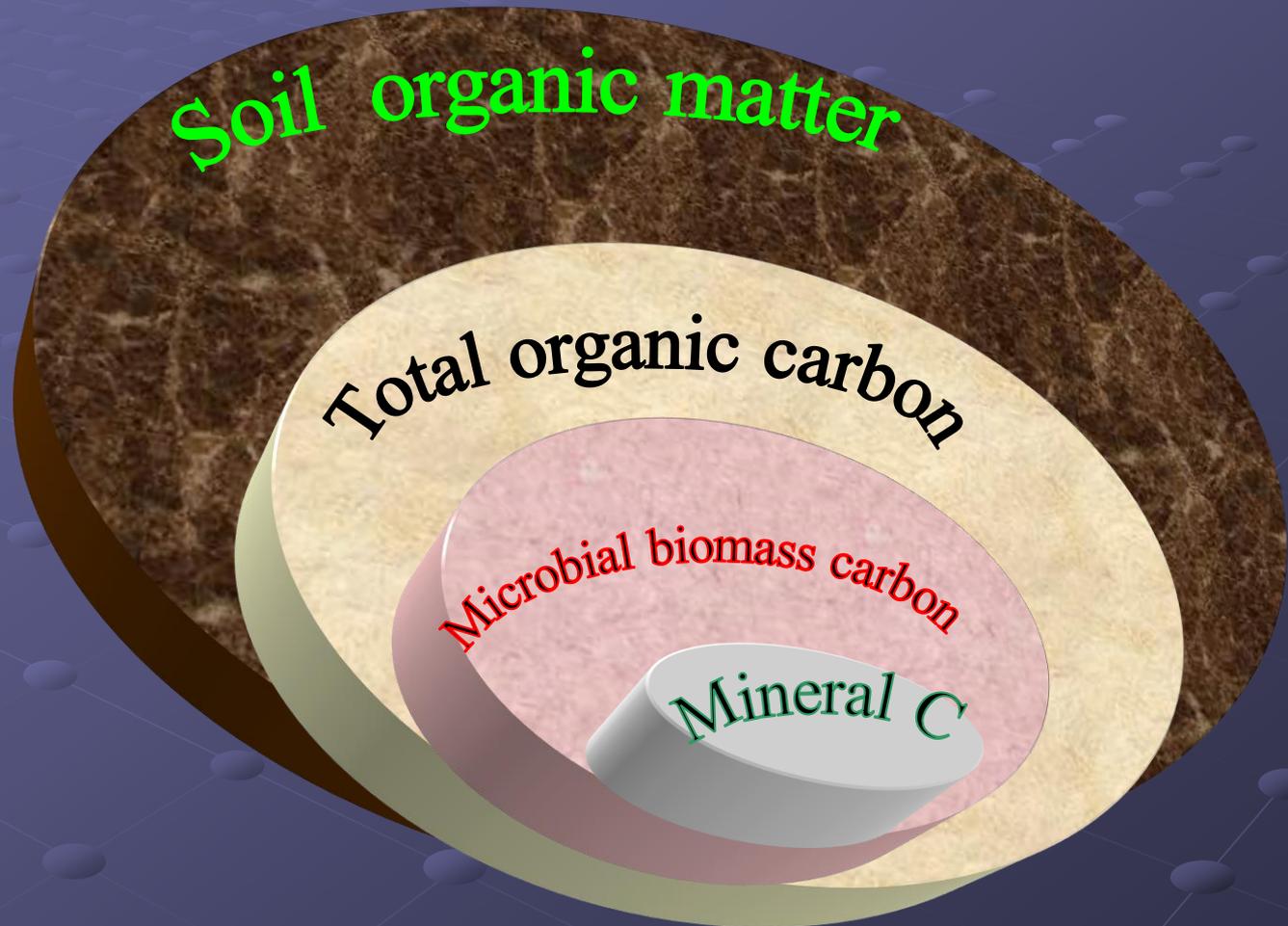
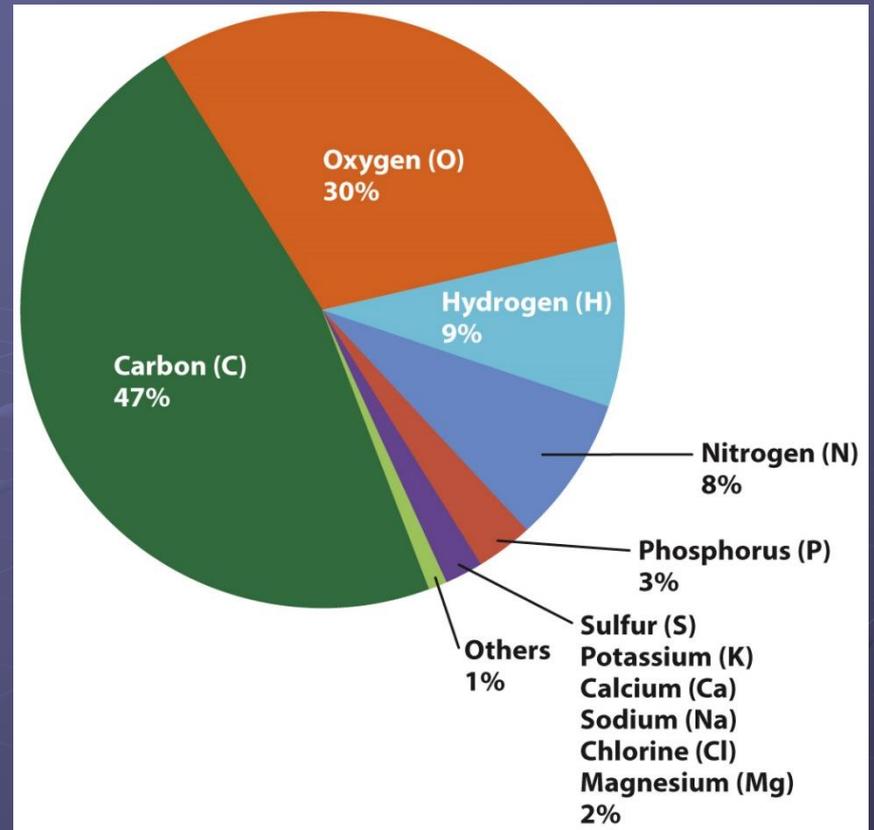


