Queensland Government

Know your soils

Understanding Soil Structure

Soil structure refers to how individual soil particles (sand, silt and clay) come together into a larger group (called peds or aggregates), and how these groups are arranged with pore spaces between them. Organic matter acts as a ‘glue’ to hold soil particles together.

Peds are not uniform shapes so they therefore do not naturally pack together tightly. The spaces between the peds are called macropores. These allow movement of gases to and from the atmosphere and within the soil. Macropores also allow water and nutrient movement into and out of soils. They are also important for root development.

Very small pores (called micropores) occur within the peds. These hold soil water, and roots take water from them as they grow through the soil. Soils need a mixture of both macropores and micropores—macropores for water entry and drainage, and micropores for water storage.

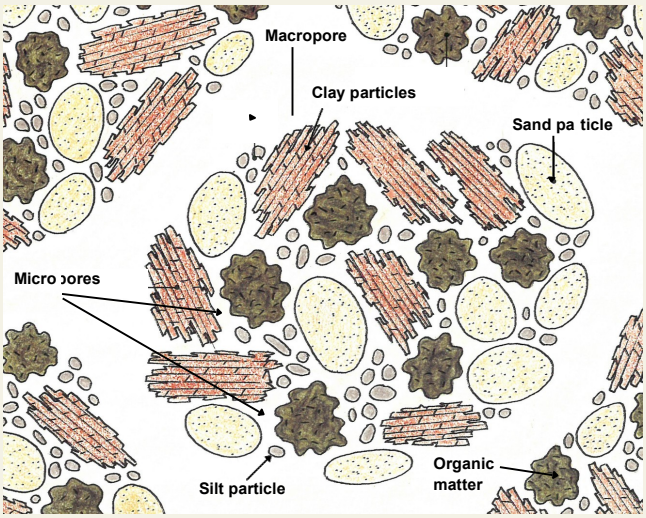

Figure 1: Close up of an individual ped, showing micropores within the ped and macropores between the peds.

Soil structure influences:

- Water entry into the soil
- Runoff of water
- Permeability (ease of movement) of water and air in the soil
- Root penetration
- Seedling emergence
- Resistance to erosion
- Workability
- Drainage

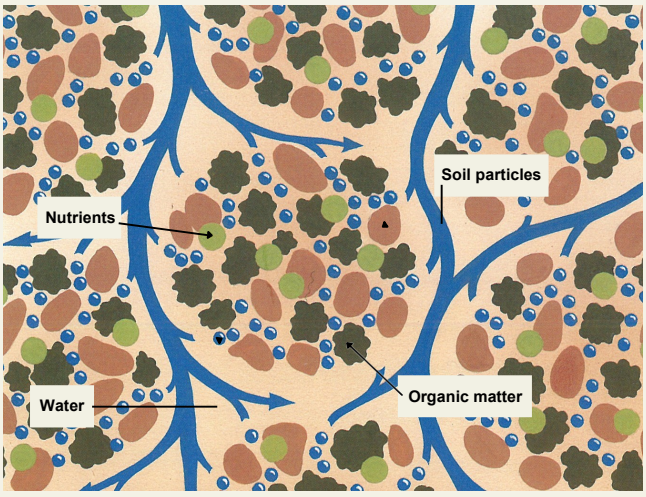

Figure 2: Water moves through the macropores. Water and nutrients are stored within the micropores.

Soil structure forms naturally through many processes e.g. wetting and drying, plant root penetration, burrowing by worms, insects and other animals, and the microbial decay of plant and animal remains. Unlike soil texture, soil structure can be altered. Soil structure can be improved by managing paddocks to include cover crops and no-till planting. Increasing organic matter will improve soil structure. Soil structure can be degraded by compaction from equipment.

For more information, contact
Soil.Enquiry@resources.qld.gov.au

There are different types of soil structure. Very sandy soils are structureless because sand particles do not group together (you can see the individual sand grains in beach sands). Some soils resemble a large, solid, featureless mass and have little or no structure. These soils are said to have ‘massive’ structure. Other soils break up easily into peds with a definite shape (for example, granular or blocky) and size (1 to 60 mm).

In some soils the peds form columnar shapes. This type of structure is often associated with soils that are high in salt and/or sodium.

