

DIRECT DRILLER

MAGAZINE

SPRAYING SUPPLEMENT

BIOSTIMULANTS

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David Fuller-Shapcott
Farm Manager, Scottish Borders



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Sarah Ferrie,
Marketing Manager,
Interagro

A WORD FROM THE EDITOR

Improving resilience is the key to yield, margin and securing sustainability.

Welcome to our Biostimulant Supplement, exclusive to readers of Direct Driller magazine. I hope you enjoyed reading our last supplement on Adjuvant Technology and it proves useful as we head into the spring spraying season.

In this issue we explore the valuable role of plant biostimulants in helping farmers adapt their agricultural systems to an increasingly volatile climate, while enhancing food production sustainably.

As we come out of 2023 with some of the driest, hottest and wettest months on record, the effects of climate change feel ever more real. Building stronger, healthier, more resilient crops better able to tolerate adverse climatic conditions, as well as reduce reliance on synthetic inputs, feels increasingly vital, both agronomically and financially.

More and more farmers are turning to biostimulants in a quest to make their growing systems more resilient and sustainable, but with mixed results in the field for some, and with a plethora of options available – where do you start?

In the pages that follow we examine the case for considering biostimulants in your growing system, how to get the most out of them, and showcase how several farms across the country have been getting on incorporating biostimulants into their growing systems as part of their journey to achieve improved resilience and sustainability. If you have a journey of your own that you'd be willing to share, we'd love to hear from you – please get in touch below.

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THE GROWING CHALLENGE

THE STIMULANT TO BIOSTIMULATION

CLIMATE CHANGE AND FOOD SECURITY

Climate change is causing more frequent and extreme weather events that can significantly impact crop development and yield.

Heatwaves

High temperatures can slow the rate of photosynthesis as plants cannot transpire fast enough to remain cool. This reduces energy production and therefore impacts crop development. Heat stress at flowering and fruiting can cause flower and fruit abortion impacting yield and quality. There's also the risk cereal crops may mature prematurely, resulting in a shortened growing season and reduced yields.

Drought

Lack of water during the growing season can cause considerable stress to plants, affecting their ability to photosynthesize and absorb nutrients from the soil. It can also lead to poor germination, stunted growth and increase the plant's vulnerability to pests and diseases, further impacting crop health and yield.

BUSINESS PROFITABILITY

Building resilience into crop management programmes is becoming increasingly vital to future-proof farm businesses. Embracing the benefits of biologicals and biostimulants has a number of important drivers to consider:

Unpredictable weather patterns

Unpredictable weather can have a profound impact on crop health and how you manage your crops, often putting you on the backfoot to establish/recover crops in season. All this puts yield and profitability at risk.

Floods

Excess water from floods can lead to waterlogging, depriving plants of oxygen and damaging roots. Nutrients can also be washed away during flooding, leading to nutrient deficient crops. What's more, submersion of crops for prolonged periods can cause complete crop loss due to drowning and a lack of sunlight for photosynthesis.

Vulnerability

Farmers are vulnerable to extreme weather events – resilience measures and preparing crops to cope can help mitigate the impact of extreme weather events and therefore risk to profits.

Resource scarcity

Reduced water, land and soil health will put pressure on productivity long-term. Finding ways to improve soil health and ensure efficient water management/capture by plants is key to securing access to natural resources.

Extreme cold

Late spring and winter frosts can damage crops, especially sensitive plants, which can even lead to complete crop failure. Cold temperatures may also delay planting schedules impacting crop development and maturity.

Market demands

Adapting to market demands, consumer demands, the regulatory arena, political environment and end markets are all putting greater emphasis on greener/sustainable solutions to food production, where reducing reliance on synthetic inputs and transitioning to a future without chemicals is moving further up the agenda.

Market volatility

Market volatility puts pressure on budgets and cashflow - growing crops in a more sustainable way may offer premiums, which in turn reduces financial risk.

RESOURCE EFFICIENCY

Efficient resource management is becoming increasingly crucial due to its profound impact on agricultural productivity, sustainability and profitability.

Optimising yields and ROI

Efficient use of crop resources – water, nutrients, sunlight – means fertilisers and pesticides can be used more judiciously, optimising yields and returns. By reducing unnecessary applications, growers can also reduce input costs and increase farm profitability and long-term viability.

Resilience to climate variability

With unpredictable weather patterns, efficient resource management is crucial. Finding ways to help use water, nutrients and capture sunlight more efficiently is key to help crops adapt.

Soil health and fertility

Healthy soils are crucial to support robust plant growth and reduce the need for excessive fertiliser inputs. As 85-90% of plant nutrients are microbially mediated, thriving soils are key to achieving optimal plant : microbial symbiosis.

Mitigating pest and disease risks

Optimising resources for plants is key to help minimise the use of chemical inputs whilst ensuring effective control. Deficiency stress makes the plant much more sensitive and vulnerable to pathogen attacks.

Environmental sustainability

Sustainable farming practices involves using resources more efficiently to minimise negative environmental impacts. Avoiding soil erosion, water pollution and the depletion of natural resources is key to promoting long-term sustainability.

PEST AND DISEASE RESISTANCE

With some pests and diseases becoming increasingly resistant to chemicals, and a lack of new modes of action to the market particularly in speciality crops, building fitter healthier plants that have more resilient natural defense mechanisms has got to be a good thing.

Plants respond to the biotic stress caused by pest and pathogen attack through their defense system that creates oxidative bursts to stop pathogen spread and by lignifying cell walls to block invasion. Plant hormones ethylene, saclicyclic acid and jasmonic acid play a key role in signaling stress responses all influenced by amino acids and peptides – roles biostimulants can fulfill.

SUSTAINABLE AGRICULTURAL PRACTICES

As custodians of the land, biodiversity conservation is inherent in the mindset of many farmers. Questions have long presented themselves about the implications of cultivations and chemicals on soil health and biology. But with time comes knowledge and with knowledge comes technological advances, and now there is a greater drive amongst growers to produce food in a more sustainable way. In fact, the move towards more regenerative farming practices – has long been practiced by many. It is up to industry to find ways to support them in doing so, with biologicals and biostimulants now proving they do have a part to play.

BIOSTIMULANT BUILDING BLOCKS

Helping you adapt to growing uncertainty

Over the past five years the potential resilience and sustainability benefits of biostimulants has captured the attention of the whole industry, becoming the fastest growing segment in ag. But with limited knowledge and experience it is no doubt daunting, and even inconceivable for some farmers, to consider how biostimulants could help them adapt their growing systems to a climate-smart model for the future which is both resilient and profitable. The below explores some key considerations to help you on your biostimulant transition:

Benefits biostimulants could offer you

Biostimulants are natural substances or micro-organisms, that when applied to seeds, plants or the rhizosphere, stimulate natural processes to enhance plant growth, development and overall health. Belonging to the family of fertilising products, they help create stronger, fitter and more resourceful plants which are less vulnerable to abiotic stress and pest/pathogen attack. What's more, the fact they are derived from natural materials - such as plants, algae and bacteria - their circular nature of origin supports a climate-smart future that is more efficient and less reliant on synthetic inputs. When used appropriately, biostimulants offer a wide range of benefits to plants. Here are some of the advantages you could benefit from:

Faster germination and emergence builds stronger plants from day one

Some biostimulants, such as signalling peptides, applied to the seed promote better seed germination and emergence, setting a stronger foundation for the entire crop cycle. This can be beneficial because chemical seed dressings have the potential to delay crop emergence by several days, whereas trials and farmer feedback have proven seed treated with biostimulants such as Newton, can emerge two days faster than naked seed and four to five days faster over SPD. Getting crops up and away faster results in a stronger more resilient start to the growing season.

Enhanced root development is the root to so many advantages

Building an expansive, more robust root system is the key to optimising resource use efficiency on so many levels and it's one of the crucial benefits biostimulants can provide. Building an extensive deep rooting network from day one not only creates a more self-sustaining plant that can fully utilise nutrients in the soil, it also puts crops in the best possible position to be able to cope in a drought. Here's just some of the advantages:

- Increasing the plants retrieval of nutrients from the soil reduces reliance on synthetic fertilisers.
- With increased access to water, heat sensitive crops such as potatoes can maintain transpiration, crucial to yield.
- It could provide the crucial water crops need to survive a drought period.
- It may avoid/delay the need to irrigate crops, conserving water and reducing management costs.
- It helps to ensure nutritional balance, making crops more resilient to pests and pathogen attack.
- Improving the structure and size of roots creates a bigger habitat and food source for beneficial microbial interactions.

Improved nutrient uptake

Some biostimulants can enhance the chelation of metal ions making some nutrients – those locked up and unavailable – more absorbable to the plant. This can lead to further improved nutrient use efficiency and better overall plant nutrition.

Supports productivity whilst protecting profitability

The primary goal for many farmers using biostimulants is to improve productivity. Increasing the growing efficiency of the plant, making better use of the nutrition you apply to your fields, combined with the ability to reduce synthetic inputs, all supports this aim.

Supports sustainable agriculture

Derived from natural sources, biostimulants fit well into integrated pest management strategies, supporting a more sustainable approach less reliant on synthetic inputs. Many biostimulants are also compliant with organic farming practices and provide organic and sustainable alternatives for improving crop performance without the use of synthetic chemicals.



Could biostimulants complement your wider programme?

Biostimulants have a lot of potential to benefit your crop management strategy but to get the best out of them you need to consider how to make use of their strengths alongside other inputs throughout the programme. Are there weaknesses in your growing system that biostimulants could help overcome? Consider soils, seed and foliar applications.



Naked seed

Vibrance Duo

Newton

Consider using different biostimulant types

Biostimulants encompass a diverse range of substances and micro-organisms that can be categorised into different types based on their composition and mode of action. Each work differently on the plant. No single biostimulant will be able to fulfill all the different benefits you may need in each crop. Consider biostimulant mode of action. Much like crop protection products, incorporating different modes of action into your crop management regime is likely to deliver more effective results, but you should be clear about what the biostimulant offers and how your crop is likely to benefit.

Humic and fulvic acids

Derived from decomposed organic matter, these acids can be used to improve soil structure, nutrient availability and water retention.

Phosphite-based biostimulants

Contain phosphite ions that promote root development and nutrient uptake.

Seaweed extracts

Obtained from various seaweed species, these extracts contain natural growth-promoting compounds such as auxins, cytokinins and betaines. Extraction method and seaweed type can influence both purity and effectiveness so check sources.

Silicon-based biostimulants

Derived from silicon compounds, these biostimulants improve plant structure and provide resistance against biotic and abiotic stresses by enhancing cell wall strength.



Untreated potatoes



Bridgeway treated potatoes

Research and refine the best options for your system

Identifying the best biostimulant options for your crops is likely to come down to trial and error, but it will also depend on how you are managing your crops and what the biostimulants you choose are being tasked to do. Here are some general guidelines to help you maximise success:

1 Understand crop and soil needs

Identify the specific needs of the crop and soil. Define a crop and soil action plan to improve resilience and consider how biostimulants could potentially help.

2 Consider how biostimulants complement other inputs

Think about the weak spots in your crop management programme that biostimulants could address e.g. speed of germination and emergence; rooting; nutrient uptake; vigour; stress tolerance.

3 Optimise biostimulant application timing and rate

Timing is crucial. Consider these weak spots you might be able to influence it for the best result. Timing is crucial and the application should align with key development stages.

4 Choose the right biostimulant products

Select the biostimulant type(s) most suitable for the crop need. Ensure biostimulants used are of high quality as efficacy will vary between manufacturers so its important to choose reliable products. Look for data on the product's efficacy.

5 Monitor and evaluate

Regularly monitor crop performance and assess the impact of biostimulant application against untreated controls. On-farm trials are a good way to compare product performance on your soils, in your climatic conditions and within your wider inputs plan. Keep in mind that biostimulants can also be used to bring weaker parts of the field up in terms of performance, and here, large tramline trials are a good way of assessing the benefits versus untreated. Adjust product and application strategy based on observations and results to optimise crop yield and to meet your overall objectives.

BIOSTIMULANTS IN A CHANGING CLIMATE

The landscape of farming is ever evolving, with new challenges continually giving reason to pause, assess the strategy and adapt to remain resilient in the face of adversity.

Continual challenge has certainly been the theme over recent years, with growers facing everything from environmental pressures, climatic changes, and the loss of key chemistry from the crop protection armoury, all making day-to-day operations trickier.

