FACT SHEET 4 Soil Physics, Texture and Structure

Soil is made up of a mix of particles which range from the very smallest clay particles to large gravel. In order to describe soils, a range of particle sizes which reflect their role in many of the soil properties are sand, silt, and clay.

Clay
Clay particles are the source of most of the chemical properties of soil. They are responsible for the retention of many of the plant nutrients in soil. Clays react with the breakdown products of organic matter to stabilize the humus in the soil.

Clays, retain greater amounts of water than sandy soils. On the other hand, clays hold the water tightly and do not release the water as readily as sands.

Clay particles have a greater tendency to stick together than sands, depending on their mineral makeup and nutrients in the soil.

Silt
particles classified as silt are intermediate in size and chemical and physical properties between clay and sand. silt particles have limited ability to retain plant nutrients, or to release them for plant uptake. Silt tends to have a spherical shape, giving a high silt soil a soapy or slippery feeling when rubbed between the fingers when wet.

Because of the spherical shape, silt also retains a large amount of water, and it releases the water readily to plants. Silts are generally considered very fertile, largely due to their water characteristics and ease of cultivation.

Sand
Sand particles are essentially small rock fragments, and as such, have little or no ability to supply nutrients or to retain them against leaching.

Sandy soils are droughty because they retain little water when wetted. Nevertheless, the water retained is released to plants easily. When rain or irrigation occurs the water readily penetrates the soil surface, the excess moves through rapidly and the soil remains well aerated.

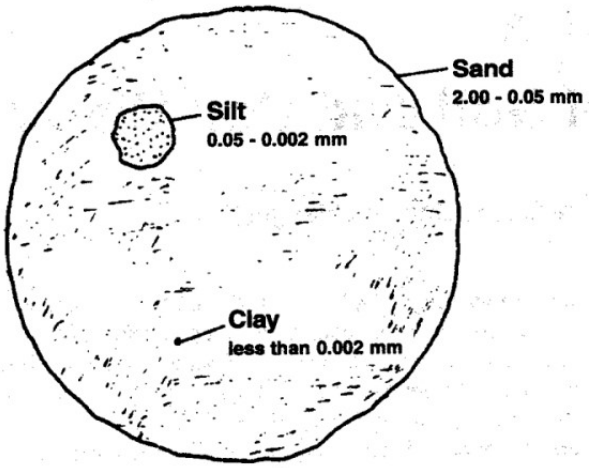

Figure 1. Relative size of soil particles

Soil Texture
As there can be an infinite array of percentages of sand, silt and clay in soils, scientist have devised a classification of 12 groups which reflect broad soil properties.

These groups are called textural class names and are obtained by applying the particle size analysis to a textural triangle (Figure 2). Thus a soil which contains 40% sand, 40% silt and 20% sand would be called a loam soil.

Figure 2. Soil Texture Triangle

Soil Structure and Aggregation

Soil structure is a key attribute of a soil's ability to support the health and productivity of plants. Soil structural units are referred to as aggregates, and form when fresh organic matter is decomposed and transformed by soil microbes into binding agents between mineral soil particles.

Depending on the composition and on the conditions in which the aggregates are formed (wetting and drying, or farming, etc.), the aggregate has a specific shape. They could be granular, blocky, columnar, platy, massive or single-grained (like beach sand). Structure correlates to the pore space in the soil which influences root growth and air and water movement.

Stable soil aggregation is a very valuable property of productive soils. Aggregate stability is a commonly used indicator of soil health because improvements in aggregate stability are related to reduced erodibility and improved soil–water dynamics.

Stable soil aggregation is a very valuable property of productive soils. The presence of organic matter with these materials improves stable aggregate formation. In nutrient management, the aggregate stability is important because well-aggregated minerals are well drained and quite workable.

Observations

The practice of mounding in orchards is common and increases the rootzone access to topsoil. The variability of topsoil depths has seen some mixing of subsoils with higher clay content and possibly nutrient chemistry constraints.

Additional soil sampling and analysis is encouraged to understand the soil conditions accurately during the planting, mound renovation or construction. Planning a better amelioration program will provide a better outcome long term.

Previous research by Dr Bruce Cockcroft in Tatura has proposed the use of ryegrass for improving local soil constraints, particularly aggregation.

Reviewing the documents from Dr Cockcroft, which can be found on the Fruit Grower Victoria website, will be beneficial.

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