CARBON CYCLE



- Carbon is the most abundant element in the world and in all organic material.
- The role of carbon during the enzymatic oxidation of plant tissues by microorganisms is very important.



The conversion of carbon in the soil and in various order after conversion is called the carbon cycle .

Carbon Cycle

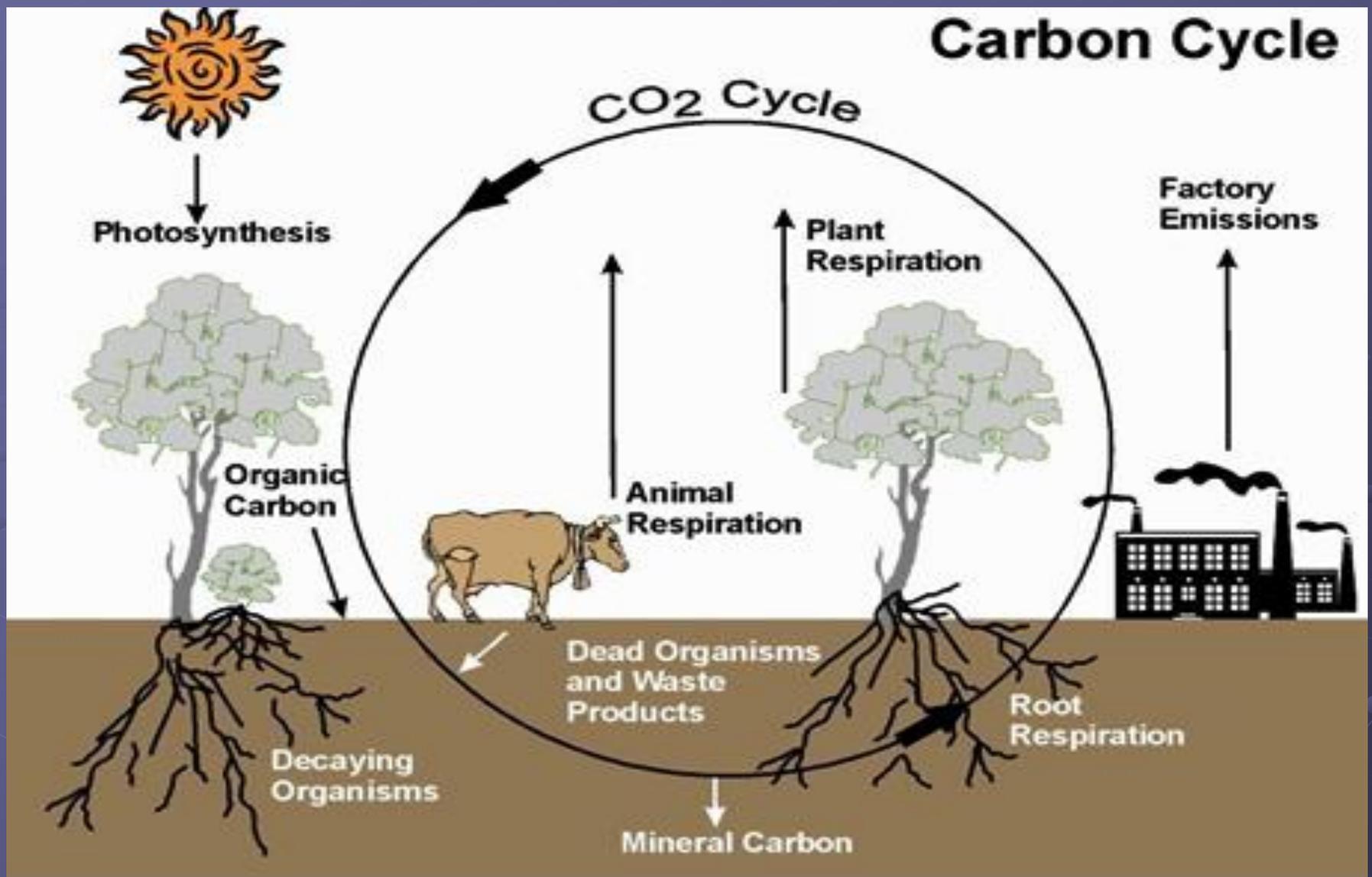
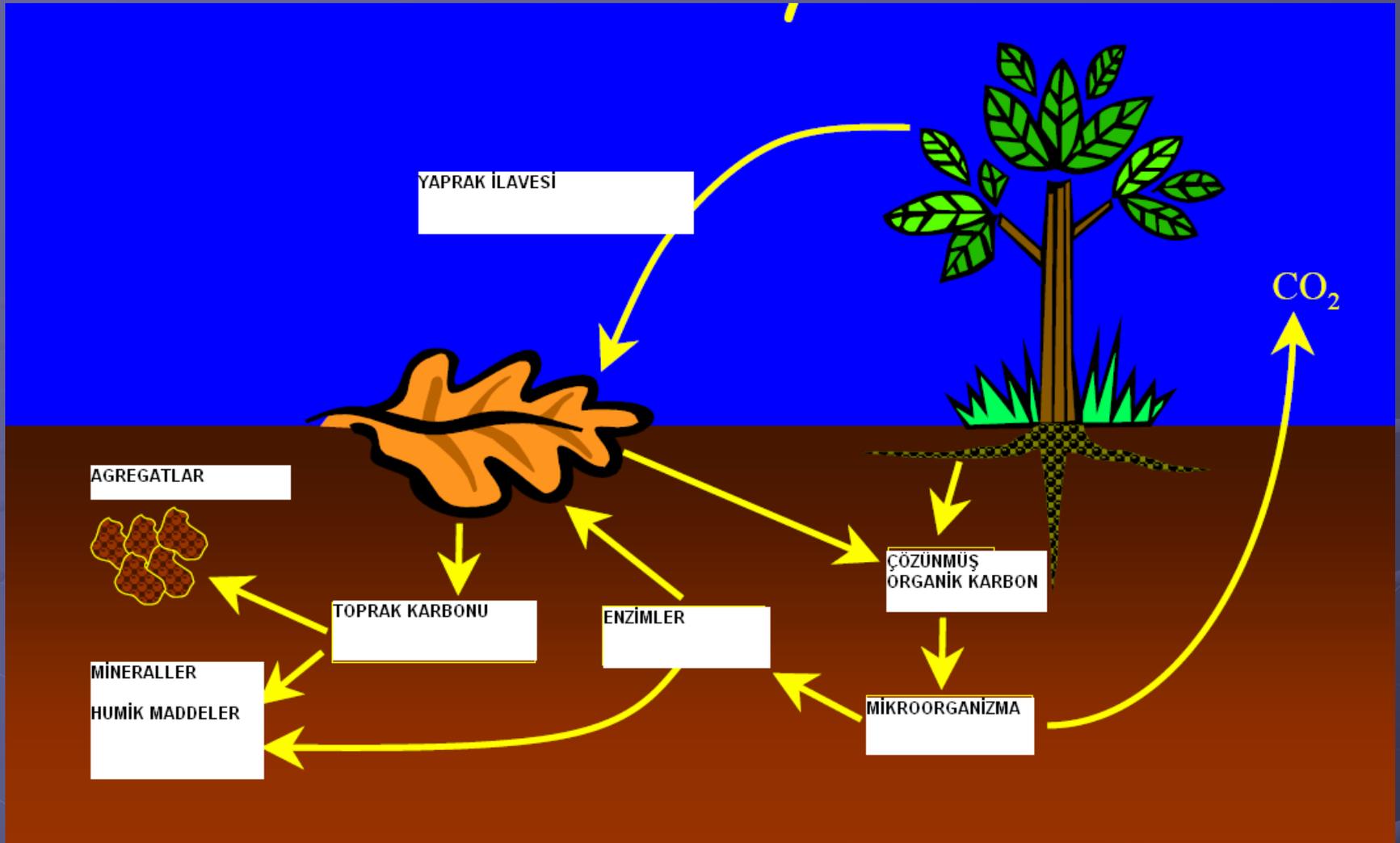


