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CROP PRODUCTION MAGAZINE

April 2025

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# ‘Regenerative agriculture must be classified’

POINT OF VIEW

**Many of you may know me or know of me; whereas some of you may well be sick and tired of the words ‘regen ag’... However, when I switched to direct drilling many years ago it was called ‘conservation ag’ or simply ‘no-till’. Subsequently, I feel that ‘regenerative agriculture’ must be classified because it’s been diluted again and again by companies wanting in on the act.**

The main objective, in my mind, is to avoid moving soil unless there’s a need – low disturbance lifting may be called for or even shallow ploughing, after all, nothing grows without air.

You want the soil to function again and make a connection with the photosynthesising plant, capturing sunlight and putting liquid carbon back into the soil through its exudates. This is how the plant feeds soil biology to obtain its nutrition.

Measuring and monitoring soil using infiltration tests and worm counts can help to reveal how it’s changing; I’d also recommend buying a microscope to get to know your soil up close.

If all things are done correctly, I believe you won’t see the yield drop that’s often spoken about. This is because the ethos is to deposit carbon back into the soil ‘bank’ to start releasing and recycling locked-up nutrition.

Carbon has been burnt out of our soils from the overuse of nitrogen, more so than excessive tillage in my opinion, thus triggering an increased availability of toxic, heavy metals which cause root and plant damage. Adding carbon in the form of compost and cover crops can start to rectify this problem.

However, the system has to roll out across the whole farm rather than dipping a toe in here and there. Yet, it has to be approached in a step-by-step manner to avoid leaving your business exposed.

Soil is a living entity and must be respected and managed in a way so it performs to a high level. Most crops are okay at 50-70% of their potential, but when you start to hit 80-90% we enter a different game.

Is it easy? No. Management is a little full-on to obtain this performance when using low inputs as I do. However, the rewards speak for themselves.

Measuring soil can help to quantify a carbon-positive primary product, which is what food and drink companies are now starting to require. This enables them to produce a carbon positive or neutral end product, to pass the benefits onto consumers and demonstrate they’re making a difference to their and the consumer’s carbon pathway. As carbon is life in an essence, ignore it at your peril!

**By Timothy Parton**

*Timothy Parton is a farm manager and regenerative advisor based in Staffordshire.*

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Find out how the world of genomics could help you to get more from alternative crop inputs like biostimulants

# April 2025

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The man to help you understand late blight control strategies P.91

Florentina Petrescu explains what LG CSFB resilience is P.47

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*CPM presents new ways of thinking for crop management.*



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## About Crop Production Magazine

*Crop Production Magazine* is the leading specialist journal for UK arable farmers and agronomists.

The magazine operates within a controlled circulation with a readership including farm managers, agronomists, machinery dealers and other arable supply industry professionals.

*CPM* is also distributed to agricultural universities, colleges and research institutes, examined by some of the leading researchers in their field as well as the next generation of crop specialists.

Above all, the magazine is read by UK farm business owners – decision makers. Articles are mostly in-depth and analytical, exploring the issues behind a current problem while aiming to present new ways of thinking.

The magazine doesn't seek to prescribe solutions, rather inspire, stimulate and inform.

*CPM* is proud to represent some of the most experienced agronomic, technical and machinery journalists, many of whom have received British Guild of Agricultural Journalist awards for their contributions.

The team works closely with companies that support *CPM* to gather inside knowledge on the technical issues that affect farmers and the wider food chain. Although small, *CPM* is managed by a driven team, responsible for delivering the sharpest insight and most relevant information across both print and digital formats.

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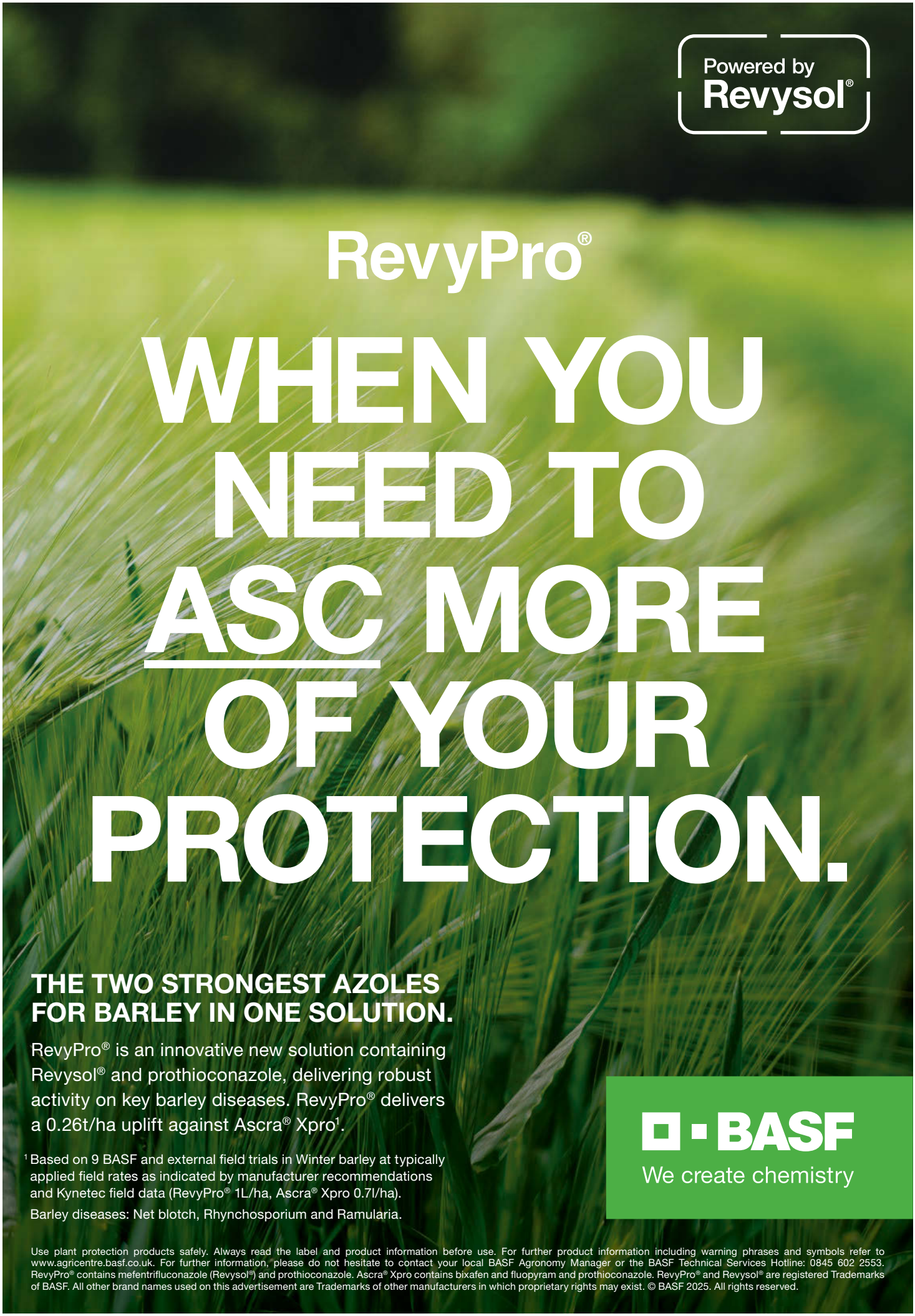
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*"If Defra had flagged budget issues sooner, we could have helped to find solutions."*

VICTORIA VYVYAN

# An abrupt move from government

**With no hint or suggestion that SFI might be closing soon, the government's latest move regarding the scheme has left much of the UK farming industry in a state of shock. *CPM* speaks to experts for their views on the situation.**

*By Janine Adamson*

**Last month, without any form of warning, Defra announced that SFI was closing with immediate effect, citing high uptake and budget constraints as the reasons behind its abrupt approach to decision making.**

Unsurprisingly, the way in which this communication was handled has received widespread criticism – it came out of the blue at a time when farmer confidence in government is fast depleting, says CLA president, Victoria Vyvyan.

She believes the government must face the truth: in shutting farmers out, it's not just hurting livelihoods, but hurting the British public. "If Defra had flagged budget issues sooner, we could have helped to find solutions. Instead, they scrapped the SFI scheme without warning, blindsiding farmers and threatening to undo years of progress in protecting nature.

"This isn't complicated; farmers don't want spin or sudden U-turns. We want honesty, a plan, and a voice in decisions that directly affect us. We all want to see farming and nature flourish but that can't happen if government repeatedly breaks faith with us."

## KEY ASKS

Victoria shares that the CLA recently met with farming minister Daniel Zeichner, where it posed a series of key asks. The first was for government to create an immediate plan for rapid co-designed revisions and launch of a new SFI, along with a commitment to stability on the ELM schemes.

Then, that nature and the environment require 'proper' funding if government is serious about achieving its own goals and legal targets. "Our analysis, and that of many other organisations, suggest that even £2.5Bn a year is unequal to the task. Reliance on emerging nature markets is unlikely to deliver at the scale required in the short-term," she continues.

The final ask has been for government to acknowledge its role in procuring environmental public goods that can't be monetised for the private sector until nature markets are established.

