JEPPIAAR INSTITUTE OF TECHNOLOGY

"Self-Belief | Self Discipline | Self Respect"

DEPARTMENT

OF

ELECTRONICS AND COMMUNICATION ENGINEERING

LECTURE NOTES

GE8291-ENVIRONMENTAL SCIENCE AND ENGINEERING

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Ecosystem.

What is an ecosystem? Explain the structure and functions of ecosystem?

A group of organisms interacting among themselves and with environment is known as ecosystem.

An ecosystem has two major compounds

1. Abiotic components
2. Biotic components.

Abiotic components.

Non-living components (physical and chemical) of an ecosystem collectively form a communicity

Eg. climate, soil, water, air etc.,

1. physical components.

The energy, climate, raw materials and living spare that the biological communicity needs. It is useful for the growth and maintaince of its member.

Eg. Air, water, soil etc.,

2. chemical components.

The source of essential nutrients.

Eg. Proteins, Lipids, micro and macro elements.

Biotic components

Living organisms (OR) living members in an ecosystem collectively form its community called biotic components.

These species are distinguished on the basis of their nutritional (feeding) relationship.

Autotrophic components

The members of autotrophic components are producers, which are autotrophs (self - nourishing). They derive energy from sunlight and make organic components from inorganic substances.

Eg. Green plants, algae, bacteria etc.,

Heterotrophic components :

The members of heterotrophic components are consumers and decomposers.

Eg. Herbivores, omnivores
Bacteria, fungi

classification of biotic components

The members of biotic components.

1) Producer → Synthesis their foods themselves through photosynthsis.

Eg. All Green plants.

2. Consumers → cannot prepare by themselves depends directly or indirectly on its producer.

Types of consumers.

a) Primary consumers → also called herbivories, they directly depends on the plants for their food. So they called plant eaters.

Eg. Insects, Rat, goat.

b) Secondary consumers → Primary carnivores, they feed on primary consumers. They directly depends on the herbivories for their food.

Eg. Frog, cat, snakes.

c) Tertiary consumers → Feed on secondary consumers.

Eg. Tigers, Lions.

3. Decomposers → Decomposers are those organisms which feed on dead organisms.

Eg. Micro organisms like bacteria and fungi.

Types of ecosystem and functions of an ecosystem.

Functions of an ecosystem: To allow the flow of energy and cycling of nutrients.

Types of functions

a) Primary function :

Manufacture of starch.

b) secondary function :

Distributing energy in the form of food to all consumers or the energy stored by the consumers

c) Tertiary function :-

The dead system are decomposed to initiate the third function of ecosystem namely "cycling".

