Unit – III
Soil Degradation

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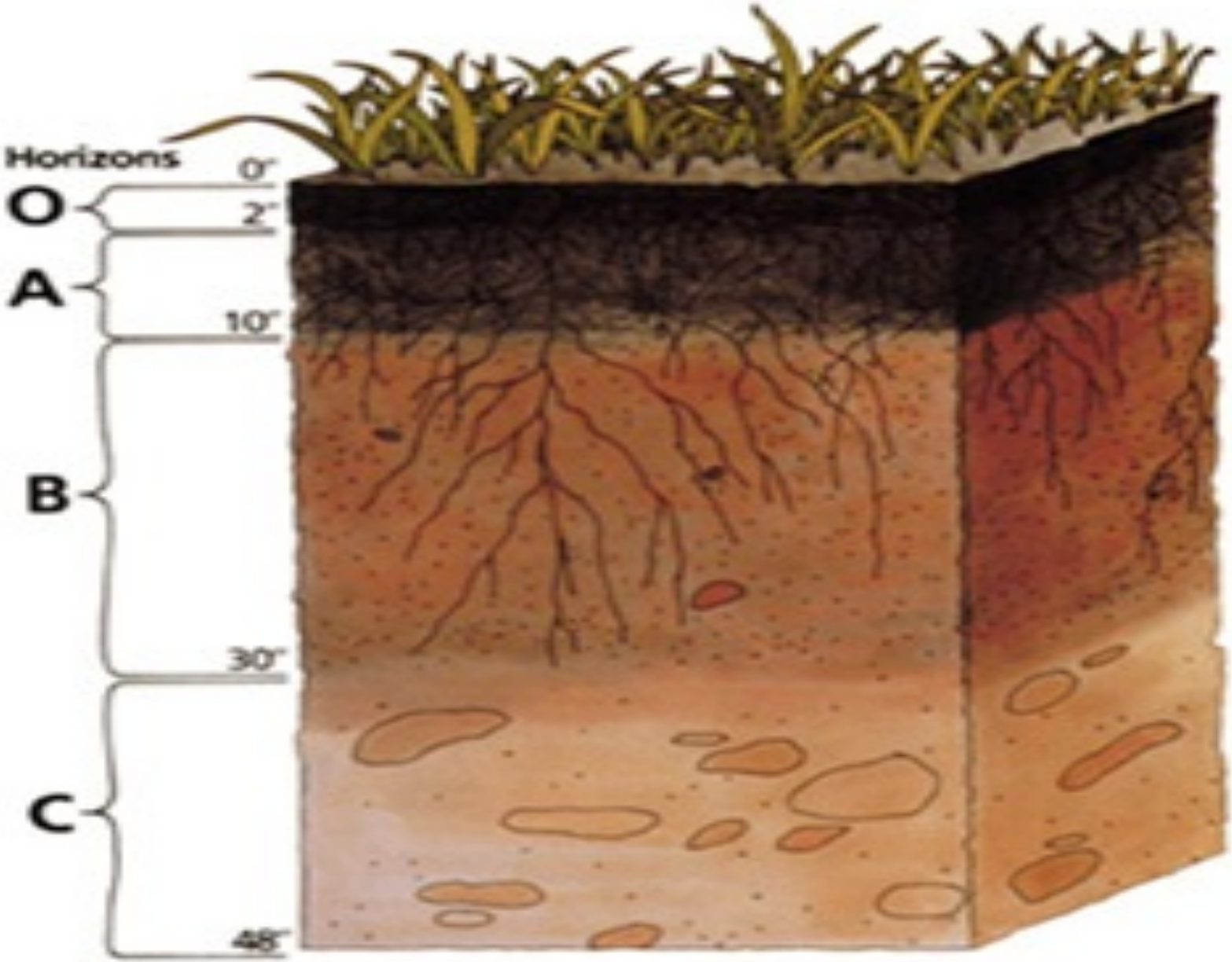
Introduction

- **Soil** is a resource for which there is no substitute. Fertilizers are not a substitute for fertile soil.
- **Soil -** "A thin covering over the land consisting of a mixture of minerals, organic material, living organisms, air and water that together support the growth of plant life".
- **Soil formation**:
  - ✔ Parent material
  - ✔ Weathering of rocks - Temperature, abrasion, wind, water, glaciers, lichens.
  - ✔ Climate and time - dry or cold climates (very slow) & humid and warm climates (rapid).
  - ✔ Under ideal climatic conditions - a centimeter of soil develop within **15 years**.
- **Mature soils** are arranged in a series of zones called soil horizons. Each horizon has a distinct texture and composition that varies with different types of soils.
- A cross sectional view of the horizons in a soil is called a **soil profile.**

Soil Profile



Soil Degradation

- **Soil degradation** is a process in which the value of biophysical environment is affected by one or more combination of human-induced processes acting upon the land.
- Important topic of **21st century**: due to its effects upon agronomic productivity, environment, and food security.
- It is estimated that up to **40%** of the world's **agricultural land** is seriously degraded.

