

Soil in the Farm System

Soil is a fundamental natural resource upon which our lives depend. As soil provides us with our basic needs for food, our whole civilisation depends on sustainable soil management as an imperative. History indicates that past civilisations failed ultimately as a result of soil degradation and erosion.

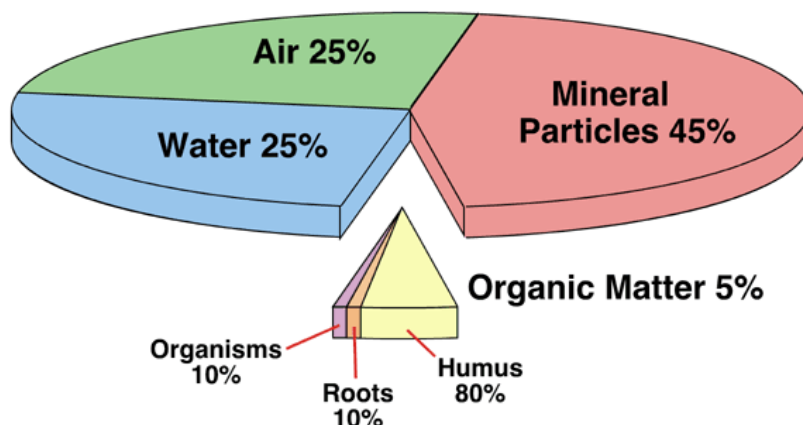
There are many definitions of sustainable agriculture, which encompass economic, social and environmental factors. Proponents of different 'schools of thought' in agriculture all want to maintain that 'their way' is sustainable, so a solid definition of 'sustainable agriculture' becomes elusive. However, bearing in mind the soil imperative, it is clear that any net loss of soil cannot be sustainable. Truly sustainable agriculture must involve a net gain of soil, or at least a steady state where no soil is lost.

Soil *gain* is observed on the best managed farms, as organic matter and the action of soil biota can build soil much faster than the traditional understanding of soil production based on weathering from parent material thought possible.

Soil is a lot more than minerals

The mineral component of soil is very important, but is only part of the picture. The diagram on the right illustrates the composition by volume of a 'typical' healthy soil. To support healthy plant growth, soil needs to absorb and hold water, and needs to hold air in its structure.

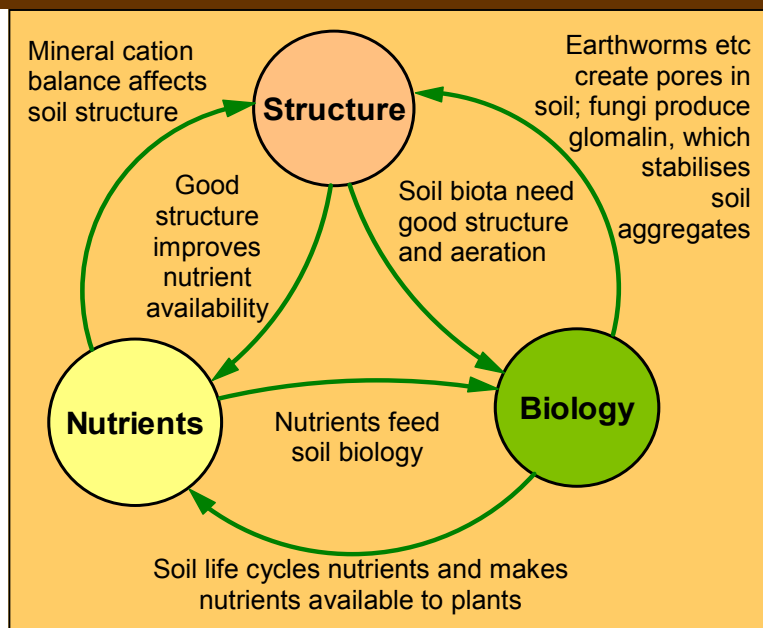
A good organic matter component (including living things and their products and remains) is essential for healthy soil. Organic matter holds



water in soil, plays a key role in soil structure and provides plant available nutrients. Soil biota, from microscopic bacteria to animals like earthworms, are indispensable for essential soil processes. Healthy soil is teeming with a myriad of visible and microscopic life forms, which cycle nutrients, make inert and insoluble nutrients available to plants, and help maintain soil structure.

Balance is the key to soil health

Soil health is complex and multidimensional. A fertile, resilient soil has a balance of biological, chemical and physical characteristics. Each of these 'dimensions' needs to be balanced in its own right, with a balance of chemical nutrients including both macronutrients (needed by plants in large amounts) and micronutrients (trace elements required to catalyse chemical reactions and for other essential functions); a balance of soil biology with an abundance and diversity of bacteria, fungi, protozoa, nematodes, arthropods, earthworms etc; and a balanced physical structure which is neither too 'closed' (compacted) nor too 'open' (dispersible).



Soil chemistry, biology and structure interact with each other in various ways, and none of these aspects of soil health can be adequately addressed without attention to the other aspects.