A complex picture

> *Soils are the building blocks of crop production, but they're also incredibly complicated environments.*

Nutrition

There's a keener than usual focus on nutrient plans this spring due to the price rises and potentially tight supply in the fertiliser market. *CPM* takes a look at the different soil types and their peculiarities when it comes to nutrient supply.

By Rob Jones

When formulating nutrition plans, it's tempting to match soil testing results to RB209 recommendations and think the job is done. While that may have theoretically taken care of supply, the availability of nutrients is a much more complex affair dependent on soil physics, chemistry and biology.

Chris Bond, commercial technical manager for crop nutrition at FMC, suggests taking a step back and starting from the soil up when formulating nutrition programmes.

"Soils are the building blocks of crop production, but they're also incredibly complicated environments which combine organic matter, minerals, organisms and soil particles — all of which have unique relationships with each other.

"Because of the soil's complexity, it's important to understand how all these factors come together to impact nutrient availability and avoid any impact on crop performance," he says.

Chris explains that something as simple as the pH of the soil can affect nutrient availability and have knock-ons for crop development, but its influence is often overlooked.

"The pH can affect how nutrient ions interact with each other and how they bind to the particles in the soil profile.

"In higher alkaline soils, the uptake of most nutrients is reduced and availability of micronutrients, such as manganese, copper and zinc, are certainly limited as they tend to form less soluble compounds, so deficiencies of these nutrients are often seen here."

Soil tests

Under acidic conditions, which are more common in lighter, sandy soils, molybdenum becomes less available as it tends to bind with metal oxides. Phosphate is also at risk as it forms precipitates with iron and aluminium, explains Chris.

Nutrient levels tend to be generally higher and more readily available in more neutral soils, between pH 6.5-7.5, so maintaining these levels will be beneficial for crop nutrition, he says.

"This is where soil samples come into their own. Most growers will carry out basic soil tests, but understanding levels of all essential nutrients and using this alongside pH information to assess the potential for lock up can help make the right choices when it comes to crop nutrition.

"Along with pH, soil type and texture can significantly impact nutrient levels in soils. It's easy to forget that soils are living and breathing and can be vastly different in their composition across the country. For example, the soil particles themselves can have a huge impact on the availability of nutrients."

Having a better understanding of soil types and their potential risks will help to inform decisions on the most appropriate nutritional applications for crops, believes Chris.

"Generally, heavier soils tend to retain good levels of crop nutrition as their profile has more clay particles than lighter soils. These help to stabilise the structure of soil and hold onto both organic matter and nutrients.

They also have a greater capacity to exchange cations. "Clay particles carry a negative charge and, as such, can bind a high level of positively charged nutrientiions or cations. These cations — such as potassium, calcium or magnesium — can be exchanged with others within the soil profile and become slowly available to crops in the soil solution.

"In addition to this, clay particles are small, which creates a greater surface area for the ions to bind to. This reduces the risk of leaching because the soil particles are better able to hold onto the nutritional elements, as well as keep water within the profile," he says.

Although leaching is less of a risk, clay soils have a higher potential for water logging. When these soils are saturated ▸

Chris Bond suggests taking a step back and starting from the soil up when formulating nutrition programmes.

HYBRID BARLEY AGRONOMY ADVICE

syngenta.

Aim to apply 3 PGRs to crops of hybrid barley

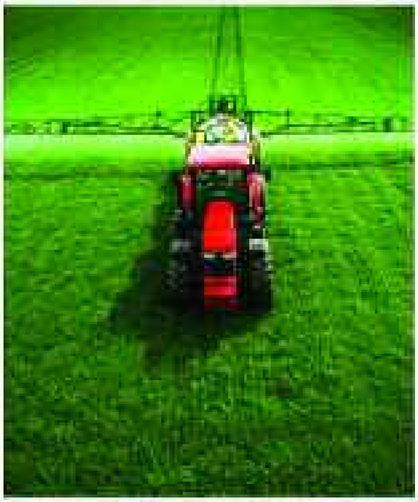
Many factors affect lodging and it is important to consider each of them when determining the risk in crops. Consider location, weather, green area index, drill date, variety and sowing rate and prioritise crops in high risk scenarios for PGR applications.

Remember to follow best practice guidelines when applying PGRs:

- Plant growth regulators should only be applied to actively growing crops
- High doses of PGRs should not be used on stressed crops
- Use best application practice for the conditions
- Discuss specific local situation with a BASIS qualified advisor

T0 GS30	**Foundation:** promotes rooting, strengthens tillers and reduces crop height	MODDUS **0.1-0.2 l/ha** + chlormequat*
T1 GS31-32	**Stem:** strengthens stems and reduces crop height	MODDUS **0.1-0.2 l/ha**
T2 GS37-39	**Centre of gravity:** reduces crop height, brackling and necking height	Ethephon based product**

Note: *Chlormequat at approx. 50% dose rate, various products and formulations exist. **Avoid later applications after GS39 especially high risk if the leaf sheath has split and the ear is visible. Please consult a BASIS qualified advisor for specific advice for each field.