Figure 1: The Carbon Cycle
Source: The Quivira Coalition



Carbon cycle in soil ecosystem;

- 1) Fixation of CO₂ by plants and its conversion to biomass
- 2) Decomposition of plant and animal residues by soil microbes (releasing carbon back to the atmosphere as CO₂ and CH₄)

The most important function of soil organisms (mainly microbes) is to decompose organic matter to operate carbon cycle in the earth .

- Most living cells contain about 50% C.
- Although the source of carbon element is CO_2 for plants, soil microorganisms mostly use various organic materials (plant and animal residues) as the main C source.
- The conversion of organic compounds to carbon is called “carbon cycle”

Soil Organic Matter (SOM)

● Definition

● Functions /Significance

● SOM Resources

- Soil organic matter (SOM) consists of plant and animal residues mixed with the soil in various ways and complex compounds formed as a result of various chemical reactions by their decomposition and decomposition products.



- Fallen leaves, dried roots, harvest residues, dried weeds, meadows, dead organisms and animal residues are the source of SOM



- Organic residues decomposed by soil microbes lost its original physical and chemical structure and changed into SOM, which is also called HUMUS

- During the decomposition of soil organic matter, CO_2 , NH_3 , SO_4 and various organic acids are released.



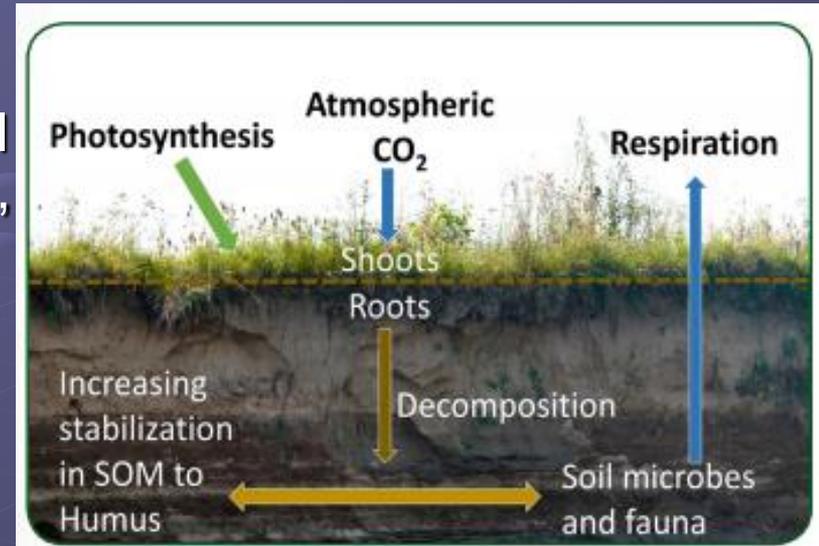
Compounds in SOM such as

- organic acids,
- polysaccharides,
- lignins,
- aromatic and aliphatic hydrocarbons,
- sugars,
- alcohols,
- amino acids,
- purines,
- pyrimidines,
- proteins,
- fat and nucleic acids

are all decomposed by one or more microbial populations to do C cycle

During decomposition of SOM

- Most of the energy required by the animal and plant communities in the soil is obtained from the oxidation of carbon, and as a result, huge amount of **CO₂ is released** to the atmosphere (C flux)
- The released CO₂ is actually due to respiration of plant roots, microbes and fauna, which is generally known as **soil respiration**
- Soil respiration is a key ecosystem process that releases carbon from the soil in the form of carbon dioxide.



Factors effecting SOM decomposition (or HUMUS formation) in soil

- Amount of SOM
- Soil management (cultivation, irrigation)
- Temperature
- Humidity
- pH
- C / N
- Clay amount
- Depth and aeration

Effects of SOM on soil properties

- ✓ SOM can hold water 3-5 times higher than its own weight and therefore increases the water holding capacity of soils.
- ✓ SOM regulates aeration and water distribution giving a better physical structure to soil
- ✓ The end products of SOM decomposition (i.e. Proteins and carbohydrates) glue soil particles. This process is known as **soil aggregation** gaining a physical structure to soil
- ✓ SOM reduces runoff losses by increasing water infiltration (permeability). This plays a major role in reducing water and wind erosion losses.