



Presentation on PRODUCTIVITY

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Concept of productivity

- The biological productivity of aquatic systems, as of land, has been at several levels.
- Primary productivity
 - Gross
 - Net primary productivity
- Secondary
 - various trophic levels

What is primary productivity?

- **Primary productivity**

- The total quantity of carbon fixed by **autotrophs** (organisms that make their own food)
- Generally known as **photosynthesis** when carbon is fixed by plants
- Photosynthesis accounts for 95% of the primary productivity of the oceans

Photosynthesis

Ingredients

Product




$$\text{NPP} = \text{GPP} - \text{R}$$

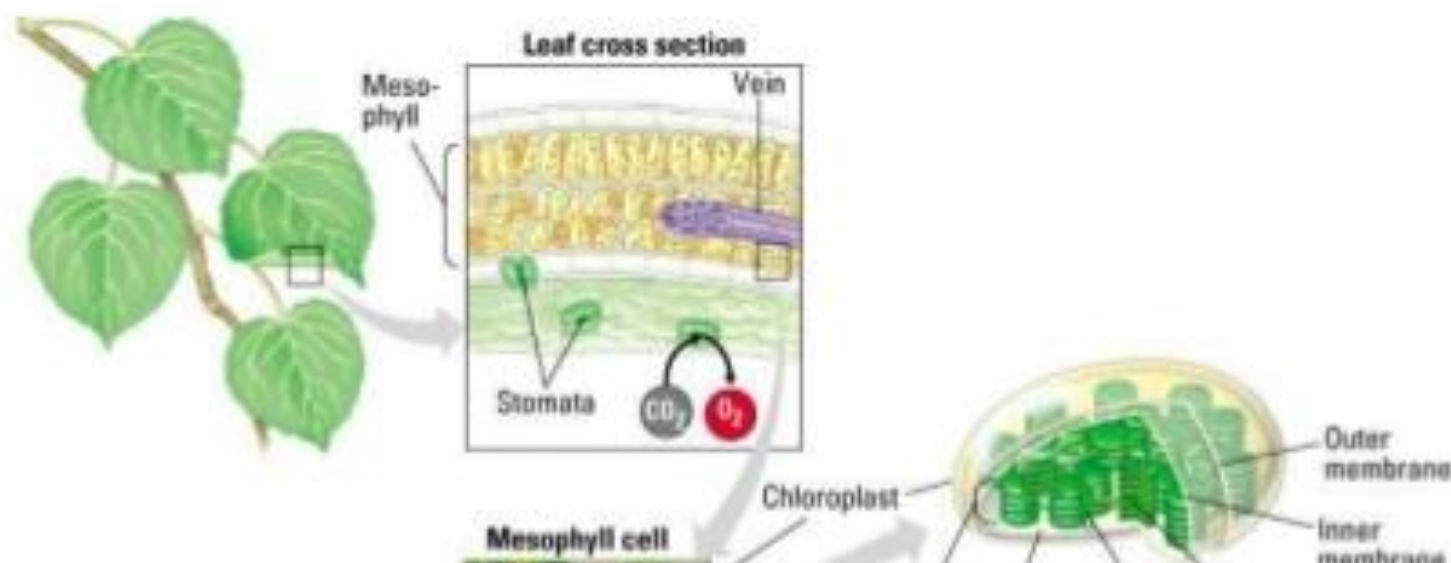
Glucose produced
during photosynthesis
(Gross Primary Production)

Some glucose used to
supply energy to drive cellular
processes
(Respiration)

Remaining glucose available
to be laid down as
new material - biomass
(Net Primary Production)

GROSS PRIMARY PRODUCTIVITY (GPP)

- is the quantity of matter produced, or solar energy fixed, by photosynthesis in green plants
- measured per unit area per unit time.
[Chemosynthesis and non-green plant autotrophs too]



* **Gross Primary Production = GPP**

GPP = All CO₂ fixed by the plant in photosynthesis.

