MODULE 19 - GRASSLAND ECOSYSTEM

OBJECTIVES

By the end of the session, the students will be able to know:

1. What is an ecosystem?
2. What are the grasslands?
3. Structure and functions of Grassland ecosystem.
4. Grasslands of India and M.P.
5. Threats to Grassland ecosystem and its conservation.

SUMMARY

This program deals with characteristic features of Ecosystem in general and structure & functions of Grassland ecosystem in various types of grasslands in the World and India have been enumerated. Common grasses of M.P. have also been mentioned. Producers, consumers and decomposers of grassland ecosystem have been listed. Conservation of ecosystems has been suggested.

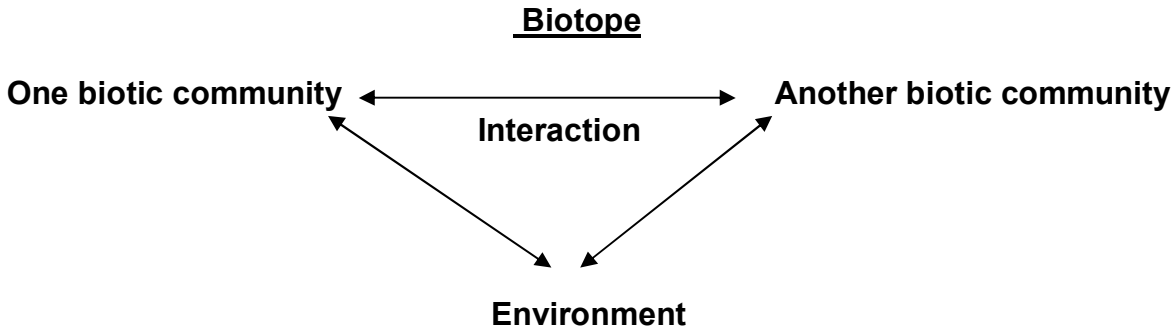
TRANSCRIPTION

Introduction:

Species is the basic unit of Ecology. Set of several species makes population, different populations make a community, and several communities interacting with each other make an Ecosystem.

Each biotic community lies in an abiotic environment called Biotope. The biotopes provide materials and energy to the communities inhabiting it. This means there is an interaction between biotic community and its environment.

The term ecosystem was introduced by AG Tansley in 1935 as Living world and its habitat, but the concept appeared in Ecology much later. An ecosystem is the structural and functional unit of biosphere comprising of the living organisms and their non-living environment that interact to form a self sufficient stable system. The relationship between a biotic community and the non-living environment is always a mutual one that means not only the environment affects the community but the community also modifies the environment as shown here:-



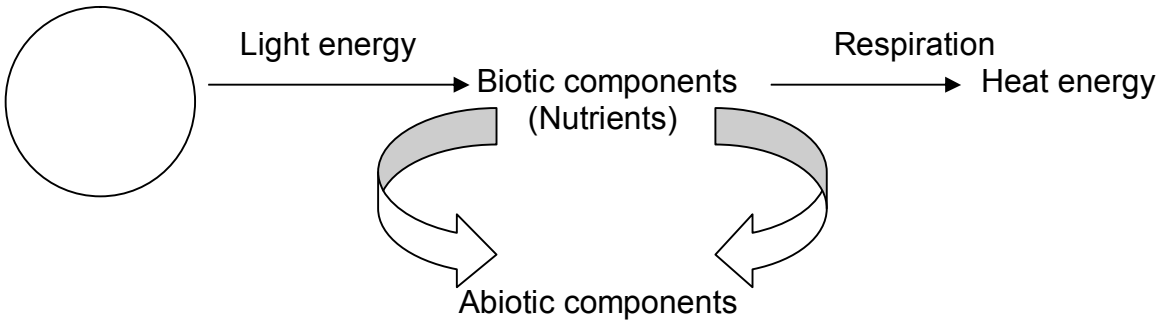
Ecosystem has been assigned various names by different workers, such as:

1. **Biocoenosis** by Karl Mobius (1877)
2. **Microcosm** by S.A. Forbes (1887)
3. **Holocoen** by Friederich (1930)
4. **Biosystem** by Thinneman (1939)
5. **Biogeocoenosis** by Sukhachev (1944)
6. **Ecocosm** by R. Mishra (1960)

The importance of Ecosystem lies in the flow of energy and cycling of matter between living and non-living components of the system.
The study of Ecosystem offers holistic approach i.e. it gives a complete picture of the unit which is more important than its individual components.

Ecosystem approach involves the following important aspects:

1. Flow of the energy from living to non living.
2. Cycling of matter between biotic and abiotic components.
3. Functional relationship between the organisms themselves and the environment.



Energy flow and cycling of matter in an Ecosystem:
An Ecosystem always remains in balanced condition unless it is disturbed by man.
The science of control of the ecosystem is called Cybernetics.

Types of ecosystem:
The natural ecosystem is of two types

(A) Terrestrial
(B) Aquatic

The terrestrial ecosystem includes forests, grasslands and deserts. In this film, grasslands and desert ecosystems have been dealt with.

