A green boost for modern farming?

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>
> ANTONIS ANGELETAKIS

CPM takes a closer look at why biostimulants could be the environmentally-friendly solution growers have been waiting for – and how they fit into a modern, integrated crop management strategy.

By Charlotte Cunningham

In a farming landscape increasingly shaped by environmental regulation and market pressure for sustainable produce, biostimulants are stepping into the spotlight as a key part of the regenerative farming toolbox. These naturally-derived inputs don't replace fertilisers or crop protection products, but instead work alongside to support plant health, improve nutrient use efficiency, and enhance crop resilience — offering growers another route to achieving yield and quality goals sustainably.

Rather than directly supplying nutrients like fertilisers or controlling disease like fungicides, biostimulants act more subtly — stimulating the plant's own physiological processes and improving soil microbiome activity. This can translate into improved root architecture, greater drought tolerance, better nutrient uptake, and even enhanced salinity resistance – all of which can have an impact on the green credentials of growing arable crops.

"They're not a silver bullet," stresses Antonis Angeletakis, director of biostimulants at Yara International. "But in the right conditions, and as part of a broader crop management strategy, biostimulants can unlock potential that would otherwise be left on the table."

This is a sentiment Yara's Natalie

Genuine plant support
Yara's Natalie Wood says modern agriculture is seeing a dramatic shift towards scientifically backed, targeted biological solutions that genuinely support crop health and productivity.

Wood agrees with: "Today, we're seeing a dramatic shift towards scientifically backed, targeted solutions that genuinely support crop health and productivity."

Antonis explains that not all biostimulants are created equal and having a sound understanding of this is key to optimising their usage. Microbial products, for example, operate quite differently to non-microbial ones — even when they're targeting similar outcomes like nutrient uptake or phosphate solubilisation, he says. "Microbial biostimulants introduce living organisms into the soil which means you have to assess compatibility with existing soil biology. Introducing non-native strains requires careful evaluation to avoid disrupting the balance."

These nuances make it all the more important that growers understand how and when to apply different products. Factors like soil health, weather, and existing fertiliser practices can all influence outcomes, meaning a one-size-fits-all approach isn't suitable, points out Antonis.

Taking a scientific approach to biostimulants is something Agrovista agronomist Pete Waltham is passionate about. With a background in biochemistry and molecular microbiology, Pete says that reimagining how farmers nurture their soils and crops – utilising tools like biostimulants – is key to building sustainable, environmentally-friendly businesses.

"The age of simply spreading fertiliser and expecting perfect results is over," he stresses. "Our soils have been under immense pressure and we're now seeing the consequences of decades of intensive agricultural practices."

Pete concurs with Antonis and says biostimulants have evolved into sophisticated scientific solutions that offer farmers targeted approaches to crop nutrition and soil health – both of which can help tick 'green' boxes for farm management. "These products are partial solutions," he emphasises. "We're not completely replacing traditional fertilisers, but we're finding smarter ways to use them and incorporating products which can complement them."

At the heart of Pete's approach is addressing nitrogen management. "Farmers are increasingly recognising that simply applying more nitrogen isn't sustainable. To grow a crop today, you require significantly more nitrogen than 30 years ago," he explains. "The fundamental reason? Our soils are nowhere near as good as they used to be."

Building sustainable businesses

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MOLASSES PRODUCT

In Pete's experience, incorporating products like L-CBF Boost – from QLF Agronomy – is changing this narrative. "Based on molasses and containing humic acids, such biostimulants can help farmers to potentially reduce nitrogen inputs by 10%. More importantly, these products support soil microbial communities, helping to restore the delicate balance of soil ecosystems."

Going beyond simple nutrient replacement, Pete has also been exploring innovative products which work with plant biochemistry. "Take 2-oxo (2-oxoglutaramate) products for example, these directly support nitrogen assimilation into amino acids. Then there are endophyte treatments that can reduce nitrogen requirements by up to 30kgN/ha. These are all worth exploring and could play a fundamental role in increasing profitability and green credentials," he says.

At critical growth stages, Pete recommends targeted interventions. "A chlorophyll-based product at T2 timing, for instance, can enhance photosynthesis and potentially support the plant's innate immunity against pathogens, making it less reliant on synthetic protection products."

Underlying all of Pete's recommendations is a fundamental commitment to soil health – something he believes the right biostimulants can have a huge benefit to. But understanding soil health goes far beyond simple nutrient measurements. For Pete, the carbon-nitrogen (C:N) ratio represents a critical indicator of soil ecosystem health, with profound implications for crop production.

