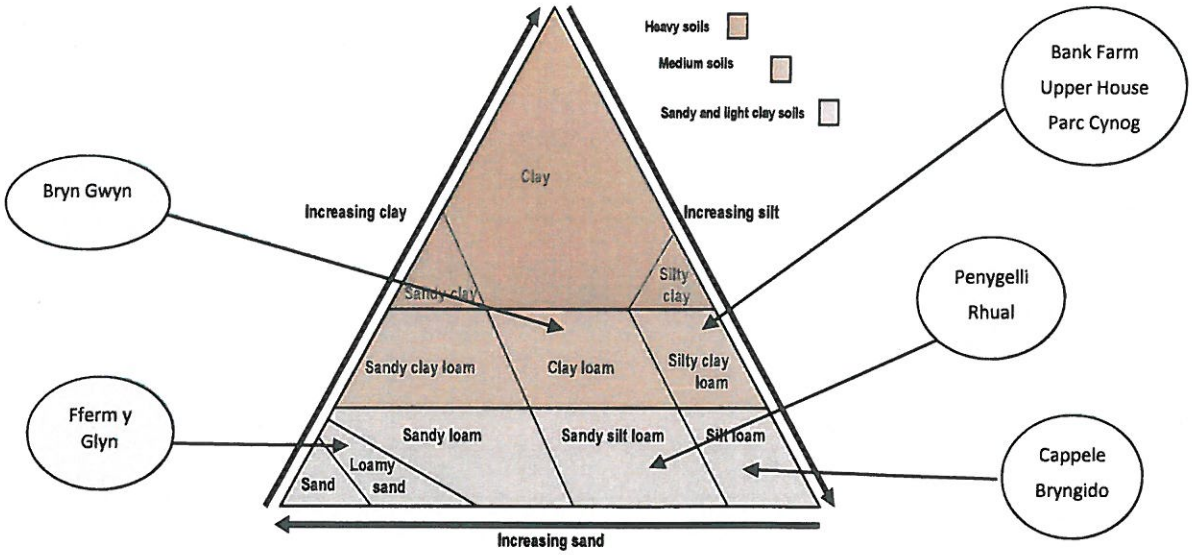
Soil Texture

Soil health and fertility are key to successful farming. Good soil management depends on assessing soils and managing them to improve the biology, chemistry and structure. Soil texture is the relative proportion of sand, silt and clay which can be accurately measured mechanically or assessed on farm by hand. Texture influences how much water and nutrients a soil can hold. Although it cannot be altered by farming practice, knowing the texture will help determine how to manage soils to optimise structure and nutrient supply in grassland. There are 11 texture classes or soil types identified in the UK.

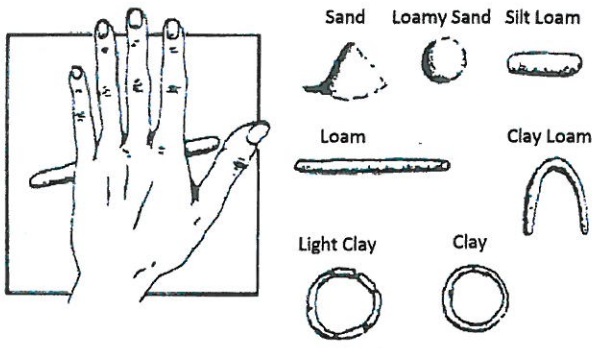
Management needs to take into account that sandy soils are free draining and warm up quickly, but do not hold nutrients well, though they enable early turn-out as they are less likely to poach. Clay soils hold nutrients and retain water better in drought, but are heavier and colder in the spring and are more likely to suffer from compaction and poaching. Whatever the texture, a soil with good soil structure will be more resilient to water stress, hold nutrients better and remain healthy.

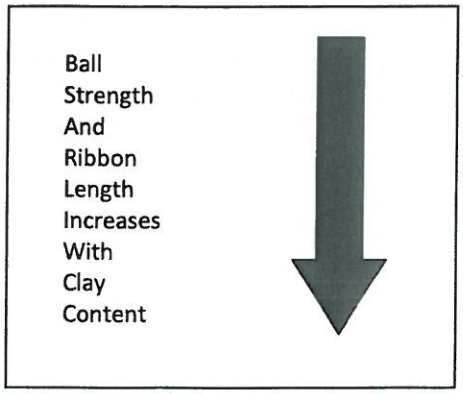
Soil textures on Prosoil Commercial Development Farms



Hand texturing soils

Place some moist soil in the palm of your hand and try kneading into a smooth and plastic consistency like moist putty and see which of the shapes below can be made (see p. 29).





Qualities	**Sandy and light silt soils** • free draining, can be worked without damage for long periods • warm up quickly in the spring; long growing season • weak structure with low clay and organic matter, which may cap or slump • prone to compaction by deep cultivation or harvesting in wet conditions • sensitive to drought
Feel	• don't stick together very easily, feel gritty • don't stain the fingers when wet • sand can't be moulded and won't make a ball • loamy sand forms a very weak ball that is fragile and easily deformed • sandy loams form a weak ball
Qualities	**Loams: medium soils, mixtures of sand, silt and clay** • contain enough clay to stick particles together • cap and slump less frequently unless soil has a high proportion of silt or fine sand • machinery and livestock can cause compaction if the water table is high or subsoil holds water • surface and deep compaction can lead to erosion in wet conditions particularly on slopes
Feel	• mould into ball more easily and form a sausage-shaped ribbon • sandy silt loams are equally gritty and "soapy" • silt loams have a more smooth, silky or "floury" feel • clay loams are sticky • sandy clay loams smear when rubbed; sand particles are visible • silty clay loams have a "soapy" feel, are sticky when wet, and take a polish when rubbed
Qualities	**Clay soils: heavy soils** • hold soil particles together; low risk of erosion • wet and cold in winter, dry in summer, with a short growing season • prone to poor drainage, water logging, and ponding • require careful management as high risk of compaction from machinery and livestock • surface run-off during periods of heavy rain can carry nutrients, pesticides and sediments causing pollution
Feel	• mould into robust balls which are not easily deformed; soil is very sticky, smears to give a polished surface, and can be rolled into long sausage-shaped ribbons over 5 cm long • sandy clays – sand is obvious on the surface • silty clays – feel smoother and more buttery • light clay – a rolled ribbon will form a ring that cracks • heavy clay – a rolled ribbon will form a ring without cracking