As such many growers are now looking at what else they can bring into crop management to help support production, which has driven a sharp increase in interest in biostimulant products over recent years.

With biostimulants claimed to offer a plethora of benefits, from enhanced nutrient uptake, root development, and plant hormone synthesis, leading to increased yields and improved crop characteristics, as farmers seek ways to optimise their production and meet market demands, the potential benefits of biostimulants have garnered attention, explains Andy Barker, research agronomist at Barworth Research Ltd.



“The term biostimulant could cover much – from fertiliser to water. We founded the company in 2008 and our driver has been to further the use of bacteria and fungi into broadacre agriculture, which certainly back then was quite niche.

“Then, as the larger agchem companies began to bring microbial and plant derived products into the market place, we started to see greater interest, but until then biostimulants were a bit ‘fringe’ - in the UK anyway.”

Finding a place in farming

So where do biostimulants now fit in this changing climate?

Specifically talking about foliar applied and seed treatment biostimulants, particularly those from naturally derived sources, Andy says there’s now a lot more interest from both growers at farm level and those higher up the supply chain. So why is this?

A declining armoury of chemistry is a key reason, believes Scottish Agronomy’s Adam Christie. “The conventional pipeline of crop protection products isn’t nearly as strong as it once was and as such, there has been a significant upshot in interest in bio products,” he explains. “We always keep copies of the green pesticide book in the office, and it gets slimmer and slimmer every year. It’s very obvious that our pesticide choices aren’t what they once were.



Adam Christie,
Scottish
Agronomy

“The days of going into a spray store and finding a product to cure all ills is long gone.”

Quest for efficiency

Nitrogen use efficiency – and making a conscious effort to reduce reliance on nitrogen – is another driver. “The industry is not quite as obsessed with nitrogen as we were two or three years ago, but it’s still £300/t and a significant spend, so ensuring the efficiency of every application is a big priority for a lot of growers,” says Adam.

Environmental advantages

With a growing emphasis on sustainable agriculture and reducing the environmental impact of farming practices, some biostimulants can help aid the sustainability of operations by improving nutrient efficiency and reducing nutrient runoff.

This is where the supply chain is particularly interested too, notes Andy. “I think commercially, some of the interest in biostimulants is being driven from the supermarkets upwards. Behind closed doors they’re asking questions about what is being done to reduce chemical fertiliser inputs, for example.

“Building on the theme of environmental challenges, in the form of climate change with increased frequency of extreme weather events, growers are looking into biostimulants as one possible avenue to help ‘soften’ the blow.

“Looking at the weather this winter for example, some of the fields around where I am are not going to be dry enough to do anything with until March at this rate. So, I think lots of farmers are trying to see what else is out there to help crops cope better.”

Investment in research

Another driver in uptake comes as a result of an investment in more scientific research on biostimulants, highlighting their potential benefits and efficacy in enhancing plant growth and stress tolerance. The availability of scientific evidence and advancements in understanding the mechanisms of biostimulants have contributed to increased confidence in their use among farmers.

“Historically, hesitancy with regards to uptake of the use of biostimulants comes down to inconsistent results,” says Adam. “Though that is improving due to more investment in trials and research, there is still a lot to learn.

“We’re on a learning journey at the moment and getting the best out of biologicals will come with learning exactly how they do and don’t work.

“I think a lot of people have also seen them as a replacement for pesticides and used them at the same timings, but we’ve actually found best results when they’re used early in the growing season to prime the crop.

Andy concurs: “Particularly with some of these foliar products, we do see a response where they’re applied – particularly if there’s a reason for doing so, like crop stress, and we can get on early, before it’s too late. We get to choose who we play with, and what we can say is that we’ve seen a response with Interagro’s products in trials.”

Adam picks up the conversation and points out that Interagro’s Bridgeway is an example of a product which has definitely got something about it. “We’re doing work at the moment to better understand that, but what we do know is that a healthier plant has a better chance of fighting off disease.

“We’ve also seen evidence that in some circumstances the seed treatment Newton can benefit seed establishment. Especially with the challenging conditions we’ve had trying to drill over the past four months – and who knows what the spring is going to be like – anything we can do to help a seed in a challenging seed bed is going to be welcome.”

Among the research bodies looking into the full scope of biostimulants is Dyson Farming Research. Dyson’s research focuses on developing innovative technologies and solutions to address the challenges faced by the agricultural industry and as such have explored the potential of biostimulants in improving crop health, nutrient efficiency, and overall sustainability.



Christine Jones,
Dyson
Farming
Research

Christine Jones heads up the potato side of the business. “We’ve been looking particularly at Bridgeway over the past few years to try and get an understanding of what it’s doing in the crop and how best to use it,” she explains. “In our trials, we’ve seen it act as a stress protectant in potato crops, meaning yield losses are reduced after periods of particularly hot and dry weather.

“We’ve seen fairly consistent results, and because we measure our crops right the way through the season, we’ve got a comprehensive understanding of how crops have behaved and how they’ve responded to the Bridgeway.”

One of the experiments Christine has run showed better tuber bulking with Bridgeway after a pause due to crop stress. “By the end of the season, the result was that the yield loss was much less in the Bridgeway-treated plots.”

But Dyson’s ethos is not to look at just one season’s worth of results. “We want to know why something happened so we can better understand where we can use them in the future,” explains Christine. “With the increased

risk of extreme weather conditions as the climate changes, it becomes more likely that potatoes are going to be experiencing hot and dry stress conditions, so we know that in this scenario, there’s going to be a much more likely response to the Bridgeway product.”

Future outlook

Looking to the future, Christine says that getting the most out of biostimulants in an ever-changing environment will rely on knowing how and where to use individual products. “There are quite a wide range of products which come under the biostimulant banner so it’s important to know how to use them best, where they might give you complementary benefits alongside your usual approach or whether it’s something that is going to stimulate the plant to grow better.”

Andy concurs: “Over the past 12 months, there have been a rush of products coming into the marketplace, some of which we’ve tested in house and would say it’s a bit ‘horses for courses’ - I think it’s important to be aware of products over-promising. But there are good and bad products out there.”

Alternative tramlines are a good way to build up an accurate picture of the potential impact a biostimulant can have, he adds. “This allows for differences from one end of the field to the other – different soil types, moisture, pH etc.”

Adam believes the use of biostimulants is only going to increase over the coming years. “We’re going to have to utilise all the tools in the toolbox.

“A lot of investment is being made in the market, so they’re products that should be taken seriously, but they also need to earn their place in the spray tank. However, products should be selected on proven merit, rather than just sentiment, and backed up with science. It’s really important that we don’t let sentiment overrule science.”

SEEDING SUCCESS FOR THE FUTURE

Safeguarding the environment and maximising efficiencies is key for the long-term sustainability of one Shropshire farming business – with getting crops off to the best start being a key part of the strategy.

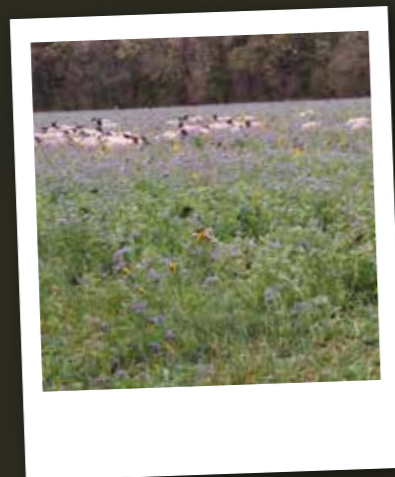
Farming 440ha near Wolverley, second generation farmer Rory Lay has his eyes firmly fixed on cultivating a sustainable business that is fit for passing down in the future.

Rory farms in partnership with his father John, operating as a mixed farm, comprising arable and livestock enterprises. Cropping across the various soil types is diverse, with components of the rotation chosen for both their returns potential and to provide the majority of feed for 240 beef cattle and 770 grazing sheep.

“On the lighter soils we’ve typically grown winter barley on a stubble turnip cover for sheep, but after more than 30 years of turnips every second crop we now have a severe clubroot problem. It has been a steep learning curve to manage it and we now have to be very careful and proactive in where brassicas get planted on the farm.”

At £8/ha, nothing comes close to the turnips in terms of seed cost and nutritional value for the sheep as they last “ages” on it, notes Rory. “I’ve tried grazing them through the winter on kale – which is clubroot tolerant – after barley, but by the time it is planted, it’s a bit too late for it to reach its full potential so it doesn’t sustain the sheep. At a seed cost of £70/ha it doesn’t really stack up financially, either,” he notes.

With this in mind, over more recent years Rory has turned to a nine-way cover crop mix of forage rye, phacelia, two types of clover, sunflowers, plantain, chicory, vetch and linseed that do well planted July time and keep the sheep well fed through the winter. Italian ryegrass is also sown on some fields as a short-term ley for the sheep to graze and is cut for silage in the spring, and followed by maize or fodder beet. On the heavier ground, a cover of forage rye, phacelia, clover and vetch is planted in August, fitting into the wheat, wheat, oilseed rape, wheat, wheat, spring bean rotation. All crops are grown for feed, with the exception of the oilseed rape, with the beans also contributing to cattle diets, meaning stock are 99% fed from the farm’s homegrown produce.



Safeguarding soils

While sheep feed is the biggest driver for planting the cover crops, as well as avoiding bare ground over winter, it’s the huge root mass and top growth benefits to soil health that Rory puts massive value on – something of which is becoming more and more important to help him achieve his goals of protecting his soils and the knock-on effect this has on crop health.

“The deep rooting nature of our cover crops not only helps improve soil structure, but also helps to build organic matter and nutrient capture from the soil and sun, which I’m trying to optimise with the diverse rooting depths and growth habits of our covers,” he explains. “For example, forage rye is really deep rooting, as is the phacelia which has a high root length density in topsoil.

“Chicory also produces a large root system and has anthelmintic properties, providing a natural wormer for the sheep.”

Sustainability goals

Cover crops are just one part of the puzzle, however, and over the past eight years the Lays have put a great deal of focus into ensuring a sustainable business that is fit for passing down to Rory’s children.

“To continue to farm we need to look after our soils, and we also need to be profitable,” he stresses. In theory, this transition actually started 25 years ago, when the farm moved away from the plough, switching to a min-til approach to save costs. However, we found the cost with the Sumo Trio was actually not all that different, so in 2015 we bought a strip till and straw rake,” says Rory.

“Allowing us to establish crops in a single pass created the biggest savings as we were able to get rid of a tractor and reduce labour.”

Despite concerns that yield could be impacted by the change in establishment techniques, this hasn’t been the case. Instead, Rory has seen benefits to soil health, including improved structure and workability, as well as savings of £70-80/ha. “These savings come down largely to the fact it’s now easier to pull the drill and we can go faster as the ground is more workable. Texture is also crumblier and walks nicer due to less soil disturbance.”

With economic savviness forming part of the sustainability picture, savings have also been made in the sheep enterprise by reducing the flock of 880 yearling ewe lambs down to 170, making it easier for the Lays to balance the summer workload. “We always sell the sheep the following summer as prime breeding ewes which always clashes with harvest,” explains Rory. “But our soils still benefit as we rent land for 600 grazing lambs which deliver a plentiful supply of manure that adds greatly to the soil’s organic matter as it breaks down.”

The value of muck is also utilised from the farmyard manure produced by the Aberdeen Angus herd, which is spread on the land to help boost organic matter levels even further. These were measured at a baseline of 4% six years ago and have continued to rise year-on-year, says Rory. “It’s a measure we keep a close eye on.”

Crop protection strategies

When it comes to crop protection, Rory is also looking to make savings to his fungicide inputs – not just from a cost perspective, but also to protect beneficial fungi and microbes in the soil. “It all comes down to getting our soils as fit as we can and ensuring a healthy plant from the start, so that we can move towards being less reliant on chemical applications.”

Being in the “wet West” yellow rust and septoria are the main disease headaches, he explains. “We’re trying to cut back on fungicide in the main crops by reducing rates and the number of applications, but because I need to make a profit to be sustainable, it does very much depend on the season how we do that. If it’s a bad disease year we can’t take the risk of losing valuable yield, so we will spray accordingly.”

Improvements have been made, however, with the farm already cutting down from an average of four to two sprays a year by reacting to the weather at the time and treating accordingly.

