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Unit-I

Introduction and Types of Biodiversity

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Agrobiodiversity and Sustainability

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Introduction

Agro-biodiversity = Agriculture + Biodiversity (biological diversity)

It includes all components of biological diversity of ***relevance to food and agriculture:***

the variety and variability of

plants, animals and micro-organisms*

at genetic, species and ecosystem level

which are necessary to sustain ***key functions*** *in the agroecosystem, its structures and processes.*

* used directly or indirectly for food

Source: Convention on Biological Diversity

Importance of biodiversity in agriculture Ecosystems

- *In agriculture ecosystem biodiversity is important*

1. *for the production of food, fibre, fuel, fodder… (goods)*
2. *To conserve the ecological foundations to sustain life for future*
3. *to allow adaptation to changing situations like climate change ,natural disaster etc.*

Components of Agrobiodiversity

- Habitat diversity (Land use varies with soil and terrains)
- Inter-species diversity (different species of Plant, animal and microbial)
- Intra-species diversity (very important for agrobiodiversity) Genetic resources , unique traits –resistance to drought, cold, disease, etc, rooting, aspect, taste, storage, etc.
- Harvested species (species used for food like wheat ,rice , maize etc.)

Benefits of agro-biodiversity

- Environmental Benefits

a) Air ,water and soil qualityimproves

b) Wildlife Habitats

- Economical Benefits

a) Conserve energy due to mixing crop which is the basic idea of agrobiodiversity

- Social Benefits

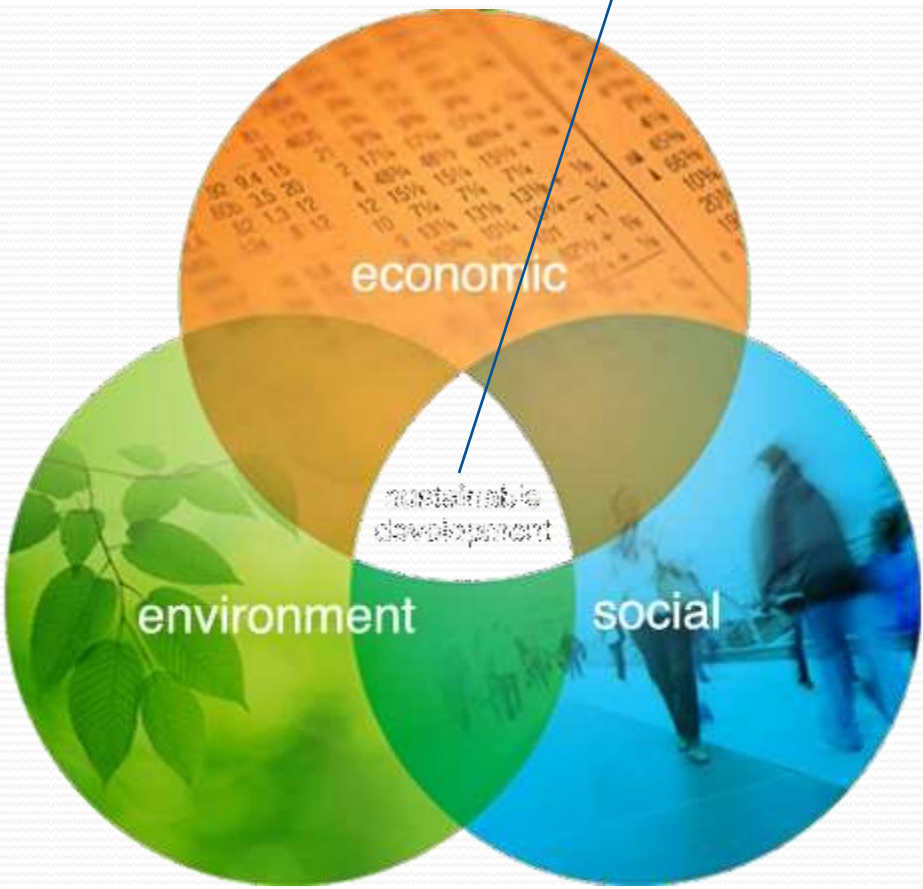
a) Improving quality of Life due to fresh environment

How we define Sustainability?