As part of the announcement, the government published a blog where it states: "Every penny in all existing SFI agreements will be paid to farmers and ▶

**Widespread impact**

**CLA's Victora Vyvyan believes the government must face the truth: in shutting farmers out, it's not just hurting livelihoods, but hurting the British public.**

# SFI UPDATE

**A lack of strategy**

**SFI was seemingly scattergun in approach with a chaotic number of available actions, says consultant, Paul Pickford.**

outstanding eligible applications that have been submitted will be processed.

"Now is the right time for a reset: supporting farmers, delivering for nature and targeting public funds fairly and effectively towards our priorities for food, farming and nature."

It also included guidance regarding what happens next, for those who were engaging with SFI, or had planned to do so (see table).

SFI consultant, Paul Pickford, says based on the published figures and a back of an envelope calculation, it's easy to see the budget is now spent. "There's no money left until 2026 when the government says it might make an announcement and re-open for further applications.

"We can assume that'll come with a significant cap – the former system was very open and farmers were given the chance to make the most of it, and they did.

"I have no problem with that other than it's an opportunity missed. We could have had something which delivered so much more, but it was seemingly scattergun in approach with a chaotic number of available actions. This is far from the government's finest hour," he comments.

## SIGNIFICANT PAIN

Paul believes that combined with the loss of BPS and other factors such as current mediocre wheat prices, the knock-on will be a significant amount of pain. "Some growers will be able to plan their way around this, others won't."

And with lofty figures cited during the announcement such as more than 50,000 farm businesses benefitting from farming schemes, equating to more than 37,000 multi-year live agreements in place, Paul suggests it's merely spin to big up government rather than explicitly admit the money is spent.

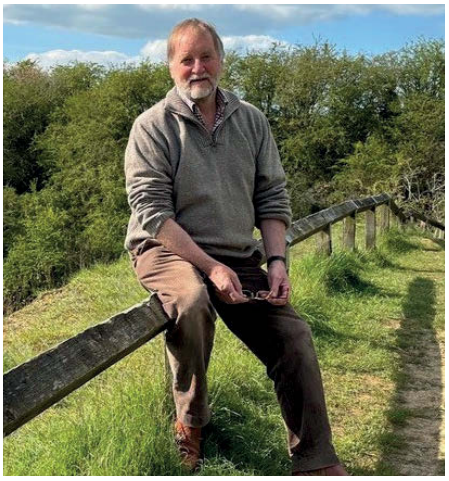
He says it should be no surprise that there was a surge in uptake. "As a farmer in business, if an opportunity comes along to make money, you do that because financially, most have little other choice.

"Farmers have a healthy attitude towards making the most of their land. It's highly unlikely they'll give up on environmental stewardship and simply return to old ways of maximising cropping. A lot of margins were put in for sound economic and environmental reasons and many have been in place for a considerable time now, so what the closure of SFI does, is limit future growth," he adds.

Wildlife farming consultant, Marek Nowakowski, has been admittedly vocal about SFI and its implementation from the start. He agrees that with so many negative factors impacting the industry at the moment, farmers shouldn't be blamed for maximising the available funding.

However, he believes the recent announcement might not be telling the whole story. "It's not an easy job for Defra and the RPA – I'm not sure I could do better – but to suddenly wake up and realise they've run out of cash and be surprised by it? They should have known; so I think there's more to this than meets the eye.

"You'd expect they'd be having regular discussions to understand why



**Science-based approach**

**Wildlife farming consultant, Marek Nowakowski, says projects such as the Hillesden Study revealed wildlife responds to appropriate, tailored, long-term opportunities.**

| Scenario | What happens next |
|---|---|
| Those with an existing SFI agreement | Nothing changes, payments will continue as usual under the terms of the agreement. If an SFI agreement was entered into this year, payments will be made until 2028. |
| An agreement has been offered but a grower hasn't accepted | If wishing to proceed, accept the SFI agreement offer within 10 working days of it being offered. If this doesn't occur, it can be withdrawn. |
| An SFI application was submitted before the scheme was closed but no offer has yet been received | An agreement will be offered providing the application is eligible. |
| An application was started but wasn't submitted before applications closed | The application can't be submitted. Exceptions to this are farmers who were blocked from submitting applications due to a system fault or who'd requested 'assisted digital' support from the RPA to apply, plus ex-SFI Pilot farmers whose Pilot agreement has ended but haven't applied for the full SFI 2024 offer on land which was in their Pilot agreement. |
| Those with an SFI Pilot agreement or whose SFI Pilot agreement has ended | Those in the SFI Pilot will be able to apply when the pilot agreement ends. |

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**Alternative opportunities**
**Now's the time to explore alternative funding mechanisms, for example, from water companies or wildlife organisations, suggests Hutchinsons' Georgina Wallis.**

▶ this hasn't quite worked. Ultimately, we're not doing so well in halting biodiversity decline," he raises.

## EXPERT INSIGHT

Marek hopes such discussions will include revising the design of SFI with greater input from farming experts. "To launch a system with no rules only aims when Defra should have been rewarding delivery, just wasn't helpful. Equally it was open to everyone, further illustrated by the fact 50% of BPS claims are for individuals with small areas less than 40ha.

"Farmers asked for autonomy but the government took that too far – nothing was targeted – they took a quantity not quality approach."

He highlights that in the past, Defra funded a raft of environmental science-based projects such as the Hillesden study, which explored how best to increase biodiversity on farm while remaining profitable. "And this approach is effective – we learnt wildlife responds to appropriate, tailored, long-term opportunities driven by quality habitats.

"SFI is fundamentally flawed – science has shown us the best way to deliver profitable farming and practical conservation but what was SFI isn't the way," he stresses. "Yet we can do better and halt biodiversity decline – the system is at fault, not the farmers."

Paul adds that although farming currently feels singled out, budget-related changes are occurring across the board. "We're somewhat in our own bubble but we're not alone in being on the receiving end of cuts. It's very frustrating for all industry."

Marek agrees: "You have to ask, are we paying the price for the pandemic when the government overspent hugely? Regardless, farming is going through a significant rough patch – you just can't run a successful business when the government makes moves like this."

Hutchinsons' head of environmental services, Georgina Wallis, highlights that now is far from the best time for farmers to have to devise a plan B. "Given we're in the spring and therefore a busy time of year, it's very poor timing and causes such distrust.

"However, the message is if you're in a scheme, concentrate on delivering it as per the stipulated guidance. If you're not, then start preparing a plan for when SFI is available again in 2026, working with a trusted advisor to identify suitable options.

"And importantly, don't rule out applying for other schemes whether that be grants from water companies or wildlife organisations, or, biodiversity net gain. It's not the end of funding altogether, so it's an ideal time to explore those alternatives," she says.

According to Georgina, Hutchinsons is devising a decision tree to help guide farmers during the months ahead. "SFI's closure has happened and there's little we can do about it, so I think the best thing to do is focus on finding appropriate solutions to move forward," she concludes. ●

# SFI: impacting the switch to organic

## Growth in the organic food sector could be curtailed by the government closing SFI applications, according to a recent poll

**Growers attending a webinar which explored the business case for organic farming, polled that the government closing SFI applications would impact their confidence in switching systems.**

**Despite the majority of attendees partaking in the session because they aren't currently organic but are interested in moving over, most (90%) then shared that the latest goalpost change would have a significant bearing on whether that comes to fruition.**

**Organic sector development advisor, Adrian Steele, said the expanded SFI release had included options aimed at growers operating within organic-based systems. "So we have to let the fog lift and for Defra to come through the other side.**

**"What we do know is, stunting the UK organic sector in this way will have to be offset by increased imports, which doesn't help Defra to achieve its wider environmental targets."**

**For context, the amount of UK farmland in conversion to organic with Soil Association Certification has doubled in the past year, which the organisation believes is in response to SFI, market supply opportunities and increased consumer demand.**

**Adrian said the Soil Association is now working closely with Defra in hope of finding a way forward. "It's all very disappointing; it's also why we're collating evidence to present to Defra including farm case studies, which we welcome further submissions," he added.**

### ORGANIC MARKET REPORT 2025

**A report conducted by Soil Association Certification reveals the sector has 'bounced back' from the cost-of-living crisis with growth exceeding non-organic, rising 7.3%, which equates to £3.7Bn.**

**Sales increased across every key channel during 2024, with independent retail, non-food and hospitality enjoying particularly strong performances, said Soil Association Certification's Sophie Kirk.**

**She added that the organic home baking category experienced £54M sales last year, equating to an 11.6% growth in volume. "As for organic cereals and morning goods, that achieved £30M of sales and 11.3% volume growth, whereas organic bakery saw a 9.5% volume increase."**

**As for organic farming specifically, the report highlights that the amount of UK organic farmland is falling behind other nations, despite a recent rise in farms converting their management approaches. The figure has remained largely static in England, representing 3% of the country's farmed area (data collected 2023).**

# Tackling net blotch risk in spring barley


**Although net blotch in spring barley is primarily transmitted via infected stubble, levels of seed-borne mycelium also appear to be on the rise. With further concerns regarding fungicide resistant strains of the disease, *CPM* looks at the steps growers can take to help mitigate risk.**

*By Janine Adamson*

**Trends in farming systems such as minimum or zero tillage, plus weather-induced rotational changes, could be behind mounting concerns surrounding net blotch in spring barley. That's according to BASF's Clare Tucker, who says although many fungicides remain effective, various factors are encouraging the threat of the disease.**

"Often, net blotch comes from infected trash, meaning the rise in popularity of min-till poses an increased risk to its transmission. With the mild, favourable weather conditions last year, the disease was a genuine concern – meaning there could be high levels of inoculum remaining in the rotation even now," she explains.