d) Energy & Material flow

b) Food chains

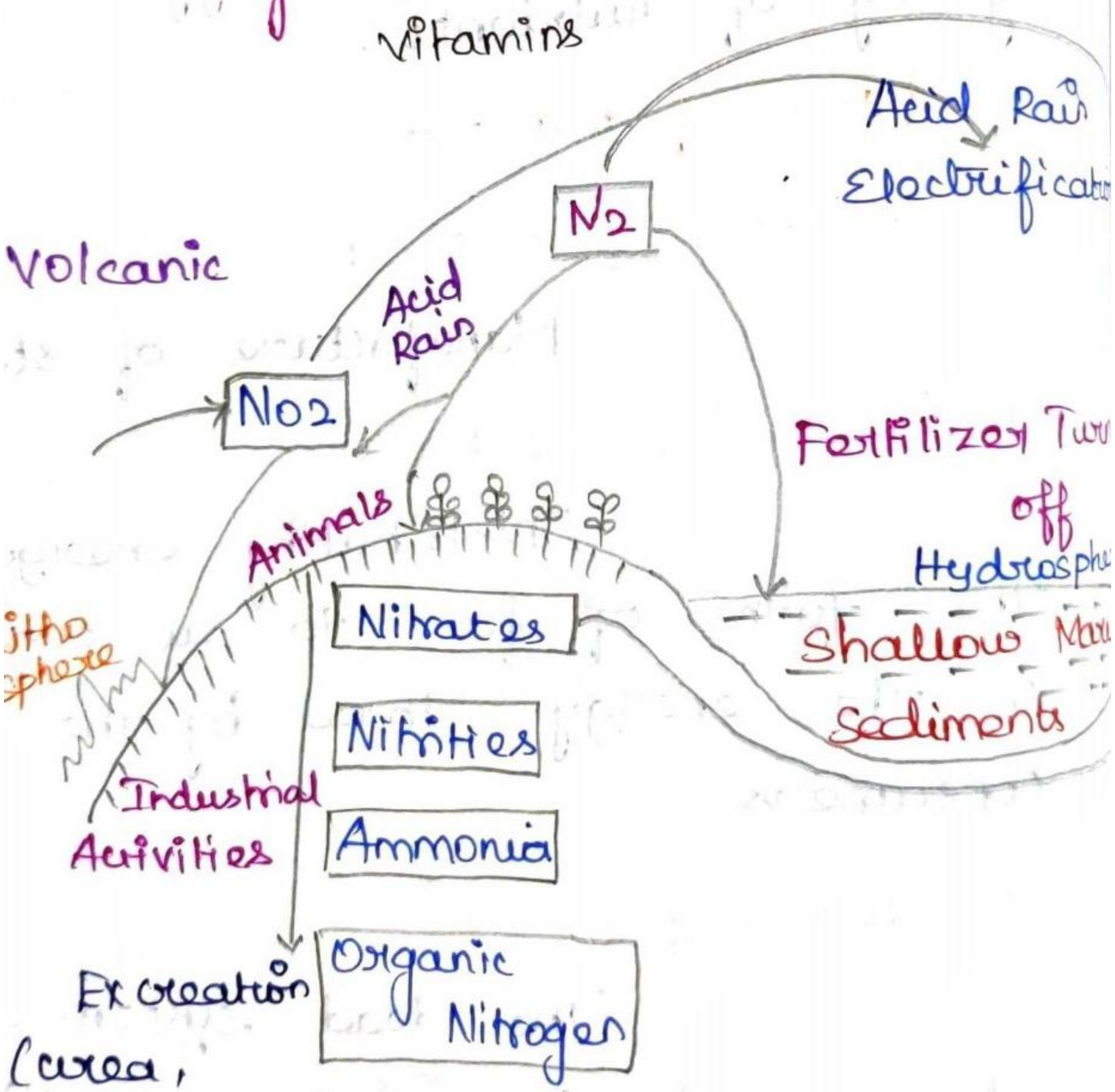
c) Food webs

d) Food pyramids.

write a ON Nitrogen cycle.

Nitrogen is present in the atmosphere as N_2 in large amounts (78%). The N_2 is present in all biotic components in different form as food.

Eg. Proteins
Vitamins



N_2 from atmosphere → Green plants → Photosynthesis → Food chain

Organic N_2 is decomposed into micro Organisms into Ammonia, Nitrites and Nitrates and which again used by plants.

Nitrification :-

Conversion of ammonia into Nitrate.

eg: Nichrobacteria, Nitrosomes.

Denitrification :-

Nitrates into Nitrogen

eg. pseudomonas, fluoroscences.

So, N_2 is released back into the atmosphere and the cycle goes on

Write a Note on Oxygen cycle;

The cycle that helps more Oxygen through three Main regions of the earth

eg. 1. The atmosphere
2. The biosphere
3. The lithosphere.

a) Atmosphere.

Plants begins oxygen cycle by photosynthesis.

$$6CO_2 + 6H_2O + h\gamma \rightarrow C_6H_{12}O_6 + 6O_2$$

So the plants breathe in CO_2 and breath out O_2.

b) The Biosphere.

The Main cycles are respiration and photosynthesis.

Animals and human breathe in oxygen and breathe out CO_2

$$6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O + Energy$$

c) The Lithosphere

Oxygen is present as silicate and oxides. The main oxygen bearing mineral as exposed to the elements, a chemical reaction occurs that wear it down and Produces free O_2.

Respiration

$$6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O + E$$

Photosynthesis.

$$6CO_2 + 6H_2O \overset{}{\rightarrow} \text{Energy} \rightarrow C_6H_{12}O_6 + 6CO_2$$

write short note on Ecological succession

The progressive replacement of one community by another till the development of stable community is a particular area.

Stages of ecological succession

1. Pioneer community.
2. Seral stage.

Types of Ecological succession.