- *Sustainability is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*

Pillars of Sustainability

- The idea is to promote a balance between these three interrelated pillars
1. Economic
2. Environment
3. Social

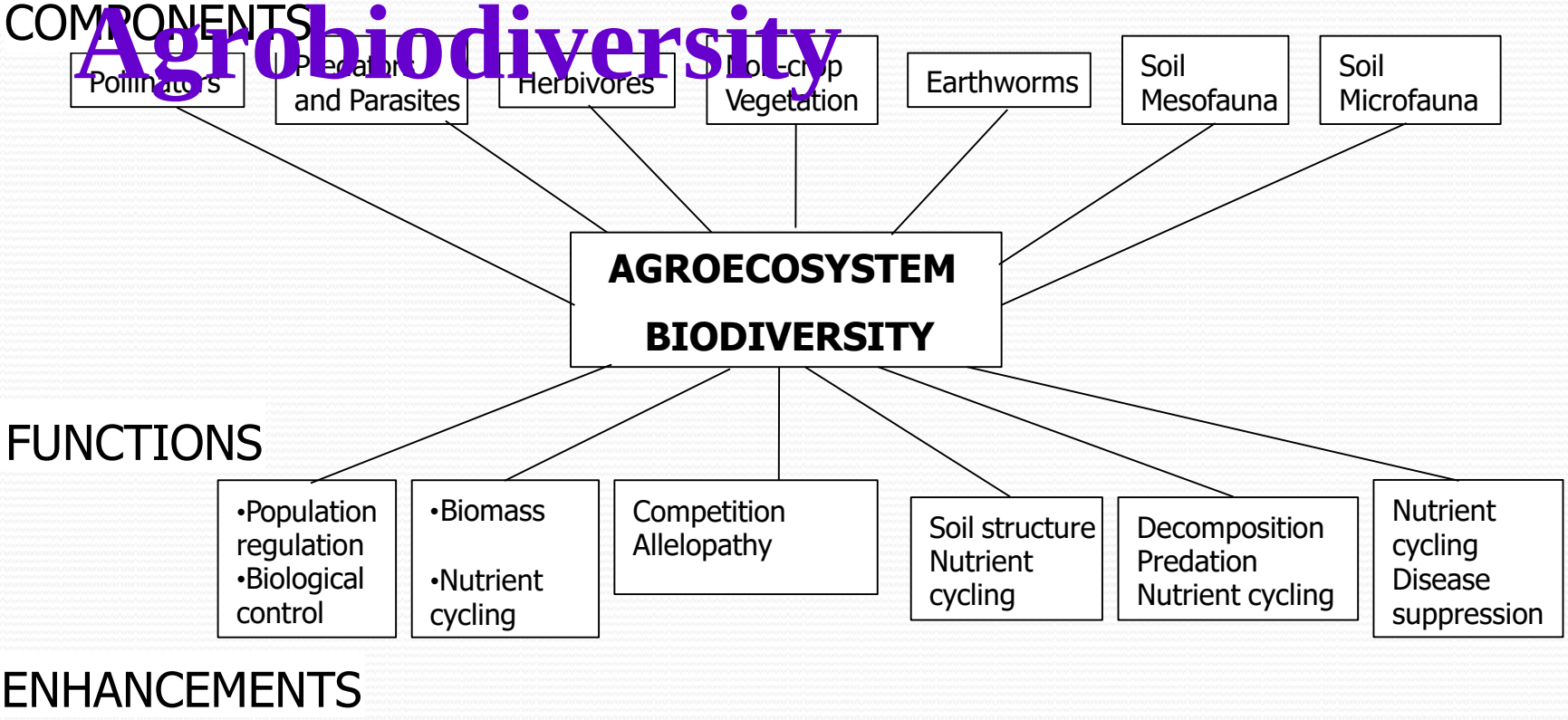


- Biodiversity loss in agricultural landscapes affects not just the production of food, fuel, and fiber, but also a range of ecological services supporting clean water supplies, habitats for wild species, and human health.

What are the Approaches ???

- Managing Agro-ecosystem biodiversity
- Soil biodiversity and its management
- Farmers' studying ecology and biodiversity
- Managing Pollinators
- Agriculture-environment collaboration

Managing of Agrobiodiversity



Source: From Altieri, M.A. Biodiversity and pest management Agro-ecosystems, Haworth Press, New York, 1994)

i) Agro-forestry

systems can be initially classified according tothe components present :

S.No.	Type	Description
1.	Silvoarable	Trees with Crops
2.	Silvopastoral	Trees with Animals
3.	Agro-Silvopastoral	Trees with Crops and Animals

