Using biostimulants to decarbonise food production

As both growers and the wider supply chain focus on developing greater resilience of food production in the face of climate threats and changing agricultural practices, the impact of biostimulants is starting to extend far beyond the farm gate. *CPM* reports.

By Rob Jones

The ability of biostimulants to increase productivity through greater yields and improved nitrogen use efficiency appears to be catching the eye of processors and retailers striving to secure consistency of supply and reduce the carbon footprint of food production.

With the output of UK arable production finding its way into a multitude of products on supermarket shelves, it's a technology capable of far-reaching effects across the food supply chain, believes independent sustainability consultant, Caroline Mason.

As the former head of agriculture fisheries and aquaculture for The Co-operative Group, with additional experience working at Waitrose, Caroline says resilience is undoubtedly the word of the moment in the wider food industry, but it's a term that means different things to different people.

"Resilience to a retailer involves understanding how the climate is changing globally and how that impacts on the ability to source food products to guarantee consistent availability throughout the year. Without reliable crop availability, the whole multiple retail business model breaks down," she suggests.

"But in farming terms, resilience has become more an expression of farming practices and decisions which guarantee there's a profitable crop to harvest at the end of the growing cycle, that in turn provides a reliable route to market and income.

"So, what both a farmer and retailer want is actually the same thing, but the blunt reality is we can no longer rely on the farming methods that have landed us where we are now. We have to think ▶

Shared benefits

Biostimulants are an example of a technology which is aligned with future sustainability objectives and one that growers, processors, retailers and consumers can all benefit from, says independent sustainability consultant, Caroline Mason.

▶ and operate differently and ask different questions."

Biostimulants are an example of a technology which is aligned with future sustainability objectives and one that growers, processors, retailers and consumers can all benefit from, she says.

"They have the potential to help farmers to improve their productivity while increasing the efficiency of their nitrogen use and reducing their carbon footprint. What's really exciting is they also work with nature and can benefit the wider food supply chain, too.

"Not only do they give producers more stability financially, but this also extends into greater stability throughout the whole food supply chain – crops which don't perform very well directly impact on how much grain is going to be on the shelves of retailers and that's a real problem for them."

According to Caroline, it's important to remember that something like wheat is both a commodity and an ingredient, and as such, ends up in multiple different products including animal feed. "Therefore, improving the sustainability of just one crop can have a massive impact across the overall food system.

"Biostimulants are also a brilliant innovative example of a Scope-3 solution because they can fundamentally reduce the carbon footprint impact of that whole ingredient supply chain. It's an area retailers are likely to be increasingly excited about as it's the type of science-driven innovation which can attract further investment.

"Consequently, biostimulants are being perceived as a part of the food supply chain that's really moving forward in the right direction," she adds.

SCIENTIFIC VALIDATION

Jack Hill, account manager for Intracrop, highlights that technical validation is a key part of the biostimulant journey, with compelling science now underpinning significant breakthroughs. "The chlorophyll-enhancing MTU molecule, for example, has just completed European CE validation some 18-months ahead of schedule. This is because of the strength of the data and trials behind it.

"Furthermore, it's one of the few biostimulants legally approved to carry the label recommendation of being capable of enhancing NUE – that's a real step forward," he comments.

Jack adds that MTU has been shown to increase chlorophyll levels by up to 20% because the more chlorophyll there is, the greater the rate of photosynthesis which leads to more CO_2 assimilation and more sugars being produced – the result being a healthier crop.

"This process also

improves NUE by increasing CO2 uptake as the plant has to compensate by boosting the uptake of nitrogen from the soil to balance the C:N ratio, as well as building resilience to deal with the greater abiotic stresses now increasingly experienced in crop production."

He says the firm's seen interesting results from an MTU and pidolic acid combination which is being marketed in the UK by Frontier as a product called Status. "For example, trials in Cambridgeshire on sugar beet have shown a root weight increase of 11t/ha – an uplift from 57 to 68t/ha – which is worth an extra £418/ha at the time of the trials in 2022 when the plant was under significant heat stress.

"Trials with Status in cereals have been equally impressive with typical nitrogen savings of 30kgN/ha achieved without a negative impact on yield."

He says another rapidly rising star in the Intracrop portfolio is Nutrino Pro – a urea polymer-based product combining Mg, S and the two biostimulants pidolic acid and R100.

"Nutrino is a foliar product where the urea polymers break down during a 6-8 week period, and which is proven to be most effective late in the season. In oilseed rape, we're typically seeing a 0.4t/ha yield response from 20l/ha application. This can be used on top of standard farm practice nitrogen applications, or, to replace around 30kgN/ha of soil-applied product.

"On paper, a 20l/ha application of Nutrino Pro only provides around 6kgN/ha, but because it's a late applied foliar product, it's hitting a lot of biomass which maximises interception and reduces the potential for leaching and volatilisation," explains Jack.

"Because it's so efficient, we're observing NUEs in excess of 95% in trials compared with 30-40% for soil-applied nitrogen in the same dry conditions. That's why we believe it's possible to replace the equivalent of 30kgN/ha soil-applied N with 6kgN/ha of Nutrino Pro."