Indicators of Soil Degradation

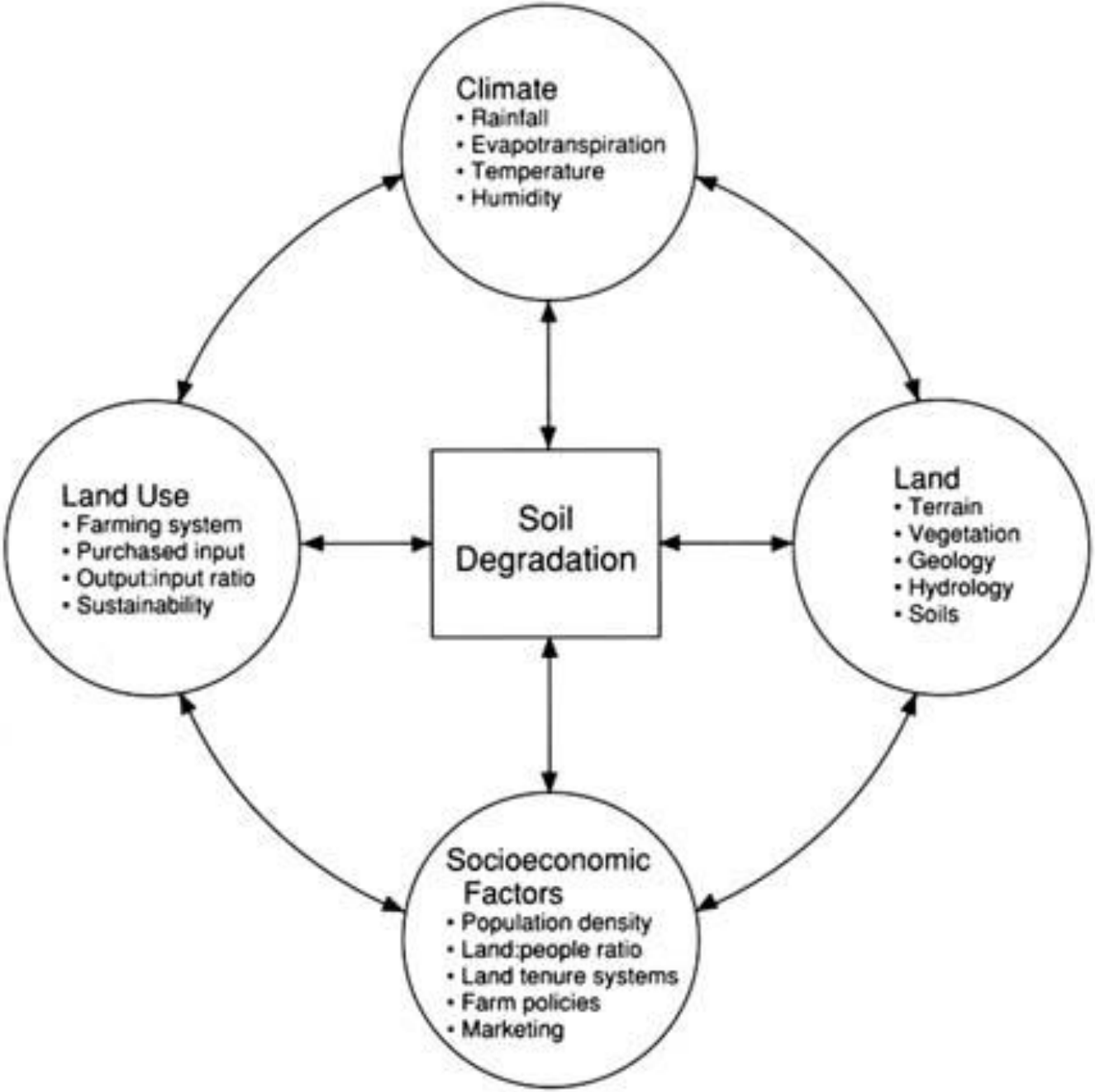
- **A temporary or permanent decline in the productive capacity of the land.**
- **A decline in the lands "usefulness"** – failure to meets population needs.
- **Loss of biodiversity:** a loss of range of species or ecosystem complexity.
- **Shifting ecological risk:** increased vulnerability of the environment or people to destruction or crisis.

