SOIL MANAGEMENT
FOR HORTICULTURALISTS
SOIL TEXTURE AND STRUCTURE

CALU DEVELOPMENT FARM FACTSHEET
April 2010

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SOIL TEXTURE

This factsheet provides a very brief and simplified introduction to soil texture. Soil texture describes the composition of the soil in terms of size of the mineral particles. It refers to soil particles smaller than 2mm in diameter. Larger particles are classed as gravels, pebbles or stones.

Soils with differing textures need to be managed in different ways. It is important to establish the texture of soil before any work is undertaken.

Soil texture:

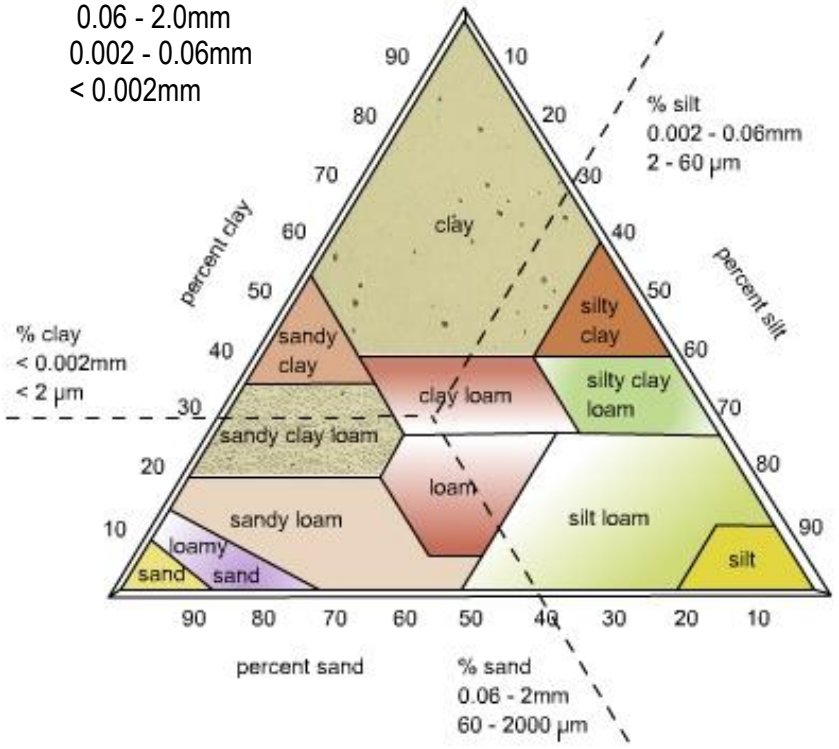
- Affects the workability of the soil.
- Provides the stability to anchor plant roots.
- Provides nutrients for the plant.
- Affects drainage characteristics.
- Determines what plants or crops can be grown.

Mineral particle size

There are several different systems of classifying soil particle size, each of which of groups the particles into gravel, sand, silt and clay. Most soils are made up of a mixture of particle sizes. The most widely used classification comes from the US Department of Agriculture system (see triangle below).

Particle size is the most important factor in determining how difficult a soil will be to cultivate and how readily it will drain.

Classification	Size (Diameter)
Gravel	> 2.0mm
Sand	0.06 - 2.0mm
Silt	0.002 - 0.06mm
Clay	< 0.002mm



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General characteristics of the three principal soil textures

Sandy soils	Silty soils	Clay soils
Gritty feel particularly when wet. Good drainage. Quick to warm up. Little nutrient retention capacity. Little water retention capacity. No electrical charge.	Silky or soapy feel when wet Reasonable drainage (if well structured) No electrical charge	Sticky feel. Heave when wet. Poor drainage. Good water retention. Good nutrient retention. Cold, slow to warm up. Negative electrical charge.

The way in which the individual particles of soil are combined to form larger aggregates is referred to as **soil structure**. The spaces between the aggregated particles are known as the **pores**. The size of the pore spaces will influence the rate at which water flows through the soil, and also the composition of the soil atmosphere.

Soils made up of sand particles will have large pore spaces, whereas soils that are mainly made up of clay particles will have small pore spaces. The ideal soil would contain a mix of small soil particles sufficient to retain water for plant root growth and larger particles to allow excess water to drain away.

Pore size	Properties
> 0.1mm	Water will drain through they will then hold air.
Intermediate pores 0.03-0.1mm	Retain water that can be used by the plant
< 0.03mm	Holds water too tightly for plant roots to extract it

Signs of good and bad soil structure

Good Structure	Poor Structure
• Good plant growth • Deep Rooting • Friable crumbly soils when wet and when dry • Even brown colour • Sweet smelling • Large numbers of worms • Network of visible pores and cracks in the soil profile • Good drainage	• Poor plant growth • Shallow rooting confined to a few cracks or earthworm channels • Soil in hard lumps or like dust when dry • Sticky airless mass when wet • Patches of grey mottled soil or red soil • Few worms • Soil layers or pans in boundary between topsoil and subsoil • Moss on surface when wet

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The tables on this page indicate various structural problems which may be encountered within the three soil types and suggest possible remedies for them.

Problems with structure in clay soils	Improving the structure of clay soils
• Plate-like particles adhere together and become heavy when wet • Slow to drain which makes the soil sticky and deprives roots of oxygen • Cracks and forms hard clods when dry • Difficulty in maintaining structure • Heavy machinery causes panning if the soil is wet	• Addition of organic matter • Addition of lime to encourage flocculation • Improve drainage • Avoid walking or working on soil when wet • Application of organic mulches

Problems with structure in sandy soils	Improving the structure of sandy soils
• Sand has very little structure • Sand grains lack positive or negative electrical charges and do not hold on to other particles or nutrients • Water drains away quickly • Organic matter is used up quickly • Nutrients are leached from the soil	• Addition of organic matter to improve water and nutrient holding capacity • Cultivation of compacted soils • Addition of clay – 'marling'

Problems with structure in silty soils	Improving the nature of silty soils
• Particles are light and tend to rise to the surface of top soil • When dry they form a crust or cap • The crust can prevent the emergence of seedlings • The downward movement of water can be impeded	• Addition of organic matter • Avoid over cultivation

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