Soil pH and Liming

Introduction

Correct soil pH is a fundamental requirement for the availability of crop macro and micronutrients and will ensure the efficient utilisation of nutrients applied from fertilisers and organic manures/materials. Correctly managed soil pH ensures sensitive crops are protected from risk of yield loss due to compromised nutrient availability. Sugar beet is sensitive to low pH so ensuring pH is at target ahead of drilling is especially beneficial.

What is pH?

- pH is a logarithmic measure of the hydrogen ion concentration of an aqueous solution (a decrease of pH 1 is ten times more hydrogen ions)
- Neutral pH is 7

Low pH (acidic):

- Generally, macronutrients (N, P and K) are less available leading to patches of stunted pale plants with stubby roots
- Limited biological activity including reducing nutrient cycling
- Mild yield effects on mineral soils below pH 6.5 but serious effects on soils below pH 6

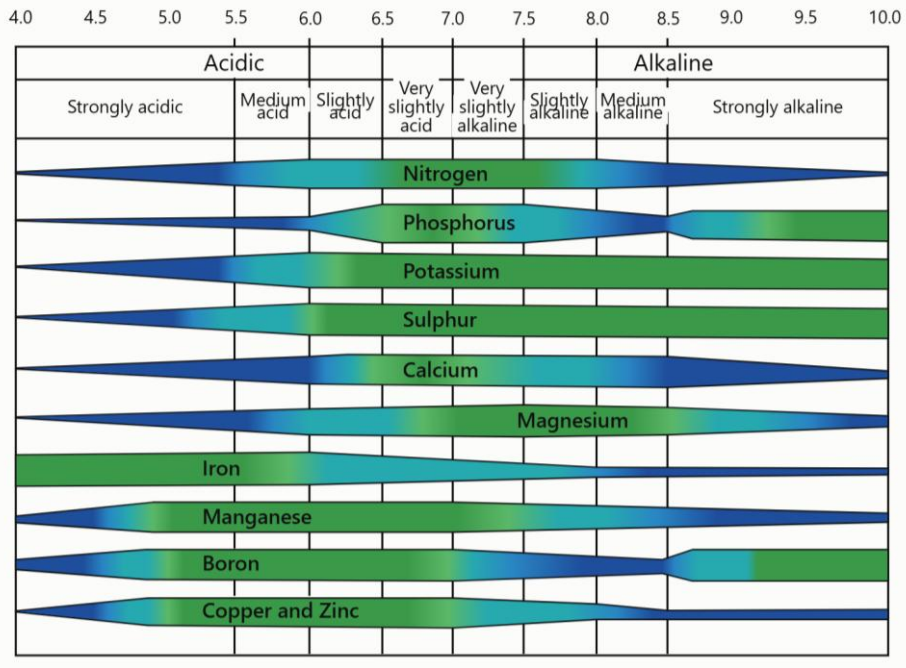
Key Points

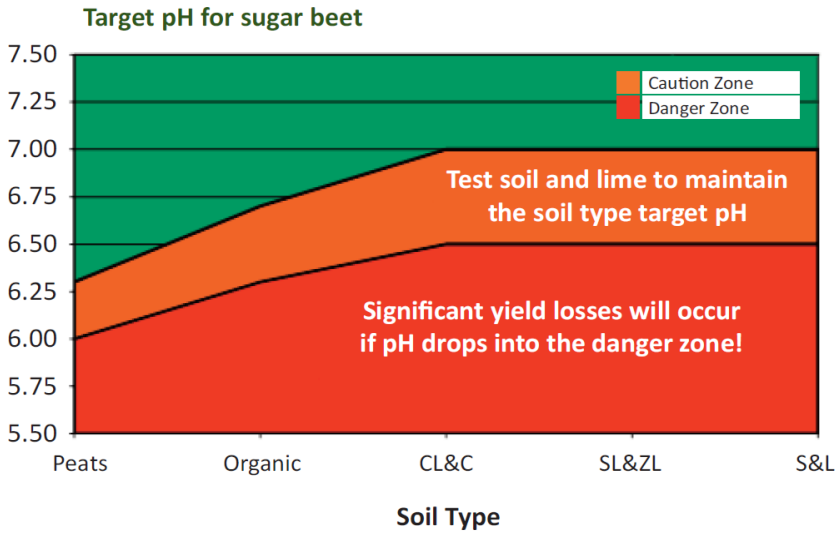
- Mild yield effects can be seen on mineral soils below pH 6.5
- Serious effects of soil acidity occur on soils below 6.0
- Liming is required to correct soil pH to maximise yield of sugar beet, which is particularly sensitive to differences in pH
- Applying lime is an essential rotational investment on many soils. Select a product that is reactive and long lasting
- For detailed information on sugar beet nutrition see the Nutrition Fact File

High pH (alkali):

- Generally, micronutrients are less available, leading to a range of nutrient deficiency symptoms
- Limited biological activity including reducing nutrient cycling

The figure below shows the availability of nutrients at differing pH values.





Mild yield effects on mineral soils below pH 6.5

Serious effects of soil acidity on soils below pH 6.0

Target pH

Target pH for mineral soils is 7 whilst for organic and peat soils it is 6.5-6.7.

Lower optimum pHs are required on organic and peat soils in response to their higher Cation Exchange Capacity (CEC) which affects nutrient availability.

Testing soil pH

Liming contractors and supplies offer soil pH testing services. Samples are typically taken in a grid pattern to account for variation across the field. Soil pH can also be tested when soil samples are taken for SMN testing at the 15-20cm depth or when undertaking soil health assessments. Refer to the **Soil Health Fact File** for more guidance on soil sampling.

Liming

Applying lime increases soil pH and is an important consideration, particularly as over 50% of arable soils are below their target pH. Arable soils should generally be limed every five years, with the period ahead of sugar beet providing a good opportunity in the rotation due to the crops' sensitivity.

Liming products vary in neutralising value (NV), fineness and reactivity. NV is expressed as a percentage of the material's calcium oxide (CaO) equivalent. For example, a product with an NV of 52% has the same neutralising capacity as 52 kg of pure CaO per 100 kg of material. Products with a higher NV require lower application rates; for example, ground limestone (NV 50%) requires less material than LimeX 70 (NV 28%) to achieve the same pH correction.

Finer, more reactive products can be applied in the autumn ahead of spring-sown beet, while less reactive materials should ideally be applied 12–18 months before cropping.

Lighter soils generally require less lime to raise pH than heavier soils due to their lower cation exchange capacity but are also more susceptible to rapid changes in pH. Lime requirements should be based on soil type and pH, using tools such as the Agricultural Lime Association (ALA) Lime Calculator.

Liming materials may also supply nutrients such as magnesium (Mg), sulphur (S) and phosphorus (P), which should be considered within the wider nutrient management plan. For further information on sugar beet nutrition see the Nutrition Fact File.