Grassland Ecosystem: Grasslands, also called rangelands provide forage and habitat to the grazing animals and wildlife. In the rural areas, dried hay is collected from grasslands especially the tall grasses are used as fuel, fodder and thatching material. Grasses are very good soil binders due to extensive fibrous roots and thereby significantly reducing the soil erosion.
In India, the area under various kinds of grass cover is estimated to be 18 to 19 percent of the total land. The annual production of dry grass or hay is about 250 million tons.

Growing grasses along with forest trees like *Teak* and *Sal* is called agroforestry in which the ground floor of soil is used for growing grasses.
In grassland ecosystem, the rainfall is from 25 to 75 cm per year. In such a low amount of rainfall the big trees can't survive.
The grasses attain a length from 2 to 3 meters. Bamboo is the tallest grass growing up to 10 meters.
Grasslands in temperate regions are pure grasslands without trees. They have been given different names such as:

(a) Prairies in North America
(b) Steppes in Eurasia
(c) Pampas in Argentina
(d) Tussock in New Zealand

Prairies have tall grasses. In hot weather, all grasses become dry and mix with the soil therefore the soil of grasslands is rich in minerals. The upper portion of the grassland soil is dark due to accumulation of the organic matter.
In the Tropics, the grasslands are mixed with trees here and there. Such grasslands are called Savanna. Savanna occur in South America, Australia and India. The climate is arid and the trees are thorny.
According to Odum, each ecosystem has biotic and abiotic components. Biotic components include producers, consumers and decomposers whereas abiotic components include inorganic nutrients, organic compounds and climatic factors.

Biotic Components: The living or biotic components of grassland ecosystem are:

PRODUCERS: Green plants are always producers because they have the capacity to produce foods like carbohydrates by combining simple substances like carbon dioxide and water in the presence of the sunlight, the process is called Photosynthesis. The common producers 'Grasses' of Indian grasslands are *Dicanthium, Sehima, Phrqgmites, Saccharum, Cynodon, Cymbopogon* etc. The common shrubs and trees of Savanna grasslands as observed in India are *Prosopis, Zizyphus, Capparis, Acacia* and *Butea*.

CONSUMERS: Consumers are of different orders such as Primary, Secondary, tertiary and the Top most. Primary consumers are the herbivores like *rabbit*, *goat*, *sheep, dear, horse, cow, buffalo, nilgai* etc. Primary consumers are called the Secondary producers because all carnivores depend on them for their food. Charles Elton has called the primary consumers as the key industry animals. Several insects like *grasshoppers, leafhoppers* are also common. *Spiders* are also found in plenty. Burrowing herbivores like *rats* are also found in plenty.
Secondary consumers are carnivores like *snakes, fox, jackals* and *wild dogs*.
Tertiary consumers are *wolf, panther* and birds like *kite, vulture* and *peacock.*

DECOMPOSERS: These include *bacteria* and *fungi* which act upon the dead bodies of producers and consumers and return minerals locked in them to the soil.

Grasslands of India:
Grasslands form a variety of Ecosystem which is located in different climatic conditions ranging from near desert conditions to the patches of Shola grassland that occur on hill slopes alongside the extremely moist evergreen forests in south India.

The Himalayan forests show grasses mixed with conifers. There are tracts of tall elephants grass in the low lying *Terai* belt of Himalayan foothills. The animals migrate up to the high altitude grasslands in summers and move downwards in the forests when the snow covers the grasslands. This Ecosystem supports several endangered species of animals such as tigers, elephants, rhino etc. Other common animals are *wild ass, hangul, Kashmir stag, langur* and *pigmy hog*.

The semi arid land of eastern India, central India and the Deccan are covered with the patches of grasses with thorn forests. The common animals are *wolf*, the *black buck* and *chinkara*. The shol a grasslands are common in Western Ghats, Nilgiri and Pulney hills. Briza minor, a grass with showy flowers adds to the beauty of these hills.

Grasslands of Madhya Pradesh:
S.D.N. Tiwari and R. Mishra have studied the grasslands of Madhya Pradesh and recognized 8 types of grasslands. Some grasses of economic value are:

S. No.	Name of the Grass	Habitat	Economic Importance
1.	Alloteropsis	Wasteland and sandy soil	Fodder
2.	Andropogon	Hilly areas	Fodder
3.	Apluda	Slopes and bunds	Soil binder as well as fodder
4.	Arundiniella	In marshes	Thatching roof
5.	Cenchrus	Plains	Excellent fodder
6.	Chrysopogon	Forests	Good fodder
7.	Cymbopogon martin	Plains of Betul, Chhindawara, Mandla	Source of commercial Russian grass-oil used in soap making

Functions of Grassland Ecosystem: Grasslands are the grazing areas for many rural communities. Farmers who keep cattle and goats as well as shepherds who keep sheep are highly dependent on grasslands. Domestic animals are grazed on the common land of the village. Dry grasses are collected as fodder and stored to feed the cattle in the summers when there is no grass left for them in grasslands. Grass is also used to thatch houses and farm sheds. Thorny bushes and trees in Savanna grasslands of India are used as fuel wood. Most of the grasses in tropical countries like India are C4 plants. They can use even the minimum amount of Carbon dioxide present in air. They start photosynthesis even when the Carbon dioxide in air is 1-10 ppm where as C3 plants like Soybean requires 50-150 ppm. The production of C4 plants is more and most of the grasses occupy this category. *Cynodon*, popularly known as *Bermuda grass* or *Dub grass* is the common plant observed throughout the world. In India, it has some religious value also as it is offered to some Gods.