Silvoarable

- Best utilization of Nutrients
- More Carbon sink
- Reduce Soil erosion

Silvopasteral

Plants + animals

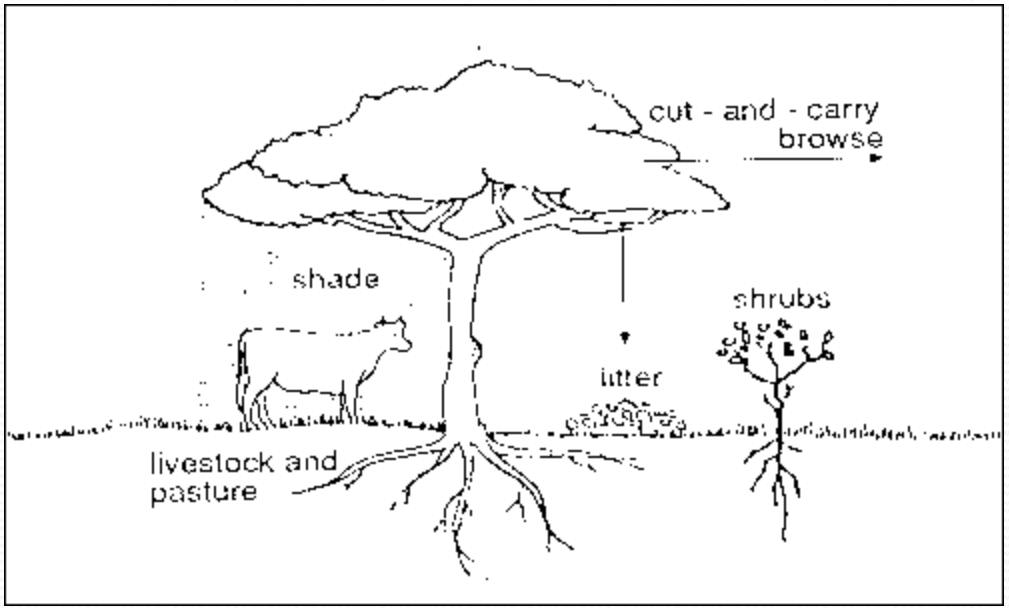
•Human fullfills their basic needs .

e.g. From plants in the formof fruit , medicines and animal (buffalo) in the form of milk and another type shown in figure…

Chickens sheltering in the silvopoultry system

Agro-Silvopastoral

Agro-silvopastoral is
- Complex systems
- Crops, trees and pasture / animals
- In the same unit of land



Source: http://www.infonet-biovision.org/res/res/files/1902.500x400.png

Case study of Agro-biodiversity

- Location : Hara Farms situated at Amadalpur ,Jagadhri, Haryana
- On 110 acres of land
- 18,000 timber trees
- 1,50,000 Poplar nursery plants
- 9574 Fruit trees which include Mangoes, litchis, sapota(chikoo), pears, peaches, guavas, etc.
- 5 acres of spice crops including turmeric and ginger
- Food crops:
  - Maize - 10 acres,
  - potatoes -5 acres,
  - peas -10 acres,
  - wheat -4 acres
  - Pumpkins - 5 acres
  - fish - 9 acres (12 tons of fish and 15 tons of water chestnuts per year)

Poplars

Poplars, Mangoes and Hybrid Corn

Mangoes

Fisheries

Production

Eco-friendly production on Hara Farms

- An abundance of timber
- Improving air quality in the area
- Enhancing labour employment
- Carbon sinks
- Food

Hara Farms production is environmentallydesirable, economically feasible, agronomically compatible, sustainable .