1. Primary succession
   a) Hydrach
   b) Xerach
2. Secondary succession.

Pioneer community → The first group of organism which establish the community in the area is called as Pioneer community.

Seral community → Various development stage of community.

Process of Ecological succession

a) Nidation → Development of base area without any life form.

b) Invasion

a) Migration → seeds in brought by wind water OR birds.

b) Establishment → Germinate and grow on the land and established their pioneer communities

c) competition → competition between different species.

d) Reaction → Living Organisms, take water nutrients and grow and modify the environment

e) Stabilisation → leads to stable community, which is in equilisation with the environment.

Trophical deserts

⇒ Found in Africa ⇒ Sahara desert
Rajasthan ⇒ Thara desert

⇒ only few species
⇒ Sand dunes.

Temperate deserts.

* Found in south califoria - Majore
*. Very hot summer and very cold winter time.

Cold deserts:.

Found in china : Gobi desert
Cold winters and warm summer.

characteristics.

*. Desert air in dry
*. climate is hot
* Annual rainfall less than 25cm
*. Soil in poor in nutrients and organic matter
*. Vegetation in poor.

Structure and functions of desert ecosystem.

Abiotic components :- Temperature, rainfall, sunlight, water etc.,

Biotic components : Producers ; shrubs, Some grasses and few trees.

Consumers : squirrels, Rabbits

Decomposers : Fungi and bacteria.

Describe aquatic ecosystem.

The aquatic ecosystem deals with water bodies.

Types

1. Fresh water life zones Eg. Ponds
2. salt water life zone Eg. Oceans

Pond Ecosystem.

Pond is a fresh water aquato ecosystem, where water is stagnant.

*. Receives enough water during rainy season.

*. Types of algae, aquatic Plants, insects, birds fishes and birds.

Characteristics.

*. Temporary, only seasonal
*. Stagnant fresh water body
*. Easily gets polluted.

Write a note on Forest ecosystem.

Forest ecosystem consists of tall and dense trees supporting animals and birds. Forest occupies nearly 40% of the world area. In India it occupies 19% of the area.

Types of Forest ecosystem.

1. Trophical rain forest
2. Trophical deciduous forest.
3. Trophical forest
4. Temperate rain forest
5. Temperate deciduous forests.

Trophical Rain forest.

* Found mean equator.
* High temperature.
*. Trees with broad leaf like Teak of sandal.
*. Animals like lion, Tiger and monkey

Trophical decidious forest :

* Found away from equator,
* Warm climate of rain only in monsoon.
* Decidious trees like oak, maple.
* Animals like deer, fox.

Trophical scrub forest

* Temperature areas with adequate rainfall.
* Trees like coniferous trees
* Animals like squirrels etc.,

Trophical Rain forest.

* Temperature areas with adequate rainfall
* Trees like confirious trees.
* Animals like squirrels etc.,

Temperature Decidous forest.

* Moderate Temperature.
* Trees with broad leaf deciduous trees like Oak, Lickory.
* Animals like Deer, fox, bear etc.,

characteristics.

⇒ Maintains climate and rainfall

⇒ Due to poor penetrate of light, conversion of organic matter into nutrients is very fast.

⇒ Support wild animals.

⇒ Protects biodiversity.

Structure and components of Forest ecosystem.

1. Abiotic components.
   climate factors
   Minerals.
2. Biotic components

Producers : Trees, shrubs.

Primary consumers : Ants, flies, insects.

Secondary consumer : Snakes, birds, fox.

Decomposers : Bacteria and Fungi

Describe Grassland ecosystem.

Grassland consists of grass species some trees and shrubs. Grassland occupies about 20% of earth's surface.

