PUC Ist year - Semester II

Unit VI. Ecology and Environment

Module No: 32. Concept of an ecosystem-structure and function of an ecosystem.

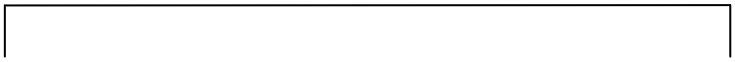
The branch of science which deals with the relationship of organisms with their environment is known as Ecology. Today, ecology has become one of the most important branches of biology it deals with the consequences of inter relationship between organisms and environment.

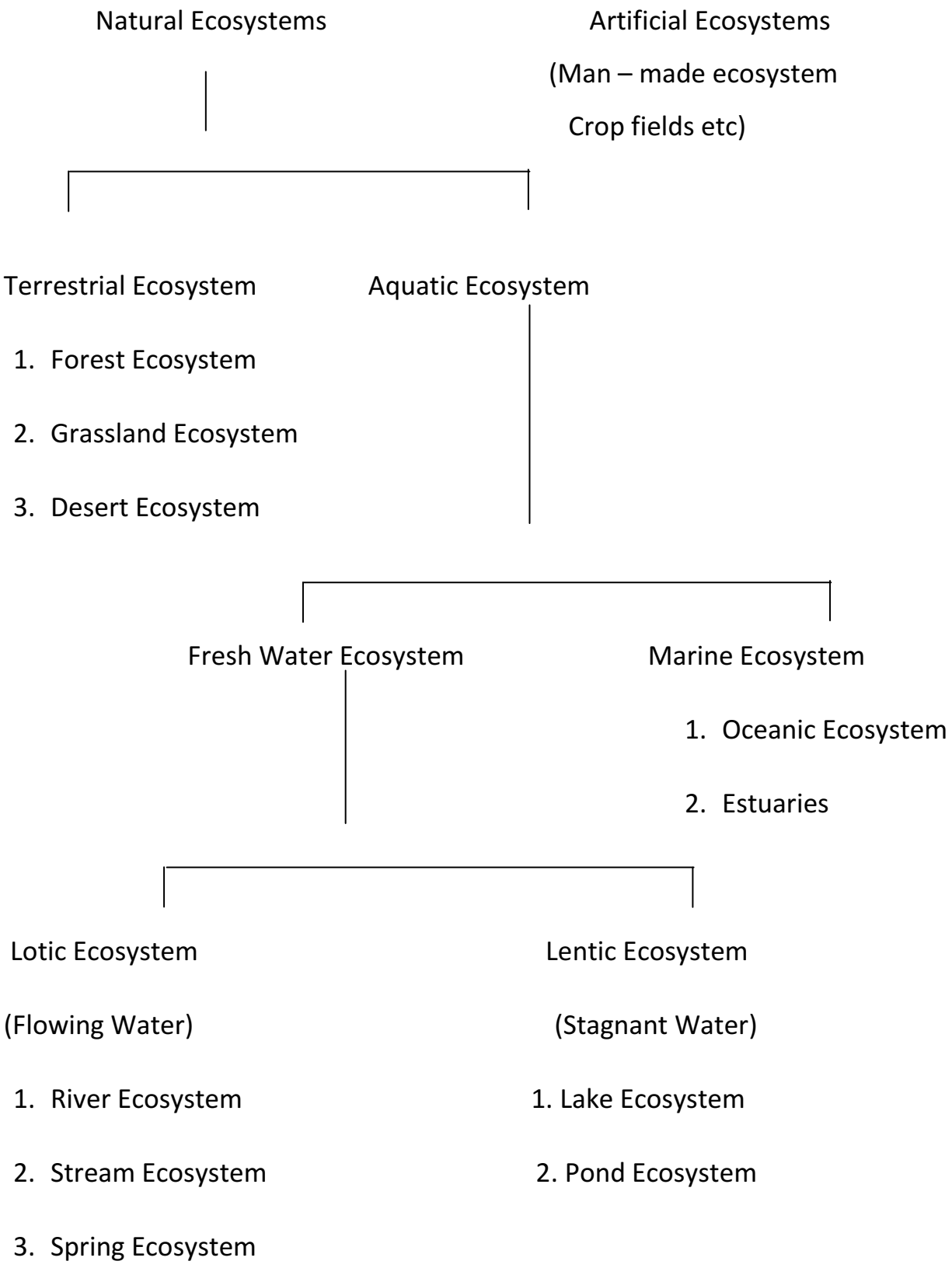
Ecosystem:

The term ecosystem was coined by a British ecologist, A.G. Tanselay in 1935, "Ecosystem is a basic functional unit of Ecology consisting of abiotic and biotic factors which interact with each other and exchange materials". They are inseparably interrelated.