What’s more, Rory says he is actively looking at what other tools are in the toolbox to help prime plants from the get-go and reduce the need for fungicides.

Varietal choice is one of those tools. “We grow all feed wheats and varietal choice comes down to disease ratings – we always opt

for varieties with a score of 7 and above for septoria as this cost is the most to control,” he explains.

“This year we’re growing Dawsum, Extase, Champion, and I’m also trying a blend of Graham, Gleam, Skyscraper and Extase to see if this can help us optimise disease resistance.

“What’s more, we’re on our fourth year of home-saved seed to see if we can make a more resilient plant stand through the mixed genetics.”

A small acreage of triticale is also grown as it is resistant to septoria. The theory behind this is that it reduces inoculum and has the added benefit of less passes, which reduces workload, explains Rory.

Another aid Rory has found to be beneficial is a biostimulant seed treatment, which he believes helps to get crops growing well in their early stages, as a healthy plant is more resilient.

He first started dabbling with foliar biostimulants eight years ago, but said he had mixed results and therefore has focused on achieving a healthy plant from the outset, with a good root system that can access nutrients and moisture as the season develops.

“I’ve spent a lot of time reading about soils and how getting the seed growing well with

Newton power

For the past three years, Rory has been treating all of his home-saved seed with Newton for the benefits mentioned, but also as part of a conscious decision to move away from chemical seed dressings. “In 2022 we had some microdochium on the seed, so we had to treat with single purpose dressing Beret Gold (fludioxonil),” he explains. “But the autumn 2023 seed has been okay, so we’ve only treated with Newton – saving us £120/t. Second wheats we’ve typically dressed with Latitude (silthiofam), but I’m keen to avoid it if possible, at £200/t.”

To look at this potential in more detail Rory set up a trial in three fields last autumn – half with Newton-only treated seed and the other half treated with Latitude + Newton. “It would have made interesting viewing, but after the worst autumn on record for the farm, the fields have been sat under water for weeks and I don’t think we’ll be able to take a single field through as seed is just rotting,” he says, disappointedly.

Looking at the bigger seed health picture, Rory says he’s also supplementing with a six-way bacterial product called Consortium from Aiva Fertilisers.

“Three years ago, I added a liquid applicator to the drill to apply the Consortium and also a silicon nutrient product to go down with the seed. To me it makes sense to maximise the rooting with Newton which aids the bacteria and the plant and provides an immediate feed source to the seedling.”

good access to nutrients is the key to reducing reliance on chemicals. It’s these benefits which resonated when reading about Interagro’s biostimulant seed treatment Newton – and also seeing the data to back it up.

“Getting crops off to the strongest start is essential and that’s what Newton gives us. Well sown is half grown, and with Newton crops are stronger and the improved rooting is key, helping improve nutrient acquisition from the soil to feed the growing plant.”



This is also part of the strategy helping Rory reduce his fertiliser inputs. “Not everything receives farmyard manure, so we’ve started using nitram and polysulphate, we’re not getting the sulphur deficiencies we used to and we’re down to 180 kg/ha N on wheats for a 10t wheat crop, down from 220 kg/ha three years ago.”

Turning to spring 2024, and Rory expects a fair amount of drilling with home-saved spring barley seed, which he will drill with Newton. But first, the coming months will be spent planting fruit and native trees as part of the Countryside Stewardship Scheme the farm is part of – with this year set to see an additional 3,000 metres of hedging and trees planted. Tree planting is an annual occurrence on the farms land as Rory is keen to support bird populations and wildlife, the Black Headed Bunting being one of the farms visitors – only the eighth sighting ever in the UK, and the third ever caught and ringed.

“Our goal is simple – to create a business and a farm which will be here for future generations. But to get there, it requires careful planning, cautious decision-making and utilising every tool available to minimise risk and maximise returns – both financial and in terms of crop and soil health.

“Starting with good, healthy seed is crucial and being able to lean on the benefits of Newton helps us ensure that, regardless of whatever else happens that season, we’ve primed crops from the get-go to perform to their full potential.”



SUSTAINABILITY STARTS WITH NEWTON

Rising input costs, loss of authorised plant protection products and weather extremes during the growing season are just some of the challenges putting increasing pressure on both growers and crops. And though these pressures are arguably out of the hands of growers, there are measures that can be taken to prime plants... and it all starts with the seed.

“Optimising plant health from day one, by targeting seeds rather than treating plants – is the number one thing growers can do to achieve a more sustainable start, both environmentally and economically, and protect genetic yield potential,” explains Stuart Sutherland, technical manager at Interagro. “Recent seasons have proven just how unpredictable the weather can be which limits everything from sowing to spraying, so by treating the seed, growers are able to take action before they even set foot in the field.”

Newton is a biostimulant seed treatment from Interagro comprised of unique stimulating peptides that stimulate plants to thrive, he adds. “Managing the balance of growth promoting hormones versus growth inhibiting hormones, Newton not only triggers faster germination, it also signals enhanced root and shoot growth and the defence systems of plants. With proven abilities in the field, Newton not only ensures vigorous crop establishment, it also helps to build stronger, healthier, more resilient plants less dependent on synthetic inputs.”

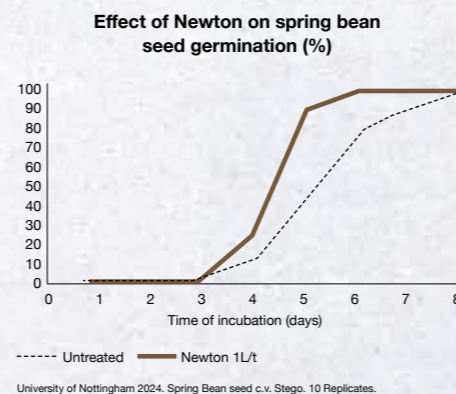
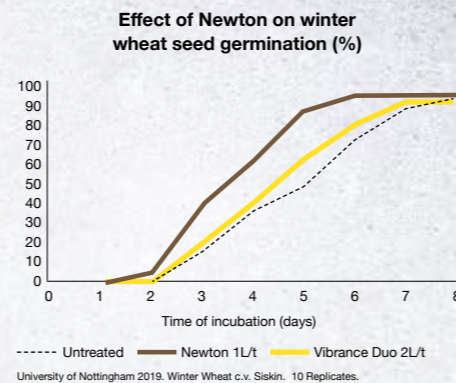
Trialled and tested

Delving deeper into this proven performance, Newton is backed by a wealth of research, field trials data and grower endorsements, meaning you can be confident in its performance, notes Stuart.

Speedier starts

Starting with establishment, in 2019 work carried out at the University of Nottingham, replicated germination studies have shown Newton brings forward wheat seed germination by 2 days in comparison with naked (untreated) seed, and by 1.5 days when compared with Vibrance Duo (fludioxonil + sedaxane).

“Further germination studies at the university in January 2024, also confirmed benefits in pulses with Newton providing enhanced seed germination in both peas and beans at 6°C,” continues Stuart. For peas the time taken to achieve 90% germination was improved by around 1.5 days and for beans by two days.



Benefiting growers

The sooner seedlings germinate and emerge, the earlier crops begin to grow and develop which can have huge consequences - benefits we widely hear from Newton users. Here's just a few examples below.



Higher emergence

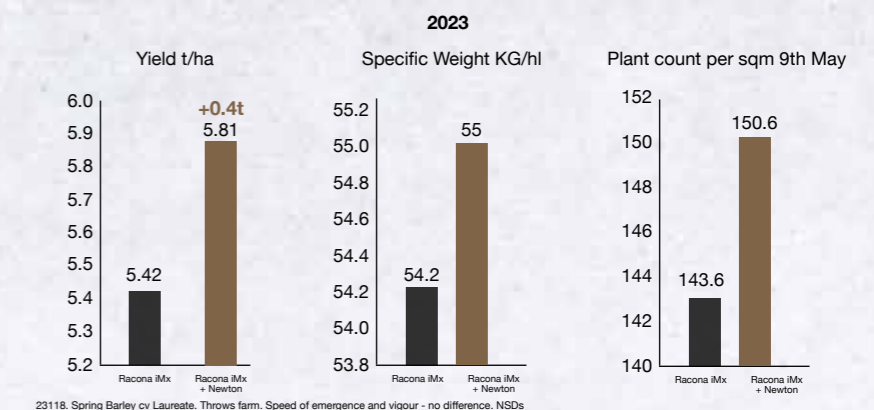
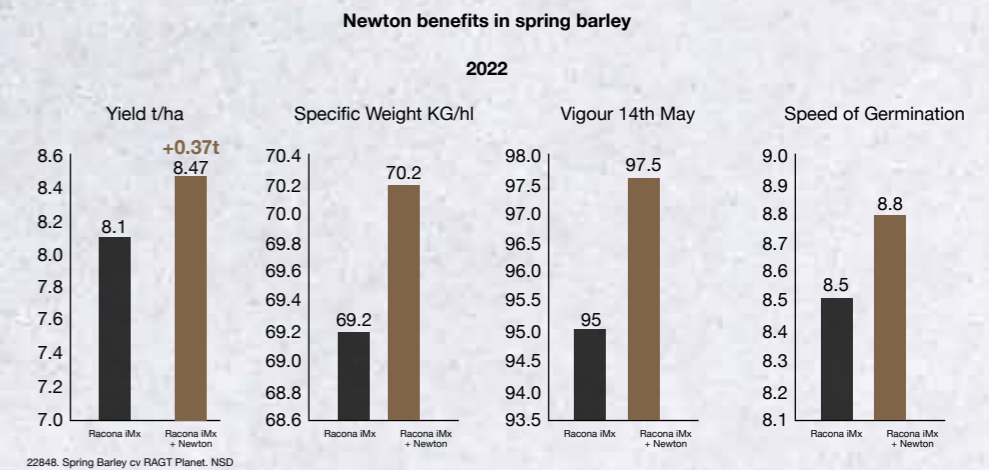
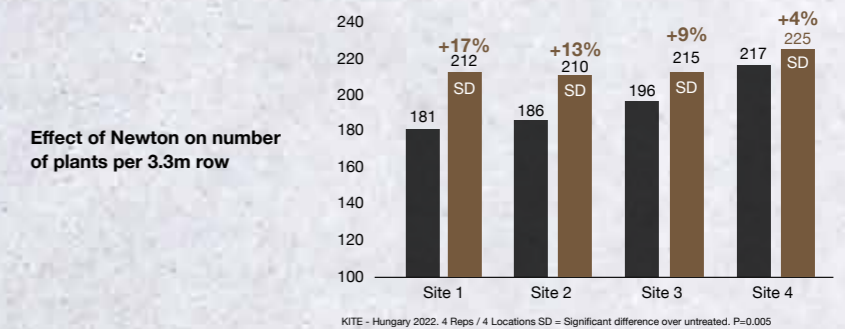
With improvements in germination and speed of emergence, replicated trials have also shown improvements in the number of plants establishing per sqm.

“This was initially seen in UK 2019 replicated field trials looking at the effects of Newton on Beret Gold (fludioxinil) treated wheat established at various seed rates and drill widths. Newton increased the number of plants per sqm by 9% which was statistically significant,” says Stuart.

In the same year, field work also looked at the effect of Newton on October (early drilled) and November (late) drilled wheat. There were benefits to plant establishment at both timings with increases of 7% and 12% respectively, though this was not statistically significant.

“Since that time replicated field trials typically show establishment benefits in both winter and spring crops taken to yield. For example, in this trial in Hungary in 2022 significant improvements in wheat establishment were recorded at three out of four sites, which also went on to show significant increases in root length and tillering at all sites,” continues Stuart.

“With the dry springs of recent years, improved establishment, both above and below ground, has featured in many spring barley trials,” he notes.



Rigorous rooting increases

Of course, to continue that growth and development, a good root system is vital. "Increasing the efficiency of a plant is key to boosting productivity," says Stuart. "Poor rooting has implications for plant health and ultimately how you will need to manage that plant during its life."

This is where Newton has the potential to make a real difference too, with trials at Nottingham University demonstrating an average 43% increase in root mass in wheat and barley compared with naked seed – see graph (right). "That's an average of four separate studies, each with four replicates, where Newton increased rooting significantly over naked seed," explains Stuart. "What's more, these extensive rooting benefits us and growers are seeing when Newton is applied to naked seed, and when co-applied with chemical seed dressing," continues Stuart.