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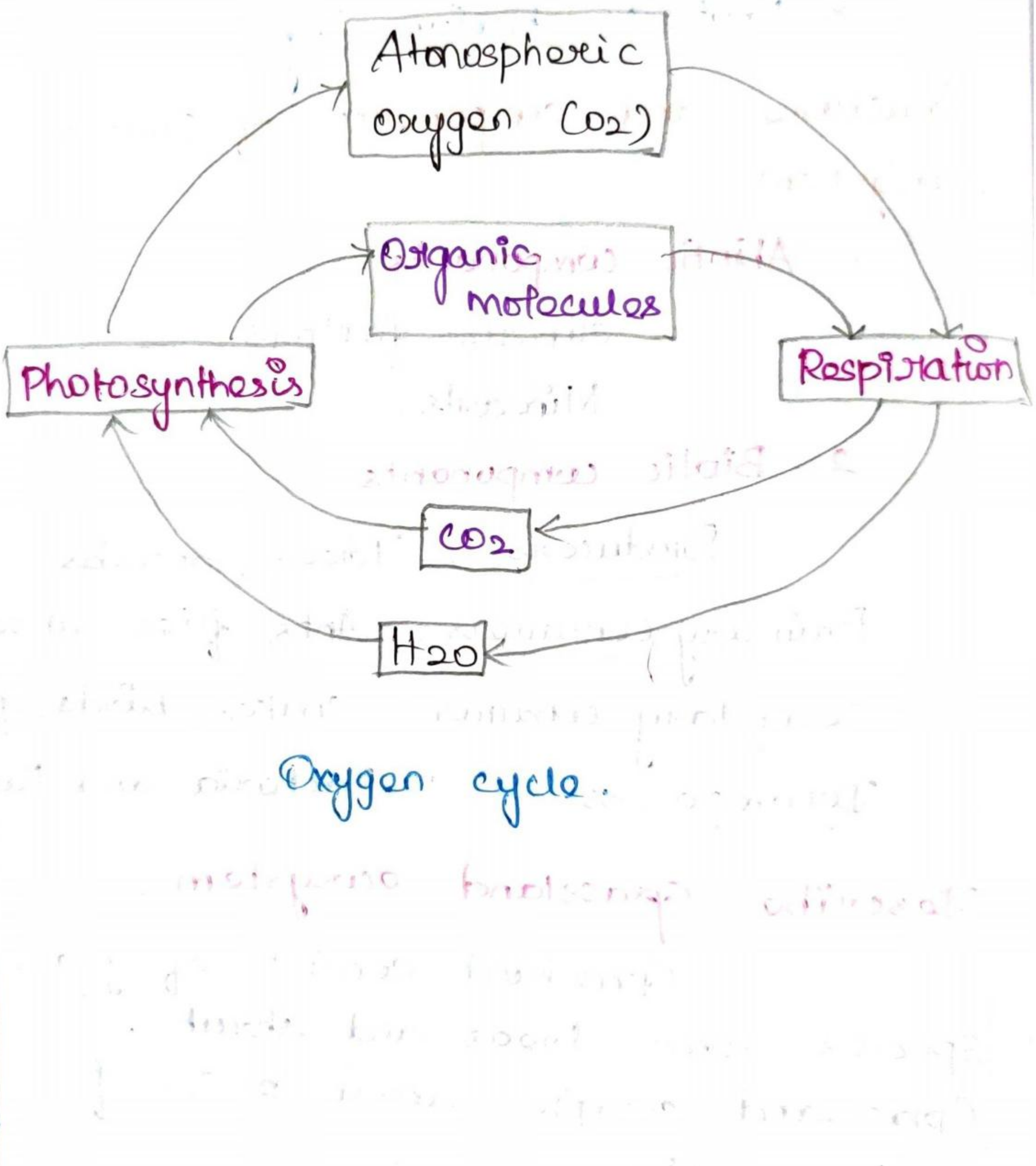
Typeas of Grassland ecosystem.

1. Triophical grassland
2. Temperature grasslands
3. Polar grassland.



Oxygen cycle.

Tropical grasslands.

→ Borders of tropical rain forest
→ High temperature and moderate rainfal
→ known as savanna type.
→ Tall grasses with scattered shrubs and stunted trees.
→ Animals like zebra, Giraffe, antelopes etc.,

Temperature grasslands.

→ centres of continents, flat and slopec hills.
→ cold winters and hot summer.
→ shrubs and trees do not grow due to intense grazing and summer fires.

Polar grasslands.

* Arctic polar region
* Severe cold & strong winds with ice and snow.
* small annual plant grow.
* Animals like arctic wolf, weasel, arctic fox etc.,

characteristics.

*. Plain occupied by grasses.
*. Soil will be rich in nutrients matter.
*. Ideal place for grassing animals
*. Low or uneven rainfall.

Structure and function of grassland ecosystem.

Abiotic components.

Nutrients, C, H, O, N, P, S etc

Supplied CO_2, H_2O, nitrates, phosphates and sulfate.