"Last year also saw much change rotations-wise with limited cropping options, meaning in some cases, successive cereals were planted where they wouldn't usually be, or spring barley drilled into alternative locations where there happened to be nearby infected trash.

"Furthermore, the noticeable rise in net blotch in winter barley this season could be warning of what's coming down


**Increasing concerns**

**BASF's Clare Tucker says although many fungicides remain effective, various factors are encouraging the threat of net blotch in spring barley.**

**T1 tank mix**

**A robust T1 in spring barley could comprise an azole, SDHI, plus one of the effective strobilurins, suggests Bayer's Greg Hanna.**

▶ the track for spring-sown crops. It's an issue we've certainly highlighted, and now, with reports of increased levels of infected seed, it's critical growers identify where net blotch is coming from on their farms so risk can be mitigated."

Sourcing adequate spring seed has proved a conundrum for multiple years, namely a result of the inclement 2023/24 season where growers were unable to drill autumn cereals. In some instances, this may have increased the quantity of farm-saved seed.

According to ProCam agronomist Alastair Gordon, there were reports of 'uncontrollable net blotch' very early in the season last year, therefore, it's suggested the source was likely to be seed-borne mycelium.

"Unfortunately, some spring seed, particularly if it's been farm-saved or 'barn dipped', won't have received a seed treatment – which is one of the most effective ways to minimise the risk of net blotch," he says.

Although there are no seed treatments with registered label claims for net blotch, because the disease is from the same fungal family as leaf stripe (Pleosporaceae), it's widely acknowledged there should be a level of efficacy, continues Alistair. "By growing untreated seed, there's a high chance of seed-borne net blotch which is becoming increasingly challenging to control with fungicides."

According to Bayer's Greg Hanna, there's a concerning move towards not using fungicidal seed treatments at all. "Seed treatments deliver significant value, particularly when it comes to controlling diseases like net blotch which can multiply quickly and cause yield losses of 10-40%.

"With spring barley especially, there can be a temptation to reduce input spend, in fact, it's sometimes referred to as a 'low input crop'. However by doing so, it's placing greater emphasis on the actives which are used such as prothioconazole," he explains.

"This is worrying because net blotch is showing considerable reduced sensitivity to prothioconazole, so therefore the active requires a mix partner for a robust approach," advises Greg.

Information issued by AHDB states farmers should opt to grow a resistant variety, guided by the Recommended List – in fact, its newest iteration includes net blotch disease resistance ratings in spring barley for the first time.

Then, as well as exercising cultural

control methods such as avoiding successive barley crops, controlling barley volunteers, and opting for later drilling dates, growers should use clean seed where possible and not save seed from heavily infested crops.

## INTEL GATHERING

Greg reminds that although it's an obvious option, testing seed provides much insight. "And that's not just for net blotch, but all seed-borne diseases. What's intriguing with net blotch is, there doesn't seem to be any correlation between the percentage of disease loading on the seed lot, versus the infection level in the subsequent planted crop.

"This has been demonstrated through trial work – it's either yes you have seed-borne net blotch, or no you don't. There's little grey area or scope for 'might'," he adds.

Regarding the issues surrounding prothioconazole, Clare agrees that due to shifts in sensitivity, some fungicides aren't working as well as they used to when it comes to net blotch. "Monitoring indicates the F129L mutation conferring reduced sensitivity to some strobilurins, is found in both the UK and the rest of Europe.

"F129L levels above 20% are common in our UK sampling and this tends to show a reduction in net blotch control from strobilurins like azoxystrobin, although this isn't exclusive within that fungicide group. Pyraclostrobin (Comet 200) controls these resistant strains and continues to offer a robust option, particularly in high pressure scenarios," explains Clare.

She adds that observations also indicate some reduced sensitivity in net blotch to a range of SDHI chemistry too.

Greg highlights that trifloxystrobin (Mobius) isn't currently affected by the F129L mutation either, whereas azoles remain useful in targeting other diseases. "There are enough tools out there to tackle net blotch, but it's critical that no one option is over-exposed. Mode of action diversity is key to avoid relying on one or two actives to do all of the heavy lifting."

He suggests a robust T1 in spring barley could comprise an azole, SDHI, plus one of the effective strobilurins.

**Getting ahead**

**ProCam's Alastair Gordon is encouraging growers to consider applying fungicides even earlier than usual, to provide spring barley with an additional layer of protection.**

"An example might be Siltra XPro (bixafen+ prothioconazole) plus pyraclostrobin, or even azoxystrobin if the pressure is more moderate.

"Equally, Ascra X Pro (bixafen+ fluopyram+ prothioconazole) has been performing strongly on net blotch

▶

for several years in both fungicide performance curves and Bayer trials. Just don't expect prothioconazole to achieve adequate control on its own."

Clare concurs and adds that as a crop, barley benefits from receiving a good range of active ingredients in fungicide mixes such as in Lentyma XE (Revysol+ Xemium) and Comet. "The crop appreciates a combination of two or even three actives – the reason for this is, all diseases seem to hit barley at the same time so there's a lot to address at once."

She stresses the importance of application timing in getting the most cost-effective benefit from fungicides. "The message is, don't delay. Growers might try to fit a fungicide application in with a PGR at GS32, but it's really too late at that point."

## PRIME TIME

"The aim should be GS25-30 ideally, perhaps even GS30-31 at a push. Given the weather permits, finessing application timing is something which can be achieved without any additional spend, plus it assists the fungicides in working harder," says Clare.

By applying a comprehensive T1, it can also have positive implications for diseases later in the season too, she highlights. "Ramularia is high risk by T2 and is exacerbated by stress in the crop, whether that's biotic or abiotic. So, reduce crop stress by keeping disease out from the start. It's also best to avoid over-complex tank mixes, especially those involving herbicides.

"With fewer options for ramularia control in spring barley, you really want to help the crop fight its own corner."

Good disease control is also critical in retaining tillers, adds Clare. "In barley, the main focus will always be building yield through tillering. Unlike wheat where you might focus on preserving the flag leaf, all leaves are important in barley."

This season, given the concerns regarding seed-borne transmission, Alastair is encouraging growers to consider applying fungicides even earlier than usual, to provide crops with an additional layer of protection.

> *"There are enough tools out there to tackle net blotch, but it's critical that no one option is over-exposed."*

"In a conventional year or low disease pressure scenario, it might be feasible to wait until T1 to apply a first fungicide treatment. But with reports that a significant volume of seed has been confirmed to have very high levels of net blotch, where untreated seed has been drilled or where drilling was brought forward to make the most of recent dry conditions, the risk will be even greater.

"Therefore the advice this year is to bring plans forward by applying a suitable fungicide treatment as soon as possible."

As such, he recommends monitoring for symptoms – brown stripes of infection spreading from the base of leaves in seedlings – ahead of the first tiller stage (GS21).

"Most growers will already be planning to apply weed control and trace elements at this timing, so it makes sense to use the opportunity to apply a fungicide to knock back any infection that's travelled up from the seed, or which has been transmitted to the emerging plant from infected trash. Remember that once conditions are favourable, net blotch cycles every 14 days," he concludes. ●

**Identifying net blotch**
Symptoms begin as individual spots which then elongate and turn into brown stripes or blotches, with a random 'netting' of darker lines along and across the leaf.

## Spotting the symptoms of net blotch

According to AHDB, seed-borne net blotch infection in barley causes brown stripes to spread from the base of leaves in seedlings and tillering plants, which can appear similar to leaf stripe infection. Then later in the season, the symptoms of leaf stripe and net blotch become more distinct, with the symptoms of net blotch becoming more typical of that disease.

However, transmission from splash-borne spores – from infected trash or neighbouring plants – is the most common cause of net blotch. These symptoms begin as individual spots which can sometimes be mistaken for ramularia leaf spot.

These spots elongate and turn into brown stripes or blotches, with a random 'netting' of darker lines along and across the leaf. In winter-sown barley, symptoms can be extensive during the winter but as affected leaves die back, new leaves in spring can be symptom-free.

Finally, the 'spot form' of net blotch is less common – a chlorotic halo surrounds oval lesions. Unlike the net form these spots don't elongate, but grow to be 3-6mm in diameter, which can be mistaken for ramularia leaf spot.

Spot form lesions aren't rectangular nor are they limited by the leaf veins. Net blotch also occurs throughout the season, whereas ramularia leaf spot symptoms typically appear after flowering.

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# Managing disease risk in winter wheat


## What actions are growers taking to tackle the ever looming threat of disease and therefore mitigate some of the risk factors involved in managing winter wheat crops? *CPM* poses the question for this month's Real Results Roundtable.