Soil biodiversity and its management

- *To improve soil biodiversity in sustainable way using :*

a) *Biofertilizers*

b) *Biopesticides*

c) *Crop-rotation*

d) *Ogranic farming including oganic manure resultant of horticulutre.*

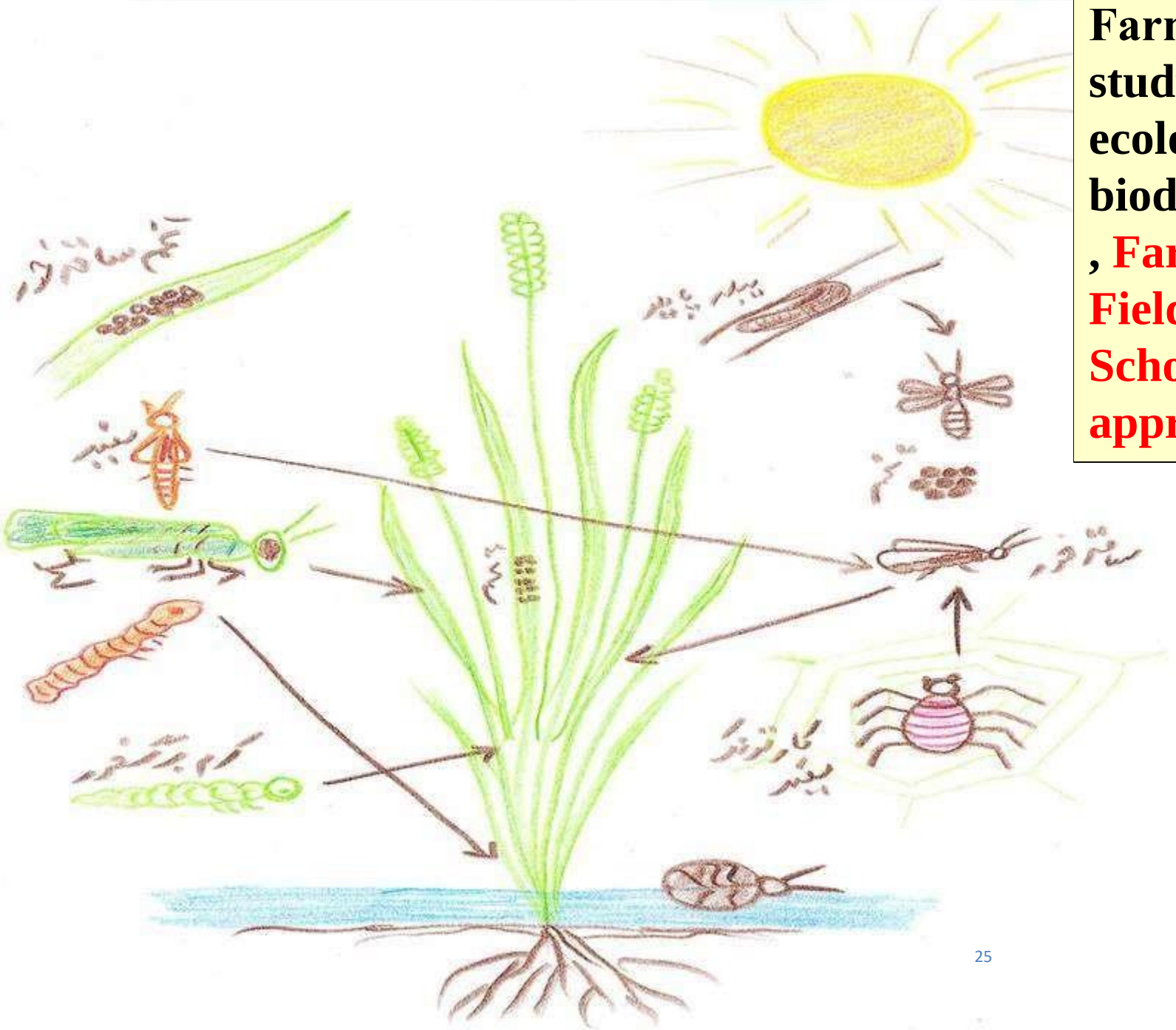
Improve Soil Biodiversity

Micro-organisms e.g. bacteria + fungi

...Roots in the soil and their interactions with species above & below ground

Macro-fauna e.g. ants, termites, earthworms

Farmers' studying ecology and biodiversity , Farmer Field School approaches



Managing Pollinators

Management practice:

→In Himachal Pradesh in Northwest Indian Himalayas farmers are using colonies of honeybees – *Apis cerana* and *Apis mellifera* for pollination of apple crop.

→*Apis* spp. Helps in pollination of apple tress

National Agricultural Biodiversity Programme

- In December 2004, the Ministry of Agriculture and Forestry endorsed the Lao PDR "National Agricultural Biodiversity Programme" (NABP) as a policy document.
- The NABP was developed to act as the framework and long-term strategy for implementing acoordinated approach to better using, developing and conserving agricultural biodiversity.

Source: ftp://ftp.fao.org/docrep/fao/010/ai759e/ai759e00.pdf

Policy framework

- The NABP is a structured policy framework which addresses the following thematic components:

a) Crop and Crop Associated Biodiversity;
b) Livestock Development and Management;
c) Non-Timber Forest Products and other Terrestrial Biodiversity;
d) Sustainable Use and Conservation of Aquatic Biodiversity;
e) Household-based Integrated Agriculture Production Systems.

Conclusion

- Agrobiodiversity has become an international priority and is institutionalized through binding international legal agreements.
- Implementation of conservation strategies falls broadly into *in situ and ex situ approaches*. Each of these strategies has advantages and disadvantages.
- But it is clear that the conservation of agrobiodiversity is a prerequisite for the development of sustainable agricultural systems.

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