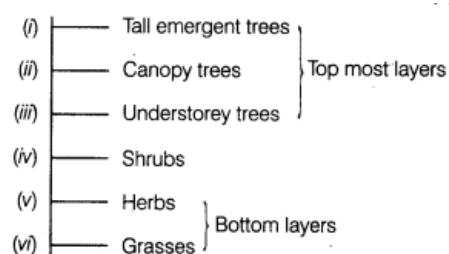


# Ecosystem-Structure & Function, Productivity & Decomposition

## 1 Mark Questions

1. How is 'stratification' represented in a forest ecosystem? [Delhi 2014]

**Ans.** The stratification, i.e. the vertical distribution of species at different levels, in a forest ecosystem can be represented as:



2. What does 'R' represent in the given equation for productivity in an ecosystem?  $GPP - R = NPP$  [All India 2014C]

**Ans.** In the given equation for productivity in an ecosystem  $GPP - R = NPP$ . 'R' represents the energy utilised by plants or producers in respiration. It is also referred to as respiration losses.

3. Mention any two reasons why the primary productivity varies in different types of ecosystems? [All India 2014c].

**Ans.** The primary productivity varies in different types of ecosystems as:

(i) It depends upon plant species (producers) of a given ecosystem and their photosynthetic capacity.

(ii) It is dependent on various environmental factors like availability of nutrients.

4. Why are green algae not likely to be found in the deepest strata of the ocean? [All India 2013]



**Ans.** Green algae survive by utilisation of food synthesised by themselves through photosynthesis. At deepest layer in ocean, light is absent. So, photosynthesis does not take place and hence, green algae are not found in deep strata.

**5. Write a difference between net primary productivity and gross primary productivity. [All India 2011]**

**Ans**

Difference between GPP and NPP is:

Gross Primary Productivity (GPP)	Net Primary Productivity (NPP)
It is the rate of production of biomass/organic matter by producers during photosynthesis.	It refers to the biomass/organic matter available for the consumption to heterotrophs, left after some respiration losses.

**6. What is secondary productivity? [Delhi 2009]**

**Ans.** Secondary productivity is defined as the rate of formation of new organic matter by the consumers.

**7. All the primary productivity is not available to a herbivore, give one reason. [Delhi 2009C]**

**Ans.** All the primary productivity is not available to a herbivore because a considerable amount is utilised by the plants in respiration, while some is lost as heat into the environment.

**8. What is net primary productivity of an ecosystem? [Delhi 2008C]**

**Ans.** The amount of remaining energy or biomass in a producer after meeting the cost of its respiration is called net primary productivity of an ecosystem.

## 2 Marks Question

**9. Differentiate between a detritivore and a decomposer giving an example of each. [Delhi 2008]**

**Ans**

Difference between detritivore and decomposer is:

Detritivore	Decomposer
Detritivore is an organism that breaks down the detritus into smaller particles, i.e. fragments. e.g. earthworm.	Decomposer is an organism, which does enzymatic degradation of detritus into simpler inorganic substances. e.g. some bacteria and some fungi.

### 3 Marks Question

10.(i) What is primary productivity? Why does it vary in different types of ecosystems?

(ii) State the relation between gross and net primary productivity. [Delhi 2014]

**Ans.** The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is called primary productivity. It is expressed in terms of  $g^{-2}yr^{-1}$ .

The primary productivity varies in different types of ecosystem as it depends upon different plant species present in a given ecosystem and each of their photosynthetic efficiency. Also, the environmental factors, availability of various nutrients vary in different ecosystems, leading to variations in primary productivity.

(ii) The relationship between gross and net primary productivity can be explained by equation:

$$GPP - R = NPP$$

While, GPP is total amount of organic matter produced during photosynthesis and NPP is same amount of organic matter (biomass) for the consumption of heterotrophs, except for some respiratory losses, i.e. energy utilised by plants during respiration.

### 5 Marks Questions

11. How is detritus decomposed step-by-step by different agents and made available as nutrients to the plants? Explain. [Delhi 2013c]

or

Describe the process of decomposition of detritus under the following heads fragmentation, leaching, catabolism, humification and mineralisation. [All India 2008C]

**Ans. Detritus** is the raw material for decomposition. It includes dead remains of plants (leaves, bark and flowers) and of animals including faecal matter. It is largely an aerobic process, i.e. requires oxygen for its processing.

Different steps involved in the process of decomposition are:

- (i) **Fragmentation** is the process of breaking down of detritus into smaller particles.
- (ii) **Leaching** is the process by which water soluble inorganic nutrients go down into the soil horizons and gets precipitated as unavailable salts.
- (iii) **Catabolism** is the process of degradation of detritus into simple organic material by the action of bacterial and fungal enzymes and their further conversion into inorganic compounds.
- (iv) **Humification** is a process that leads to an accumulation of a dark coloured, amorphous and colloidal substance called humus which is highly resistant to microbial action and decompose at a very slow rate. It serves as a reservoir of nutrients.
- (v) **Mineralisation** is the process by which humus is further degraded by microbial action and release inorganic nutrients.



**12. (i) Explain primary productivity and the factors that influence it. (ii) Describe how do oxygen and chemical composition of detritus control decomposition? [Delhi 20U]**

(i) Primary productivity can be defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis. It is expressed in terms of weight ( $\text{gm}^{-2}$ ) or energy ( $\text{kcal cm}^{-2}$ ).

It can be divided as:

(a) **Gross Primary Productivity (GPP)** It is the rate of production of biomass/organic matter by the producers during photosynthesis.

(b) **Net Primary Productivity (NPP)**

It is. the biomass/organic matter available at the producer level to the primary consumers, i.e. GPP respiratory losses.

Factors affecting primary productivity:

- Availability of nutrients.
- Quality and duration of sunlight.
- Water availability.
- Temperature of given place.
- Type of plant species.
- Photosynthetic capacity of plants.

(ii) (a) **Oxygen composition of detritus**

- Decomposition is an oxygen consuming process. Anaerobic conditions inhibit decomposition.

(b) **Chemical composition of detritus**

- Decomposition is fast when detritus is rich in nitrogen and water soluble substances like sugars.
- It is slow, when detritus is rich in lignin and chitin.