Biotic components.

Producers :- Grasses, shrubs

Consumers :-

Primary consumers → cows, buffalos

Secondary consumers → Snacks, Lizards fox etc.,

Tertiary consumer → Hawks, eagles etc.,

Decomposes → Fungi & bacteria.

Write a Note on Desert Ecosystem.

Desert is characterised by less than 25cm rainfall. Dry atmosphere and poor insulator desert occupies about 35% of our world's land.

Types of Desert ecosystem.

1. Tropical deserts
2. Temperate deserts
3. Cold deserts

Structure and function of pond ecosystem.

Abiotic components.

Temperature, light, water & Organic and Inorganic.

Biotic components.

Producers : a) Phytoplankton
b) Microphytes

Consumers : a) Primary consumers

Microscopic animals which freely floats on the surface of water.

Eg. Protozoa, Very small fish, flagellate.

b) Secondary consumers.

Eg. Insects like water beetles and small fish.

c) Decomposers.

Eg. Fungi, bacteria and flagellate

They decomposes the dead plant and animal matter and their nutrients are released and recycled by the green plants.

Lake ecosystem.

Lakes are large natural shallow water bodies.

Supplied with water from rainfall melting snow and streams.

Types of lakes.

1. Oligotrophic lakes.
2. Eutrophic lakes.
3. Dystrophic lakes.
4. Volcanic lakes.
5. Meromitic lakes.
6. Artifical lakes.

Zones of lakes :-

Littoral Zones :- Top larger of the lak

Limnetar Zone :- Effective penetration of solar light takes place.

Profundal zone :- Deep open water, where it is too dark.

characteristics

⇒ Shallow fresh water body.

⇒ Permanent water body with large water resources.

⇒ Help us irrigation and drinking.

Structure and function of lake ecosyster

a) Abiotic components

Temperature, light, proteins and lipids.

b) Biotic components.

1. Producers :- Green plants

Eg. phytoplanktons, algae and flagellate.

2. consumers :-

a) Primary consumers

Eg. Ciliates, Protozoans etc.,

They feed on phytoplankton.

b) secondary consumers.

Eg. Insects and small fishes

They feed on phytoplankton.

c) Tertiary consumers.

Eg. Large fishes like game fish

They feed on small fish.

Decomposers.

Eg. Bacteria, fungi and actinomytes

They decompose the dead plants and animals.

River (OR) Stream Ecosystem.

Characteristics.

Fresh water, free flowing water system.

Dissolved oxygen content is more.

Large amount of nutrients are deposits.

Structure and functions of River.

Abiotic components :

Eg. Temperature, light, PH, nutrients

Biotic components.

Producers.

Phytoplankton, algae, water grasses, aquatic masses and other amphibious plants.

Consumers.

a) Primary consumers.

Eg: water, insects, animals, fishes

They food on phytoplankton.

b) secondary consumers.

eg. Birds and mammals.

c) Decomposes.

Eg. Bacteria and fungi

Write short notes on Ocean ecosystem

Characteristics.

*. Occupies a large surface area with saline water.

*. Rich in biodiversity.

*. Moderate the temperature of the earth.

Zones of Oceans.

Coastal of Zone :- Warm nutrient rich shallow water; High primary productivity.

Open sea :- Deeper part of the Ocean

a) Euphotic Zone → Receiver abudan light shows high photosynthesis activity.

b) Bathyal zone → Receives dim light and is usually geological activity.

c) Abyssal zone → Dark Zone, Very deep.

Structure and function of Ocean ecosystem.

Abiotic components

Eg. Temperature, light, Nacl, k, ca and Mg

Biotic components

Producers.

Eg. Phytoplankton.

consumers

a) Primary consumers.

Eg. crustaceous, moilusses, fish.

b) Secondary consumers.

Eg. Herring sahd, mackerel etc.,

c) Tertiary consumers.

Eg. cod, Haddock etc.,

Decomposes.

Eg. Bacteria and some fungi

write a note on estuarine ecosystem.

An estuary is a partially enclosed coastal area at the mouth of a river, where river joins of the sea.

characteristics.

*. Transition Zones, strongly affected by tides of the sea.

*. water characteristics are periodically changed.

Structure and function of Estuarine ecosystem

a) Abiotic components.

