



# Topsoil Terminology & Science

Andy Spetch, British Sugar TOPSOIL

# Presentation

- Introduction
- Soil Profile
- Soil Structure
- Soil Texture
- Compaction
- Cation Exchange Capacity
- Soil pH
- Nutrients / Organic Matter / EC / PTE's

# Introduction

British Sugar National TOPSOIL Manager 20+ years

Worked for British Sugar for 32 years

Agricultural background

Volunteer groundsman for 25 years

RFU / IOG

National Volunteer Groundsman of the Year 2012



# Our Sites: Four advanced manufacturing plants processing sugar beet in the UK

Lowest cost sugar processor in the EU

## Newark

### Details

- Circa. 190 permanent and seasonal employees
- 700 growers supply 1.6 million tonnes of sugar beet every year

## Wissington

### Details

- Circa. 400 permanent and seasonal employees
- 1,000 UK growers supply over three million tonnes of sugar beet every year
- Largest beet sugar factory in the world

## Peterborough

Head Office  
Circa. 200 permanent employees

## Cantley

### Details

- Circa. 160 permanent and seasonal employees
- Over 700 growers supply over 1.3 million tonnes of sugar beet every year
- Cantley was the first sugar factory built in the UK in 1912

## Bury St Edmunds

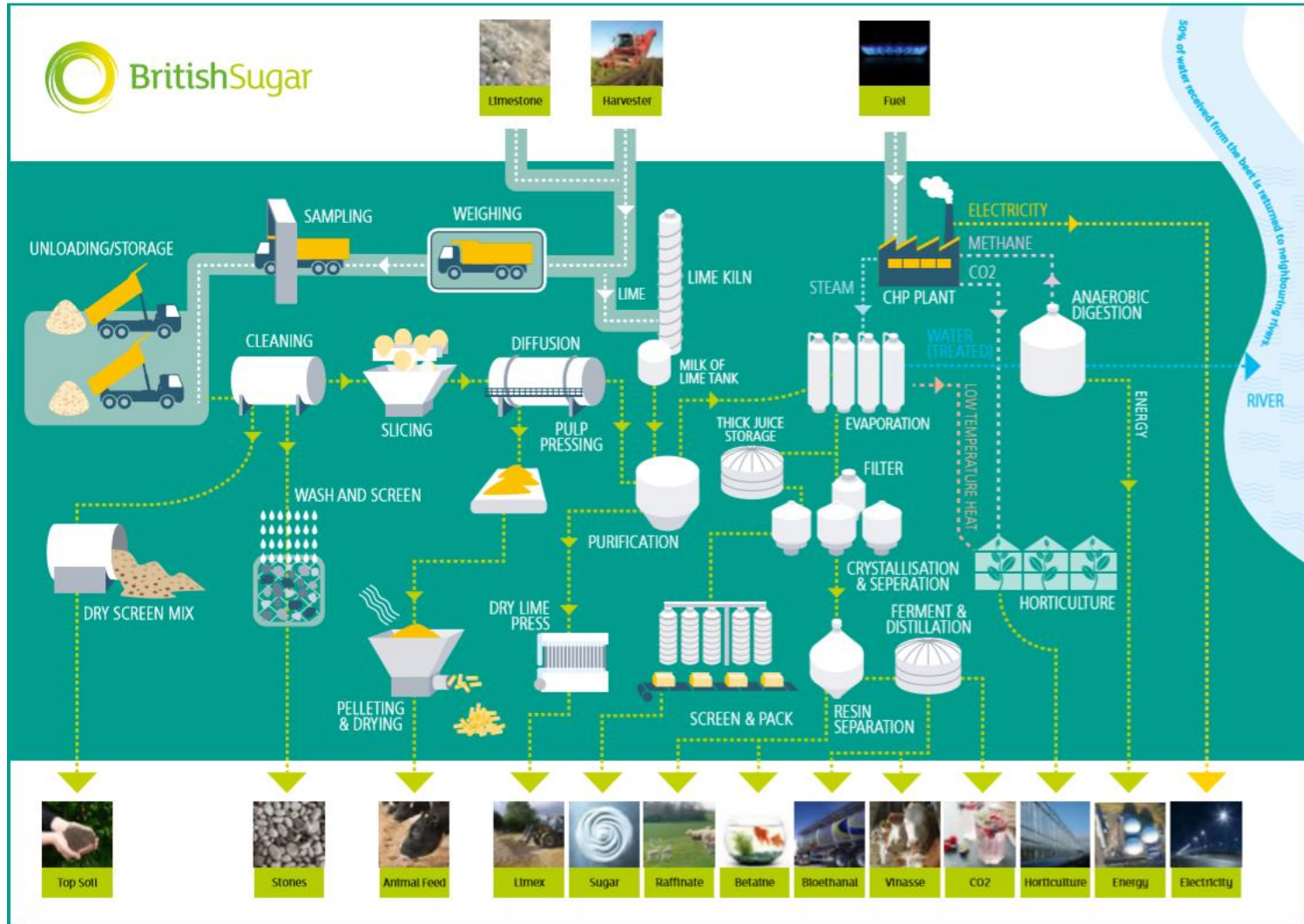
### Details

- Circa. 360 permanent and seasonal employees
- Over 700 growers supply over two million tonnes of sugar beet every year
- Bagged sugar packaging facility

# A sustainable operation: More than simply sugar

Power generation for a city the size of Peterborough

Fuel, animal feed, topsoil, pharmaceuticals