Causes of Soil Degradation

- **Deforestation**
- **Depletion of soil nutrients** through poor farming practices
- Livestock **overgrazing**
- Inappropriate **irrigation** and over drafting of **ground water**
- **Urban sprawl** and commercial development
- **Soil contamination** including industrial waste
- **Mining**
- Exposure of **naked soil** after harvesting by heavy equipment
- **Monoculture**
- **Soil erosion**
- **Climate change:**

✔ Seawater inundation, particularly in **river deltas** and low-lying **islands**, is a potential hazard of climate change.

✔ Sea-level rise - **salinity** levels can reach levels where agriculture becomes impossible in very low lying areas.


Climate
• Rainfall
• Evapotranspiration
• Temperature
• Humidity
Land Use
• Farming system
• Purchased input
• Output:input ratio
• Sustainability
Soil Degradation
Land
• Terrain
• Vegetation
• Geology
• Hydrology
• Soils
Socioeconomic Factors
• Population density
• Land:people ratio
• Land tenure systems
• Farm policies
• Marketing

Effects of Soil Degradation

- Substantial reduction in **soil productivity**
- Accelerated **soil erosion**
- **Soil acidification** resulting in barren soil
- **Soil alkalinisation** due to irrigation with water containing sodium bicarbonate leading to poor soil structure and reduced crop yields.
- **Soil salinization** in irrigated land
- Soil **waterlogging** in irrigated land
- Destruction of **soil structure** including loss of organic matter

Soil Erosion

"Movement of surface litter and topsoil from one place to another"

- While erosion is a natural process often caused by wind and flowing water it is greatly accelerated by human activities:

✔ Unsustainable farming – Pesticide & Fertilizers, Mono-cropping, Tillage

✔ Construction

✔ Overgrazing by livestock

✔ Burning of grass cover

✔ Deforestation.

- **Problems**:

✔ Soil fertility & productivity decline

✔ Soil water holding capacity decline

✔ Water pollution - clog lakes & increase turbidity of the water

✔ Loss of aquatic biodiversity

✔ Desertification – formation and expansion of deserts

✔ Flood

1 inch of topsoil formation: **200-1000 years** - a **non-renewable resource**.

Soil Erosion Control

- Increase **vegetative cover** on the land.
- **Terracing** - hill slopes
- **Windbreaks** (shelterbelts) - rows of trees and shrubs around fields to shield crops against winds:

✔ Improve microclimate

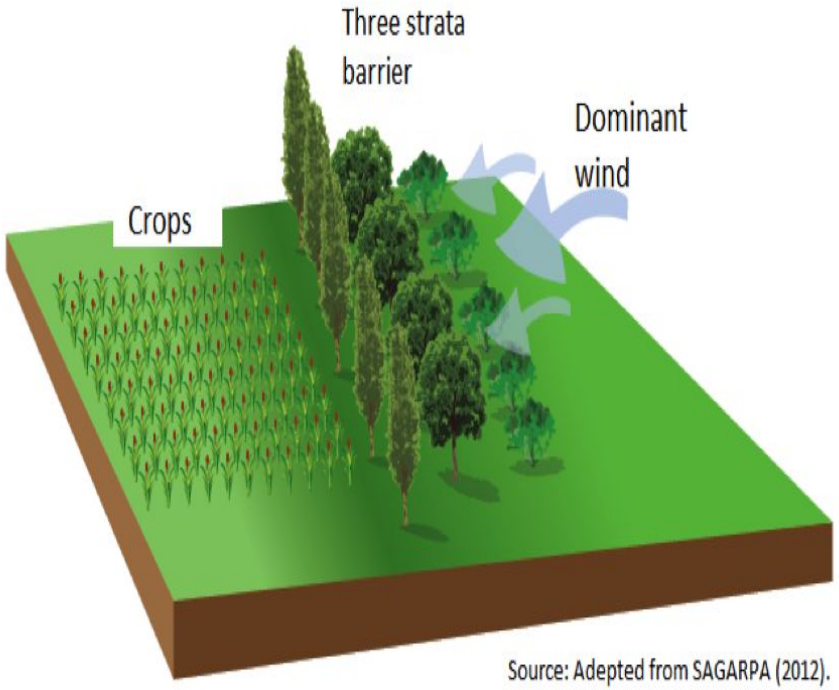
✔ Protect from dehydration

✔ Habitat for beneficial bird species

✔ Carbon sequestration

✔ Aesthetic improvements

- **Mixed-cropping**
- **Crop rotation**



Source: Adepted from SAGARPA (2012).

Further Readings

- Soil degradation and how to correct it, https://youtu.be/DM4AhycQzv0
- The value of soil, https://youtu.be/403sT9CGRl0
- Top Soil Loss- Protecting Your Farm's Most Valuable Asset, https://youtu.be/EPeUmVkrjUI
- Soil Conservation, https://youtu.be/3MlceK6tLpw


Thank you for attention!!!