Temperature, PH, sodium and potassium salts and various nutrients.

b) Biotic components

Producers — Mash grasses, sea weeds, seagrasses and Phytoplankton.

Consumers — Oysters, crabs, sea birds.

Decomposers — Bacteria, fungi

BIODIVERSITY

Biodiversity :

The variety and variability among all groups of living organisms and the ecosystem in which they occur.

classification :-

a) Genetic diversity :- Genetic diversity in the diversity within species

i.e, variation of gene within the species.

Eg. Rice varieties.

b) Species diversity :- species diversity is the diversity between different species. The sum of varieties of all the living organism at the species level.

Eg. Plant species, Animal species.

c) Ecosystem diversity :-

The diversity at the ecological or habitat level is known as ecosystem

Eg. River ecosystem.

Ethical values :-

It involves ethical issues like "all life must be preserved."

Our rich heritage teaches us to worship plants, animals, rivers and mountains.

The ethical values means that a species may OR may not be used, but it existence in nature gives us pleasure.

Eg. The river, ganga as holy river.

Vembi, Tulsi, Vengai are some of the trees worshipped by the tamilians

Aesthetic values

The beautiful nature of plants and animals consists us to protect

Eg. Eco - tourism.

optional values

The optional values are the potentials of biodiversidity that are presently unknown and need to be known. The optional values of biodiversity suggets that any species may be proved to be a valuable species after someday.

Values of Biodiversity.

consumption use values

These are direct use values, the biodiversity products are harvested and consumed directly.

Eg. Food, drug, fuel etc.,

Productive use values.

Biodiversity products have obtained a commerical valu

These products are marketed and sold. These product may be derived from the animals and plants

Social values.

Social values of the biodiversity refers to the manner in which the bio resources are used in the society. These values are associated with the social life, religion and spiritual aspects of the people.

Eg. Holy plants, Holy animals.

Eg. Medicinal plants and herbs play a very important role in our Indian economic growth.

Indian is a Major - diversity Nation explain

Indian in one among the mega diversity countries in the world. It has 89,450 animals species accounting for 7.31 % of the global faunal

Species and 47,000 plant species which accounts for 10.8 % of the world floral species. The loss of biodiversity on endemin in about 33 %.

Endemism (OR) Endemic species.

The species which are confined to a particular area.

Flowering plants → 33 %.
Fresh water fishes → 53 %.
Amphibians → 60 %.
Reptilies → 36 %.
Mammalians → 10 %.

RED Data book :-

A catalogue of taxa facing rice of extinction.

Purpose :-

⇒ Provide awarness to the degree of threat to diversity.

⇒ Provide global index on already decline of biodiversity.

⇒ Help in conservation action

⇒ Information about international agreements.

Identification of species at high risk of distinction.

According to the 'Red' Book data

Plant → 44 critically endanger
54 dangered.
143 Vulnerable.

What do you understand by hot spots of diversity ?. Name any two hot spots of biodiversity in India.

Hot spots are the geographic areas which posses high endemic species.

At global level, these are the areas of the high conservation priority, if these species lost, they can never be replaced (OR) regenerated.

The richness of the endemic species is the primary criterion for recognising hot spots.

The site is under threat.

The hot spots should have a significant percentage of specialised species.

It should contain important gene pool of plants of potentially useful plants.

Biodiversity hot spots in India.

1. Eastern Himalayas.
2. Western ghats.

Eastern Himalayas.

Geographically these area comprises Nepal, Bhutan and Neighbouring states of Northern India.

Plant species → 35000

Endemic species → 30%

Eg. Rice, Banana, citrus, ginger, chilli, jute and sugarcane.

Eg. Rice Banana.

a) Mammals → 63%

b) Indian birds → 60%.

c) Huge wealth of fungi, insects, Mammals.

Western Ghats.

The area comprises Maharashtra, Karnataka, Tamilnadu and Kerala Nearly 1500 endemic, 62% amphibians and 50% lizards are endemic.

only 6.8% of the original forests are existing today.

Some common plants :- Tornstroenia, Japonica, Rhododendron.

Some common animals :- Blue birds, lizards, hawk.

Threats of Biodiversity

Any disturbance is an natural ecosystem tend to reduce its Biodiversity.

Various Methods of Biodiversity.

Habitat loss :.