# #BackBritishSugar: Average 28 miles from farm to factory

Creating a level playing field for the British beet sugar industry

What can you do to show your support?

- Buy homegrown British Sugar - look out for the Silver Spoon brand



- Show your support for a great British industry on Twitter (@BritishSugar)
- or Instagram (@BackBritishSugar) using #BackBritishSugar



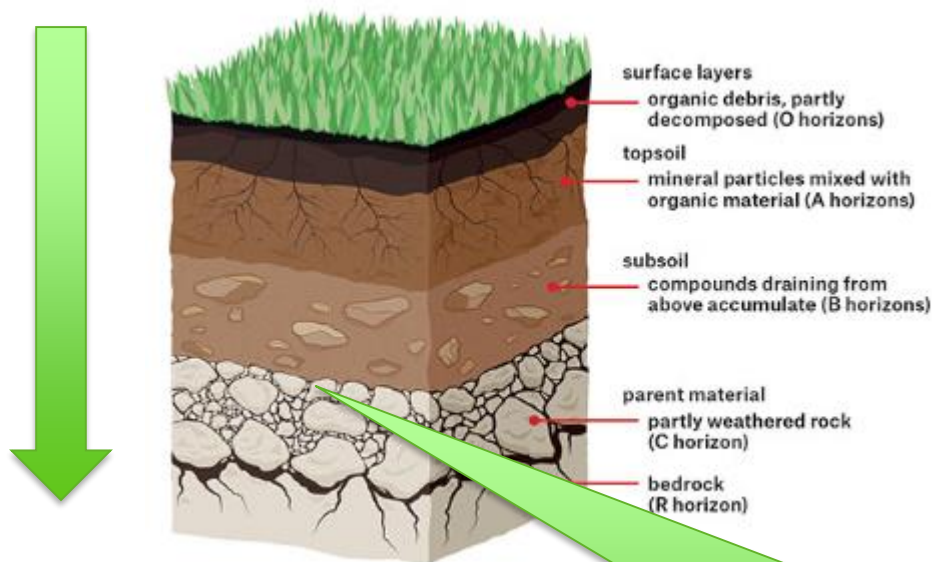
# What is Soil: A blend of sand, silt, clay & organic matter

Topsoil is composed of mineral particles, organic matter, water and air

Loam is composed of mineral particles, organic matter, water and air

# A Soil Profile

A Soil Profile should allow free movement of water, air and roots



Topsoil: Typically the top 30cm, darker and fertile

Subsoil: Directly under topsoil, lighter in colour, less fertility

Parent material / Bedrock: can be solid rock which breaks down with weathering

Dig a pit to understand your soil profile

***Topsoil will only function if it is in sync with its subsoil***



# Soil Structure

What is soil structure?

- Soil structure is the arrangement of soil particles (sand, silt, clay and organic matter) into granules, crumbs or blocks. It is the shape that the soil takes based on its physical, chemical and biological properties. Soil structure is often confused with soil texture, both of which affect the soil's drainage and aeration capabilities.

Well-structured soils are crumbly and friable and have plenty of pore space to allow water and air movement and healthy root development.

Poorly structured are cloddy soil, which will be difficult to work.

Why is structure important?

