# Chapter 8: The Nature of Resources

## Factors that Affect Soil Quality

- *Texture* refers to the type of particles in the soil
- Both (1) particles size and (2) the extent to which particles bond to one another affect soil quality
    - They determine how much water will flow through the soil
    - The water holding capacity of the soil
    - Air movement through the soil

- Three types of particles are:
    1) Sand – 85% or more of the soil is sand; the remaining parts are silt/clay
        - Soil is loose and coarse
        - Results in easy water and air penetration (good for drainage, bad for large scale plant growth)
    2) Clay – 40% or more of the soil is clay; the remaining parts are sand/silt
        - Five grains of silicate containing aluminum and water (good for bonding)
        - Absorbs and holds water like a sponge
        - Soil is slow to warm, slow to drain and hard to work
    3) Silty Soil – contains characteristics of both sand and clay
        - Particles of various sizes including sand and soil

- The most desirable soil for farming is *loam* (a combination of all three types)
    - Loam can be subdivided into two types:
        a) Sandy loam (mostly sand)
        b) Clay loam (mostly clay)
    - With various particle sizes and sufficient spaces between them, loam enables easy penetration of plant roots and nutrients

## Fertility

- Soil fertility is measured in terms of a soil's humus content relative to the amount of ground-down bedrock it contains.
- A soil's fertility depends on the blend of inorganic materials (rocks and minerals) and organic materials (plant and animal remains). The key in determining the fertility of the soil is its humus content
- *Humus* – decomposed organic content – is a rich source of nutrients for plants and other forms of vegetation. Humus also absorbs and retains the moisture required for plant growth
- Fertility is also affected by climatic conditions because the decaying process of plants and animal remains is determined by moisture and heat levels
    - In regions with hot, moist climates (rainforests), bacterial action is rapid, so vegetation and animal remains decompose quickly. Nutrients are also

quickly washed out of the soil by heavy rains, resulting in an infertile soil called *latasol*

- In the mid-latitude temperate regions (grasslands), the accumulation of humus is greatest. Leaching and eluviation is not excessive, and capillary action is moderate, resulting in a thick, sod-grass type of vegetation. This soil is known as *chernozem*, and it is extremely fertile
- The tundra area has very little plant growth and little accumulation of humus. The cold temperatures impede bacterial activity, and permafrost prevents adequate water drainage. This results in a very infertile soil called a *tundra soil*

**Soil Types**

| *Soil type* | *Ecosystem* | *Climate features* | *Leaching/ eluviation* | *Capillary action* |
|---|---|---|---|---|
| Podzol | Boreal or temperate forest | -cold winters<br>-short summers<br>-precipitation all year | Moderate | Weak |
| Chernozem | Temperate grassland | -humid continental<br>-temperate | Weak | Moderate |
| Desert | Desert | -extremely hot<br>-dry<br>-high evaporation rate | Weak | Strong |
| Latasols | Tropical rainforest | -hot<br>-precipitation all year<br>-continuous growth | Strong | Weak |
| Tundra | Tundra | -cold<br>-no month exceeds $10^{o}C$<br>-permafrost | Weak | weak |

- Soil differs from place to place.
  - Climate is the key factor that determines the type of soil a location will have. Climate controls the amount of heat, moisture, and vegetation that influences a soil's formation
  - The second factor is the type of bedrock that is the source of the soil's mineral content.
  - Other factors include human activities, time and the slope of the land

- Three processes involved in soil formation:
  A. <u>Leaching</u>
     - Some organic and inorganic material is dissolved and carried down into the lower portions of the mantle rock as rainwater seeps through the soil.
     - Excessive leaching removes minerals from the upper soil zone, where it is needed for plant growth.
     - Leaching is more severe in hot, humid regions near the equator

B. Eluviation
   - Percolating rainwater washes fine particles of insoluble inorganic matter downward through the soil.
   - Severely eluviated soils are usually coarse and poor for farming

C. Capillary Action
   - In arid regions, upper soil levels are drier than lower soil levels
   - The upper levels act like towels or sponges to "soak up" water in the subsoil, as water percolates upward through capillary-sized holes