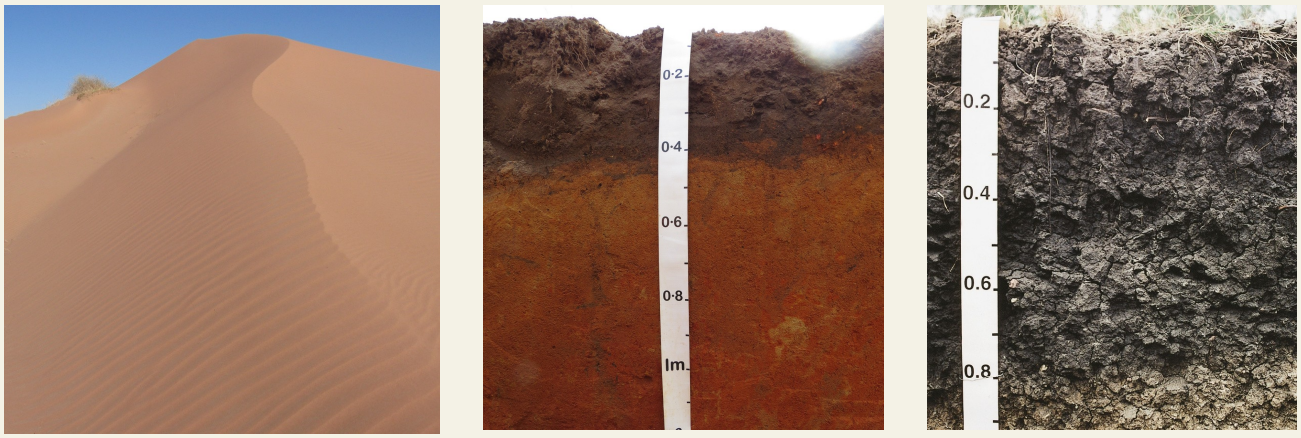

Image 1: Three soils showing a structureless soil (left), massive structure (middle), and blocky structure (right)

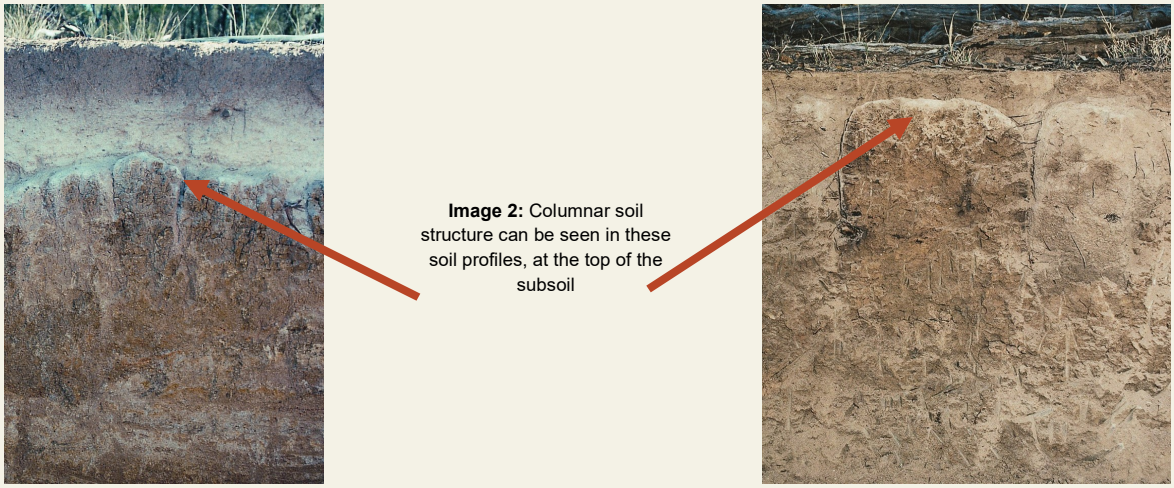

Image 2: Columnar soil structure can be seen in these soil profiles, at the top of the subsoil

Well-structured soils are friable (e.g. plough easily), break up easily into granular or blocky shaped small peds, and have an abundance of macro and micropores (allowing water and air to move readily into the soil and to root systems). This means that following rainfall, water penetrates the soil instead of running off. The peds of well-structured soil are more difficult to move and are more resistant to erosion. Overall, good structure enhances crop production, soil aeration, root growth, infiltration and stability.

A poorly structured soil has little pore space for air and water because the soil peds are packed tightly together. This means that water infiltration is greatly reduced, water movement through the soil is slowed (and may not reach deeply enough to sustain crops), and water storage and aeration is reduced.

Other fact sheets in this series:

- Understanding Soil Texture
- Understanding Soil pH
- Understanding Soil Colour
- Understanding Soil Sodicity
- Understanding Dispersive Soils
- Understanding Soils from an Erosion Rehabilitation Perspective

For further information on soils, refer to the Queensland Government website at https://www.qld.gov.au/environment/land/soil/

resources.qld.gov.au

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