- To perform effectively as a growing medium soils need an open structure through the soil profile.
- A good soil structure is important to allow air and water into the soil which are vital for healthy plant growth. It will improve drainage and reduce soil erosion caused by excess surface run-off.

Without structure, soils will suffer from anaerobism, waterlogging and nutrient lock-up and, ultimately, turf will suffer!



# *Don't forget the subsoil BS8601:2013*

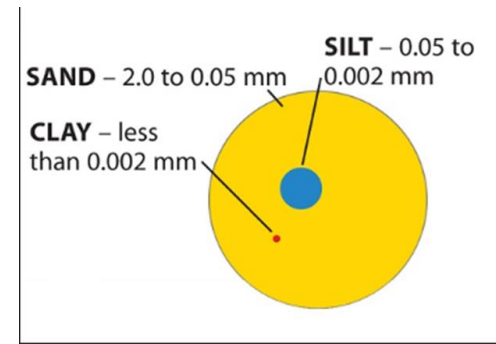
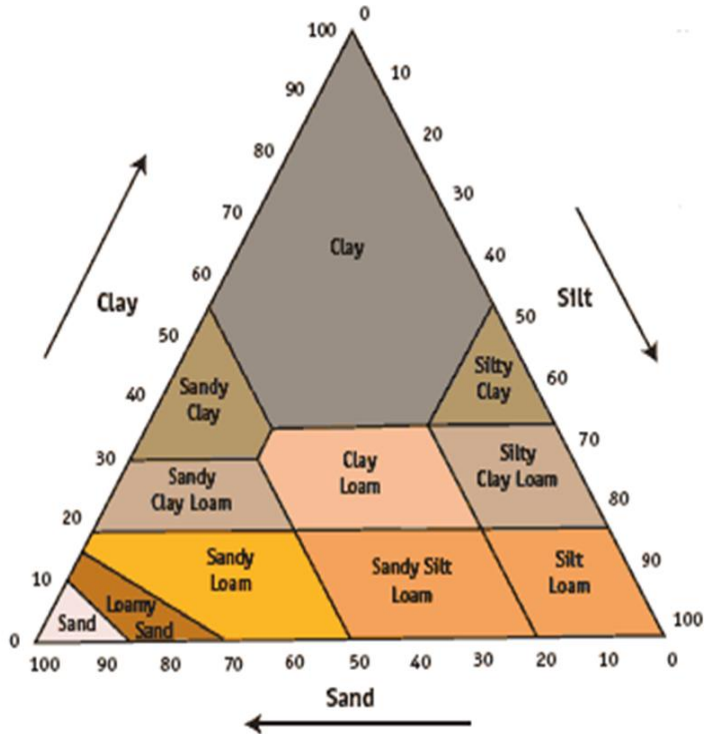
- Only applies to IMPORTED Subsoil
  - Multipurpose Grade
  - Specific Purpose Grade (acid / alkaline / low fertility)
- It is not the 'be all end all'
- A good starting point
- Build 'project specific' soil specifications for each scheme
  - Consider the drainage?
  - Consider the topsoil?
  - Consider the planting scheme?
- Don't always think that compliance to BS8601:2013 means you will get a suitable subsoil delivered!

# Soil Texture

Soil Texture indicates the relative content of particles of various sizes, such as sand, silt, clay and organic matter in the soil.

Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil

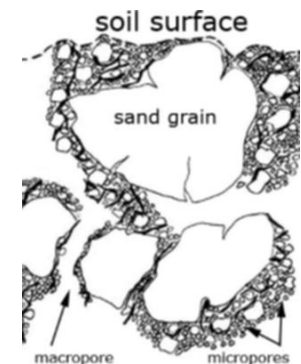
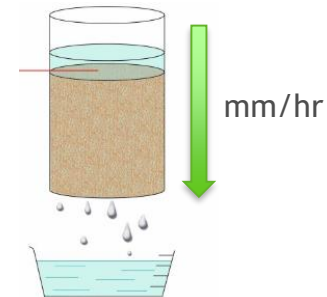
Silt and clays have a flatter structure compared to sand