*By Janine Adamson*

**Farming is frequently coined a risk-laden business to be in, namely due to the impact of external factors which are beyond the control of growers and their agronomists. However, with this risk can come reward, often the case when it comes to maximising returns from one of the most profitable crops in the rotation – winter wheat.**

Recognising that disease pressure is a significant threat to crop performance, this month's BASF Real Results Roundtable focuses on the topic of disease risk management. To discuss, *CPM* brings together Northamptonshire-based farm manager, Giles Benson; grower and technical agronomist for BASF, David Hawcroft; and BASF's agronomy manager, Andrew Smooker.

Giles manages Turney Partners Farming in Quinton – an arable and contracting business operating across 1100ha of combinable crops including winter wheat, winter beans and spring oats. David represents mixed farming enterprise G A Hawcroft in East Yorkshire, but also works within BASF's R&D team, contributing to the firm's trials work.

### SPRING RECOVERY

Although the overall national picture

**Management actions**
**Grower David Hawcroft believes ensuring adequate crop nutrition and undertaking actions such as using Cambridge rolls on frost damaged areas, is what he perceives as the first steps in mitigating risk.**

**Pulse-width modulation**
**Purchasing a new sprayer with pulse-width modulation has improved the timeliness of fungicide applications by opening up spray windows, explained grower Giles Benson.**

is generally more positive compared with this time last year, Giles explained that for him in Northamptonshire, the weather conditions this year have been worse than what the farm experienced last season. "I'd say 80% of our wheat looks okay with the remaining 20% not so brilliant, mainly due to a really difficult drilling period again in the autumn.

"As such, we're slightly worse off in terms of soil conditions than last year, although the weather has dried up since January."

Giles added that having assessed the status of his crops and with the weather permitting, he's applied nitrogen and sulphur in the hope of kick-starting spring growth. "Normally at this time of year I'd apply around 40-50kgN/ha just to get crops moving, but this season, I've stepped it up to 70kgN/ha."

In response, David highlighted that ensuring adequate crop nutrition and undertaking other management actions such as using Cambridge rolls on frost damaged areas, is what he perceives as the first steps in mitigating risk.

"On the farm here we have quite variable soils and with the cold January we saw a lot of frost – any lighter areas have particularly suffered. But we've managed to get across quite a few fields of wheat with the Cambridge rolls to press those roots in and hopefully boost the crop's potential."

He added that on lighter soils, he believes applying early nutrition is even more important. "I have to get a lot of my fertiliser on in good time to get crops in as good a condition as they can be, so if they do dry out, they can withstand some of the stress. I use the same principles with PGRs to encourage rooting."

## WIDER MANAGEMENT APPROACHES

Expanding on the point raised regarding ensuring optimum crop health, the Roundtable discussed the influence of alternative solutions such as biostimulants. Giles said while he recognises their growing popularity, he prefers to focus on fine-tuning crop nutrition.

"The past few years we've undertaken around 30 detailed grain analysis samples during harvest. This gives us a real breakdown of nutrient use efficiency and where we might need to tweak applications in the future.

"We've not seen any significant problems during that time, it seems to be where it should be," he commented.

Andrew added that while the benefits of biostimulant products can be subtle, they can certainly play a role in creating more resilience and consistency within a crop.

Giles then shared that a key factor when it comes to fungicide performance has been the purchase of a new sprayer which has vastly improved his application timeliness. "We can spray around 600ha in 2.5 days, often in windier conditions than most, purely due to pulse-width modulation (PWM) on our Bateman sprayer. It's revolutionised application because we can reduce drift by dialling in different pressures and droplet sizes.

"Consequently, our number of suitable spray days has increased by a lot, and we're far more accurate in what we're applying," he said.

## THE ROLE OF THE T0

Having heard that Giles has 50% of his winter wheat area down to Crusoe for milling specification, and with concerns regarding the variety's brown rust score, David asked Giles whether he'd managed to apply all of the farm's T0s last year.

Giles answered that he indeed was successful, and that he's been a great believer in T0s for years. "You have to protect crops – there's no point in waiting and seeing what comes because those days are long gone. With the competitive price of tebuconazole at the moment, it's a no brainer in many ways. That's been our strategy here for a number of years – treat crops early at T0," he commented.

And even though he perceives the risk of brown rust to be lower this year – mainly due to more frost events in his area – his aim is to make sure crops are clean from the off, given some are later drilled and therefore backward.

In reply, Andrew suggested that current concerns regarding brown rust risk may be due to fears of inoculum being present from last year, plus, an overall mild winter. "It's still very early days but it does add to that picture of risk, and therefore the case for T0s and robust programmes throughout is only getting stronger.

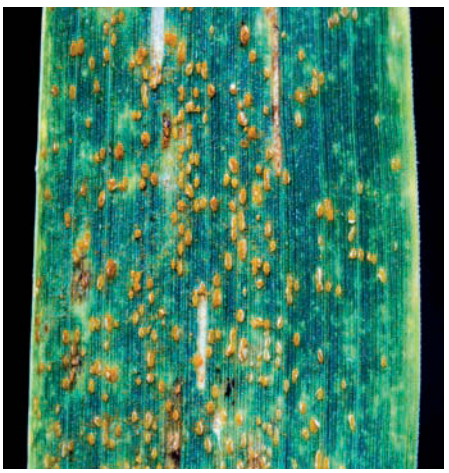
"Some have discussed whether you see a difference in septoria control from a T0, but with the weather patterns we're experiencing, plus having rust in the equation, it makes sense to utilise the early timing if you can," he said.

David added that preventative action is key. "If you rely on curative activity from your fungicides, you really are asking a lot. But I believe it's about assessing yield potential along with disease risk when deciding on crop inputs and spend, whether that's fertiliser or fungicide for additional output."

Giles pointed out that while he has a confirmed plan for T0 and T3, at the moment, T1 and T2 are still up for discussion. "With milling premiums and wheat prices both being squeezed, price will influence this somewhat," he admitted.

## FUNGICIDE PROGRAMMES

The discussion evolved to preferred approaches for later in the programme, with David highlighting that he's pondering whether to include premium products earlier, and therefore reduce spend towards the end while still achieving septoria control across ▶



**Brown rust concerns**
**Concerns regarding brown rust risk may be due to fears of inoculum being present from last year, plus, an overall mild winter, discussed the Roundtable.**

**Preventative approaches**
**According to BASF's Andrew Smooker, with limited options for curative activity and high pressure seasons during recent years, growers may want to enhance the robustness of earlier fungicide applications.**

▶ a more balanced programme.

Giles agreed that it's something he's also considered. "But at the end of the day, you want to keep the flag leaf and leaves two and three clean, so you have to be careful where you start to reduce spend.

"I understand the principle where if you've eradicated the septoria risk in the crop, you should be able to have a reduced investment later on, it just depends on how significant the risk of septoria is. Equally, if we reflect back to drilling date, we're planting later as part of blackgrass management, so I hope that'll effectively reduce pressure a little too."

He added that if his drilling dates do have to come forward due to perceived weather constraints, he'd definitely consider realigning his fungicide programme's spend.

Andrew suggested that during a dry spring, there can be talk regarding trimming investment at T1. But with limited options for curative activity and several high pressure seasons during recent years, it's more likely to be around enhancing the robustness of earlier applications, he said.

"And of course, this season will be another with so many different scenarios regarding drilling date – anything from September through to late November and beyond – so there'll be all manner of situations and spends.".

All-in-all, the Roundtable agreed that growers can't be in a situation where curative activity is relied upon. "That's especially the case with brown rust – although tebuconazole does a good job of removing a lot of it from the leaf, it's already down at the leaf axles and cycling very quickly," stressed Andrew.

## AZOLE FUNGICIDES AND REVYSOL

Referring to mefentrifluconazole (known as Revysol), Andrew asked the group what they thought about the azole class of fungicides. In response, David said he always strives to include Revysol in the programme; last season he used it in combination with Xemium (fluxapyroxad) and F500 (pyraclostrobin).

"You achieve good all-round disease control plus greening in one package – I think we can all agree that's a reliable fungicide mix."

Giles pointed out that it was also this combination which formed his T2 spray last year due to its overall cost-effectiveness during a high rust pressure year.

> ***"We've relied heavily on prothioconazole for a long while, it's important to add in different azoles where you can to preserve the chemistry."***

Andrew added that as well as covering septoria and eyespot, using these three actives in combination offers a robust rust package plus addresses any resistance management concerns. "We know the work the azoles have done during the years, with two key options – Revysol and prothioconazole. As such, we've relied heavily on prothioconazole for a long while, but it's important to add in different azoles where you can, to preserve the chemistry."

Having used Revystar XE (Revysol+ Xemium) in the past, whether that be at T1 or T2 depending on the year, Giles said it's worked well at either timing. "But I think we'll be considering it at T1 for this season."

In agreement, Andrew said Revystar XE has proven itself over a number of years in either slot. "However, getting the foundation of a programme right has become increasingly important during recent years, especially with the increasing threat of rust as well as some high septoria pressure seasons.

"While Revystar XE can still fit at T2, we do have another option now available for both wheat and barley in the form of RevyPro (Revysol+ prothioconazole). It's a good tank mix partner option in wheat and provides flexibility in the fungicide programme."

Andrew reminded that it must be used with another mode of action when targeting septoria, boosting the level of disease control and enhancing the performance of the mix partner. "So when you look at the potential of what RevyPro can achieve, it's perhaps suited to a higher risk, higher input situation at T2, with Revystar XE in that T1 slot."