The ecosystem may be natural (Operating under natural conditions without any major interference by man) eg: terrestrial – grass land, desert, forest etc., and aquatic – fresh water (eg. Ponds, lakes and streams) and marine(eg: open sea, coastal and estuarine) ecosystems or artificial (man – made ecosystems eg: croplands, space – ecosystems etc). An important feature of an ecosystem is that it is capable of self maintenance and self regulation. It has a tendency to resist change and to remain in a state of equilibrium.

Ecosystems




Natural Ecosystems
Artificial Ecosystems
(Man – made ecosystem
Crop fields etc)
Terrestrial Ecosystem
Aquatic Ecosystem
1. Forest Ecosystem
2. Grassland Ecosystem
3. Desert Ecosystem
Fresh Water Ecosystem
Marine Ecosystem
1. Oceanic Ecosystem
2. Estuaries
Lotic Ecosystem
(Flowing Water)
1. River Ecosystem
2. Stream Ecosystem
3. Spring Ecosystem
Lentic Ecosystem
(Stagnant Water)
1. Lake Ecosystem
2. Pond Ecosystem

Concept of an ecosystem:

The concept of ecosystem can be well explained that the organisms and the environment are inter related and interdependent with each other. Holozoic animals cannot synthesize their food material, hence they have to depend upon plants either directly or indirectly. Even plants which are capable of synthesizing their own food depend upon the biotic environment from which they receive light, water, Co_2 and mineral salts, other inorganic and organic substances of absolute necessity for the synthesis of food. After the death of animals their dead bodies undergo putrification with the help of micro organisms and convert into inorganic and organic substances. The inorganic substances are added to the soil by the excretory substances of animals. These substances are absorbed by plants through their root system which are necessary for the existence of plant community. Thus a dynamic and delicate balance exists between the biotic and abiotic environments and this system of interaction and their dependence is termed as ecosystem.

Structure and Function of an Ecosystem:

The two major aspects of an ecosystem are, the structure and function. By structure we mean

1. The composition of biological community including species, numbers, biomass, life history and distribution in space etc.
2. The quantity and distribution of the non-living materials such as nutrients, water etc. and
3. The range of conditions of existence, such as temperature, light etc.

By function we mean

1. The rate of biological energy flow i.e., the production and respiration rates of the community
2. Rate of materials or nutrient cycles and
3. Biological or ecological regulation including both regulation of organisms by environment (photoperiodism etc) and regulation of environment by the organism (nitrogen fixing organism etc). Thus, in any ecosystem structure and function are studied together.

Functional aspects of an ecosystem will be discussed in other modules in details.

Structure of Ecosystem: (Components of an Ecosystem)

The ecosystem comprises two major components

1. A biotic component and
2. Biotic component

I. **A biotic component:** All non-living factors of ecosystem is called A biotic component, which includes
   a. **Organic substances:** These are proteins, carbohydrates, lipids, amino acids etc present either in the biomass or in the environment.
   b. **Inorganic substances:** These include elements like C, H, O, N, P, Mg, Fe, Cd, Cu, Na, H_2O, Co_2 etc. These are present either in free state or in the form of compounds dissolved in water and present in the soil.
   c. **Climatic Regime:** It comprises of physical factors such as light, temperature, atmospheric pressure etc.

II. **Biotic Components:** All living organisms constitute of biotic components.

They are

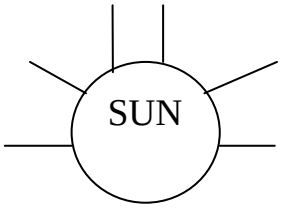
1. **Producers:** These are autotrophic green plants and some photosynthetic bacteria. The producers fix radiant energy of the sun light and with the help of minerals derived from the water and mud, they manufacture complex organic substances. Only green plants are capable of trapping the solar energy which is the ultimate source of energy for all the organisms of an ecosystem. Only producer are capable of absorbing the essential elements from the soil and making them available to animals for their growth and development.
2. **Consumers:** (Macro consumers) These are heterotrophic organisms. All the animals which directly or indirectly depend upon plants for their food are called consumers.

   Consumers are of three types

   a. **Primary Consumers:** These are Herbivorous animals. These feed on green plants. Ex: Deer, Sheep, Goat, Horse, Rabbit, cattle, insects etc.
   b. **Secondary Consumers:** These are Carnivorous animals. These feed on Primary consumers. Ex: Wolves, Dogs, Cats, frog, fox etc.
   c. **Tertiary Consumers:** These feed on both Primary and Secondary consumers. Ex: Lion, Vultures, Eagle, Hawks etc.
3. **Decomposers:** (Micro consumers or reducers)Micro organisms such as bacteria, and fungi, secrete enzymes to decompose the dead bodies of plants and animals (producers and consumers), into smaller bits or molecules. They bring about the degradation of the complex compounds of dead protoplasm into simpler a biotic compounds. Decomposers use some

of the products for their maintenance and release the rest to the environment.