Beret Gold + Latitude **Naked seeds** **Newton**

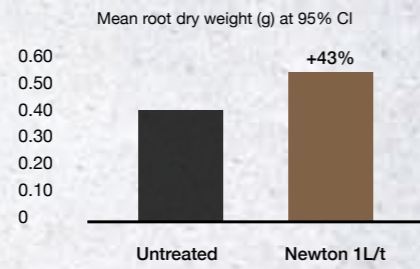


Subsequent studies at the university continue to demonstrate rooting benefits in other crops, including peas, beans, oats and maize.

"In the 2023 bean research, significant increases of 66% were seen in root nodule numbers, demonstrating significant increases in nitrogen fixing bacteria," says Stuart. "With no seed treatments available in beans, this makes Newton a really exciting, cost-effective option for growers, both in terms of speed of emergence, and also rooting. This is also reflected in field trials with improved vigour and yield recorded in peas and beans."

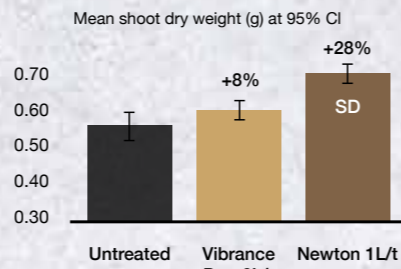
Significant root mass increases

Effect of Newton on early root growth in wheat & barley



University of Nottingham 2018 & 2019.
Above: N=4 . 3x Winter Wheat cv Siskin;
1x Spring Barley cv Concerto

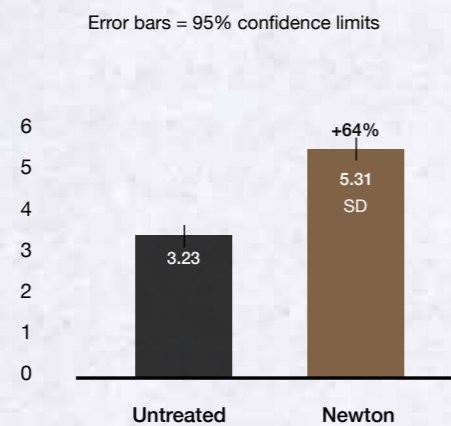
Effect of seed treatment on early root growth in winter wheat



University of Nottingham 2019.
Winter Wheat c.v. Siskin. 10 replicates
SD = Significant difference over untreated and Vibrance Duo

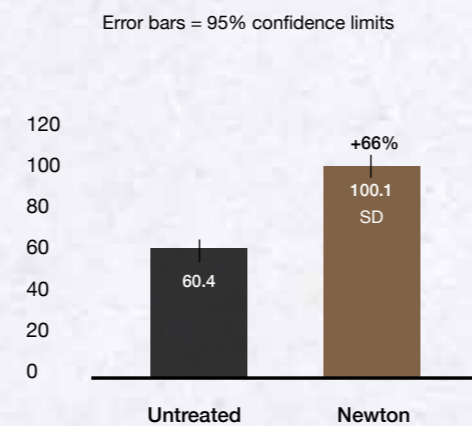


Effect of Newton on early root growth in spring field beans



University of Nottingham 2023 Rhizobium was included in the growing compost. Newton 1L/t
SD = Significant difference over untreated

Effect of Newton on nodule number in spring field beans



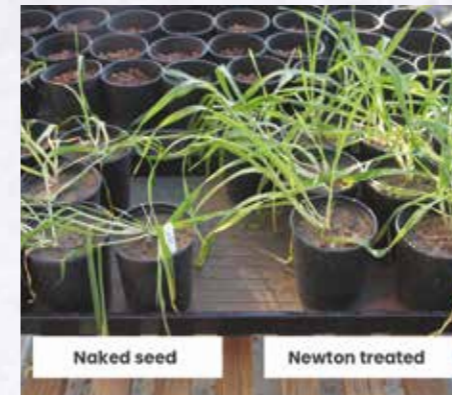
Higher nutrient uptake

"Longer, bigger roots mean better nutrient uptake potential," notes Stuart. "Not only is this better for crop performance, but it also has economic advantages as crops are better able to scavenge the soil for the nutrients they need, rather than having to rely on costly inputs." These are advantages growers are actively benefiting from on farm, with leaf tissue tests revealing increases in nutrient uptake, as shown right, for example.

Drought resilience benefits

Improved rooting also has huge implications when it comes to drought resilience with further studies at the university demonstrating what happens when water is withdrawn. The aim of the experiment was to investigate the effect of Newton on early root and shoot growth in spring barley in a drought situation.

Nottingham's Dr Steve Rossall concluded that Newton enhanced both root and shoot development in the spring barley and that these effects were seen in unstressed and drought-stressed plants. Statistically, this was represented as a 16% increase in shoot growth under no stress, and a 47% improvement under drought conditions. "The greatest effects were seen on root development, and this allowed better survival in field soil when water was withdrawn," says Steve (as shown below).



Crop vigour increases

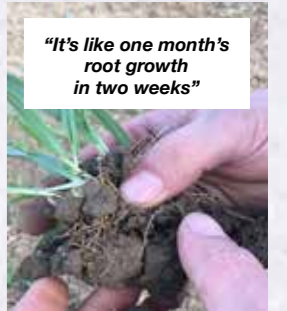
Further work by the university has also proven a benefit to early shoot growth where Newton was used. "Stimulating more shoot mass compared with naked seed, Newton has the ability to increase crop vigour, giving plants a competitive edge over challenging weeds and suboptimal weather conditions," says Stuart.

In trials this was proven by a 22% increase in shoot mass in both wheat and barley, as well as a 15% increase in shoot mass compared with Vibrance Duo on winter wheat. Similar results were also seen in beans (57% increase), maize (30% increase), peas (27% increase), spring oats (9% increase) and spring barley (6% increase), demonstrating the flexibility of Newton to perform on a wide range of crops," adds Stuart. "Such benefits we often see in the field, though I would encourage growers to pull plants during establishment to really look for the rooting benefits which is a highly visible benefit of Newton."

Analysis	Naked seed result	Newton seed result	Newton benefit (% difference)
Nitrogen (%)	5.92	6.25	+6%
Phosphorus (%)	0.28	0.26	-7%
Potassium (%)	5.36	6.11	+14%
Calcium (%)	0.91	1.09	+20%
Magnesium (%)	0.13	0.15	+15%
Manganese (ppm)	42.3	57.8	+37%
Boron (ppm)	6.3	6.5	+3%
Zinc (ppm)	46.3	50.9	+10%
Iron (ppm)	265	289	+10%
Copper (ppm)	10.7	10.9	+2%
Molybdenum (ppm)	5.25	5.50	+5%
Sulphur (%)	0.43	0.47	+9%

Leaf tissue samples from Spring Barley c.v. Planet 2018. Belvoir Farming Company. Sample 28 days after drilling

More roots = higher nutrient uptake in farmer trials



Soil benefits

And the benefits of Newton are not just limited to the crops...

Enhanced structure and size of root systems makes for a bigger habitat and food source for microbial activity, explains Stuart. "Optimum soil health is key to enhancing plant health – 85-90% of plant nutrients are microbially mediated. No matter how much you feed your plants, they won't be able to access it properly unless your soils are in optimum health."

Nurturing soil biology is therefore key, he adds. "With this in mind, Newton's ability to improve the structure and size of roots enables biology to colonise and feed. The result is higher root exudates, which provide crucial carbohydrates for microbes to function."

The impact of the combination of these individual benefits is that farmers are likely to see yield improvement as a result.

"We've run numerous yield trials over recent years, on a number of different crops and varieties, and they've consistently shown that the addition of Newton can increase yield by up to 10%," explains Stuart.

Practical application

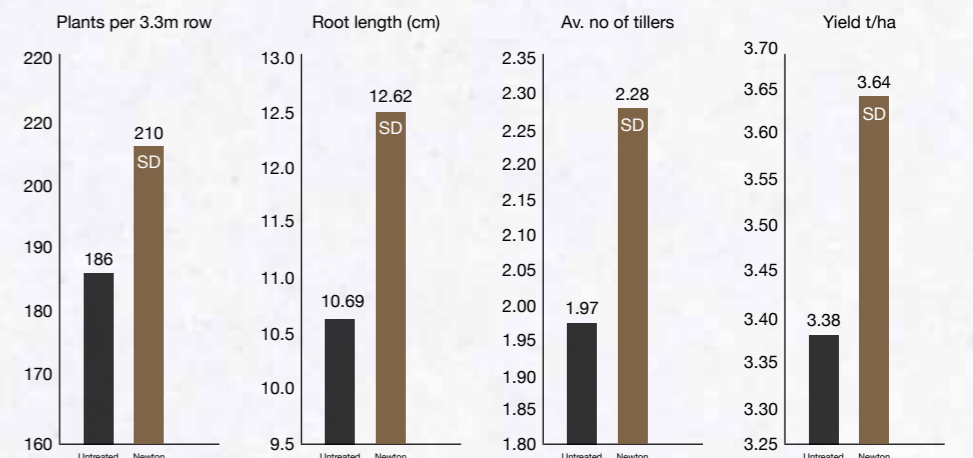
Aside from crop performance, there are many practical benefits of Newton too, adds Stuart. "I think there's often the misconception with seed treatments that it's fiddly, costly and time-consuming work. But something we continuously hear from growers is how practical the product is. As it's a non-microbial treatment it has a very long shelf life. In practical terms, this means farmers can leave it on the seed without the worry of it spoiling or decaying like a microbial treatment would do."

"Farmers and seed treaters also regularly speak about how well it mixes with other seed treatments, again increasing that practicality."

Looking to the season ahead, with many growers just finding their feet again after what has been a brutal autumn for some, Newton could be an even more useful addition to the programme this year, believes Stuart.

"Whether it's re-drilling lost winter acreage or increasing the area of spring crops because of the autumn, there is a lot of pressure on both farmers and crops this season to do well. While there's no way of knowing what the rest of the year may hold, growers can plan to get crops off to the best possible start by using a proven seed treatment to prime crops against whatever is to come."

Effect of Newton on winter wheat establishment and yield



Hungary 2022. 4 Reps. Winter Wheat cv Gabrio sown 5th October. PGP assessments 11th November 2021. SD = Significant difference over untreated.

SECURING A SUSTAINABLE FUTURE

Creating a simple, low input system that produces nutrient dense food with a low environmental and economic cost is the ultimate goal for one Borders grower, as part of his aim to move towards a net zero future.

David Fuller-Shapcott is a multi-award winning fourth generation farmer, operating a mixed arable and livestock farm across 369ha in the heart of the Scottish Borders.

The farm is predominantly arable, with 32ha of permanent pasture and a small area of rotational grass park lets for bed and breakfast cattle over the summer months and grazing sheep over the winter.

While the livestock aren't his own, the grazing provides valuable income to the business and are also part of David's ambition to help the next generation get into farming. Having been involved with his 51st lambing last year, there's not much he doesn't know about shepherding...



David Fuller-Shapcott
Farm Manager, Scottish Borders

On farm challenges

As well as an income, there are associated muck benefits to soil health from grazing livestock, however as a general rule, cropping and soil health has historically been quite challenging on farm, explains David. "Improving soil health has been a key focus for a while. We're farming mostly heavy clay, high magnesium soils which are very sticky when wet, but like concrete when dry.

"It means our crops have a very short growing season as they are slow to warm up in spring, and then quick to cool with the wet in winter."

At up to 600ft above sea level, the farm is also a very "late" one, notes David. "The consequence of that is we can have difficulty getting crops, and cover crops, established and sustaining them."

Like many, this autumn growing season has been particularly challenging for David. "We've had failure on 30ha of cover crop this winter which were broadcast onto wheat stubbles.

"We planted two thirds of the wheat we'd planned to, and half of that has failed — we've lost a seed crop as well. The relentless rain and field conditions also mean no herbicide has been applied to any of the wheat and I don't have a single field where you can see crop across the whole field."

As a result, David has all his hopes pegged on drilling the remaining area in the first couple of months of the year and from a long-term perspective — with climatic extremities seemingly becoming the norm — he believes utilising all the tools in the toolbox will be vital in helping both farming businesses and crops become more resilient in the face of adversity. "Farming is a continuous journey and with the speed it's advancing at, you need to be on the front foot of change.

"I see synthetic chemicals as a 70–100-year phenomenon, which are unlikely to be around in 20 years time.