To conclude the discussion, David shared that he has plans to use a Revysol-based mix at T1, possibly following up again at T2. "We have to take the season one step at a time and see how these crops respond." ●

# Real Results Roundtable

**BASF's Real Results Circle is a UK-wide agricultural network now in its eighth year. The initiative is focused on bringing together growers, industry experts and BASF to create a more resilient farming system that's sustainable for farm business profit, for the people we feed and for the planet we live on.**

**Real Results Roundtable is a new initiative which explores related topics, such as resilient disease control, environmental stewardship and return on investment. Roundtables centre around Real Results Circle farmers and associated experts from the wider industry.**

**By coming together to openly discuss and therefore face challenges as one, we can find out what really works and help to shape the future of UK agriculture.**

***CPM*** **would like to thank BASF for kindly sponsoring this feature, and for its assistance in providing access to the relevant experts and contacts required to produce it.**

# Making the most of actives


**Isofetamid could offer growers another string to their bow to help combat sclerotinia in oilseed rape, providing the option of a little-used active that works well with others. *CPM* investigates the ins and outs of the chemistry.**

*By Melanie Jenkins*

**Applying fungicides is more than a simple matter of preventing or tackling the disease at hand, it's also about resistance management and optimising efficacy by using the various tools available.**

With fewer actives coming onto the market than being removed from it, it's more vital than ever to use a diversified spray portfolio and apply what's available in a preventative manner, highlights ProCam's Mike Thornton.

Although it might be lesser known than actives such as commonly used prothioconazole, isofetamid can be used in oilseed rape to target sclerotinia, and could be an option to include in programmes going forward, he says. "What drew me to Zenby (isofetamid) is that it sits apart from other actives in terms of its mode of action."

## SUB-GROUP ACTIVE

Isofetamid is an SHDI which comes under the chemical grouping phenenyl-oxo-ethyl thipheneamide, says Certis Belchim's James Cheesman. "It's in a sub-group of its own and isn't used in UK cropping as much as most other SDHIs, which means it stands out."

With a unique structure, Isofetamid remains effective against the majority of fungal isolates that have developed resistance to other SDHI fungicides. Studies indicate this is due to having flexibility at the binding site, rather than standard SDHIs which have a rigid structure.

Equally, with reports of reduced sensitivity to SDHIs in sclerotinia in France, Mike feels it's an important addition to have. "There's an ever diminishing number of actives available for OSR and of the different classes there are even fewer, so anything you can employ to reduce pressure on one particular group has to be worth considering," he adds.

With any product, be it a herbicide ▶

**Diversified approach**

**ProCam's Mike Thornton believes it's more vital than ever to use a diversified spray portfolio while applying what's available in a preventative manner.**

or fungicide, it's important to be mindful of resistance issues, but this is particularly true in OSR, suggests Mike. "We're perhaps all guilty of applying prothioconazole widely, and although this isn't necessarily an issue for the diseases you're trying to control during flowering, inevitably it'll hit non-targets.

"For example, if there's some light leaf spot and you use prothioconazole again, you'll drive resistance because you'll be taking out certain isolates," he explains.

"So by using products like Zenby, it can help to slow the resistance build up in the disease you're aiming for, as well as some non-target ones because it's not being used elsewhere on the crop. It's also highly unlikely to be used anywhere else in the rotation because isofetamid's other authorised uses are on crops such as lettuce or spinach, and it won't be used in cereals so there's no potential for a build-up on volunteers either."

James points out that sclerotinia can come in many shapes and forms, and OSR is one of many crops which can suffer from it. "The disease occurs in plenty of other crops, so it's advisable to understand what else could harbour it, be it another crop in your system or even weeds and other plants that occur on your or your neighbour's land."

**Spray on risk**

**Isofetamid can be applied from early flowering depending on conditions, but AHDB's sclerotinia forecast indicates the level of risk and when best to apply it.**

In terms of positioning, Mike prefers to use isofetamid as a second flowering spray, towards the end of the period. "Whether you use one or two flowering sprays will depend on the season, weather and pressure from sclerotinia and the potential of the crop, but isofetamid can only be used on OSR once per year."

However, it can be applied from early flowering, depending on conditions. "It's advisable to look at AHDB's sclerotinia forecast to determine the level of risk and base when you apply on this. I'd also suggest looking at your individual fields and having a handle on the risk factors that are pertinent to that site.

"Although some people might not feel it's ever a risk, sclerotinia is one of

those diseases that as an agronomist, once you've seen it, it'll haunt you," says Mike. "I've only seen it badly once and you could smell it down the road.

"But because sclerotinia doesn't occur every year, it can be easy to become complacent towards it. Using the agronomic tools at your disposal is about insurance – taking steps based on how things could turn out and mitigating risk – it's about the potential losses stacked against spend.

"An extreme example is deciding to not apply a cheap but effective aphicide to a cereal crop in the autumn and then having an infestation, resulting in phenomenal yield and quality losses – it's the same with sclerotinia; when it does go wrong, it goes really wrong," he warns.

## APPLICATION TIMING

Unlike some fungicides which have specific calendar-based application windows, Zenby is based on growth stage, meaning it's easier to apply it when a crop requires it, says Mike. "When fungicides have calendar date stipulations, this can make a big difference across the country because a crop might be at the right growth stage within the window in Sussex, but it'll be completely different in Scotland.

"However, we know when OSR starts flowering and when it ends, so you're able to make an informed decision on when to apply Zenby."

According to James, the product can be applied alone or mixed, although mixing is preferential for resistance management. "It can be used with metconazole, azoxystrobin, or the mix of prothioconazole and tebuconazole, depending on other disease pressures."

Consequently, Mike says he advises mixing isofetamid with a second product, for example, azoxystrobin to help improve greening as an additional benefit. "You want to approach this in the same way you would with any other crop, such as mixing triazoles with SDHIs."

### Assessing the canopy

**One of the most important things with any pesticide is to understand the canopy structure of the crop and how to penetrate this with the product, says Certis Belchim's James Cheesman.**

During flowering, it's the point where the canopy is at its largest and the days are at their longest, so if the plant isn't going to photosynthesise effectively then, it's never going to, suggests Mike. "But by using more than one active you can target different points of a disease's cycle and help to keep the plant healthy and green for as long as possible, while respecting the principles of resistance management.

"If you don't mix isofetamid with a triazole, which shouldn't be overused, should you want to mix it with an insecticide then there aren't any issues around the repellency of that insecticide on beneficials being masked. Applying it this way makes it both a useful and flexible product," he says. "However, it's likely that not many insecticides are being used that late in the season any longer."

In terms of the options available to tackle sclerotinia, there are a number of potent molecules available in this

**Lateral disease thinking**

**Sclerotinia can come in many shapes and forms with OSR one of many crops that can suffer from it.**

sector, says Mike. "Isofetamid sits in the middle of the range of options. Some of the others are being used on a lot of crops, which isn't something I'm ever very comfortable doing.

"And unlike wheat, which you could look at now and take a guess at what it might yield, with OSR it's always impossible to know what it'll achieve until it goes through the combine. Because there are so many things that can go wrong with OSR, if you can still do a reasonable job and achieve better value from the products you use because of their price point, then Zenby could provide a suitable option," he explains.

"For example, this season there's been quite a lot of pigeon damage resulting in uneven crops, but we require crops to be wall-to-wall to achieve the average yields we want. You have to deal with the problems in front of you, but when looking for good value options I think this fits well and, especially if you're short on flowering time, could help save £/ha when using it with azoxystrobin, or even triazoles such as metconazole, prothioconazole."

So far, as Mike is aware, there isn't anything that isofetamid can't be used with, noting that it's pretty benign. "However, we know with certain nutritional elements, such as boron, that we have to be careful. But, I've known growers mix Zenby with liquid nitrogen and that doesn't seem to be a problem. Having this level of compatibility is useful because growers are busy and no one wants any nasty surprises."

The full label rate for Zenby on OSR is 0.8 l/ha but Mike has generally applied it at 0.4 l/ha or 0.5l/ha mixed with a partner product. "I'd suggest adjusting the dose rate depending on the perceived risk, actual forecast risk, land history and your geographical location. Plus, keep in mind that some varieties are more susceptible to it than others, and that your rotation and nearby crops could have an impact."

One of the most important things with any pesticide is to understand the canopy structure of the crop and how to penetrate this with the product, using water volume, nozzle selection and forward speed being key, says James.

"At a full dose, Zenby should be applied with 300 l/ha of water, but depending on dose rates can be reduced pro rata but coverage is still key. And of course, if you're mixing with partner products, you must always adhere to their label requirements. Higher water volume and nozzle choice are the best ways to achieve canopy penetration, which can optimise product performance."

As for taking a low input, low output approach, Mike struggles to see how this ever works out. "I agree that growers should look after decent crops and take steps based on perceived risks but even when the price of OSR is low, yield is still everything, because it always multiplies up into the £/t and either way you'll still have to cover fixed costs as well as variables."

James agrees that there's always going to be variable costs to manage, but the fixed costs still have to be paid for. "If you're planting a crop, you should be investing in it, otherwise, don't plant it."