Threats to Grassland ecosystem:
In many areas grasslands have been used for centuries by pastoral communities. Due to population explosion and industrialization, grasslands have been converted to residential areas and industries. Farmers have started cultivating cash crops like sugarcane. It needs more irrigation and has made the soil saline. Short term economic gains should not go at the cost of long term economic losses and ecological losses.

The number of grazing animals has increased and present days grasslands can't support it. Therefore grasslands are undergoing deterioration.
Fires, natural as well as man-made also, result into the degradation of grasslands ecosystem. In India the area under grasslands has squeezed to 3.7% at present.

Why are our grassland species disappearing?
Several grasslands species have disappeared from several parts of India in which they were found 50 to 60 years ago. The *wolf* is now highly threatened. The *black buck* and *chinkara* are poached for their meat. Birds such as *great Indian bustard* are vanishing due to degradation of grasslands ecosystem.
Due to disappearance of grasses, several wild grasses will also disappear. Our present day wheat '*Triticum aestivum*' has originated by cross between two wild grasses:- *Triticum monococcum* and Aegilops squarrosa. Grasses are important for developing new varieties of crop plants. Genes from wild herbivores like wild sheep; wild goat may be used for developing new strains of domestic animals.

How can grassland ecosystem be conserved?

1. Grazing should be allowed by rotation.
2. Fires should be controlled.
3. Different grasslands to be declared as National parks and Sanctuaries where not only grasses shall be protected by animals like *wolf*, animals like *Chinkara* and birds like *Bustard* and *Floricous* will be conserved.
4. Grasslands shouldn't be converted to Industrial areas.
5. Awareness should be created in the common man about the long term advantages of grassland ecosystem.
6. Keeping grasslands alive should be a National priority.

GLOSSARY

1. **Ecosystem**: Interaction between the organisms and the environment
2. **Biosphere**: Living organisms in a particular atmosphere
3. **Biotope**: Abiotic environment in which the organisms live
4. **Inhabiting**: Living in a particular habitat
5. **Forage**: Fodder
6. **Thatching material**: Roofing material
7. **Agroforestry**: To grow grasses on forest floor
8. **Temperate**: Cold
9. **Soil erosion**: Removal of soil layer
10. **Savanna**: Grassland mixed with scattered trees
11. **Nutrient**: Providing nourishment
12. **Biotic**: Living
13. **Abiotic**: Nonliving
14. **Photosynthesis**: Synthesis of food by green plants by using sunlight as the source of energy
15. **Burrowing**: Digging hole for living
16. **Shola grassland**: Grassland along hill slopes in moist evergreen forests

F.A.Q.s

Q. 1: Which name has been suggested for Ecosystem by Prof. R. Mishra?
Ans: Ecocosm

Q. 2: Who disturbs the Ecosystem?
Ans: Human beings

Q. 3: What is Cybernetics?
Ans: The science of control of Ecosystem.

Q. 4: What is another name of Grassland?
Ans: Rangeland

Q. 5: List 3 advantages of Grassland Ecosystem?
Ans: It provides fodder, fuel and thatching material.

Q. 6: What is Agroforestry?
Ans: Growing grasses along with forest trees.

Q. 7: How do grasses act as soil bindesr?
Ans: Through extensively grown root system.

Q. 8: What is the range of rainfall in Grassland ecosystem?
Ans: 25 to 75 cm per year.

Q. 9: Name the tallest grass?
Ans: Bamboo

Q.10: Name the grass plant common throughout the world.
Ans: 'Cynodon dactylon' also known as Bermuda grass or Dub grass.

Q. 11: Write the name of grassland found in N. America.
Ans: Prairies

Q.12: What is the name of the grassland of Eurasia?
Ans: Steppes
Q. 13: What is the name for the grassland od Argentina?
Ans: Pampas

Q. 14: Where do the Tussock grassland occur?
Ans: New Zealand

Q.15: What type of grasslands are found in India?
Ans: Savanna

Q.16: List three other regions where Savanna grasslands are found?
Ans: (a) East Africa (b) South America (c) Australia

Q.17: Write two other names of Primary consumers.
Ans: (a) Herbivores (b) Secondary producers

Q.18: Who has called primary consumers or herbivores as the key industry animals?
Ans: Charles Elton

Q. 19: What is the position of Fox in grassland ecosystem?
Ans: Secondary consumer

Q.20: List any 4 tertiary consumers of grassland ecosystem.
Ans: (a) Wolf (b) Kite (c) Vulture and (d) Peacock

Q. 21: List three important threats to grassland ecosystem.
Ans: (a) Population explosion (b) Industrialization (c) Natural/manmade fire