodiversity

Ex-situ conservation:

- Refers to conservation of components of biodiversity outside their natural habitats, e.g. zoos, museums, gene banks, botanic gardens/arboretums;
- Used for threatened and endangered species to avoid their extinction; also known as captive conservation.

In-situ conservation:

- Refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats.

National parks and game reserves - These are different from zoological gardens and are established on terrestrial and aquatic ecosystems with the objective to preserve wildlife that cannot co-exist with human beings and human activities. National parks are under the jurisdiction of central government while game reserves are managed by the local county council.

Biodiversity Conservation

In-situ conservation

Ex-situ conservation

- 1. Seed bank
- 2. Field gene bank
- 3. Cryopreservation

- 1. Home garden
- 2. Sacred plant

Protected Area

National park Sanctuary Biosphere reserve

Terrestrial Marine

- 1. Botanical garden
- 2. Zoological parks
- 3. Aquaria
- 4. Arboreta

SCHEME SHOWING BIODIVERSITY CONSERVATION MANAGEMENT SYSTEMS.

(a) In-situ conservation:

In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance.

Some protected areas are:

Cold desert (Ladakh and Spiti),

Hot desert (Thar),

Saline Swampy area (Sunderban and Rann of Kutch),

Tropical moist deciduous forest (Western Ghats and north East) etc.

Protected areas include national parks, sanctuaries and biosphere reserves. There are 37,000 protected areas throughout the world. As per World Conservation Monitoring Centre, India has 581 protected areas, national parks and sanctuaries.

Many National Parks and Sancturies have been established to preserve wildlife in their natural environment. There are about 89 national parks in India. Some of them are given below along with important species found there.

- Kaziranga sanctuary (Assam) – One-horned rhinoceros
- Manas sanctuary (Assam) – Wild buffaloes
- Gir forest (Gujarat) – Lions, chital, sambar, wild bears
- Kelameru bird sanctuary (Andhra Pradesh) – Pelicans and marine birds
- Dachigam sanctuary (Jammu and Kashmir) – Kashmir stags, Himalayan tahr, wild goats, sheep, antelopes.
- Bandipur sanctuary (Karnataka) – Indian bison, elephants, langurs
- Periyar sanctuary (Kerala) – Elephants, barking deer, sambhar
- Kanha National Park (Madhya Pradesh) – Tiger, leopards, wild dogs
- Simipal National Park (Orissa) – Mangroves, marine turtles lay eggs
- Bharatpur bird sanctuary (Rajasthan) – Ducks, herons
- Corbett National Park (Uttaranchal) –Tigers, barking deer, sambar, wild bear, rhesus monkey.
- Jaladpara sanctuary (West Bengal) – Rhinoceros

go through it twice

Sanctuaries:

These are the areas where only wild animals (fauna) are present. The activities like harvesting of timbers, collection of forest products, cultivation of lands etc. are permitted as long as these do not interfere with the project. That is, controlled biotic interference is permitted in sanctuaries, which allows visiting of tourists for recreation. The area under a sanctuary remains in between 0.61 to 7818 km.

- (i) Nandankanan Zoological Park*
- (ii) Chandaka Elephant reserve*
- (iii) Simlipal Tiger Reserve*
- (iv) Bhitarkanika Wild life Sanctuary*
- (v) Gharial project at Tikarpada*
- (vi) Chilika (Nalaban) Sanctuary*

go through it twice

(b) Ex-situ conservation:

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation.

The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation there by providing conditions necessary for a secure life and breeding.

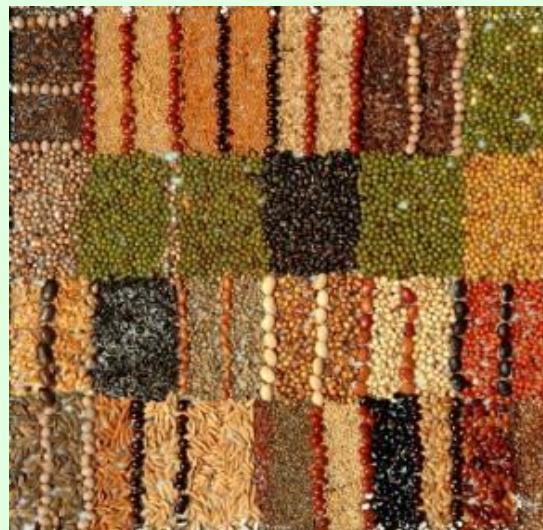
Some important areas under these conservation are:

- (i) Seed gene bank,
- (ii) Field gene bank;
- (iii) Botanical gardens,
- (iv) Zoos.

Biodiversity Seed banks in India

It has been estimated that 37% all living species may vanish in the next century due to climate change.

Many of them may vanish due to climate changes, human activities or due to natural disasters before we can understand their importance. Hence, it is important to not only know about biodiversity and also to take action to conserve them for our future generation. Here comes the role of seed banks.



Rice seed diversity

Agro-biodiversity can be divided into two categories:

- ⇒ Intraspecific diversity covers the genetic variety within a single species – such as different sub-species of rice, Basmati rice, Thai Jasmine rice, Japanese Mochi rice, Sona Masuri, etc.

- ⇒ Interspecific diversity refers to the number and types of different species – such as potatoes, carrots, peppers, lettuce etc.

Hot Spots:

Norman Myers, a British Ecologist, developed the concept of hot spots in 1988 to designate priority areas for *in situ conservation*. According to him, the hot spots are the richest and the most threatened reservoirs of biodiversity on the earth. The criteria for determining a hot spot are:

- i) The area should support >1500 endemic species,
- ii) It must have lost over 70 % of the original habitat

Twenty-five biodiversity hot spots have been identified in the world. These hot spots are characterized by posing exceptionally high biodiversity.

For example the total area of these 25 hot spots cover 1.4% of the total land area, support 44% of plant and 35% terrestrial vertebrates.

No need to memorize the data, only for your information

Hot Spots:

- *Hot spots are the areas with high density of biodiversity or mega diversity which are most threatened at present.*
- **OF ALL THE HOT SPOTS IN THE WORLD , MOST OF THEM ARE LOCATED IN TROPICAL AREAS**
- *Out of 25 hot spots in world, two are located in India namely North-East Himalayas and Western Ghats.*

The hot spots are determined considering four factors:

- (i) Degrees of endemism;
- (ii) Degree of expectation
- (iii) Degrees of threat to habitat due to its degradation and fragmentation and
- (iv) Number of Species diversity.

Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographical regions and twenty five biotic provinces.

Biogeographical regions are:

- (i) Trans Himalayas,
- (ii) Gangetic plain,
- (iii) Desert,
- (iv) Semiarid zone;
- (v) Western Ghats; *go through it twice*
- (vi) Deccan peninsula,
- (vii) North eastern zone,
- (viii) Coastal lands
- (ix) Himalayas,
- (x) Islands.

When the last tree is cut

When the last river is dry

When the last fish is caught

Then we realise that

Money just can't be eaten