Mike stresses the importance of not approaching this year's crop based on last year's. "With so many of these diseases we always have to target them in a protectant capacity rather than a reactive one. The more you can prevent the loss of green leaf area then the more potential the plants have to photosynthesise – this'll always be better for the crop overall."

Although he isn't aware of any factors that could affect the efficacy of Zenby, Mike warns that applying it in situations where sclerotinia is overwhelming and where an application has been really delayed could impact its level of control. "However, this is true for a lot of products, so be sure to apply with timeliness to achieve the best results."

**Keep the volume up**

**At the full dose rate Zenby should be applied with 300 l/ha of water, and at lower rates a decent water volume should still be maintained to ensure effective coverage.**

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*ADAS Bean Physiology Studies 2020-2022, N=3, winter and spring beans.

# Smith's SOAPBOX

WITH GUY SMITH

## United we stand

**As I write, there's chat on social media about arable farmers refusing to load out milling wheat in April as some sort of protest. I'm not sure if it's an April Fool, but nonetheless it does catch the attention and maybe that's the whole point.**

As a milling wheat grower it was easy for me to heed this strike call, not just because I was keen to show solidarity, but also because I'd already cleared the grain store before Christmas.

Usually I do have several loads to market after Easter, but this year I was keen to see the 2024 cereal harvest moved early in case a certain fungal sclerotium reared its nasty purple head and was spotted at intake, meaning my milling wheat would then eat up road-miles and haulage charges in search of a colour sorter.

Mercifully and somewhat miraculously, I've somehow survived the season with only one rejection. I'm not sure whether this was due to a divine hand guiding the sampling spear, or whether my paranoia had exaggerated the problem in my mind in the first place.

It reminded me of the old adage – 'the harder you look, the more you find'. Four months on, just to add to my smugness, I'm conscious that my determination to get the 2024 harvest sold and moved early had proven a piece of marketing brilliance, as I caught market highs and avoided the later market lows. However it should be noted here, that like a lot of my self-acclaimed brilliance, it was actually a strike of pure luck.

But maybe my marketing smugness should come under review. Maybe a so-called 'milling wheat strike' will send the market into orbit as millers and bakers do everything in their financial power to prise open grain store doors. After all, as we know it only takes a 20% reduction in global wheat production to double its price. It was only three years ago in 2022 that milling wheat prices nearly doubled on the back of bad weather and a nasty war in Eastern Europe.

Which brings me to an idea that's been doing the rounds for many years now in rural pubs in eastern England – that being, if farmers across the world could somehow limit wheat production then they'd have some control of the prices they receive.

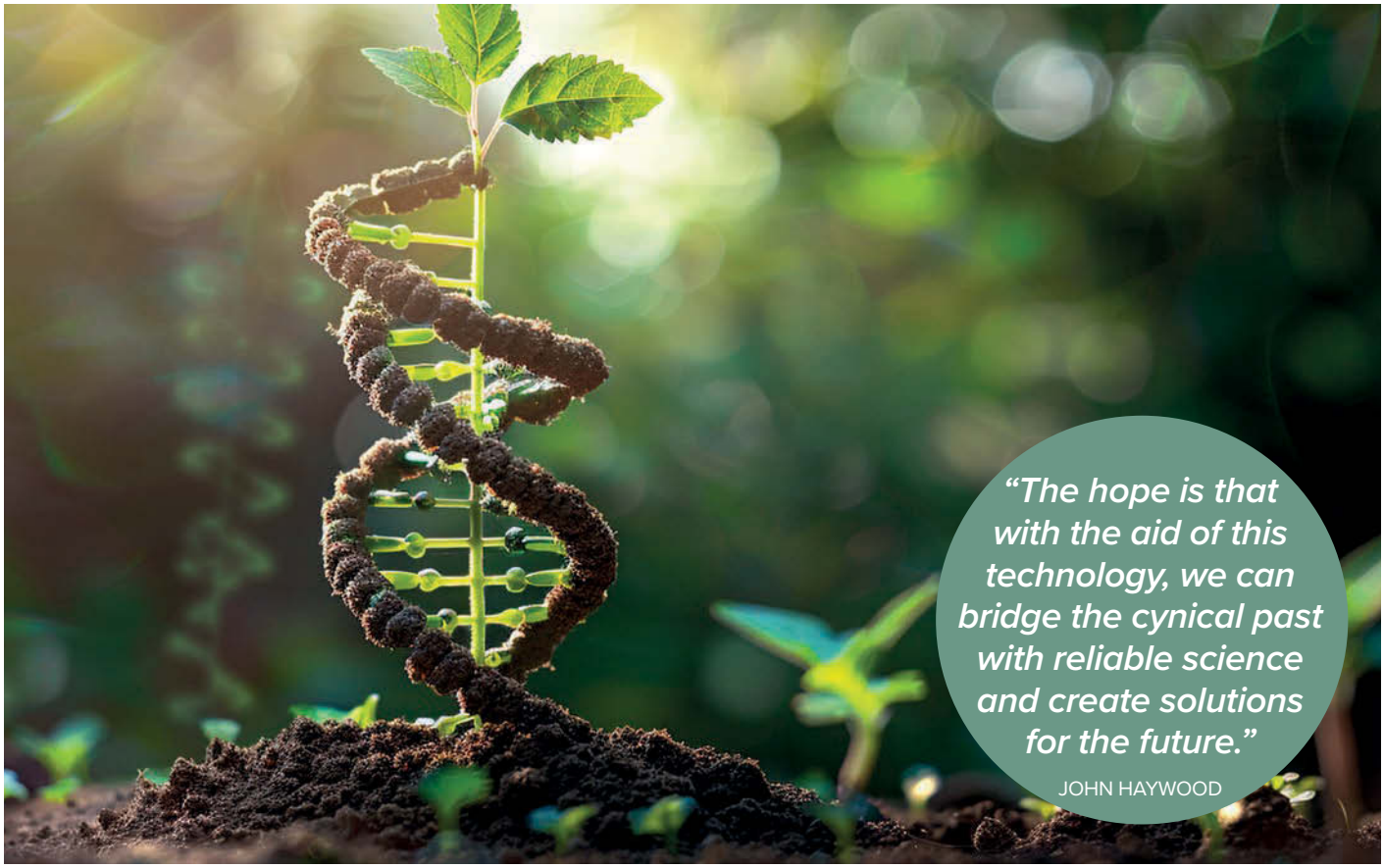
It's not unknown in other commodities such as oil, where the oil-exporting nations try to control the price of crude through OPEC. It's a nice idea that smacks of a pipe dream. This current attempt by farmers to limit supply could be an interesting exercise in market control, but it'll only bear fruit if enough farmers get involved – and there's the rub. ●

**The sight of a rather disgruntled looking barn owl sitting on top of one of our nesting boxes reminded me there's some spring cleaning to be done. We put eight of these pole boxes up more than 20 years ago and I'm pleased to say they've provided much required accommodation. At the current count, we've ringed well over 200 chicks since the millennium. However, it's time for a refresh as they're clearly in need of refurbishment if not replacement. Time to get the carpentry set out.**

### YOUR CORRESPONDENT

**Guy Smith grows 500ha of combinable crops on the north east Essex coast, namely St. Osyth Marsh – officially the driest spot in the British Isles. Despite spurious claims from others that their farms are actually drier, he points out that his farm is in the Guinness Book of Records, whereas others aren't. End of. @essexpeasant**

# Genomics: paving the way for biostimulant payback




## As technology continues to drive innovation in agriculture, *CPM* takes an in-depth look at how genomics could help growers to get more from alternative crop inputs like biostimulants.

*By Charlotte Cunningham*

**Those au fait with the livestock world will know that genomics have been used for some time to accelerate breeding programmes to focus on better productivity, sustainability and disease resistance, to name but a few advantages.**

Now, this technology is breaking barriers in the arable sector – and could be the key to accelerating both plant productivity and input efficiency, believe experts.

A recent webinar, hosted by Unium Bioscience in collaboration with the British On-Farm Innovation Network (BOFIN) explored how plant genomics are driving innovation – encompassing everything from advanced biostimulants to sustainable strategies for boosting crop resilience and productivity.

"Unlike genetic modification, or gene editing techniques known as CRISPR, genomics is a field of science that uses genomic information to study how genes affect plant health and biological processes," explained BOFIN founder, Tom Allen-Stevens. "It doesn't alter DNA but analyses genetic data to unlock insights."

### BIOSTIMULANTS

Among the areas where this unlocking of information is proving beneficial is the biostimulant world. With more than 25


**Understanding genomics**

**Genomics is a field of science that uses genomic information to study how genes affect plant health and biological processes, explains BOFIN founder, Tom Allen-Stevens.**

**Industry solutions**

**Unium's John Haywood says that by utilising genomic technology, the industry will have access to quicker solutions to the problems which are arising and changing all the time.**

years of experience under his belt, Unium Bioscience's John Haywood said it's been his ambition during that time to lose the 'snake oil' image of the biostimulant and biological industry.

"We've used peer reviewed science and lots of independent data to create reliable solutions, but there's always a cynicism that we face year-on-year which we have to overcome.

