Healthy Soil Recycles Nutrients and builds Soil Organic Matter

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6$ (sugar) $+ 6O_2$ (oxygen)

Harvest the Sun's energy through living plants (cash crops & cover crops)

Harvested Crop

C:N ratio, Temperature, Moisture, Aeration & Soil pH affect OM decomposition.

Irrigation Water Mgt. considerations: water quality (salinity & nutrients), quantity available, irrigation system efficiency, crop consumptive use, leaching requirement, etc.

O_2

CO_2

Ammonia Volatilization

Immobilization: the conversion of an element from the inorganic to the organic form in microbial tissues or in plant tissues.

Glomalin & Root Exudates

N (Legume)

Arthropod shredders, earthworms, saprophytic fungi, actinomycetes, bacteria & other organisms decompose dead organic matter and other organic wastes. These decomposers are prey for other Soil Food Web (SFW) organisms (i.e. predators).

Mineralization: the conversion of an element from an organic form to an inorganic state as a result of microbial decomposition.

Glomalin & Root Exudates are consumed by bacteria that live in the rhizosphere. Protozoa, nematodes & other soil organisms consume bacteria and release ammonium N. These organisms are prey for other SFW predators. The entire process results in mineralization.

Ammonification

Soil Solution

NH_4^+ Ammonium ⇄ pH ⇄ NH_3 Ammonia

Nitrification

NO_2^- Nitrite (plus H^+) → NO_3^- Nitrate

Soluble organic N

Denitrification → N_2O, N_2, NO

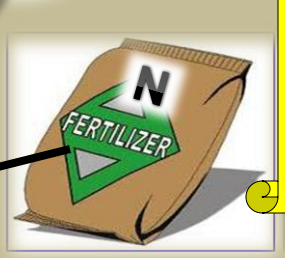
Adsorption

Desorption

Fixed NH_4^+

Leaching

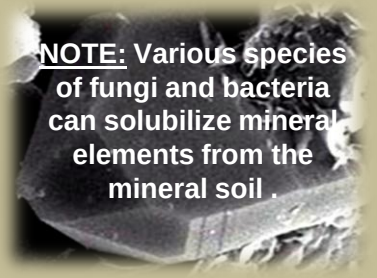
free-living N-fixing soil bacteria



Soil Health

- Crop diversity
- Living roots throughout the year
- Cover the soil
- Less disturbance
- Livestock integration where applicable

Additional N losses: runoff & erosion



NOTE: Various species of fungi and bacteria can solubilize mineral elements from the mineral soil .

Carbon Dioxide

Photosynthesis

Decay

Plant Biomass

Soil Organic Matter

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Ref. The Nature and Properties of Soils, 14th Edition revised (Chapters 11, 12 & 13)

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