Jack adds that work undertaken by Dyson Farming Research in 2024 also demonstrates a consistent yield increase in winter wheat of 0.3-0.5t/ha as an outcome of using Nutrino Pro at optimal and sub-optimal base nitrogen rates.

Such improvements in yield and nitrogen use are also resulting in significant environmental benefits with sizeable reductions in carbon footprint of production being seen, he suggests. "We've invested in producing a true 'cradle to grave' indicative carbon footprint for Nutrino Pro from raw materials, inbound logistics, production, outbound logistics, product use and disposal.

"When you look at a standard wheat system using 200kgN/ha from AN, and one where AN provides 170kgN/ha combined with Nutrino Pro at 20l/ha, you achieve the same yield but with a 12% reduction in carbon emissions.

"The Nutrino Pro approach, where 30kgN/ha is replaced with 20l/ha of Nutrino Pro, produces 296kgCO2e/ha less than the AN-only system, which is a sizeable amount from such a simple switch," believes Jack.

Proven benefits such as these are

Status update

According to Intracrop's Jack Hill, the company's seen interesting results from an MTU and pidolic acid product called Status.

Nitrogen use efficiency

The goal is to make every kg of nitrogen as impactful as possible to produce as much food as possible – that's very different from just reducing nitrogen use, believes Frontier's Robert Nightingale.

▶ why the benefits of biostimulants are being increasingly noticed by the food supply industry downstream of farmers and growers, says Frontier Agriculture's sustainability technical lead, Robert Nightingale.

"It's a significant topic of discussion with customers and we're increasingly engaging with processors and retailers to discuss the benefits to them of biostimulants and other practices in sustainable food supply.

"What we know is the nitrogen efficiency piece is very important to them. When you look at food products and feed, some 30% of the carbon footprint of beer comes from the grain involved, with bread that's 60%, with flour it is 90%, and with feed production similar.

"In terms of grain production itself, around half to three quarters of the carbon footprint is connected to nitrogen manufacture and nitrogen use with this split roughly 50:50 between the two, so improving nitrogen use efficiency is key.

"The real goal is to make every kg of nitrogen as impactful as possible so we can produce as much food as we can; that's very different from just reducing nitrogen use."

He says this is where biostimulants can make a difference, with many of Frontier's customers now appreciating this and therefore looking at how they can reduce their overall emissions and carbon footprint.

In fact, Frontier has a rapidly growing cohort of 150 farmers on 'sustainable supply chain contracts' which actively reward participants for good agricultural practices, including the use of biostimulants, he explains.

"We're trying to incentivise farmers to make more sustainable decisions and reward them accordingly. So in the first instance, we're talking about the adoption of sound nutrient planning practices to get the fundamentals right around nitrogen use.

"We're then encouraging the use of biostimulants. The more positive steps a grower takes, the more they move up through a bronze, silver and gold ranking system and the more they're rewarded for their actions," adds Robert.

The firm also has a 'sustainability data collection programme' which involves going out to customer businesses and seeing what's actually happening on farms through relatively light touch surveys, he comments.

"This not only helps to build a picture of the carbon footprint of the grain which farmers are producing, it also gives valuable insight into what impact different practices are making to NUE and carbon at a collective level."

KNOWLEDGE BANK

Frontier head of crop nutrition, Edward Downing, believes such initiatives not only directly reward the farmers involved, but also build valuable knowledge for the future. "There's still a lot of scope for all of us to improve and so encouraging farmers to use best sustainable practices and rewarding them for adopting these makes perfect sense.

"There's an aspect of win-win across the food supply chain from such thinking, ranging from efficiency and financial gains for the farmer to significant benefits to the environment and the creation of more resilient food supply."

But there really is no silver bullet, he stresses. "Biostimulants are an increasingly important part of the process, but it extends far beyond these if we're to achieve the goal of fully decarbonising food production in the way we all desire.

"It's also about looking at crops other than just the staples like wheat and barley; we're only just beginning to understand the implications of biostimulants and other beneficial practices with regard to these.

"At the end of the day, we all require food and that has to be front and centre of everything. Consistent and reliable supplies of high quality food produced in a sustainable and environmentally responsible way is everyone's ultimate aim," he stresses.

For Caroline, with her experience in food retail, the challenge is even more succinct. "It's very clear that whether you use the words sustainable or regenerative, such practices will help to produce a more balanced agriculture with greater longevity, greater income stability and greater environmental benefits.

"We all have to be talking in a much more collaborative and efficient way across the food supply chain from farmers at one end, processors and manufacturers in the middle, and then retailers and consumers at the end.

"Whether you're on the bus or not, things are changing and technologies like biostimulants are transformational with a hugely exciting role to play," she concludes. ●

Rewarding best practice

Frontier's Edward Downing says as scope remains to improve, encouraging farmers to use best sustainable practices and rewarding them for adoption makes perfect sense.

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