* **Respiration = R**

R = CO₂ lost from metabolic activity

R_p = Respiration by Plants

R_h = Respiration by Heterotrophs

R_d = Respiration by Decomposers

* **Net Primary Production = NPP**

NPP = **GPP** - **R_p**

* **Net Ecosystem Production = NEP**

Two Kinds of Biological Production

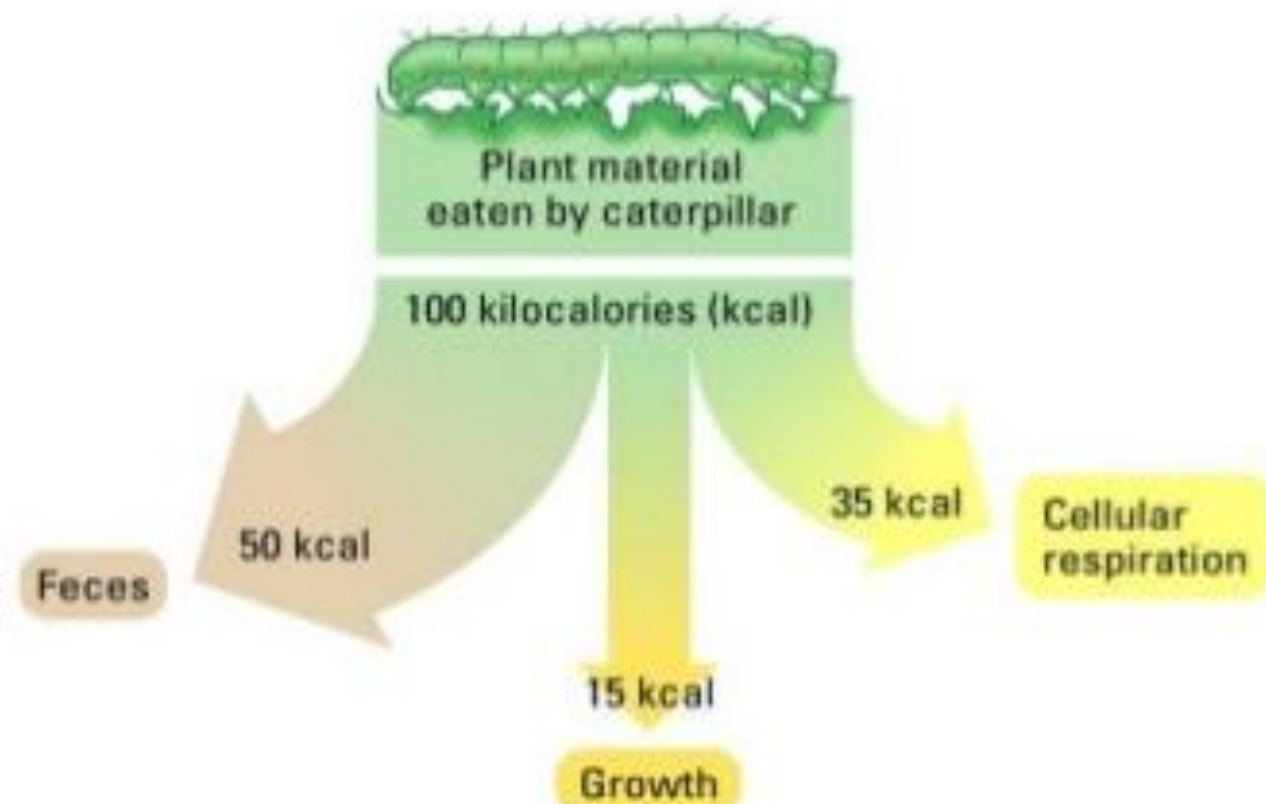
1. Primary Production

- Make their own organic matter from a source of energy and an inorganic compound
- Carried out by autotrophs and chemoautotrophs
- Ex) photosynthesis (energy “fixation”)

2. Secondary Production

- Cannot make their own organic compounds and therefore must feed on other living things
- Carried out by heterotrophs (animals, fungi, many bacteria...)

- biomass gained by heterotrophic organisms through feeding and absorption.
- Not all food eaten is absorbed (assimilated) into an animal's body
- Unassimilated food = feces or droppings



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$$SP = \text{food eaten} - \text{fecal loss}$$

Energy: Secondary Productivity

- **Secondary productivity** is the rate of new biomass production by consumers
 - highest in ecosystems with high net primary productivity
- Remember net primary productivity is concerned with producers, secondary productivity is concerned with consumers.

Primary productivity	Secondary productivity
The organic matter produced by producer in unit area for particular time duration.	The organic matter produced by consumer in unit area for particular time duration.
It is generally very high	It is generally very low and also decreases at each trophic level.
Inorganic matter converts into organic matter	Organic matter converts into organic matter.


Difference between GPP and NPP is:

Gross Primary Productivity (GPP)

It is the rate of production of biomass/organic matter by producers during photosynthesis.

Net Primary Productivity (NPP)

It refers to the biomass/organic matter available for the consumption to heterotrophs, left after some respiration losses.

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- (i) What is primary productivity? Why does it vary in different types of ecosystems?**
 - (ii) State the relation between gross and net primary productivity.**