"Now, through partnerships with cutting-edge science, we can take this to the next level with genomic studies that link plant physiology, plant genetics, nutrition and the biostimulant/biological platforms to create solutions for farmers and growers."

As Tom alluded to, John stressed that exploring genomics isn't about changing genetics. "The best analogy for it, is that we're going to learn how to read the book without changing the text. GMO and CRISPR may change the text, and they look to change the words, but what we're wanting to do is read the book and read it at a more detailed level."

John explained that by doing this, the industry will have access to quicker solutions to the problems which are arising and changing all the time. "That gives us a more targeted, accurate approach to achieve our objectives, but importantly, solutions which are reliable and robust. And now through this technology being lower cost, affordability for farmers.

"It's a really interesting time because around 60-70% of crop production losses are attributed to abiotic stress – or environmental stresses. This is compared with biotic stress – diseases, weeds or pests – which cause about 15-20% of losses.

"The reason why this is interesting, is that only around 40% of farmers are using products like biologicals to mitigate these abiotic stresses. So the hope is that with the aid of this technology, we can bridge the cynical past with reliable science and create solutions for the future."

## GENETIC EXPRESSION

Someone majoring in this area is Layne Ellen Harris of US-based Foresight Agronomics. The firm is a research consultancy with the goal of demystifying the use of biologicals by looking at how these products can influence genetic expression in plants.

Speaking during the webinar, she said: "Whenever we look at how products are affecting the expression of genes in a plant, we're able to look under the surface. We're able to look in real-time at what a product does and how a plant is perceiving what the application of it does – gene expression is one of the ways that we do that."

Layne Ellen added that typically, when using biostimulants, farmers and agronomists stick to the equation of applying a certain product at the right time and getting

an expected result. “But there’s a huge question mark on how does that get there – essentially, how does this product applied at this rate to these crops, at this time, actually get us to these expected results? That’s really where gene expression comes in.”

Describing this in its most basic form, Layne Ellen said that the genetic material of a plant is stored in the nucleus of the cell. “This is where the DNA is, so whenever we say that a gene is expressed, what it’s doing is accessing regions of DNA and reading it like a code.

“This is called the central dogma of molecular biology, which is essentially how information is transferred in a cell from DNA to RNA and then to a protein; there are lots of nuances and regulatory systems that the cells use to maintain and protect this pathway.

“But essentially, whenever a gene is expressed, for example, a plant is getting stressed and it has to access some of its abilities to deal with that, it will go and find regions of that DNA which have genes that code for proteins, giving that plant special abilities to deal with the stressor.”

In situations of drought, this might mean aiding the plant to not lose water or protecting some of the enzymatic functions in the cells, explained Layne Ellen. “So that gene or sequence is located in the DNA, but the DNA is stuck in the nucleus of the cell. When this process occurs, what happens is – in an amazingly efficient and elegant way – the DNA unwinds and a copy of it is made.

“That copy is essentially a little mobile version of the gene which can leave the nucleus of the cell and go to where it has to go to be translated into the enzyme or protein that this gene is actually the code for.”

Layne Ellen highlighted that it’s now possible to measure how many copies of these genes are being expressed and exactly what by using sequencing and tests like PCR. “In any typical plant, there are thousands of genes ▶

## Expressing potential

**By looking at what genes are expressed – or not – as a result of applying biostimulants to crops, Layne Ellen Harris of Foresight Agronomics says growers and agronomists can narrow in on what exactly products are doing to the plant and how that plant perceives that.**

**In-field decision making**

**Helm Agro's Tim Eyrich says during the past five years in particular, being able to use genomic technology has meant biostimulants are working more consistently and growers are now able to take this genomic data and put it into in-field decision making.**

available in this library of DNA.

"What we can do through sequencing technology, and through understanding this central dogma of how genetic information is being accessed within the plant, is identify the mRNA, or messenger RNA. Then we can actually see what genes a plant is turning on, or turning down, in response to stress, to the developmental stage that it's in, or in response to biological products that we put on it."

Taking drought as an example again, Layne said there are certain triggers that happen when a plant experiences drought stress that activate lots of pathways in the plant. "These are both biochemical and genetic pathways. If we think about the result of this, of all these genes expressing, the plant now has the ability to resist some of the drought stress – to use its water more efficiently, or maybe continue to grow despite the stress.

"By identifying those genes, we can see if a product can elicit some of these same responses in a plant. As such, make it think that it's being stressed but actually cause it to be more resistant to future stress down the road.

"So the idea of this type of approach is to really narrow in on what exactly products are doing to the plant and how that plant perceives that. And, we can measure it by the types of genes the plant is turning on or turning down in response to individual products."

When this science is overlayed with some of the typical responses elicited with biologicals and biostimulants, farmers and agronomists can begin to be strategic with what they use and when, as well as incorporating other factors that fuel plant pathways, such as nutrition, she believes.

"Nutrients like calcium, phosphorus and potassium are involved here and they're important pieces of this signal transduction that the crop has to have enough of, in order to perform certain functions and have the best ability to fully express these mechanisms."

Building on this and turning focus to how it translates to the field, Helm Agro's Tim Eyrich has been looking at the relationship between biostimulants and nutrition for the past few decades. "During the past five years in particular, being able to use genomic technology has meant our biostimulants are working more consistently and we're now able to take this genomic data and put it into in-field decision making.

"Biostimulants and crop nutrition are dependently linked – we can't separate them. If you use a biostimulant, there will be a group of nutrition that has to be present in the plant to allow that biostimulant to work at its highest possibility," he said.

> ***"We now have a very good understanding of what we need to do to get those 95-100% returns on investment from biostimulants."***

"Understanding this nutritional biostimulant interconnection has been possible through genomic work and we now have a very good understanding of what we have to do to get those 95-100% returns on investment from biostimulants. We're not working in the dark anymore.

"Being able to understand what genes we're having a positive effect on and what they actually do, allows us to create phenotypic plasticity where we cultivate the most optimised genetic plant for the environment that we're growing in that given year and handle stress much better."

Tim explained phenotypic plasticity as the ability of a plant to change to stimuli or inputs from its environment. Being able to manipulate this is particularly beneficial when trying to mitigate stress in plants, which can occur in many forms, he commented.

"The first thing we can look at is application timing and durability of the biostimulant to optimise its effect – information which is available through genomic investigation."

Tim said this is likely to vary significantly depending on the purpose of the product. For example, something that increases nutrient uptake will behave differently to a product designed to improve nitrogen use efficiency.

Secondly, Tim added that it's important to pair biostimulants up with their dependent nutrients, and work has shown that sulphate is particularly influential – although again, this will be product dependent. "We always used to think potassium was the most important water-stress nutrient, but new knowledge tells us that sulphate is now perhaps more important."

He concluded: "Having genomics knowledge provides clear vision and insights into phenotypic plasticity that's provided by a nutrient and/or biostimulant. Through this technology, we can better understand the correct time to apply the product and be accurate with the duration it's likely to last for and when we may need multiple applications.

"As such, this can lead to a high return on investment and success rate with every single biostimulant you apply." ●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# Overcoming biological barriers


## Efficacy, usability and regulatory constraints may have hindered more widespread adoption of biological products. *CPM* looks at how these barriers could be overcome, including innovative approaches to formulation.

*By Janine Adamson and Rob Jones*

**Farmers are often told that biological products are the future, yet they remain little more than a niche part of the crop input world in the UK and Europe, according to data.**

Analysis by global market research company DunhamTrimmer suggests biologicals make up just 0.5% of the crop input market value in the UK. France leads the way in Europe at just under 8%, with most other countries below 2% at best.

Those figures, to some extent, may mask the fact the market is growing in both the UK and Europe, fuelled by consumer demand for lower pesticide use.

At the same time, government regulation for the approval and re-approval of pesticides is becoming ever more challenging, with supermarkets responding to consumer concerns with their own standards and protocols. These can demand more draconian reductions in residue levels than regulatory standards, which with biocontrol products often exempt from such, has driven adoption, particularly in the fresh produce sector.

But there remain barriers for the biological sector to overcome before products are truly mainstream, particularly in broadacre crops, acknowledges Dr Belinda Clarke, director of Agri-TechE. She says the organisation's membership is growing increasingly interested in biologicals, particularly given the regulatory pressure bearing down on some existing synthetic chemistry solutions.

"But a new solution should strive to be better, easier, cheaper or more reliable than the existing one," adds Belinda.

Unfortunately, biologicals have often struggled to fulfil even one of those criteria, let alone all four, which has led to farmer and agronomist confidence being dented, she believes.

A key part of repairing confidence will come through transparency around how these products work. "We're now seeing more rigour and robustness around trials to understand how, where and when to use biologicals, aided by more forensic analysis and understanding of modes of action.

"The whole point of a biological product is you understand the environment in which you're applying it."