"We're already seeing restrictions on synthetic fertilisers and there will undoubtedly be further reductions where we need to get smarter as farmers."

Sustainability strategy

It's this big picture thinking which is driving David's sustainability and net zero strategy to farm in a way that is sympathetic to nature and will enhance biodiversity. "I'm particularly focused on my soils and farming in a way to enhance the wildlife and birds, rather than destroy them. That might mean lower yields and lower inputs, but margin is incumbent and at the moment yields and margin are not all that different."

Acutely aware that change doesn't happen overnight, David has been working away at this goal for quite some time, starting with a shift in how soils are managed 14 years ago. "We started the transition towards healthier soils back in 2010 on one field which was the heaviest and most difficult to farm."

Named 'Easter Myre' — Scottish for sh*t — David remarks this is now one of his easiest fields to work. "A key part of achieving this has been the move from the plough to min-till," he explains. "The change in cultivations has not only brought cost savings, but greatly benefited soil structure and aeration.

"Being heavy clay soils with impeded natural drainage, we've had to be very focused on the soil and that's included regular maintenance of the extensive under ground drainage in most of the fields."

As part of this, David's aim has been getting direct drilling to work for him. Though this is very difficult to achieve in Scotland, he's made good progress and in 2023 was able to direct drill all of the crops. "I've now sold the plough and the power harrow has been collecting dust in the shed and is ready to sell too."

Improved soil health goes hand-in-hand with enhanced soil biology — another aspect of management David has been looking at over the past few years. "I've been focusing on soil health for a while, but now we're trying to nuance that — refine that focus — to improve the proportion of soil fungi, which is one of the main reasons I'm not very keen on putting fungicidal seed dressings on the crop.

"Though I've been told they have no effect, I have difficulty believing that a fungicide in the soil doesn't influence fungi populations."

It's this reason that one of David's main goals for the farm is to reduce his dependence on chemicals. "To enable this, we need to make sure that the seed we plant is healthy — everything starts with the seed. One of the things that chemicals have bought in the past is rooting benefits, but I'm looking at what else is out there to provide the same advantages."

Biostimulant benefits

This is where biostimulants have proved to be a good alternative option.

In his own words, David says biostimulants have become a key part of the strategy for him and are one of the tools which he sees as the next logical step in the industry's journey towards sustainability — a journey that he describes as one that won't ever really come to an end.

Over recent year's David has particularly found success from using Newton — an organic plant-based biostimulant seed treatment from

Interagro which aids both crop establishment and helps to build healthier, stronger plants which are more resilient in the face of stress factors such as drought. As well as the wheat, spring cropping also features heavily in David's rotation of oilseed rape, wheat, spring oats, wheat, spring barley — most going for distilling — and it's in the spring barley where David first put Newton to the test. David tested Newton for the first time three years ago, putting it up against Kick Off — a phosphate-based seed treatment designed to help boost rooting — incorporated with a fungicide. "I trialled it in a field of spring barley, sowing 56m wide strips and comparing paired 28m tramlines of Newton with paired tramlines of Kick Off.

"I then asked the agronomist to see if he could find any difference," recalls David. "I told him where the breaks were in the tramlines, but not what the products were, and he could not find a single difference between the fungicide and Kick Off tramlines and where Newton was used alone.

"What we took from that is that Newton was bringing a fair bit to the party in terms of how it benefited crop performance, and also reducing my seed costs as a consequence. We took this through to combine yield at harvest over a weighbridge and found no statistical difference in yield either, so now I just use Newton alone. I don't bother with Kick Off or SPDs in the spring now — Newton does it all."

In 2023 all of David's spring seed was sown with Newton only. "My spring barley was direct drilled for the first time including the Newton, and it got away fine — we didn't suffer with any moisture stress which a lot of spring barley in the area did. Generally speaking, it looked very well.

"With my YEN hat on, it's very clear that we need to be enhancing rooting to maximise output — rooting is imperative to both water and nutrient capture — and as a treatment, Newton ticks that box well.

"Using it means my nitrogen use efficiency has improved because rooting and water capture has got better, therefore I've not been suffering in these dry springs we've been having recently."

David notes that he sees the spring as being a particularly beneficial timing for the application of Newton. "These dry springs seem to be getting more common, so I think Newton will have a really big role to play prior to this window to help bolster plant resilience. This spring Newton only will be applied to spring barley which will be a big acreage. Fundamentally, getting roots down to capture applied nutrients and what's already in the soil will be crucial."

Stress-busting solutions

But it's not just on the seed where David has been utilising the plant health benefits of biostimulants. He also sees them as being crucial alongside nutrition to help keep plants in optimal health and stress-free during the season — a strategy which he is employing to help reduce reliance on foliar fungicides, having already dropped insecticides from the crop protection toolbox some time ago.

It's a careful approach that is needed, adds David, because although he's looking to lower inputs, he's aiming to do that without lowering output too much.

To help with this David applies silicon as a preventative spray early season to help strengthen the plant cell walls from pathogen attack. "Septoria is the principal problem in wheat. In the barley, rhynchosporium is the more prevalent disease, though I've found its relatively easy to keep on top of it with a two-spray programme. I am, however, a strong believer in using nutrition and biostimulants to keep plants healthy, and certainly to manage the ramularia threat. Driving roots down early and optimising the plant's nutrient capture is crucial to help with that.

"We monitor what the plant needs in season by doing regular tissue tests to see what our plants are getting out of the soils and where there maybe deficiencies that need rectifying.

"Also, if we know a crop can be typically deficient in copper, zinc or manganese for example, we will be checking for it and give crops a boost if needed. There will be products that we nuance in-season and then there will be other products that we apply routinely.

"Some years we see ramularia, and some years we don't. It depends on the triggers and making sure crops are stress-free reduces the risk."

In 2023 that included pairing herbicide with the likes of Oceana — an amino acid + seaweed biostimulant blend from Interagro — to keep the barley stress-free as conditions became drier, he adds.

With improved soil health, increased rooting from biostimulants, and pairing nitrogen applications with Nurture N from Aiva Fertilisers, David has also been able to reduce his reliance on synthetic fertilisers and over the past couple of years, has managed to cut his nitrogen inputs for wheat from 220 kg/ha N to 160 kg/ha N, from a 60:80:60 kg/N split to 60:60:40.

However, this spring he may need to up the earlier nitrogen and reduce the later nitrogen following the challenging winter. "It's all about being pragmatic with the approach."

Capturing a premium

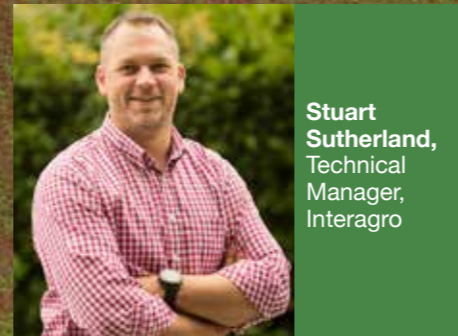
David says that his sustainability journey is continuously evolving and ultimately, he is striving to get his farm and soils in a position that make the farm more resilient to the intense weather patterns the farm is facing. And this drive is already paying off, allowing him to capture a sustainability premium as part of his contract with Simpsons Malt and the Chivas Brothers for growing his winter wheat for distilling in a more environmentally sustainable way.

"Long-term I want to be in a position where we are — or are close to being — net zero and we're recognised for that," he concludes. "Biologicals will be a key component in achieving this — they're absolutely part of the IPM approach to how we grow crops. We're losing chemicals, either regulatory or efficacy wise, at an alarming rate and we've got to get on the front foot and understand what we can do to improve the way we're growing crops.

"Farming more in harmony with nature with natural products will become increasingly important, and I see micronutrients and biostimulants being a key part of that."

BUILDING PERFORMANCE WITH BRIDGEWAY

Heat stress, drought and disease all have the potential to threaten crop performance, but incorporating biostimulants into the programme can help prepare crops to cope better.



That's the advice from Stuart Sutherland, technical manager at Interagro who says biostimulants are becoming increasingly valuable tools within the wider IPM toolbox for building stronger, healthier more resilient plants less dependent on synthetic inputs.

"Biostimulants offer many crucial benefits to plants when used appropriately and one of the most proven in my professional opinion, is Bridgeway — Interagro's foliar amino acid and peptide biostimulant. It promotes healthier crops by stimulating growth, optimising resource use efficiency and crucially, it increases immunity against stressful growing conditions, something that is becoming increasingly vital to growers."

Amino acid advantages

So what are the advantages of an amino acid-based formula?

Amino acid biostimulants can play a crucial role in improving plant health because they influence so many physiological and metabolic processes.

They are fundamentally the building blocks of proteins, which are essential for the structure and function of plant cells, enzymes and other biochemical processes.

"In fact, amino acids influence virtually every process within plants. This includes photosynthesis enhancement, nutrient uptake and transport, hormone regulation for plant growth and development, root growth and architecture, stress tolerance and disease resistance," explains Stuart.

In essence, Bridgeway provides high concentrations of all the amino acids plants need leading to more efficient and resilient growth.

"The problem is, whilst plants can synthesise the amino acids they need - from nitrate in the soil and glucose from photosynthesis - it costs the plant a lot of energy," continues

Stuart. "In stressful growing conditions these amino acids are not even readily available to the plant, which has implications for crop growth, coping and recovering from stress and its ability to resist pest and pathogens.

"Supplementing crops with Bridgeway at the critical stages of crop growth – when they are in highest demand - provides the immediate supply of amino acids crops need, when they need it. This also enables the plant to put more of its energy into optimising growth and development, which is key to securing the higher yields and quality you may be aiming for," says Stuart.

Trialed and tested

"Bridgeway has been researched and trialed extensively in a wide range of crops over the years, with work based around two key objectives. One, proving enhanced resilience where Bridgeway is included in the programme and two, determining the optimum timing for best results," says Stuart. "It's a programme we continually invest in year after year."

Resilient and ready

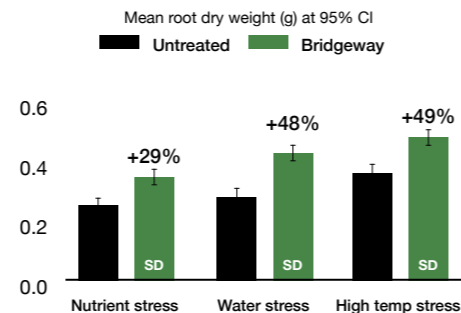
A resilient crop is one which is better able to capture water, nutrients and sunlight, explains Stuart, and that's exactly what the research and trials show can be achieved using Bridgeway.

"This all starts with building a good root system early in the life of the plant, and rooting research at Nottingham University has shown Bridgeway to be one of the strongest stimulants of its type, increasing root mass by an average of 52% over nine separate studies."

What's more the trials revealed that Bridgeway helps plants develop significantly bigger root systems when the resources they need are in short supply, explains Stuart.

"The work looked at the effect of Bridgeway on plants when nutrients were withdrawn, water was reduced and plants were subjected to heat stress. Plants treated with Bridgeway grew significantly bigger root systems (up to +49%) than untreated plants subjected to the same stresses, which also led to significantly bigger plants – up to 27% more shoot mass.

Effect of Bridgeway on early root growth in winter wheat



University of Nottingham 2018. Winter Wheat cv. Siskin. Treatments applied at GS14. SD = Significant difference over untreated.

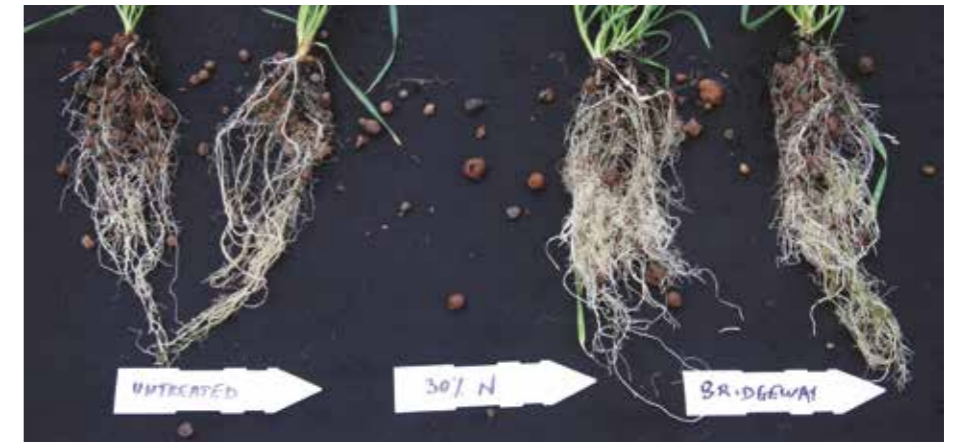
"Crucially for growers, it means applying Bridgeway to plants early in the growing season will help create more resourceful deep-rooted plants - better able to scavenge when moisture and nutrients are in short supply – to feed the growing plant. With increasingly hot and dry conditions now becoming the norm, it can be a real game-changer for growers."