"When the C:N ratio becomes imbalanced we trigger a cascade of negative consequences," he explains. "A low carbon-nitrogen ratio creates a hyperactive bacterial environment which can rapidly mineralise organic matter faster than it can be replenished. This process might seem beneficial at first, but it leads to a destructive cycle of soil degradation.

"Excessive bacterial activity actually

starts to consume organic matter at an accelerated rate," he warns. "As organic matter decreases, we lose both the habitat and food source for crucial soil microbes. This reduction creates a compounding problem: less organic matter means reduced microbial diversity, particularly among beneficial fungal communities."

The implications extend beyond microbial health. Depleted organic matter compromises soil structure, reducing air circulation and creating conditions that favour anaerobic microbes – typically less beneficial to crop production. These microbes can potentially harm crop root systems and reduce overall soil health, says Pete.

Particularly problematic are agricultural practices involving heavy slurry and digestate applications with high nitrogen but low carbon content, he adds. "Year after year these practices can catastrophically affect soil structure."

The solution lies in carefully managed inputs that maintain a balanced C:N ratio, with biostimulant products which contains molasses and humic acids able to help restore this delicate balance by providing carbon-rich materials that support microbial diversity and slow-release nutrient cycling.

Healthier crops and better soils all support overall crop production, and according to Antonis, there's much potential in exploiting untapped yield potential with biostimulants. "The five-year average wheat yield in the UK is around 8t/ha, but in 2022 a record 18t/ha was achieved," he notes. "That's a huge gap — and it highlights the potential headroom available. Biostimulants, if used correctly, can help to close that gap."

Yara's own trials investigating this show promising results, with typical yield increases of 5–6% observed in cereals. In high-value crops like potatoes, vegetables, sugar beet, and fruit, the benefits are even clearer, he adds. "We've seen win rates of 85% in these crops with yield increases averaging around 8%."

REPLACING INPUTS

Trials are also at the heart of UPL's approach, with a new project dubbed '25 in '25' kicking off this spring. Head of technical services Stuart Jackson explains that the aim of the project, which is currently in the pilot stage, is to see if it's possible to replace 25% of synthetic inputs with the same quantity of biological solutions.

"Our goal is no longer just maximising yield, but creating inherently more resilient agricultural systems,"

Slashing synthetics in new trial

In a trial launched this spring, UPL is aiming to see if it's possible to replace 25% of synthetic inputs with the same quantity of biological solutions, explains the firm's Stuart Jackson.

he explains. “With biostimulants, we’re building plants with superior root architectures which can naturally combat environmental stresses like drought, extreme temperatures, and nutrient limitations – and this project is set to unveil just how far we can push this.”

BIOLOGICAL INTERVENTION

The trial is taking place on three commercial farms, with each dedicating a portion of their winter wheat fields to a biological intervention. “By strategically replacing synthetic inputs with advanced biological solutions, the technical team is testing the limits of sustainable crop production.

> *“The age of simply spreading fertiliser and expecting perfect results is over.”*

“We didn’t just want to talk about marginal reductions either,” adds Stuart. “We’re looking to comprehensively replace 25% of traditional synthetic inputs with biological alternatives across multiple intervention points.”

A split-field methodology has been deployed with the trial farms having received a loading dose cocktail of biological products, which will be followed at subsequent key growth stages through the season, explains Stuart.

Delving deeper into what biostimulants will be used, and as nitrogen management represents a key focus area for the project, the team are looking at replacing traditional fertilisation with products such as R-Leaf, an innovative microbial product designed to enhance nitrogen fixation. Fulvic acids will also be introduced to improve nutrient transportation and metabolic efficiency, potentially reducing the need for synthetic fertilisers, explains Stuart.

Disease management in the trial follows a similar approach and instead of relying solely on traditional fungicides, the team is optimising the use of laminarin to trigger the wheat’s natural disease resistance mechanisms. This approach aims to build intrinsic plant resilience rather than creating external chemical protection, he adds.

Looking at the current stage of the trial, farmers are now applying treatments at the T1 growth stage with the research team carefully monitoring plant health, disease resistance, and early yield indicators. Success will be measured not just by crop yield, but by overall economic return and environmental impact, emphasises Stuart. “Profitability remains our ultimate metric – we’re essentially trying to prove that reduced synthetic inputs don’t mean reduced farmer returns.”

Early indications appear promising. Initial observations suggest that the biologically-treated crops demonstrate comparable vigour to conventionally-managed fields, with potentially superior stress resistance. Full results are expected later this year.

“This isn’t just an agricultural experiment – it’s a potential blueprint for a more sustainable farming future,” concludes Stuart. “If successful, the trial could provide a scalable model for reducing agricultural chemical dependency while maintaining food production capabilities.”

