# Advice Sheet 30: Textural Classification at NRM

Knowledge of the soil type of each field is a prerequisite for making effective decisions on fertiliser and lime use. The soil type is related to the soils texture which is an intrinsic property of that soil, and will not change over time. The soil texture is defined by the proportion of sand, silt and clay sized mineral particles, and utilising the UK/ADAS classification system where sand particles are those between 2.00-0.063mm, silt particles are those between 0.063-0.002mm and those particles which are less than 0.002mm are the clay particles.

Particle Size Distribution (PSD) can be determined in 2 ways at NRM but both methods remove the organic matter by peroxide treatment prior to analysis:

## Pipette by Sedimentation with sand fractionation (if required)

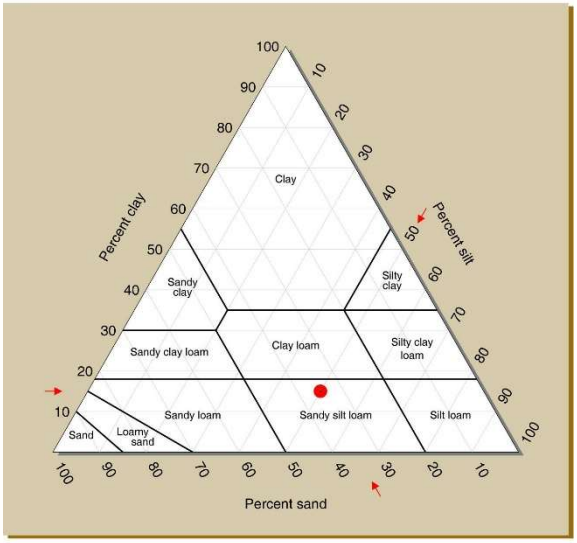
In this method the sand is removed by sieving and then the resulting sample is mixed to form a suspension with water. The clay and silt fractions are then determined by pipette sampling from suspension at different sedimentation times according to Stokes Law. This method is dependant upon the fact that the sedimentation rate of dispersed soil particles is proportional to their size.

## Laser Diffraction Method

The soil sample is suspended in water and passed through a flow cell. The flow cell is positioned in the path of a laser beam and the particles of soil passing through the cell causes the laser light to be defracted. The amount of light that is diffracted is dependant upon the size of the particle in its path. Small particles cause greater diffraction than large particles. By measuring the diffraction pattern of the laser beam it is possible to predict the size and relative population of particles in the sample.

Once the PSD has been determined the soil can then be given a textural class utilising the ADAS Triangle Structure as depicted below:

Triangle Structure for the Determination
of Soil Textural Class (UK Classification)




Sand : 35 %  Silt : 50 %  Clay : 15 %

Soil Textural Class : Sandy Silt Loam(4)



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## Method Comparison

Both of these methods are very different in a number of ways. The Pipette by Sedimentation technique is very precise but it is painstaking and time consuming, with the test taking a minimum of 3 days to complete. The Laser method is quick and can be completed in a fraction of the time of the Pipette method, but is not as precise for all soil classes and should only be used when knowledge of soil **TYPE** is sought, not the individual proportions of sand, silt and clay. This instrument is employed as an alternative to hand texturing, another technique sometimes used to classify soils, but hand texturing is subjective and can fall foul to misjudgements.

Choosing the method that is appropriate is largely dependant on 2 factors, which is the budget and the end use of the result. The laboratory charges for the Pipette by Sedimentation method are high and its inherent precision may be unnecessary for most agricultural scenarios, where really only knowledge of the soil type is adequate. The laser results here will be fit for purpose. However for agrochemical residue studies, or for example where an organic grower is seeking approval by a certification body to apply potash products, without losing his organic status, by demonstrating that his soil contains less than 20% clay, the pipette method will be the technique of choice.

## Calcareous Soils

Both PSD techniques share the underlying principle that they are assessing the percentage of particles based on their SIZE. Consequently, any carbonate present in a sample (chalk) will also be measured. There is not a standard method suitable for routine use which allows for removing carbonate without changing the soil structure.

Non-calcareous (<1% calcium carbonate), slightly calcareous (1 – 5% calcium carbonate) and moderately calcareous (5 – 10% calcium carbonate) soils can be tested for PSD without an adverse impact on the particles measured in each fraction. However, in analysing very calcareous soils (>10% calcium carbonate) the carbonate particles present do contribute which *may* alter the textural classification of the soil.

This pipette method is not as severely affected by the presence of carbonate as the laser but results with calcium carbonate above 10% should be viewed with caution. The presence of calcium carbonate in samples tested on the laser has been found to significantly increase the proportion of clay measured.

To enable customers to have more awareness of the calcareous nature of their soil samples, the calcium carbonate content can be determined by the neutralising value test (test code 39).



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