# Soil Texture: Will influence the Saturated Hydraulic Conductivity mm/hr

**Saturated hydraulic conductivity** is a quantitative measure of a saturated soil's ability to permit water movement

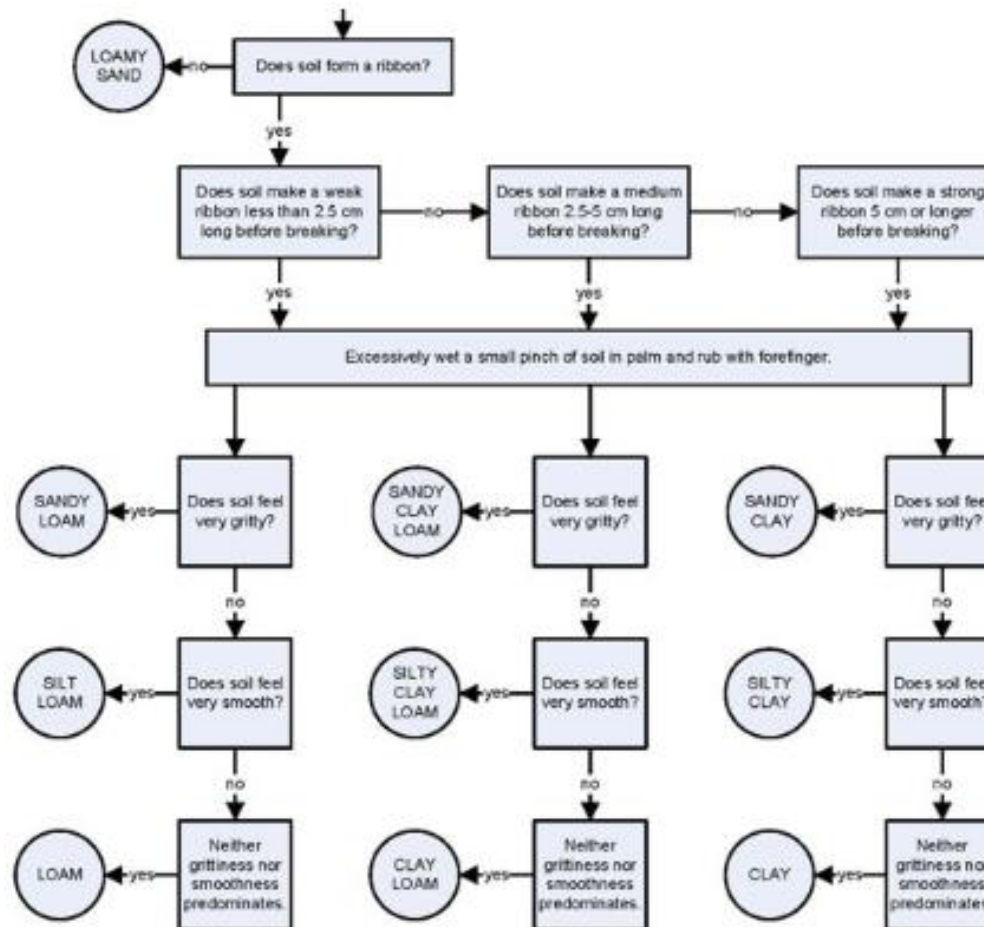
- Industry standards
  - Fairway / Tee STRI 0-15mm/hr
  - Greens USGA 150mm/hr
- Slow isn't always bad
- Slower drainage equals
- Less need for irrigation
- Irrigation lasts longer
- Longer nutrient retention
- Environmental and cost benefits
- Soils with a higher soil content need regular aeration
- **Total Porosity**
  - The total porosity is the total void space between soil particles
  - USGA / UK Golf Guidelines 35%-55%
- **Air Filled Porosity**
  - Air-filled porosity is the voids in soil at any point of time, which is not filled with water
  - USGA / UK Golf Guidelines 15%-30%



# Soil Texture: Spit & Rub

Soil Texture indicates the relative content of particles of various sizes, such as sand, silt and clay in the soil.

Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil



# Soil Compaction

**Soil Compaction** is the most common cause for a loss of soil structure. It can occur in the topsoil and subsoil layers.