- *Soil profile* refers to the fact that soil is arranged in recognizable layers, or horizons
  - *A Horizon,* the uppermost layer, is commonly known as topsoil. It is found where the accumulation of humus occurs and where leaching and eluviation are greatest
  - *B Horizon,* or subsoil, contains large amounts of fine-grained material as a result of leaching and eluviation. In some instances, the subsoil may contain tough layers of "hard pan." This results from the deposition of materials by excessive leaching and eluviation in the A Horizon
  - *C Horizon* contains mantle rock or slightly altered parent material.
  - *D Horizon,* the lowest zone, is the bedrock or unaltered parent material

- Soils are vital to the development and preservation of healthy ecosystems, soil is used to provide directly and indirectly for human consumption
- Plants and animals are dependent on soil for most of the nutrients needed to sustain life. The entire food chain depends on it

**Composition of Soil**

1) Inorganic – mineral matter, ex: sand, rocks, minerals

2) Organic – consists of dead microscopic and macroscopic forms of flora and fauna

3) Moisture and Air – as much as 50% of soil can be made up of these two substances. As moisture increases, the air decreases

- The respective contents are determined by:
  - Porosity – the ability of soil to hold air and water
  - Permeability – the ability of soil to drain water (ex: sand is very permeable)

**Genesis of Soil**

- Bedrock is weathered
- Lichen and mosses are able to grow and further degrade the rock
- As these fauna die, worms, insects and fungi reduce the organic matter into a dark layer of humus

- Humus is rich in nitrogen, potassium and phosphorus
- The natural vegetation affects what type of humus is created (climate affects vegetation)
- If there's a lot of dead organic material, rich deposits will develop

**Global Patterns in Relation to Soil Loss**

- Certain regions of the world enjoy more fertile soil than others, but all regions face the threat of soil loss.
- Soil loss is due to:
    - Erosion
    - Water run-off down a slope of land washes away valuable soil (wind and ice too)
    - Urban expansion
    - Overgrazing (ex: ranching in Brazil)
    - Flooding
    - Deforestation
    - Desertification

- North and South America as well as the Sahel in Africa suffer from desertification
    - This is due to overpopulation and climate change
    - Fragile ecosystems are capable of supporting limited herds of animals and small numbers of people
    - When they are required to support more, the areas come under greater and greater stress and the land becomes overused, resulting in desertification

**Resources**

- Resources are the available assets or sources of wealth that benefit and fulfill the needs of a community

<u>Different Types of Resources:</u>

1. *Natural Resources* – the natural source material found in the environment

    a) *Organic Resources* – resources that are living organisms. They are renewable and can be divided into two groups: flora (plant-life) and fauna (animal-life)

    b) *Inorganic Resources* – these consist of non-living source materials in solid, liquid or gaseous form. An example would be a mineral such as copper. Inorganic resources are non-renewable, meaning they cannot reproduce their own kind

c) *Permanent Resources* – these are resources that are not significantly destroyed or eliminated as people use them to satisfy their needs and wants (ex: air)

d) *Recyclable Resources* – these are inorganic or organic resources that are recycled or reused over and over again (ex: metals)

2. *Capital Resource* – money and equipment needed to extract the natural resource, refine it and develop it

3. *Human Resources* – entrepreneurs and others who organize and oversee the operation of the capital resources needed to develop the resource

<u>Conditions:</u>

- Certain conditions must be met in order for a natural resource material to be considered a resource:

  1) *Need or Want* – a culture must have a need or want (create a demand) that requires the use of a material
  2) *Technology and Development* – a culture or society must have the technology (equipment and expertise) to extract and develop the material
  3) *Profitability* – a culture or society must develop and use the material and make a profit (ex: sell for more than it costs)

- Examples:
  - *Sea urchins were not traditionally seen as a resource in Newfoundland because we did not eat them or use them for any reason. There was no need or want for sea urchins. However, in the cultures of Southeast Asia, sea urchins are a desired food source. With the opening of world markets, sea urchins became a resource. Asia had the "want". We have developed the harvesting "technology" because the demand was there. It is "profitable" due to inexpensive technology and high demand. Consequently, all three conditions were met and sea urchins became a resource*
  - *Sea weed or kelp was not traditionally seen as a resource in Newfoundland. Some people would throw it on their vegetable gardens as fertilizer but there was no real demand for it. However, kelp is a highly desired food in southern Asia. Furthermore, it is used to extract agar and other substances for a variety of products such as ice-cream and make-up. With the variety of demand for kelp, some people have begun to harvest it off our shores and others have tried to farm it (aquaculture). Once the desire is created, the technology was developed in a way to make it profitable.*