Some bacteria and fungi bring about the transformation of decomposed products into basic biotic substances (ex: C, O, H, N, P, Fe, Na, etc.)



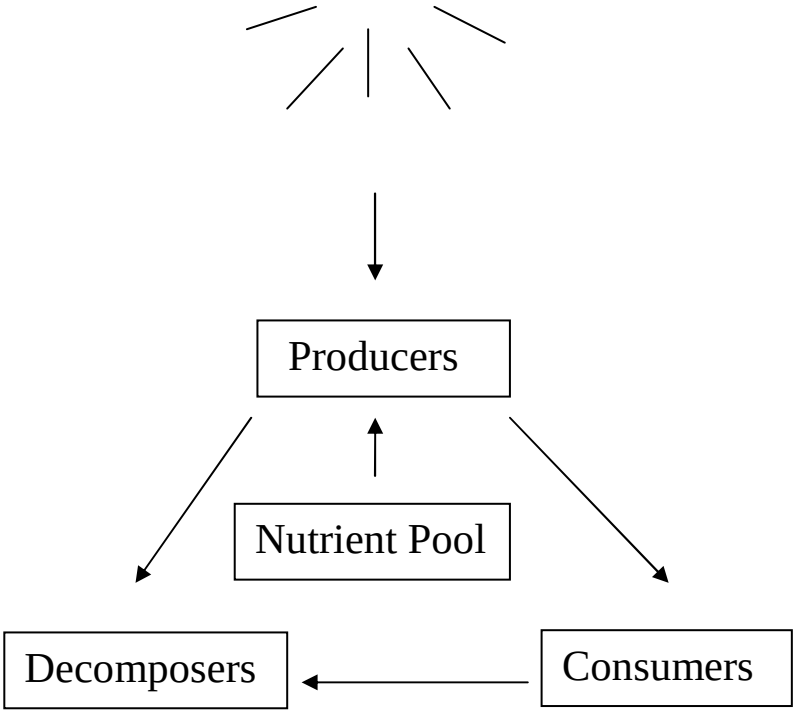
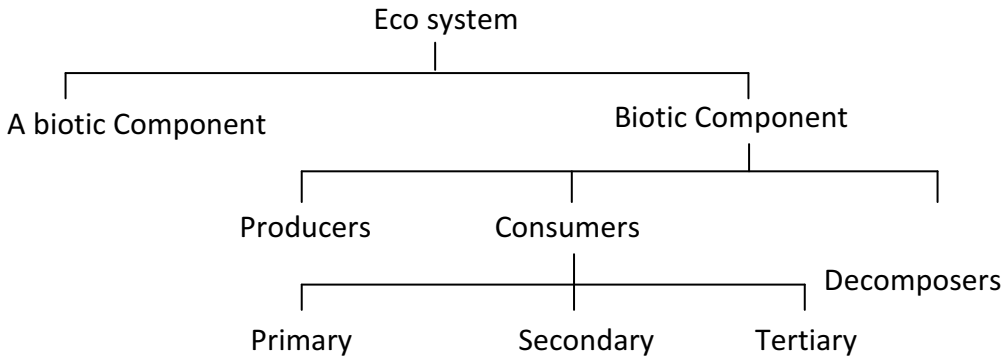