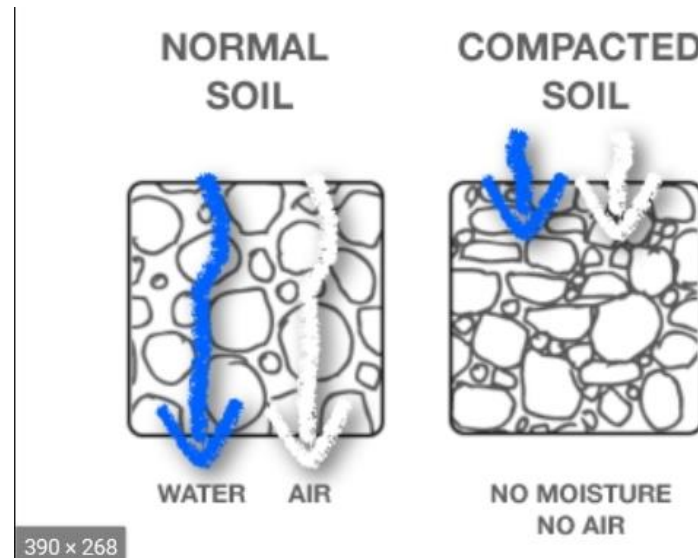
The result is a soil profile that is impregnable to plant roots, water and air.

Typical causes of soil compaction include:

- Excessive foot trampling and vehicle trafficking over soils;
- Storage of building materials on exposed topsoil or subsoil;
- Handling soils when they are wet and plastic;
- Stockpiling soils inappropriately.

Signs of soil compaction include:

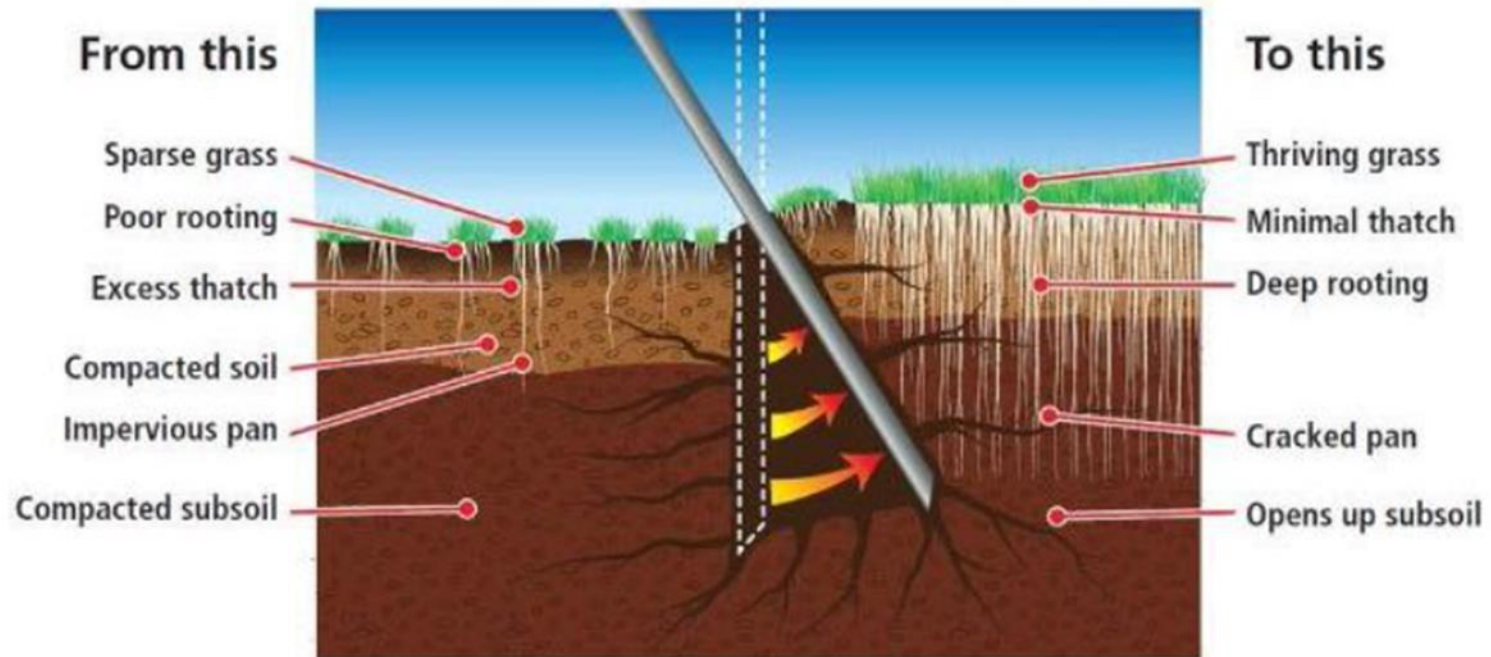
- Surface water 'ponding' and/or waterlogging;
- Soil resistance when pushed with a spade or probe;
- Black/grey, anaerobic topsoil with a sour odour ;



