The importance of managing soil pH

Overview

Soil pH is important for optimising plant growth, by influencing the uptake of nutrients.
Perfect management of your soil pH can provide:

- ✔ Financial savings due to greater efficiency in fertiliser uptake and use
- ✔ A reduction in greenhouse gas emissions, including the highly potent nitrous oxides
- ✔ Protection of watercourses by reducing run off

pH stands for "potential Hydrogen", and measures the amount of hydrogen ions in the soil. Too many hydrogen ions create acidic conditions, i.e. a low soil pH.

It is important to monitor soil pH on a 3-year cycle across all your fields.

The effect of ammonium fertilisation

When ammonium is converted to nitrate in the soil, hydrogen ions are released, creating acidic soil conditions. Different fertilisers have different acidifying effects. MAP (monoammonium phosphate) causes the lowest impact on soil acidity and urea the greatest impact.

The finances

The closer your soils are to the optimal pH of 6.5, the higher the availability of nutrients to the crop. The use efficiency of Nitrogen increases from an estimated 77% at pH 5.5 to 89% at pH 6.0. In effect, **at pH 5.5 a quarter of your nitrogen fertiliser is wasted compared to a soil at pH 7.0.**

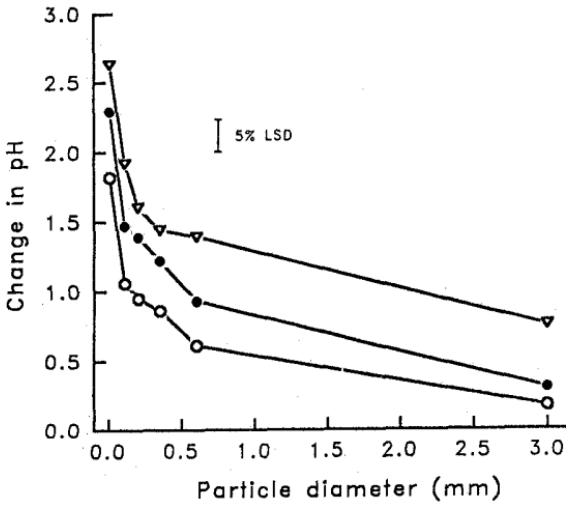
This is not just a financial waste, but contributes to the farm's carbon emissions without a corresponding benefit to production.

Soil pH	Equivalent rate of 40kgN/ha	Equivalent price of Ammonium Nitrate per tonne* (£)
5.5	30.8	415
6.0	35.6	374
7.0	40.0	337

***Source: AHDB**

Which liming product to use?

Lime is a material that reacts with excess hydrogen ions to remove them from the soil (known as "neutralising"). Particle size is the biggest influence on the neutralising ability of liming agents: the finer the particle size, the more rapid the change in pH and the greater the exchangeable calcium.



The increase in soil pH (0-10cm) due to particle sizes of limestone at three application rates: 2.5t/ha (o),

5t/ha (•) and 10t/ha (▽) Taken from: Scott et al (1992) Aust. J. Agric. Res.

Neutralising value

When buying liming agents, the cheapest is not always the best. Look at the NV (neutralising value) – the higher the value the more effective the liming agent.

$$\text{Cost per neutralisation unit} = \frac{\text{cost/tonne}}{\text{NV value}} + \text{haulage}$$

Environmental benefits

The main environmental benefit of improved soil pH is the ability to reduce fertiliser applications by increasing nutrient use efficiency.

Fertilisers contribute to greenhouse gas emissions in both their manufacture and through nitrous oxide emissions from their application to fields. If you can improve nutrient use efficiency through improved soil pH, you can reduce fertiliser use and therefore reduce carbon emissions.

Fertiliser	Emission/tonne (tCO_2e)
Ammonium nitrate	2.28
Urea	3.40
Urea Ammonium Nitrate (liquid fertiliser)	2.19

Over-applying fertilisers also increases the risk of nutrient leaching and runoff into watercourses. Improving nutrient use efficiency can reduce the amount of nutrients "free" to leave the soil and pollute watercourses.

There is also evidence to suggest that lime can help to improve soil structure, reducing compaction and benefiting crop growth. Improved crop growth has the potential to increase carbon captured through photosynthesis and stored in the soil.