Fig: A Scheme of the structure of a unit of typical ecosystem



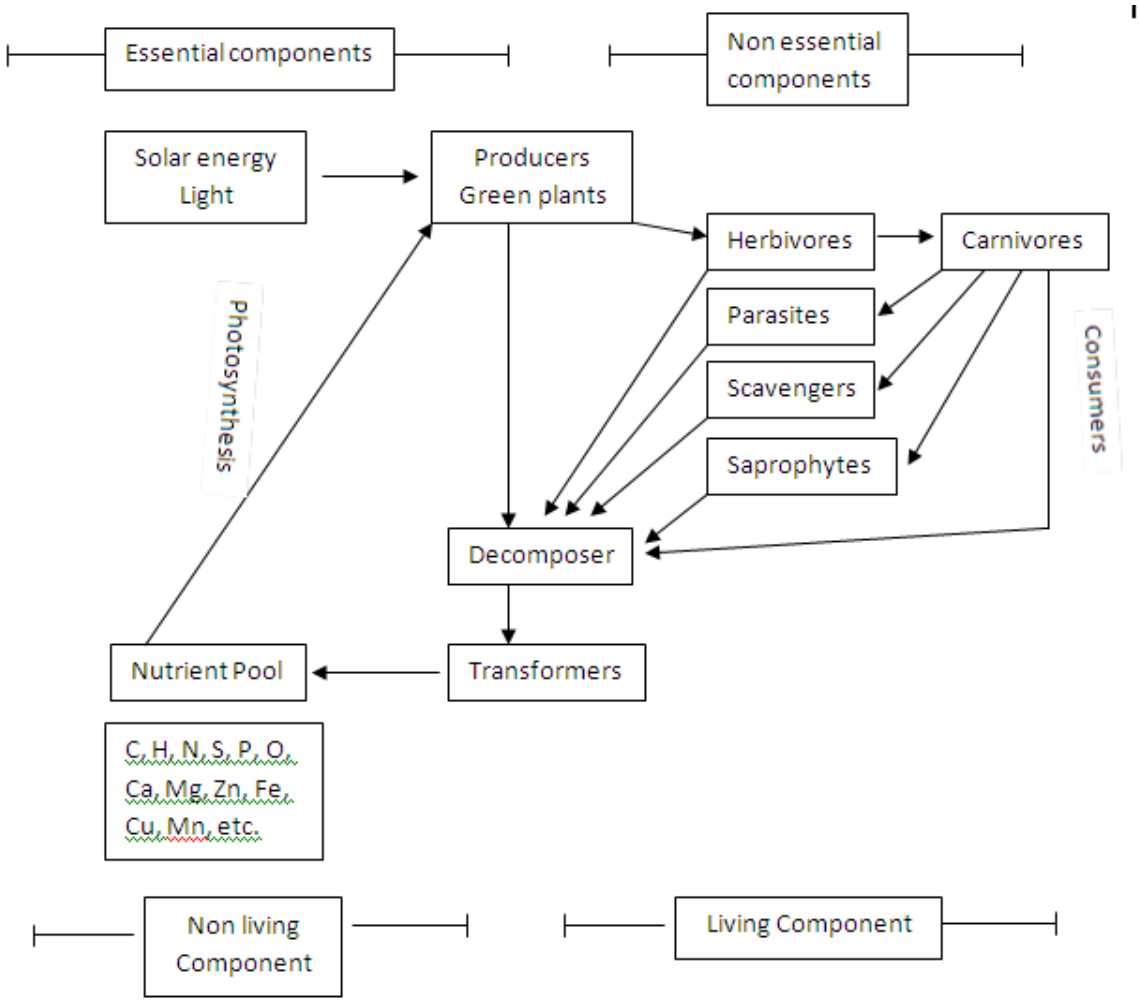


Fig: Principal steps and components in a self sufficient ecosystem

Check Points

- Ecosystem is the basic functional unit of Ecology.
- Non-living substance present in the ecosystem forms abiotic component.
- All living organisms present in an ecosystem constitute biotic component.
- Green plants, algae and diatoms are the producers present in the ecosystem.
- Producers receive the sunlight and fix it in the form of organic compounds.
- Consumers depend upon plants for their food.

- Herbivorous animals are the primary consumers
- Carnivorous animals are the secondary consumers.
- Bacteria and moulds are called as decomposers. Their activities make chemical substances available for producers.

Short Answer Questions:

1. What is ecosystem?
2. Describe the concept of an ecosystem?
3. Describe the abiotic component of ecosystem?
4. What are Consumers?
5. Explain the role of decomposers in an ecosystem?

Long Answer Questions:

1. Explain in detail the various components present in an Ecosystem?

Multiple Choice Questions

1. Which of the following is an abiotic component of the ecosystem.

   A) Bacteria

   B) Plants

   C) Fungi

   D) Inorganic elements

2. In an ecosystem bacteria are considered as

A) Primary Consumer

B) Secondary Consumer

C) Tertiary Consumer

D) Decomposers

3. Lion in an ecosystem acts as a

A) Primary Consumer

B) Secondary Consumer

C) Tertiary Consumer

D) Decomposers

4. Biological equilibrium is found between

A) Producers and consumers

B) Producers and decomposers

C) Producers and light

D) Producers, consumers and Decomposers

5. A rabbit feeding on potato tuber is

A) Producer

B) Primary Consumer

C) Secondary Consumer

D) Decomposer

6. Ecosystem has two components

A) Plants and animals

B) Weeds and trees

C) Biotic and abiotic

D) Producers and consumers

7. The frog that feeds on an insect is a

A) Tertiary Consumer

B) Decomposer

C) Primary Consumer

D) Secondary Consumer

8. Which are the biotic components of an ecosystem

A) Producers

B) Consumers

C) Decomposer

D) All of these

9. In a biotic community, the primary consumers are

A) Herbivores

B) Carnivores

C) Omnivores

D) Detritivores

10. The term Ecosystem was coined by

A) Tanselay

B) Aristotle

C) Kherana

D) Brown

11. Energy enters ecosystem through

A) Decomposers

B) Producers

C) Herbivores

D) Carnivores