Quadrant II – Transcript and Related Materials

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Paper Title: Fundamentals of Ecology

Unit No.: 3, Functional Aspects of Ecosystem

Module Name: Pathways of Energy Flow in the Ecosystem

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- **Notes**

Introduction

- ✓ Living organisms cannot live isolated from their non-living environment (physical environment) because the physical environment provides materials and energy requirements for the survival of biotic community.
- ✓ The biotic community together with its physical environment forms a stable interacting system, which is known as '*ecosystem*'.

Energy Flow in the Ecosystem

- ✓ Energy has been defined as "the capacity to do work."
- ✓ Energy enters all the ecosystems as sunlight and is gradually lost as heat back into the environment.
- ✓ However, before energy flows out of the ecosystem as heat, it flows between organisms in a process called energy flow.
- ✓ It's this energy flow that comes from the sun and then goes from organism to organism that is the basis of all interactions and relationships within an ecosystem.

❖ **Producers/ Autotrophs:** Producers are the chlorophyll containing organisms in the ecosystem that receives energy from sunlight and transform into food. E.g. – Plants and photosynthetic bacteria (terrestrial ecosystem), and algae and phytoplankton (aquatic ecosystem). As the green plants manufacture their own food they are known as Autotrophs (i.e. auto = self, trophos = feeder). Producers form the base of the food chain/web and are generally the largest group in the ecosystem by weight, or biomass.

❖ **Consumers/Heterotrophs:** These are the organisms which do not prepare their own food and depend upon other living organisms (Autotrophs) for their nutritional and energy requirements. Heterotrophs are divided into three categories:

1. Herbivores (Plant-eaters)

- ✓ Obtain their food directly from green plants or producers or autotrophs.
- ✓ They are also called as primary consumers or first order consumers
- ✓ E.g. grasshopper, deer, rabbit, goat, cattles, etc.
- ✓ Elton (1927) called them as "key industry animals" – they convert the plant matter into animal matter/material.

2. Carnivores (Flesh-eaters)

- ✓ Feed or prey upon other animals.
- ✓ Carnivores feeding upon herbivores are called primary carnivores. E.g. Frog, Fox
- ✓ Animals feeding upon primary carnivores are called secondary carnivores.
- ✓ E.g. Snake, Peacock
- ✓ Carnivores/Predators occupying the top position in food chain cannot be preyed upon further.
- ✓ E.g. Lion, Tiger, Owl etc.

3. Omnivores (variety-eaters)

These are consumers who actually eat either plant matter or animal meat. E.g. Rat, Chicken, Man etc.

❖ **Decomposers:** These micro-organisms obtain their food from dead bodies/ organic matter of either producers (plants) or consumers (animals) and their organic waste. E.g. bacteria, fungi, termites, worms etc. They are also known

as micro-consumers and reducers (decompose the dead bodies of organisms). They absorb part of decomposed material for their own nourishment and remaining substances are been added to the soil and the process is called "*mineralization*".

Pathways of Energy Flow in the Ecosystem

- ✓ When the solar radiant falls on the green surfaces of plants it gets transformed into chemical energy and in the presence of inorganic substances such as water and CO2 this chemical energy is stored as organic molecules (carbohydrates, proteins etc.) within the plants.
- ✓ Herbivores feed upon plant matter and convert this chemical energy into kinetic energy for their movements. Similarly, all the higher organisms feed either upon plant matter or herbivores to derive their energy requirements.
- ✓ The assessment of energy flow in an ecosystem can be done through food chain, food web or ecological pyramids.
- ✓ The position of an organism in the food chain signifies the **Trophic level** (TrL) of an organism.
- ✓ Producers form the first TrL in the food chain. Similarly, herbivores forms second TrL.

Biogeochemical Cycles

- ✓ The cycling of the nutrients in the biosphere is called biogeochemical or nutrient cycle.
- ✓ It involves movement of nutrient elements through the various components of an ecosystem.
- ✓ The purpose of biogeochemical cycles or nutrient cycles is to maintain an equilibrium state that ensures the sustainability of life on the Earth's surface.

Food chain

- ✓ The transfer of energy from one trophic level to the next trophic level; through a repeated series of eating and being eaten.

Three types: 1) Grazing food chain

2) Detritus food chain

3) Parasitic food chain

Food Web

- ✓ Food web is a set of integrated food chains or the combination of different food chains.
- ✓ Food webs describe the relationships in terms of trophic links or connections among different species in an ecosystem.