HYBRID BARLEY HAS A LARGER FLAG LEAF THAN CONVENTIONAL VARIETIES

Hybrid barley has a much larger flag leaf than conventional barley. This larger leaf will contribute more to yield than the flag leaf typically does for a conventional crop. This means that disease protection at T1 and T2 applications are important to maximise yield and quality. Fungicide timings also reduce brackling later in the season, which correlates with increased yield.

PRIORITISE CROPS WITH BROWN RUST RISK AND APPLY A RUST ACTIVE TRIAZOLE AT T0 OR T1

For more information on Sygenta hybrid barley varieties, visit **www.syngenta.co.uk/varieties/hybrid-barley**

FIND OUT MORE AT SYNGENTA.CO.UK @SYNGENTACROPSUK

Sandy soils struggle to hold onto nutrients because the soil particles aren't charged and water because of the size of aggregates.

▸ with water, the particles can bind tightly together, meaning water struggles to percolate through the soil profile.

"This can affect the availability of essential micronutrients, such as copper and zinc, which can become insoluble in an abundance of water," he says.

He also notes that certain elements can be antagonists within clay soils. "For instance, a high concentration of potassium has the potential to antagonise magnesium and vice versa.

"If lock-up or antagonism is suspected, this can be remedied through foliar nutrition. By taking this approach, the plant will be able to access the nutrients it needs through its leaves rather than through the roots, where they are likely to be locked-up," he explains.

Unlike clay soils, sandy soils often struggle to retain nutrients and are at a more significant risk of leaching. "This is because sand particles are much larger and carry no charge, meaning there are bigger gaps between the particles in the soil profile, and nutrients can slip through.

"Additionally, because sand particles often struggle to hold onto water because of their large particle size, in heavy rainfall water washes quickly through the soil profile, often taking nutrients away with it.

"Nitrogen and sulphur, for example, are crucial nutrients which can easily be leached from sandy soils under these conditions."

Dry conditions also pose a problem in sandy soils as they struggle to hold onto moisture. This is a particular issue for any nutrients, such as boron, that rely on mass flow for uptake into plants, adds Chris.

Chalk soils

"This can be a particular problem in oilseed rape, where boron deficiency could be an issue. Carrying out tissue testing and following up with foliar applications to remedy insufficiency is the best course of action."

The main concern when it comes to chalk-based soils is the level of calcium. "Calcium is one of the most antagonistic nutrients within soil profiles so it can have numerous implications for other nutrients.

"High levels of calcium ions can lock-up zinc, magnesium, manganese and phosphate, effectively blocking the uptake of these nutrients by crops. This can cause a range of issues in cereals as these nutrients are particularly important for resilience in the early stages of crop growth," he explains.

In this situation, Chris recommends the use of foliar nutrition to deliver the required nutrients straight to the leaf tissue and bypass any calcium antagonism in the soil.

"Any nutrition applied in a granular form could be at risk of being locked up and inaccessible to the plant. In this instance I would encourage foliar applications of zinc, magnesium and manganese instead," he says.

Peat soils are some of the most fertile soils in the UK and can be significant stores of carbon, so are particularly valuable in the arable sector.

"They're characterised by high levels of organic matter which has not fully decomposed in the wet, acidic conditions found in bogs and marshes," explains Chris.

Organic matter is important in soils for many reasons but if organic matter is in excess within the soil profile it can be problematic, he explains.

"High levels of organic matter in any soil type has the potential to lock up important micronutrients such as manganese, copper and zinc.

"Zinc helps to drive important metabolic reactions within plants which are essential for growth and development. Copper is also vital for crops as it plays an important role in enzyme systems, pollen formation and cell strength," he says.

"Soil types across the UK are incredibly varied and each type will pose different challenges for crops. This means crop nutrition isn't a one size fits all approach for every farm across the country, as it may not be suitable for their soil type.

"Therefore, when considering crop nutrition, it's important to think about soil type and texture first, whether you have a light sandy soil, a heavy clay-based soil or anything in between. This will help to ensure you get the most out of your applications," he concludes. ■

New guide to regenerative agriculture

A new guide that outlines the key principles of regenerative agriculture has been released by Agrovista. *The Regenerative Agriculture Guide* is packed with useful information and tips and has something for everyone, from the mildly curious to those who have already embarked on the journey.

Chris Martin, the guide's author and head of soil health at Agrovista, says: "The ongoing degradation of biodiversity and soil fertility that global agriculture has experienced has led to increasing calls internationally to switch from degenerative to regenerative approaches.

"Regenerative agriculture has shot to prominence over the past couple of years in the UK, but many people are unsure what it entails. I define it as a system of farming principles and practices that aims to reverse the errors created by previous unsustainable methods.

"It works alongside nature to increase biodiversity, improve soils and protect the environment, while delivering benefits to humans through an improved natural environment and healthier ecosystems."

The journey towards regenerative agriculture can appear very daunting, says Chris. "However, it's not prescriptive — how far people want to go is a personal choice. It doesn't have to be all or nothing, and it can be undertaken at a pace that suits the individual.

"By adopting some of the principles in the guide that best fit a farm's individual circumstances, growers can start to build long-term soil health and functionality whilst maintaining farm yields and improving overall farm profitability."

Chris Martin says embarking on a journey into regenerative farming isn't prescriptive.