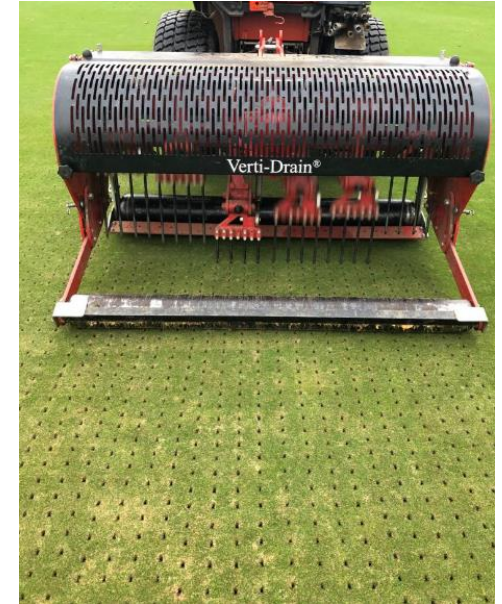
# Soil Compaction

## Soil Decompaction

Soil decompaction is necessary to aerate the soil and allow free movement of water and roots.



# Decompaction Implements





# Top ten tips for soil sourcing and on-site management

To give your project the best chance of success:

- Assess the quality and suitability of the site soils (preferably before stripping the topsoil) by conducting a Soil Resource Survey (separate from a normal Ground Investigation);
- If imported soils are required, use only BS 3882:2015 compliant topsoil and BS 8601:2013 compliant subsoil from reputable suppliers who must provide a valid load-specific Declaration of Analysis (including contamination analysis);
- Refer to both the above Standards, STRI or Consultants for advice on correct soil sampling, handling, storage, soil preparation and depths;
- Avoid handling topsoil in wet conditions;
- Create a dry, clean, segregated holding area for storing topsoil, and seal in or cover the heap;
- Minimize the amount of human and mechanical traffic from the area to be landscaped to avoid compaction;
- Set levels for topsoil application - minimum depth 150mm, maximum depth 300mm;
- Avoid compacting newly laid topsoil;
- Slightly consolidate the new topsoil by lightly pressing with the back of a excavator bucket;
- Work off a board when planting or turfing.

# Soil Science

- Cation Exchange Capacity
- Soil pH
- Nutrients
- PTE's

# Cation exchange capacity (CEC) is a soil chemical property. It is the ability of the soil to hold or store cations.

## Cation exchange capacity.

Soil nutrients exist as positively charged (SAND) or negatively (CLAY) charged ions when dissolved. The positively charged ions are known as cations and the negatively charged ions are known as anions

The nutrients which exist as cations include calcium ( $\text{Ca}^{2+}$ ), Magnesium  $\text{Mg}^{2+}$ , ammonium ( $\text{NH}_4^+$ ), potassium, manganese ( $\text{Mn}^{2+}$ ), zinc ( $\text{Zn}^{2+}$ ) and copper ( $\text{Cu}^{2+}$ ).

Some of the nutrients exist as anions are chloride ( $\text{Cl}^-$ ), nitrate ( $\text{NO}_3^-$ ), sulphate ( $\text{SO}_4^{2-}$ ) phosphate ( $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^-$ ), borate ( $\text{BO}_3^-$ ), and molybdate ( $\text{MoO}_4^-$ ).

# Cation exchange capacity (CEC) is a soil chemical property. It is the ability of the soil to hold or store cations.

Soils with high sand content have low holding capacity for cations compared to clayey and silty soils because they are +VE charged.