Soil texture and Cation Exchange Capacity (CEC)

Cation Exchange Capacity (CEC) is a measure of the ability of a soil to hold on to nutrients and is affected by the soil texture and organic matter content. It is part of soil analyses for Base Cation Saturation Ratio (BCSR).

The total CEC of a soil is a measure of the maximum number of negatively-charged sites able to bind positively-charged cations including calcium, magnesium, sodium, potassium, hydrogen and others in an exchangeable form. CEC is expressed as milli-equivalents/100g of soil.

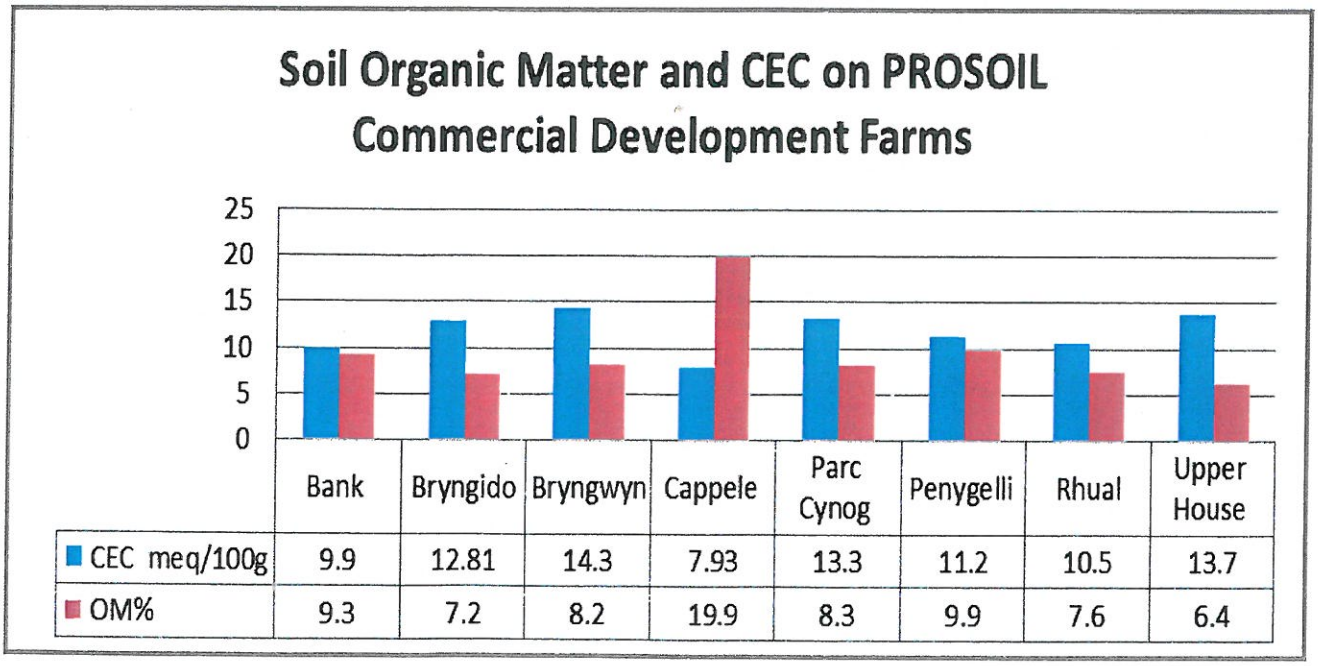
In general, the more clay and organic matter in the soil, the higher the CEC. Although the amount of clay in a soil cannot be changed, the organic matter content can be managed. The CEC of a light soil may be improved through the addition of organic matter such as well-composted manure.

	Optimum	Sandy	Intermediate texture classes	Clay	Peat
CEC (meq/100 g)	>12	from 2	mostly 10 -30	up to 50	>50

Soil organic matter percentage measured on PROSOIL Commercial Development Farms (CDFs) ranged from 6.4% to 19.9% with CEC ranging from 7.9 to 14.3 meq/100g. These figures are typical of grassland soils and reflect the differing soil types across the PROSOIL project.

Organic matter, like composted manure, improves the CEC of all soils. Stable organic matter can hold on to basic nutrients at least twice as well as clays, enables heavy soil to drain more effectively, and helps sandy soil to hold on to plant-available water.

Although clay and organic soils need more lime than sandy soils to increase the pH by one unit, due to their higher CEC sandy soils have a reduced capacity for holding liming materials and are more vulnerable to leaching, so tend to have a quicker return to a low pH.



	Bank	Bryngido	Bryngwyn	Cappele	Parc Cynog	Penygelli	Rhual	Upper House
CEC meq/100g	9.9	12.81	14.3	7.93	13.3	11.2	10.5	13.7
OM%	9.3	7.2	8.2	19.9	8.3	9.9	7.6	6.4

Identifying soil type

Place a handful of soil in the palm of a hand. Slowly add water drop by drop kneading the soil to make a smooth consistency like moist putty.