On farm this has translated into higher macro and micronutrient uptake and improved resilience. It's also a way to help reduce reliance on synthetic inputs.

Getting more from your nitrogen

Studies at the university conducted in 2022 showed that reducing nitrogen beyond 60% can reduce root and shoot growth but Bridgeway helps plants compensate.

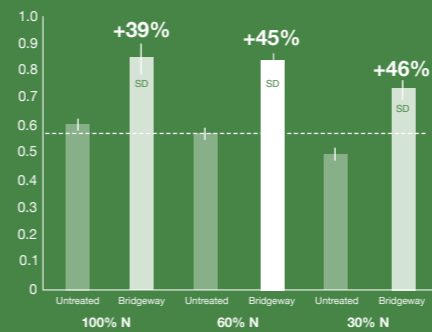
"Plants at growth stage 12-14 were fertilised with varying levels of nitrogen, 100% N being equivalent to 80kg/ha. At 60% and even at 30% N, Bridgeway treated plants had 45% more roots and over 30% more shoots, compared with control plants at 100% N. They also had up to 18% more nitrogen in their leaves and chlorophyll levels were increased significantly at all N rates," says Stuart.



Bridgeway increased rooting significantly at all N rates

Effect of foliar Bridgeway on early root growth in wheat at different N levels

(100% = 80kg/ha.) Error bars = 95% confidence limits



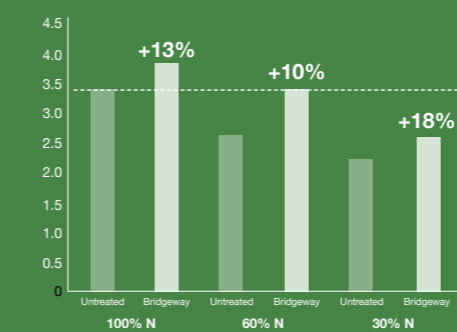
Untreated

Bridgeway



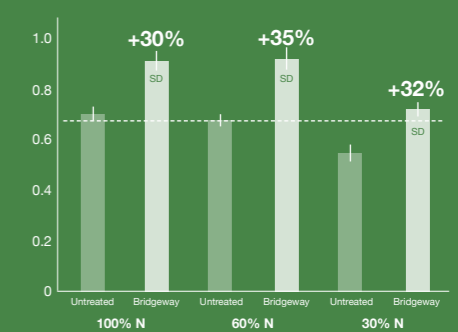
At 60% nitrogen, Bridgeway treated crops had as much N in their leaves as untreated at 100%

Effect of foliar Bridgeway on leaf N content in wheat at different N levels (100% = 80Kg/ha)



Bridgeway increased shoot growth at all N rates

Effect of foliar Bridgeway on early shoot growth in wheat at different N levels (100% = 80Kg/ha). Error bars = 95% confidence limits



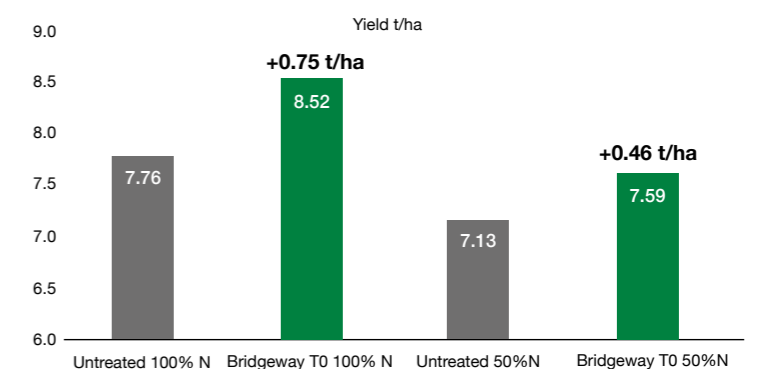
But does this translate in the field?

"Yes it does," says Stuart. At Barworth Research Ltd in 2022, applying Bridgeway 2 l/ha at GS12-14 in spring barley increased yield by 0.76 t/ha at 100% N and 0.46 t/ha at 50% N. At the 50% N rate Bridgeway actually brought the yield closer to the untreated 100% N rate.

Barworth Research Ltd 2022. P=0.189 NSD cv Diablo. Sleaford. Bridgeway applied at 2L. T0=GS12-14. Fungicide programme oversprayed. 100% N=150kg/ha (30% at drilling, 70% at GS13)

Bridgeway increased spring barley yields at 100% & 50% N rates

At 50% N rate Bridgeway helped lift yields near to 100% rate





Stress-busting resistance

As well as the drought and sustenance benefits afforded by enhanced rooting, amino acids play a pivotal role in stress responses by acting as osmoprotectants, helping plants to cope with various stress conditions such as extreme temperature, drought and salinity.

“These benefits come through year after year in trials,” says Stuart. “Under heat stress, root crops like potatoes slow tuber bulking as they cannot take up water faster enough to keep cool and to maintain photosynthesis. Plot digs in potato trials with CMI and Dyson Farming Research, shows Bridgeway maintains the rate of bulking, leading to significantly higher yields as a result.”

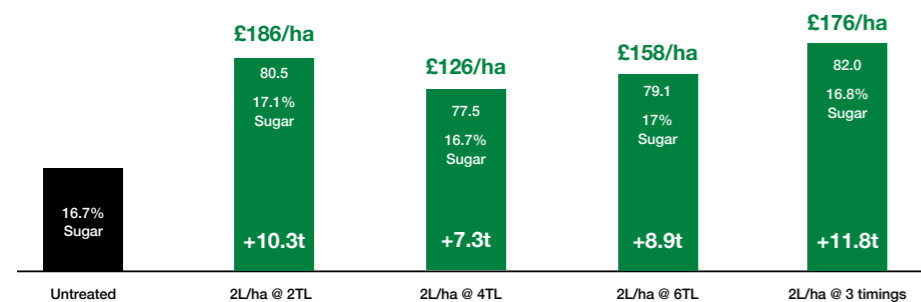
In all trials conducted in 2017, 2018, 2019, 2021 and 2023, Bridgeway increased yields. “In all trials, applications around the onset of tuber bulking have always increased yields significantly - with two or three applications (each two weeks later) optimal for margin over input cost,” explains Stuart. “In the 2023 trials this translated into a 28% yield increase compared to control plots.”

So what about other root crops such as sugar beet?

In replicated field trials significant yield increases have been achieved from applying Bridgeway early, from 2-4 true leaves (TL), says Stuart. “In stress years, multiple applications can be beneficial to yield as shown below.”

Adjusted - Bridgeway delivered valuable yield and margin gains in 2019

Effect of Bridgeway on sugar beet yield (t/ha) & margin over input cost (£)
Adjusted yield (t/ha) by sugar content as shown



CMI 2019. Sugar Beet. cv BTS 1140. Harvested 21st October. Sugar beet at £20/t MOIC based on Bridgeway £10/L

Stress-busting recoveries

As well as preparing crops to tolerate stressful growing conditions, it's Bridgeway's amazing ability to help crops overcome stress, even when on the brink, that is perhaps even more impressive, believes Stuart.

“We got our first insight into what Bridgeway could do back in 2017 when poor sprayer hygiene almost killed a crop of sugar beet (right) – the herbicide damage was that severe. But an application of Bridgeway, applied as a last resort to save the crop, stimulated new crowns to grow, recovering crop health and yield. It was quite miraculous,” says Stuart. Since that time, the stress-busting benefits of Bridgeway have continued to help growers.



Primed to fight disease

While Bridgeway is an excellent fire brigade treatment, applying it to crops early in the season to build high performing self-resilient plants is the best course of action where possible, with trials and farmer feedback having shown that Bridgeway can indeed help plants better fight off infections.

“If we're thinking about prevention in wheat, T0 is a really good time to start supporting your plant's own defence system,” says Stuart. “It really is best to go early to prime plants. Various trials have also supported this, showing a reduction in septoria when Bridgeway was applied at T0 as shown in these examples right.”

“Co-applications with fungicide at T1 and/or T2 has also shown benefits, sometimes significant.”

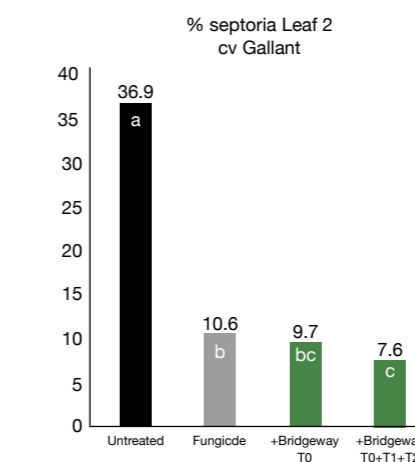
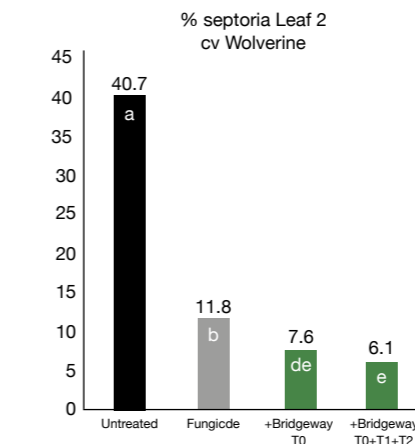
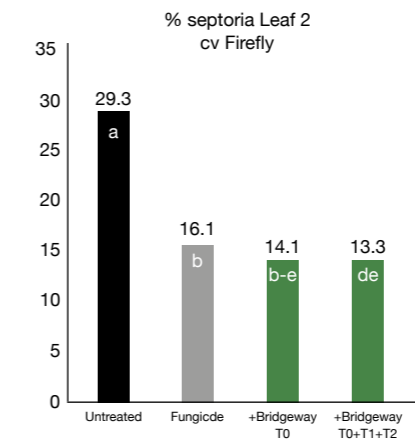
“In spring barley, evidence suggests early applications are optimal for reducing ramularia infection, though we are doing more work on this. In veg crops, early applications are key to build defences from day one, particularly as there are less synthetic crop protection inputs to fall back on,” explains Stuart.

So how does all of this impact yield? “If crops are taking up more nutrients, fighting off disease better and are able to keep going even during stress periods, then the natural result is going to be better yields,” says Stuart. “But you have to time applications to what you are trying to achieve for best result and where the risk factors are.”

“Going back to the beginning, the trend now is all about getting more from less, and the simple addition of a biostimulant like Bridgeway offers the potential to help growers get significantly more from their inputs and crops, despite the challenging climate many find themselves in. For that, you need to go early to build the plant, and then top up ahead of extreme stress periods.”

“While biostimulants are by no means a silver bullet, products like Bridgeway are a proven, scientifically backed, small investment which could result in potentially huge returns.”

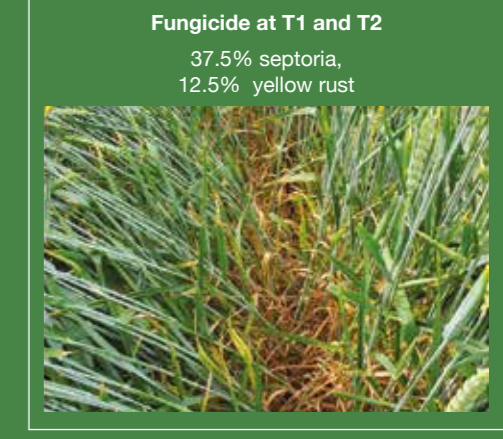
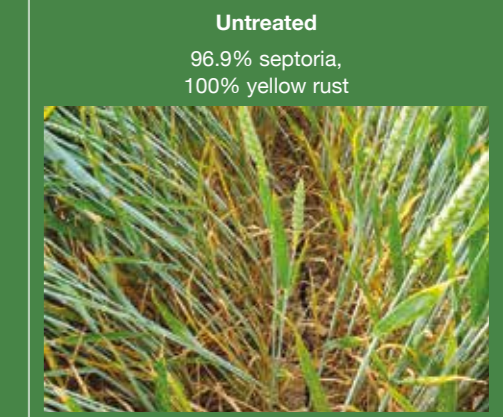
Bridgeway - Reducing incidence of septoria



2023 Prime Crop Research. Fungicide was T1 Ascra Xpro 1 + Arizona 1 lb T2 Revystar XE 0.8 Arizona 1. Different letters show significant difference between treatments.