**Clay and silt particles have negatively charged sites** which enable them adsorb and hold on to cations.

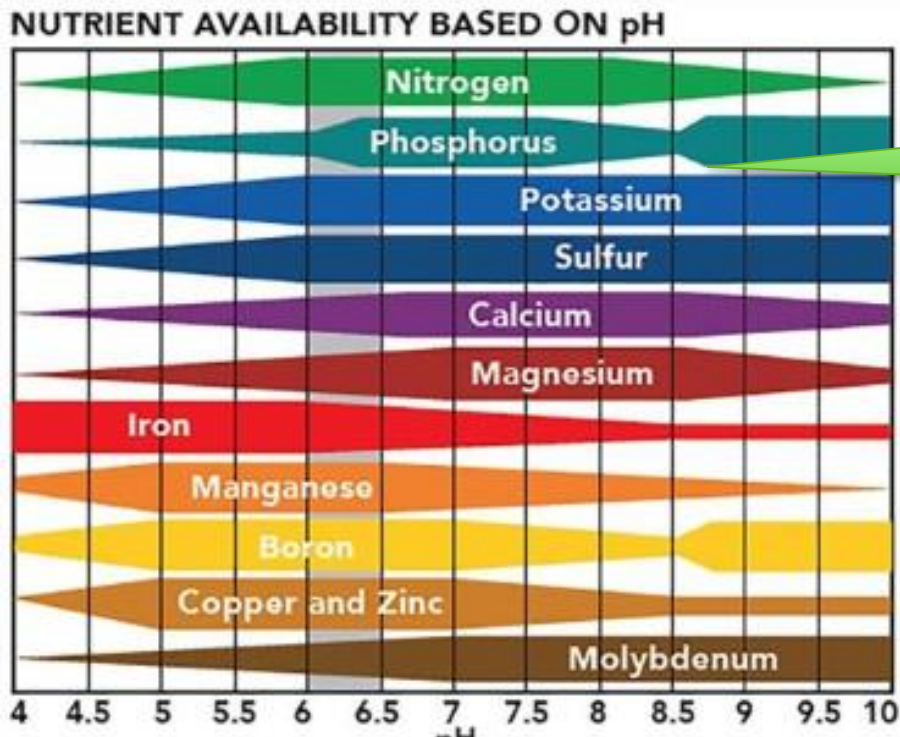
When soil particles are negatively charged they attract and hold on to cations (positively charged ions) stopping them from being leached down the soil profile.

The cations held by the soil particles are called exchangeable cations

Negatively charged soil particles repel anions (negatively charged ions). The implication of this is that negatively charged nutrients such as nitrates, sulphate and chlorides are vulnerable to leaching down the soil profile.

# Soil pH

- Soil pH is an indication of the **acidity** or alkalinity of soil
- It is measured in **pH** units
- The **pH** scale goes from 0 to 14 with **pH 7** as the neutral point.



Remember Clay is -Ve charged and many major nutrients (cations) are +ve charged

# Nutrients

## Nitrogen

Required for the growth of leaves and stems

Deficiency causes weak, stunted growth and yellowing of older leaves.

Excess nitrogen can also be detrimental causing such effects as disproportionate leaf growth at the expense of other parts of the plant (e.g. flowers)

## Phosphorous

Principle nutrient for root growth and development

Deficiencies may cause stunted root systems whilst the leaves on some plants may also exhibit a dull green or purple coloration

## Potassium

Essential for growth and water and nutrient transportation

Deficiency in plants include brown **scorching** and curling of **leaf tips** as well as **chlorosis (yellowing)** between **leaf veins**. **Purple spots** may also appear on the **leaf undersides**. Plant growth, root development, and seed and fruit development are usually reduced in potassium-deficient plants.

## Magnesium

A constituent of chlorophyll, the green pigment which enables plants to photosynthesise

Deficiency may be noted by the interveinal yellowing of the plant's older leaves.

# *British Sugar TOPSOIL Product Range*

## *Available in bulk loads or bulk bags*

### **Landscape** **20**

Landscape20 is a fully-analysed and compliant to BS3882:2015, sandy loam, TOPSOIL. It is ideal for general landscaping projects such as seeding and turfing .

### **Hort** **Loam**

HortLoam is a BS3882:2015 compliant planting topsoil. With optimum reserves of organic matter and nutrients, HortLoam is ideal for planting rootball trees, shrub bed, retained planters and vegetable planting projects.

### **Sports&Turf**

Sports & Turf is ideal for use as a topdressing to repair badly damaged and divoted surfaces or for constructing tees. The blend of medium to coarse sand and soil gives good drainage whilst promoting grass establishment and growth.

### **SubSoil**

General Purpose subsoil: Compliant to BS8601:2013 as a multi purpose subsoil. Suitable for general landscaping purposes, trees, shrubs and amenity grasses

To find out more about British Sugar TOPSOIL

To arrange a visit or for more information on TOPSOIL products call 0870 240 2314  
or visit our web site [www.bstopsoil.co.uk](http://www.bstopsoil.co.uk)



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# Soil Science & Terminology

Tuesday 16<sup>th</sup> June 2020

4.00 - 5.00pm

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