



Ecosystem

B.Tech. II year
Subject Environment Science

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- The German biologist Ernst Haeckel in 1869 coined the word “Ecology” combining two Greek words – oikos, meaning “household” or “home” and logos, meaning “study of” – to coin ecology, the science that deals with the study of organisms in their natural home interacting with their surroundings ie., other living organisms and physical components.

- In 1935 essay the English biologist Arthur Tansley proposed the concept of an energy model involving “ecosystems” and “energy”.
- Tansley (1935) described an ecosystem as a group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter.

- The flow of energy, the cycling of materials and community are the components for making an ecosystem functional.
- The living community of plants and animals in any area together with the non-living components of the environment such as soil, air and water, constitute the ecosystem.

- Ecosystems are divided into terrestrial or land based ecosystem and aquatic ecosystem in water.
- These form the two major habitat conditions for the Earth's living organisms.

- At a sub-global level, this is divided into bio-geographical realms.eg. Eurasia called the palaeartic realm; South and South-east Asia of which India form a major part is the Oriental realm; North America is the Nearctic realm; South America forms the Neotropical realm; Africa the Ethiopian realm; and Australia the Australian realm.

At the national level or state level, this forms biogeographic regions. There are several distinctive geographical regions in India-the Himalayas, the Gangetic Plains, the Highlands of Central India, the Western and Eastern Ghats, the semiarid desert in the West, the Deccan Plateau, the Coastal Belts, and the Andaman and Nicobar Islands.

These geographically distinctive areas have plants and animals that have been adapted to live in each of these regions.

3.1.1 Structure and functions of an ecosystem:

The structure of an ecosystem consists of both biological communities and abiotic components. The two basic components of an ecosystem are i. The autotrophic component and ii) the heterotrophic component.

- The autotrophic components include the autotrophs which convert the radiant energy of the sun into chemical energy and stored as complex organic molecules. The heterotrophs feed on the food manufactured by the autotrophs. The heterotrophs recover the energy by breaking down the complex organic molecules.

- An ecosystem comprises of : 1. Abiotic, 2. Producers, 3. Consumers and 4. Decomposers.
- The nonliving substances called abiotic include factors like light, temperature, pressure, soil, water, carbon dioxide, pH, mineral and chemical compounds.

The physical and chemical components of an ecosystem constitute its abiotic structure which includes soil, geographical, climatic factors, energy, nutrients and toxic substances. The producers are to autotrophs mainly green plants, algae, etc., and they are further sub-divided into i) micro vegetation and ii) macrovegetation.

Producers can make their own food by using the carbon dioxide in the atmosphere, water and sunlight and chlorophyll in the leaves through the process of photosynthesis.

They are also called as photo autotrophs. Some microorganisms can produce organic matter through oxidation of certain chemicals in the absence of sunlight.

- They are called as chemosynthetic organisms or chemoautotrophs. At ocean depths, chemoautotrophic bacteria using the heat available at earth core to convert dissolved hydrogen sulphide and carbon dioxide into organic compounds.

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- The consumers are mainly heterotrophs like animals that feed on other organisms.
- They are further sub-divided into micro-consumers and macro-consumers. Herbivores or primary consumers feed directly on producers.
- Carnivores or secondary consumers feed on herbivores and if they feed on other carnivores known as tertiary carnivores.
- Omnivores feed on both plants and animals. Detritivores feed on the parts of dead organisms and wastes of living organisms.

- The Decomposers are heterotrophs which
- include mainly bacteria and fungi which derive their nutrition by decomposing and breaking down the complex organic molecules to simple organic compounds and ultimately into inorganic nutrients.
- The biotic structure prevails in most of the ecosystems. In forests and agroecosystems primary producers predominate whereas in deep ocean decomposers predominate.

- Each organism in the ecosystem is assigned a feeding level depending on its nutritional status.
- The level of energy flow in each link of the food chain is called 'trophic level'.
- There are three types of food chain viz i) prey predator, ii) detritus and iii) parasitic food chains. Prey predator food chain is also called grazing food chain: grass land ecosystem, pond ecosystem, marine ecosystem and forest ecosystem.
- Detritus food chain is also called as saprophytic food chain like mangrove habitat. Parasitic chain goes from larger to smaller organisms.
- These food chains are not isolated units but are hooked together on food webs.

- Flow of energy through an ecosystem in a way parallels the flow of food through the
- food chain. Photosynthesis is the process through which solar energy breaks the
- chemical bonds of carbon dioxide and water molecules forming new molecules of
- carbohydrates and oxygen.

- Respiration transforms carbohydrates and oxygen back into carbon dioxide, water and energy.
- The energy released in this process powers the chemical and physical processes of life, growth, reproduction and so on.
- Photosynthesis and respiration are the processes of the carbon and oxygen cycles in ecosystems.

3.2.1 FOOD WEB:

- Food web is a network of food chains where different types of organisms are connected at different trophic levels, so that there are a number of options of eating and being eaten at
- each trophic level. Food webs give greater stability to the ecosystem

- Food chain and food web play an important role in the ecosystem, because the energy flow and nutrient cycling take place through them.
- Food chains regulate and maintain the population size of different animals, thereby maintaining the ecological balance.

- However, many heavy metals, pesticides and other chemicals are not bio-degradable and also not decomposed by micro organisms.
- These chemicals pass on from one trophic level to another and at each level they keep on increasing in concentration known as 'biomagnifications'.

FUNCTIONS OF ECOSYSTEM

- The main functions of an ecosystem are
- i) Energy flow, ii) food chain, iii) biochemical cycling of nutrients, iv) primary and secondary production and v) Ecosystem development and regulation.

