Soil Fact Sheet 2b

Soil Texture

There are 19 grades of texture that can be simplified into six major groups: Sands, Sandy Loams, Loams, Clay Loams, Light Clays and Medium to Heavy Clays. These texture differences are the result of fineness or coarseness of particles in the soil. The particles are divided into three size classes:

Clay < 0.002 mm
Silt 0.002 - 0.02 mm
Sand 0.02 - 2 mm
(Note: 1000µm microns = 1mm)

Sand, silt and clay percentages are related together in a triangular graph. The graph shows groupings of soils and the name that is given to that grouping.

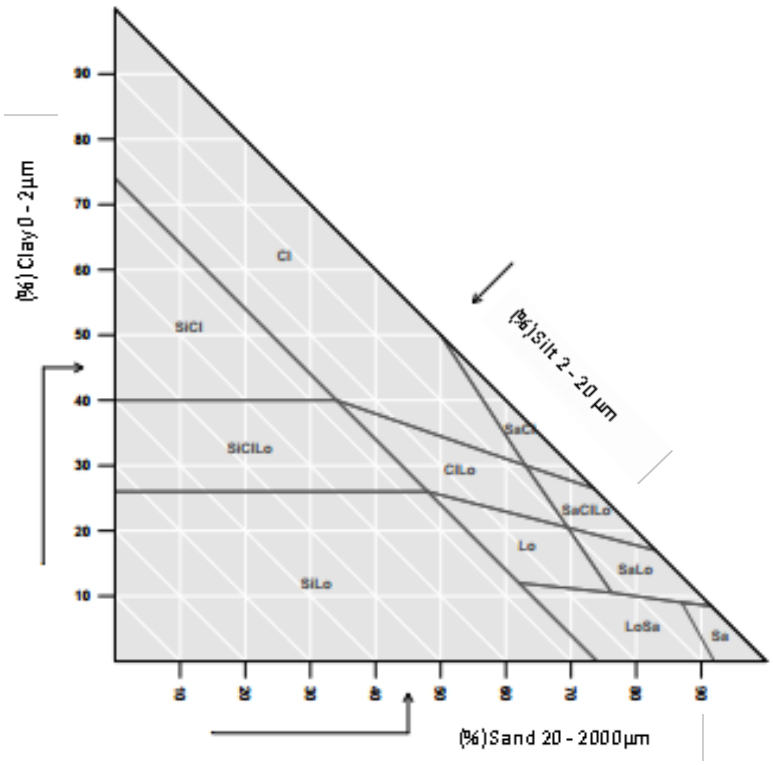

Figure 1. Texture Triangle Graph

Abbreviation	Name
Cl	Clay
SiCl	Silty Clay
SiClLo	Silty Clay Loam
SiLo	Silty Loam
ClLo	Clay Loam
Lo	Loam
LoSa	Loam Sand
SaCl	Sand Clay
SaClLo	Sand Clay Loam
SaLo	Sand Loam
Sa	Sand

The effect of particle size

The relative size of particles is important. For example, the finest sand particles are 10 times the diameter of the largest clay particles. The surface area of a spherical particle 0.02 mm diameter is 100 times greater than a spherical particle of 0.002 mm diameter. Clays have an even greater surface area than spherical particles as they are made up of sheet-like structures stacked together. This difference in surface area contributes to the differences in adhesion and cohesion of the texture groups.

How do sands, loams and clays behave?

Sands because of their large grain size allow faster permeability of water than clays. The disadvantages of sands are that they hold very little water that would be available to plants and have no ability to hold onto plant nutrients in the way that clays do.

Loam soils contain sand, silt and clay in such proportions that stickyness and non-adhesiveness are in balance - so the soils are mouldable but not sticky. Loams are the "friendliest" soils to cultivate.

Clays can absorb and hold onto large amounts of water because of their sheet structure and large surface area. This property causes the swelling and shrinking of clay soils as they wet and dry.

Clays are therefore also important in generating cracks in soil through which roots can easily pass. When some clays are wet and swollen soil drainage is affected and water cannot pass freely. The surfaces and edges of the sheet structure of clay particles carry negative charges. Elements such as Potassium, Calcium and Magnesium (Cations) are held on these charged surfaces and can be taken up in solution by plant roots. Clays therefore play an important role in soil fertility.

What else effects soil texture?

How moist soil feels when manipulated in the hand is influenced by how much sand, silt or clay is in the sample, and also soil components such as organic matter.

Table 1. Influences on soil texture

Medium and coarse sand	Easily felt
Fine sand	Felt and heard by manipulating the soil close to the ear
Silt	Silky or smooth feeling similar to that of talcum powder
Clay	Sticky, cohesive and plastic
Clay type	Clay mineralogy affects tractability. Montmorillonitic clays (swelling clays) resist deformation and are stiff to ribbon. Kaolinitic clays (e.g. red soils) tend to produce a short thin ribbon.
Organic matter	Cohesion of sandy textures and greasiness of clays
Oxides	Cementation (Al & Fe) masks fine textures
Carbonates	Cohesion in sands and loams, but inhibits ribboning in clays

Organic matter is an important contributor to soil texture and helps to ameliorate stickiness and also helps sandy soils hang together, making them feel more loamy.

How does texture change?

Texture often changes with depth down the soil profile. It is important to describe texture changes that occur within the soil profile. Many of our soils have loamy surface soils and heavy clay subsoils. This arrangement controls the movement of water through the profile, the clay restricts downward drainage and encourages water movement along the top of the restricting layer. This can result in waterlogging of the surface soil, even though the subsoil may not be saturated.

Further Information

Please contact Council's Development and Environmental Health Group on Ph 02 6686 1210.