Early Bridgeway helping reduce disease incidence in a wet year

Infection on Leaf 3:



Agrisource New Zealand / Fieldtek Research, 2023. Fungicide programme was T1: Prostaro 1 + Folpet 1.5 T2: Elatus Plus (benzovindiflupyr) + Opus

CULTIVATING SUSTAINABILITY

From small holding to globally integrated farming and food business, award-winning vegetable producer, Barfoots, has put sustainability at the front and centre of its operation — with biostimulants an increasingly important tool in its crop management strategy.

The Barfoots business was founded in 1976 when fifth generation farmer Peter Barfoot started growing courgettes at the family farm in Botley, Hampshire.

Over fifty years later and still family-owned, the company has grown exponentially to become a global supplier of semi-exotic fresh produce, covering a vast number of acres and employing thousands of people — all the while striving for advances in fresh produce excellence.

Growing, packing and processing a wide range of vegetables at its farm facilities around the world, Barfoots helps to ensure a year-round supply of high-quality produce to all the major supermarkets in the UK and Europe as well as food service customers.

The company has also gone on to become the biggest European producer of sweetcorn, UK suppliers of Tenderstem broccoli and courgettes, and majors in asparagus, legumes and pumpkins.

And for those who have had the pleasure of courgette spaghetti, butternut squash noodles

and corn ribs from the supermarket, these all originated from the Barfoot's Innovation Kitchen.

Managing the companies UK farm on the South coast, farms director Neil Cairns is responsible for the £24M operation having 40 years of agronomy experience under his belt, supported by agronomy and farm technical manager Emma Lilley.

"In the UK we're farming 9,500ac between Southampton, Pulborough and the Isle of Wight, with 50% down to sweetcorn, 550-600ac of Tenderstem, 400ac courgettes, 750ac asparagus, and we grow a lot of green beans and pumpkins," explains Neil.

"We try to keep to a one-in-five rotation for the courgettes, Tenderstem and beans, with the sweetcorn grown in with a cereal rotation of one in two or one in three years, depending on land availability. Of the 9,500ac we farm, we own a quarter of it and rent the rest through either long-term farm business tenancies or a short-term cropping license."



Disease challenges

The rotation is key for disease control in the beans and Tenderstem and keeping clubroot and sclerotinia out, continues Emma, who is also responsible for the companies' UK trials and research programmes.

"In fact, pest, disease and weed control has become an increasing challenge over the past five to six years with the loss of approved chemistry for use in veg. For example, we lost Dursban (chlorpyrifos) four years ago, which was key for the control of bean seed fly, and there has been no alternative options to replace it.

"Aphids can also be problematic for crop quality as they bring in viruses, while mildew needs to be treated for routinely and cercospora in some years."

Biostimulant solutions

It's for these reasons that the business started looking at biostimulants, says Neil. "Biostimulants have been on my radar for 20 years, but I'd always been very sceptical until about five years ago when we started looking at them seriously in our trials programmes.

"With the loss of chemistry and few solutions on the horizon, we've had to find alternative ways of protecting our crops."

Going down the biostimulant route has been based on the theory that if crops can establish and get away faster, pests like the bean seed fly become less of a problem, he explains.

"Through researching different biostimulant options and applying them in our trials programme on the farm, we've found Interagro's Bridgeway to be key. In our first year of trials, we recorded a 25% yield improvement in our Tenderstem broccoli where it had been treated with Bridgeway — a substantial increase."

Over the past few years, the farm has been applying several applications of Bridgeway early on — to seedlings, at transplanting and also post-planting — with good success.

"With the Tenderstem, for example, we establish seedlings in trays under glass



Healthy soils

Biostimulants are just one piece of the puzzle, however, feeding into the bigger picture of prioritising plant health.

And productive crops start with healthy soils, explains Neil. "Soil health is a huge focus. We rent and lease a lot of land and our ethos is that we should look after it as if we will farm it forever.

"We min-till or strip-till to minimise soil disturbance as much as we can, and we're using cover crops across 2,500ac to help with soil structure and improve organic matter levels. Their strong root growth gives a subsoiling effect and also helps with moisture retention and reducing run-off.

"We typically use a three-way mix of phacelia, burslem clover, rye or black oats after early harvested crops such as the sweetcorn. With beans and broccoli in the rotation we have to be careful to avoid clubroot, so we avoid brassicas and legumes for example."

and these all receive a dose of Bridgeway before they're moved out to the field. We use automatic planters to transplant them and apply a second and third dose of Bridgeway one to two weeks later."

On the organic crops — courgettes, Tenderstem and sweetcorn — where there are fewer crop protection alternatives, the team are applying weekly, adds Emma.

"All our crops are massively impacted by heat stress, and we find early applications not only improve crop resilience, but the Bridgeway is also crucial to help crops put their roots down. They're the lifeline to the plant and a more extensive root system helps increase water retention so we don't have to rely so much on irrigation."

Emma adds that broccoli in particular is very sensitive to heat stress and requires a lot of nutrition, so manipulating the crop with biostimulants to improve nutrient use efficiency and maintain transpiration is key. "If extreme heat is forecast, we will apply another dose of biostimulant ahead of time, as we've found it helps the crop cope better and take in the required water. Stressful field conditions cause broccoli to flower and therefore it becomes out of spec."



Sustainability strategies

Alongside sustaining plant health, another key strand of the business is environmental sustainability — reducing, re-using and recycling so "waste" doesn't go to waste.

In 2010 Barfoots built its first AD plant producing enough green energy from waste generated at Seftor Farm to power the entire site. As well as this, it also creates organic fertiliser in the form of digestate for Barfoots Farms, enabling huge savings on synthetic fertiliser inputs.

Fed by the rye, maize and waste from the sweetcorn husks, the digestate is rich in nitrogen, phosphorus, potassium and micronutrients, leading to a 50% reduction in synthetic fertiliser use and increased organic matter in the soil, says Neil. "Carbon emissions are a huge focus for our customers and the Barfoots family, so we continue to explore ways to reduce it further."

Water management and conservation is also a priority, and in 2022 a water treatment facility was built at Seftor Farm to convert all factory wastewater into irrigation water for crops. Re-using 280,000 litres of water daily, the irrigation water can cover 300m³ per day.



Future plans

This quest for sustainability is very much part of the long-term strategy, concludes Neil. "We're trying to apply chemistry prescriptively, rather than routinely, by optimising plant health and trapping pests for thresholds. The weather and climate change influences that, so we're trying to be more proactive in how we prepare our crops.

"Product efficacy is waning, and while there maybe new crop protection inputs coming to the market in the near future, I see us using more biostimulants. Products like Bridgeway help us keep the crop greener for longer and allows us to make maximum use of the crop nutrition available — especially micronutrients — which is vital, particularly for our organic crops."



CO-CREATION UNEARTHS THE COURSE TO PROFITABILITY

Transitioning clients towards more sustainable farming practices has become a passion for one Dorset contract farming business — with soil and plant health forming a key part of the resilience strategy.

Long before regenerative farming became fashionable, the A&R Fraser family in Dorset realised adopting more sustainable farming practices was crucial for the long-term viability of their farm.

As such, over the course of the past nine years the business has been transformed, transitioning the contracting enterprise to one that specialises in direct drilling, cover cropping and reducing synthetic inputs to improve soil health and growing resilience.

Now somewhat local experts on the subject, George Fraser and brother Johnny host no-till trials and discussion groups and have guided numerous clients through the regen ag transition from traditional farming methods, endeavours which led to them becoming finalists in the FW Farm Contractor of the Year Awards in 2021.

From their base at Braeside Farm in Charlton near Shaftsbury, the brothers operate throughout Dorset, Wiltshire, Hampshire and Somerset, offering the full suite of arable services, from no-till/direct drilling to cultivations, slug pelleting and crop spraying, fertiliser spreading and combining.

They've even established their own organic digestate service which they can apply to clients' fields and are TASC-approved hauliers enabling them to transport it, as well as assured grain, feed products, fertiliser and liquid waste.

"At the home farm we have a couple of hundred acres of arable land and a small beef herd," explains George. "Over the past four or five years we've built up the contract farming enterprise to around 1,000 hectares, winning tenders against local contractors.

"A lot of the land around here is not farmer-owned so land is put up for tender every five years. With many years experience of min-till and direct drilling under our belts, we have a lot of knowledge to impart to help our clients move to a more resilient growing system."

Agronomy advances

This change in direction has been aided by close collaboration with their multi-award winning Agrii agronomist Todd Jex — which has brought extra attention to detail on the home farm and contract farms and is helping to unearth the right course of action for long-term sustainability, believes George.

"We've been working with Todd since 2013, though we knew each other long before. We were looking to change our farming approach, and Todd's views were very much aligned with our own.

"Improving soil health is a major focus for us and back in 2017 we started paying a great deal of attention to our soils and monitoring how our actions are influencing soil structure and worm numbers with Todd's help."

The duo also leant on the expert advice of Dr Jackie Stroud, assistant professor of soil science at Warwick University, who has a strong research background in earthworm biology and ecology, explains Todd. "Jackie was very influential in our mindset, and we put a lot of emphasis on using worm populations to help us ascertain the health of our soil ecosystems — 'if you can measure it, you can manage it' was, and still is, very much the ethos.

"We're using the scoring system I've developed to benchmark each parameter and give the field an overall rating. By doing this I can produce recommendations for improvement and when we retest in four years, we can assess the progress."

The scorecard automatically produces a traffic-light snapshot of soil health to guide management decisions, he explains. "We got hands on collecting lots of data, digging three pits per field every three to four years. We found that most fields needed improvement, and a lot of the repair work required has come down to reducing tillage and raising organic matter levels."

Soil solutions

Adding to this, taking on new blocks of land has typically come with structural issues on heavier ground where deep cultivations from the past had mixed chalk into the soil profile, making crop establishment and deep rooting crops challenging, notes George. "Calcium in the chalk causes nutrient lock-up which impacts plant health. So how we assess soil health and the progress we are making comes down to a much broader understanding of what's happening at a chemical, physical and biological perspective, using tests which Todd has developed."

Accurately measuring is key, but when it comes to chalk soils, organic matter readings can be easily skewed, adds Todd. "You could do three different tests, send them to seven different labs and get different results from each of them," he explains. "I think Skaler is the most effective for an analysis of soil indices in chalk soils as it can extract inorganic carbon.

"The slake test shows how well soil holds together in water. We also test for pH, nutrients, biological carbon to nitrogen ratios and microbial biomass, as well as assessing worm populations and juveniles versus adults."

"With the soil health work we're measuring 25 parameters covering physical, chemical and biological characteristics at each pit, three pits per field, once every four years.

In optimal field conditions during the spring, George and Todd also make an assessment of crop rooting, measuring the rhizosheaths in the rhizosphere. "These are coatings of soil particles that cling to plant roots and are a useful indicator of biological/microbial activity," explains Todd. "This is all part of our soil pit assessment which we geotag using Agrii's Rhiza software, enabling us to come back in four year's time to precisely the same area of the field to monitor progress on our actions."

Making improvements to the soil and organic matter has largely come down to green covers over winter and a straw-for muck-deal, says George. "Cover crop wise, we tend to use a mix of phacelia, buckwheat, linseed, sunflower, vetch, crimson clover or burseem clover — adjusting the mix by soil type.

"Sunflower is better on the heavier land as the bigger tap root it produces helps against compaction. We avoid brassicas as we have rape in the rotation and higher glyphosate rates are needed for more lignified materials which we want to avoid."

Drawing on the challenges of the approach, George points out that slugs are a major problem in a no-till and regenerative system and therefore they have to consider carefully what they do with the straw and how they manage the carbon to nitrogen ratio to keep the slugs at bay and ensure nitrogen is accessible to the plant.