In-season nutrition adjustments key to optimising cereal crop performance

Experts at ADAS say checking and adjusting nutrition strategies throughout the season is vital for good crop performance and efficient input use

With spring in full swing, crop walks across the country should be focusing not just on spotting pests and diseases, but increasingly on evaluating crop nutrition. This is according to Dr Sarah Kendall, crop physiologist at ADAS, who says visual checks provide a vital opportunity to refine nutrient strategies in real-time.

"The first fertiliser plan often comes together before the season starts," she says. "But if you stick rigidly to that, you miss the opportunity to respond to how well crops have actually established or any seasonal quirks. In-season observations help to tailor nutrient applications more precisely."

Dr Kate Storer, ADAS crop physiologist, is urging growers to pay close attention to signs such as crop growth stage, leaf colour, shoot number, and rooting. These can indicate emerging nutrient deficiencies sometimes before physical symptoms are obvious, she warns.

"It's not about scouring every square metre," she says. "Use guides like AHDB's RB209 to know what symptoms to look for. Focus on field areas where issues are likely such as corners or low-lying ground. Then assess whether any action is worthwhile — some deficiencies can be too advanced to correct or low product efficiencies can minimise potential to rectify."

If a deficiency is identified and treatment is viable, adjusting fertiliser strategy should be targeted and measured. "One of the simplest methods is to leave an untreated tramline," says Kate. "But be careful to not choose a tramline with unrelated issues like compaction or different soil types."

If an issue can't be corrected this season, Kate recommends grain analysis after harvest to inform decisions for next year. "It's still incredibly valuable data. You may not solve the problem this time, but you're setting yourself up to avoid it in future seasons."

When it comes to assessing crop nutrient status mid-season, several tools are available — each with their own strengths and limitations.

Kate recommends firstly looking at soil mineral nitrogen levels which can vary widely across fields, especially following wet winters. ADAS recommends either using the field assessment method (based on soil type and previous cropping) or the measurement method, which involves laboratory testing. "Where soil nitrogen supply is uncertain, particularly after heavy rainfall, lab tests offer a clearer picture," she says. "That gives more confidence in adjusting N rates appropriately."

NDVI tools often integrated into drone or satellite imagery platforms can also be used to estimate canopy size and greenness. While potentially useful for identifying spatial variability, Kate warns to not rely on NDVI alone. "It's best used to compare relative differences such as treatment trials. But other factors like pest pressure or soil differences can also affect readings; NDVI doesn't always correlate well with final yield."

Broad-spectrum leaf analysis is another approach which offers a snapshot of nutrient status – although interpretation still lacks consistency across laboratories, adds Kate. "The most useful way to use leaf tests is comparatively—take samples from a problem area and a healthy area. That gives you a better handle on what's going on, just be sure to stick with the same lab year on year."

Spotting the signs
ADAS' Dr Kate Storer is urging growers to pay close attention to signs such as crop growth stage, leaf colour, shoot number, and rooting this spring as these can indicate emerging nutrient deficiencies sometimes before physical symptoms are obvious.

In terms of areas to watch, she warns that sulphur deficiency is becoming more common particularly in cereals due to reduced atmospheric deposition and leaching during wet winters. "By the time you see symptoms, it's often too late. If in doubt, test leaf tissue using a malate sulphate test. We've had very good responses to sulphate application in trials where deficiency was confirmed."

Views from the field

South Shropshire farmer Andrew Williamson is a firm believer in letting the crop guide nutrient decisions. Farming 364ha of combinable crops, he uses variable rate N technology to respond in real-time and has been part of the Nutri-Check Net Crop Nutrition Club trials. "There's so much variation across a field – it's not just about applying evenly. Tools like the N tester give us a good snapshot while the data from our soil moisture probes helps with timing."

Further north in Fife, fellow triallist David Aglen agrees. "We've undertaken all sorts of testing – soil N, SAP analysis, N testers – but it comes down to understanding how representative the data is. In Scotland, we're often dealing with slower crop development so we have to be even more flexible."

David finds value in N testers for in-field decision making but is cautious regarding over-reliance. "If it tells you to push 300kg N, you have to balance that with experience and economics. SAP analysis had potential, but delays in getting results back made it hard to act in time. If we can get live data in field, then we can get something on during the next day to help."

Ultimately, both scientists and farmers agree on one point – being reactive and observant through the season is the best way to optimise crop nutrition. Whether it's spotting a leaf colour change, trialling a tramline treatment, or adapting a fertiliser plan based on in-field data, success hinges on tuning in to what the crop is telling you.