The loss of populations of interbreeding organisms is caused by habitat loss. Habitat loss threatened a wide range of animals and plants.

Factors influencing Habitat loss.

1. Deforestration
2. Destruction of wetlands.
3. Habitat fragmentation
4. Raw materials.
5. Production of drugs.
6. Illegal trade.
7. Developmental activities.

Poaching of wildlife :

Poaching means killing of animals (OR) commerical hunting It loads to loss of animal biodiversity.

a) subsistence poaching.
b) commerical poaching.

Factors influencing Poaching

1. Human population
2. Commerical activities.
   a) wildlife products
   b) wealth of wildlife.
   c) Importers of wildlife.

Man - Wildlife conflicts :-

It arises when wildife starts causing immense damage and danger into the man. under such conditions it very difficult for the forest departments to comprimse the affected villages.

Factors influencing Man - wildlife conflicts.

Shrinking of forest cover complete wildlife to move outside the forest and attack the fields and human.

Human encroachment

Inquired Animals.

Endangered species.

A species is said to be endangered when its number has been reduced to a critical level.

Unless it is protected and conserved it is in immediate danger of the extinction.

In India, there are 450 plant species, 100 mammals, 150 birds.

Birds → Peacocks, Pelican, Indian Bustard.

Mammals → Indian wolf, red fox, Indian lion, desert cat.

Plants → Sandal wood tree like Sandalum cycas beddoneistic.

Features

Pollution

over population

climate change.

Red data book.

Book with the list of Endangered species of plants and animals of any region.

Endemic species.

species which are found confirmed only in a particular region

In India 7000 plants are endemic 62%, 50% lizards are endemic to the western ghats.

Endemic flora → Saprica himalayan

Endemic fauna → Indian salamande

Factors affecting the endemic species.

Habitat, Fragmentation, over hunting, pollution, Filling of wetlands

Conservation of Bio-diversity ..

In order to retain the capabilities of the life supporting systems it is essential to save and maintain species and ecosystem for survival of the human race.

Types of conservation

a) In-site conservation
b) Ex-site conservation

Insite conservation

The preservation of the species in its natural habitat (OR) ecosystem.

a) Biosphere Reverse.

Biosphere reverse are areas of aside for conserving the flow, fauna & environment for the long times. It covers large area more than 5000 sq. km.

*. Gives long term survival.
*. Protects endangered species threatened species.
*. Protect maximum number of species and communities

*. useful for educational and research purpose

*. Site for recreation and tourism.

Name of Biosphere	State
Nanda Devi	Uttrapradesh
Manas	Assam
Gulf of Mannar	TN
Nilgris	TN, Kerala
Sundharbans	West bengal

2. National Parkes :-

*. Area dedicated for conserving wild life only with its environment.

*. Small area covered about 100 - 500 sq.

*. legally protected area by wild life act 1972.

*. Boundaries of parks are well marked.

2. Role of National park.

1. Place for enjoyment through tourism.

2. Grazing of the domestic animals inside the parks its prohibited.

3.

Eg. Nagar Hole National park in Mysore, Gir National park in Gujarat.

3. Wild life santuaries.

Area where wild animals are protected.

Forestry operations are permi

In India nearly 492 wild life sanctuaries are present.

Eg. Mudumalai wild sanctuaries

Vedathangal bird sanctuaries

4. Gono sanctuary.

To conserve the plants in North east India.

a) One gene sanctuary for culture.

b) One gene sanctuary for the Pitcher plant.

5 Other Reserve.

To Maintain a viable Population of Tigers in India for scientific economic, cultural and ecological value.

To preserve for all the Times for benefit, education and enjoyment of the people. The Program started in 1973 when there in high population dwindling around 270.

Ex.

Sariska Park in Rajasthan
Dudeva Park in UP.

Ex - Site conservation

The protection of the flora and fauna Outside the natural habitats.

The preserve the endangered plant species, seeds and collected and stored in the seed banks.

Example :.

Botanical gardens, gene banks, germ banks and other research facilities have been used to based to breed endangered animals. New offering may release base to wild.

Other Important Methods of Ex-Site conservation

National Bureau of plant Genetic Resource (NBPGR)

National Bureau of Animal Genetic Resources (NBAGR)

National facility for plant tissue culture Responsibility (NFPTCR)