Looking at the bigger picture, the resilience benefits of no-till have been broader than just soil health improvements — it has also made a big difference to the bottom-line, notes George. "There's been a massive reduction in fuel costs from the reduced horsepower needed by the tractors. Combining the drill and cultivations, we've gone down from using 120 litres of fuel/ha, to just 4-5 litre/ha, which delivers cost savings for us and our customers."

Reducing inputs

The Frasers have also been looking at other ways to make savings via reducing synthetic fertiliser inputs, with the digestate proving to be a good alternative.

"It's mostly food waste which acts as a type of biofertiliser that we obtain on an offtake contract with Biogen — the second largest food waste recycler of its kind in the UK," explains George. "We have the kit to apply it and it's a great way to reduce synthetic fertiliser on our clients' farms. We can hold large volumes, improving the efficiency of the whole operation."

The digestate is full of nitrogen, potash, phosphate and trace elements in a form that enables them to be readily taken up by the crop and has allowed significant savings — 100% reduction in synthetic N in spring crops, and up to 80% in winter crops, he adds. Inhibitors are also being used to help reduce emissions and protect soil levels, while regular GAI monitoring in the spring, Yara N testing and the Skippy Scout drone system are being used to help monitor plant health.

Plant health has been of equal focus for the team, with rooting, nutrition and keeping crops stress-free being crucial parts of the strategy to not only protect profitability, but to also help reduce reliance on synthetic chemicals.

"We're growing mostly quality wheats and continuous spring barley so keeping plants stress-free and in good health is crucial, particularly on our drought-prone soils, says George. "Our holy grail is to create the healthiest plants in the field which are less susceptible to disease, reducing our reliance on crop protection inputs.

"We only use insecticides on earlier planted wheat for BYDV and we don't use a T0 spray unless rust becomes a serious threat."

Another part of the approach is to grow more resilient varieties, he adds. "Fitzroy is an example of a wheat which is proving very robust and has helped to much reduce T1 and T3 fungicide inputs."

Pushing performance

Where chemistry is used, adjuvants are deployed simultaneously to help improve the efficiency and effectiveness of the products, and biostimulants have also found a place in the programme — particularly when it comes to managing disease threats. "Specifically, we're using biostimulants to manage the ramularia and lodging threat," explains Todd. "The evolution of fungicide resistance in ramularia to the main single-site fungicides has enhanced the need to find another approach to managing the disease."



Continuous barley and drought-prone soils are the perfect storm for creating a stressful plant that is at risk of ramularia, he adds. "The stress of flowering marks a change in the barley's metabolism and is a key trigger for the disease.

"The plant begins to mobilise assimilates to the developing grain and essentially gives up on its own natural defences as it shifts its resources into ensuring the next generation.

"Other environmental stresses such as waterlogging, high light intensity and drought can all exacerbate the disease, bringing on more severe symptoms."

The farm's use of biostimulants began five years ago when we conducted non-scientific farm trials, followed by two years of tramline trials, explains Todd. "With a wide range of soil types on the farm, we were in a good position to be able to evaluate product performance.

"Of the products tested, Zonda was the most effective. Agrii also screened hundreds of biostimulants and found a lot of inconsistency, with Zonda proving to be one of the better ones in terms of ROI," he says.

Zonda is an amino acid and peptide biostimulant from Interagro, designed to help crops reach their genetic yield potential and reduce the impact of abiotic stress by improving plant health. "Feeding a crop Zonda guarantees the supply of amino acids for building protein, critical for plant health," explains Interagro's Stuart Sutherland.

Ramularia reductions

Todd's approach has been to apply Zonda early, using 1 l/ha at T1.5 before there has been any sign of ramularia leaf spotting. "In the first year of tramline trials on continuous spring barley we had a yield response of 0.15t/ha over the weighbridge. In 2018, the uplift was 0.28t/ha in a spring barley crop following winter wheat. In 2019, we had an uplift of 0.1t/ha and 0.4t/ha, a margin over input cost of £7/ha and £58/ha respectively."

Biostimulants act in many different ways, including signalling to cells to help the plant ward off disease. To get this 'elicitor effect' then you have to go early, explains Todd. "We found spring barley responds particularly well, with applications optimal at T1 and T1.5. Any later is too late, as the crop starts to get stressed, increasing the ramularia risk. But the benefits have been really quite visual in droughty years."

Agrii trials have also shown Zonda applications to be beneficial alongside PGRs, reducing the stress to the crop, and also benefitting lodging control, he adds.

Future plans

Moving forward, reducing reliance on slug pellets is high up on the agenda and there is interest in trialling Interagro's Newton seed treatment this spring, concludes George. "If we can get crops up and growing away faster, it would certainly help."



Alistair Gordon, Agronomist, ProCam

STRESS SAVINGS WITH ZODIAC

With high stress periods now commonplace during the growing season, including a biostimulant within the programme can act as an insurance policy for growers looking to protect yield and quality.

This is according to Alistair Gordon, Scotland-based agronomist at ProCam, who says that an increasing number of growers are now looking at all options when it comes to improving growth and protecting crops against stress. "I really enjoy working with farmers to discuss what they want out of their systems," says Alistair. "Our main cropping in the area is spring barley, and grass is very important here, too. We also have some crops of winter wheat, barley and oilseed rape — as well as a lot of seed potatoes.

"With spring barley mainly going for malting, growers here are looking for a quality product - they're not just trying to fill a shed."

Technically, this means growers are trying to hit a nitrogen specification of 1.4-1.6% nitrogen, so there is often a lot pegged on and invested in crop performance, he adds.

As such, over recent years Alistair says he has turned to biostimulants in a bid to help protect this potential. "I am definitely using more and more biostimulants, particularly Zodiac from Interagro.

"If we take spring barley for example, I'm particularly using it in this crop because quite often we get a dry spell in the summer. At this point, the barley is growing that fast that if it hasn't received a biostimulant, the crop becomes very stressed.

"Last year in May and June, we had a particularly dry period, and there was a visible difference between those crops which had and those which hadn't been treated with Zodiac."

Seaweed benefits

New from the Interagro stable, Zodiac is a natural growth stimulant combining the unique biological stress defence and elicitor properties of polysaccharides in *Ascophyllum nodosum* — a strain of cold water seaweed — with biochemical stress busting and biostimulation properties of amino acids and peptides in vegetal protein hydrolysates, explains Stuart Sutherland, technical manager at Interagro. "When used correctly, seaweed can be an incredibly beneficial inclusion in biostimulants.

Cold water seaweed specifically is a natural source of essential nutrients such as nitrogen, phosphorus, potassium, and trace elements. These nutrients are vital for plant growth and development.

"It also contains bioactive compounds like cytokinins, auxins, and gibberellins that can stimulate plant growth, improve flowering and fruiting, and enhance overall plant health. What's more, the compounds found in cold water seaweed help plants withstand environmental stressors such as drought, salinity, and disease. This can improve crop resilience and productivity."



Stuart Sutherland, Technical Manager, Interagro

Tried and tested

Alistair first saw Zodiac in ProCam trials three years ago. ProCam has carried out a number of laboratory trials comparing Zodiac and other similar biostimulant type products, with Alistair sending down some of his local soils to build an accurate picture of just if, and how, certain products could be useful in his area. "The lab took our medium and planted spring barley plants in it, before spraying them with Zodiac and other similar treatments. However, Zodiac was selected as the one which improved tillering and root mass the most."

Delving into this trial further, the work was carried out by Dr Steve Rossall of Nottingham University, who also proved this benefit again in further work in 2022, explains Stuart. "Zodiac was applied to winter wheat at GS14, at a rate of 2 l/ha, and compared with untreated crops. After 29 days, both plants were measured for root and shoot mass, as well as root length.

"The study showed a 48% increase in root mass where Zodiac was used, as well as a 22% increase in root length and 17% greater shoot mass. The effect of this is better nutrient uptake and growth for optimum production." Stuart says that this includes better nitrogen uptake, and nitrogen use efficiency. Of course, better growth often translates into better yields too, and over recent years — in numerous trials — Zodiac has proven to increase yield in a variety of crops, including wheat, potatoes, swede and fodder beet, he adds.



Outstanding in its field

Despite its impressive performance in trials, what really sold him on the product was Zodiac's performance in the field, says Alistair. "Trials are great, but nothing beats seeing a product in the field. After good results in the lab, we found a spring barley seed grower who didn't have quite enough seed to sow a field, so we thought this would be a good opportunity to stretch seed rates and see what impact Zodiac might have."

The variety in question, Laureate, tends to average three to four tillers per plant, explains Alistair. "Lower seed rates tend to increase tiller counts, but spring barley is often unable to compensate. The side of the field with the normal nutritional program of manganese, copper and zinc averaged four tillers per plant, but when Zodiac was added it increased to seven tillers. This is unheard of in spring barley.

"This highlighted just how useful Zodiac could be during times where certain stressors, like the weather or pests, could lead to gappy crops."

Grower tramline trials further north in Aberdeenshire on swede and fodder beet have also shown benefits with early applications of Zodiac, continues Stuart. "In the swede, variety Lomond, test digs showed two applications of Zodiac at 1.5 l/ha gave a yield benefit of 40% over the untreated. In the fodder beet, variety Geronimo, the Zodiac treated crops had 10% more top weight and 19% more root weight, to the farmers delight."

Optimising usage

In terms of optimising usage, Alistair says early application is key. "Previously, I'd used another seaweed product in the middle of a drought, when crops were already stressed, and didn't really see a result.

"The reason for this is because at this point, there's no actual growth to stimulate, so the biostimulant will fail. Therefore, it's vital to get it on before a perceived stress period as a sort of insurance policy."

Alistair also believes the improved plant health and growth could enable crops to fend off disease better.

"When chlorothalonil got revoked, it became obvious that we were struggling with current chemistry. So my thoughts are that using something like Zodiac will help reduce stress in the plant, making it more likely to be able to fend off disease in an era of declining chemistry.

"Ramularia in particular is a key disease of concern in spring barley, which is often brought on by stress. My thinking is that if we can reduce the amount of stress in the plant, we may be able to reduce the severity of any ramularia that does appear."

The season ahead

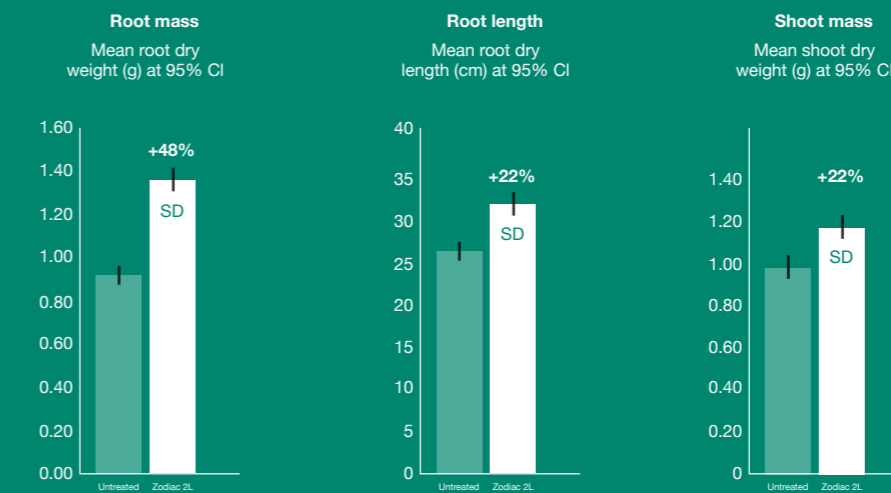
Looking to the season ahead, while he usually advocates a proactive approach, Alistair says he'll also be attempting to rescue some of the crops that have come out of winter looking a little worse for wear. "I don't usually put Zodiac on winter wheat, but this year I will be trying it on some of the more backwards crops, along with some manganese, to try and improve the tillering.

"An increasing number of growers are now making use of Zodiac. As an agronomist, you have to believe in products yourself first, so it does take a few years to work everything out. But with the results we're seeing at the moment, products like Zodiac are bound to gain more traction."



Zodiac significantly increases roots & shoots when applied early

Effect of Zodiac on early root and shoot growth in winter wheat



University of Nottingham 2022. Zodiac applied at GS14. Trial terminated & assessed 29 days later. Winter wheat cv Siskin. 10 Replicates. SD = Significant difference over untreated



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