The downside is that it could mean trials are, by necessity, more expensive and complicated. "But as has been shown in protected crops, it's not

**Artificial intelligence**
**AI is very good at modelling the behaviour of biological systems and organisms within it, says Agri-TechE's Dr Belinda Clarke.** *Photo: Agri-TechE*

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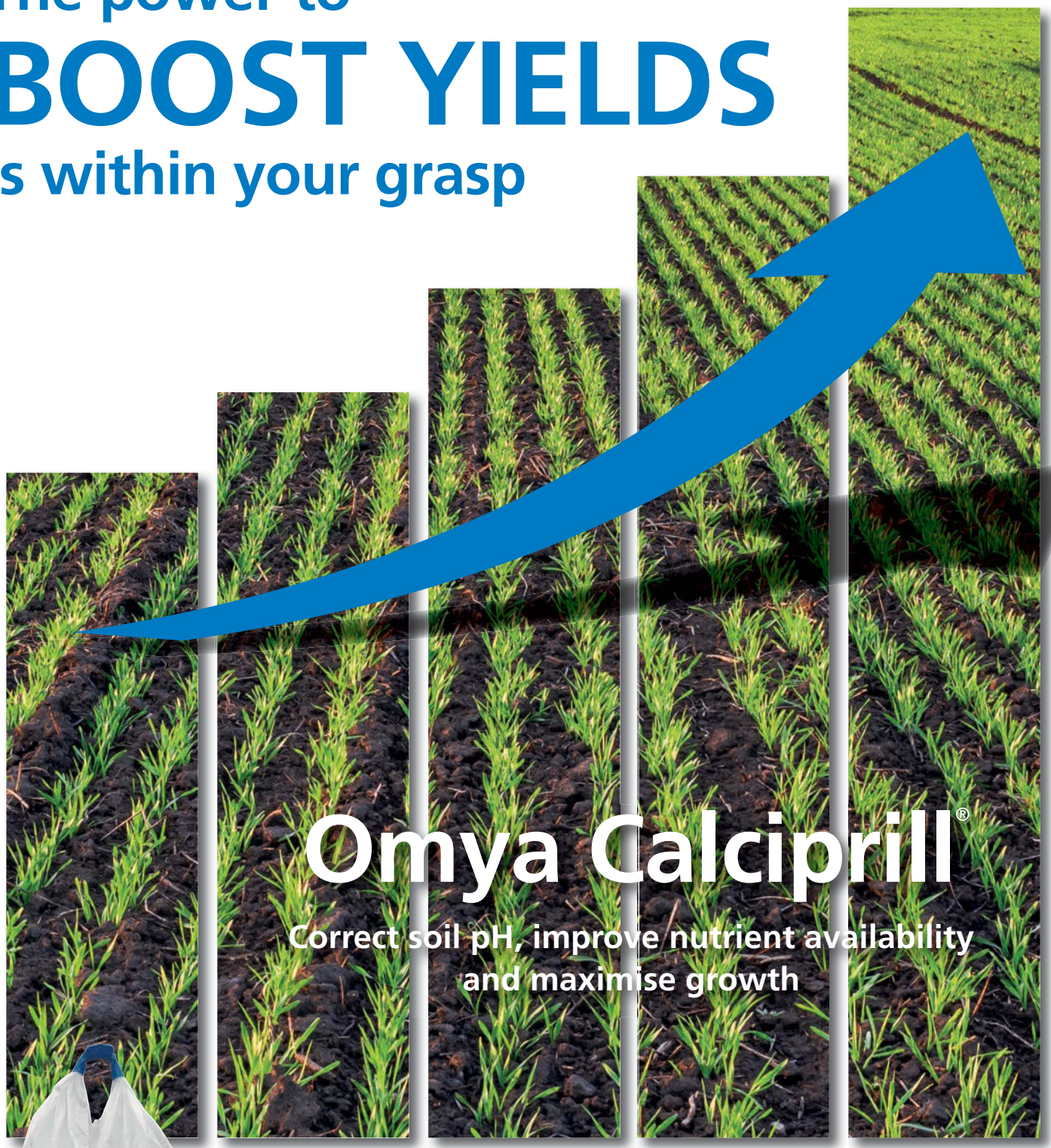

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THINKING OF TOMORROW

**Current knowledge**

**There isn't necessarily the in-depth understanding of how biologicals actually work, states Agrii's Jodie Littleford.**

impossible to manufacture products that fulfil those criteria," she suggests.

Artificial intelligence tools could improve analysis, too. "AI is very good at modelling the behaviour of biological systems and organisms within it, and these models can take into account other parameters that we don't think about to help predict outcomes," comments Belinda.

Giving more exact recommendations about what problem a product solves and how it should be used could help to increase farmer confidence. This is rather than promising a biological will solve a wide range of problems or help with an abstract issue, believes Bayer's Richard Phillips.

He says it's about finding the best position for them and proving they work in that scenario. In fact, this has led to more research by Bayer to test products in set conditions, such as lack of water, low nitrogen or heat stress, says Richard.

"It's also about managing expectations – as an industry we've been guilty of over promising efficacy."

Some biological products can match the performance of conventional crop protection, believes Agrii technical manager, Don Pendergrast. "We're seeing ones that pass the bar when used as part of a programme, and they've become more refined, focusing on delivering specific quality traits or crop management."

Like Bayer, Agrii believes it's important that understanding of how and where to use biological products improves and becomes more focused, adds the firm's Jodie Littleford. "There isn't necessarily the in-depth understanding of how they actually work, which is part of the reason we've made a significant investment in new glasshouse facilities at Throws Farm in Essex to help us to do that research."

One example is a sugar beet product that in the past has been used at four or five different timings, but Agrii has now identified that its strength is developing root systems, explains Don. "That's led to us applying it at either pre-emergence or early post-em, which helps the plant to progress through the early stress of beet herbicide applications."

## EFFICACY CLAIMS

For biostimulants and biofertilisers, until relatively recently, a lack of regulation has played a role in allowing manufacturers and suppliers to launch this type of biological product without having to prove efficacy.

"The EU has just brought in overarching regulations for biostimulants where you have to undertake basic testing to show efficacy, although it's not to the same level as for crop protection. In the UK there's still very limited regulation though," says Richard.

In contrast, biopesticides follow many of the same rules and timelines as synthetic crop protection. The costs are slightly less because there are certain data you don't have to provide such as residues, but in this case, there's probably over-regulation that slows down innovation in the sector, notes Richard.

"We're yet to reach that perfect ground where one type is regulated enough, and the other is regulated correctly."

Another major challenge to be overcome for biological products to be used more widely is around scaling production, formulation, and the ease of use.

That's where a company many farmers may not have heard of brings its expertise. The Centre for Process Innovation (CPI) is a technology innovation centre and a founding member of the UK government's High Value Manufacturing Catapult.

Its aim is to ensure innovations have the best opportunity to be successfully marketed and works in areas as diverse as energy, health technology, pharmaceuticals and agrifood technology. "We have multiple sites for different technology teams," explains Dr Joanne Neary, fermentation manager for CPI's biotechnology centre, based on an old ICI site near Redcar.

"In biotech, we make raw materials for our clients – not commercially – but by designing processes from which either data or the material can be used to further their journey towards commercialisation."

Facilities from lab-scale to pilot and demonstration plants up to 10,000 litre scale are used to help build a production process that's scalable, she explains. "Our clients can be anything from start-ups, established small and medium-sized enterprises, to global corporations. The start-ups tend to come with a live bacterial product, a nitrogen-fixing bacteria or biostimulant for example, that so far, they've only grown in a shake flask.

"We work with them to put that process in a fermenter – an industrially relevant environment to work up a production process."

A second centre concentrates on formulation. "If you're making a biological product with live microbes, formulation is everything," says Joanne. "Often our agri-tech clients want to understand the formulation first because they know how to do fermentation, how to make microbes."

Liquid formulations are simpler to make, with sterility the main focus, explains Rosalind Hay, head of biomanufacturing at CPI. "The most important factor, if you're making a product that's a live microbe, is making sure no other microbes are introduced that spoil it."

But there are other significant disadvantages with liquid formulations, including having to keep them cold, and more expensive transport because of much greater bulk quantities than a solid formulation.

"So we work with customers to move away from that type of product, usually to a dried product. It's a complicated area

**Formulation finesse**

**The Centre for Process Innovation's Joanne Neary believes when making a biological product with live microbes, formulation is everything.**

**Conflicting approaches**

**According to Cambridge Consultants' Niall Mottram, the moment a live biological organism is forced through a system designed for chemistry, it doesn't work out so well.**

that we're still learning about along with our customers."

Drying techniques such as freeze, spray, or fluidised bed drying can increase shelf life and reduce volumes from litres of liquid product to single figure grammes, with the associated savings in packaging and transport costs, she highlights.

But the process also comes with major risks for viability, acknowledges Joanne. "You can't just put naked microbes into a freeze dryer and expect them to live through the process – you can lose around 99% of viability."

That's where CPI expertise in formulation comes to the fore, with the team using various excipients (non-active ingredients) to help retain greater viability, with 60-80% possible with gram-positive bacterial strains such as bacilli, she explains.

Gram-negative bacterial strains, such as Pseudomonas species, have weaker cell structures, making thermal stability even more challenging. "But these drying techniques are scalable and are most likely to be the immediate future for microbial products," says Joanne.

## MICROENCAP-SULATION

Further down the line, microencapsulation could be the formulation of choice. Used in the food industry for probiotics where it protects the bacteria from stomach acids, it's now being applied in agriculture, she adds.

"It's a tried and tested method for protecting cell viability. One potential use could be to make a product with both chemicals and microbes separated by the encapsulating polymer."

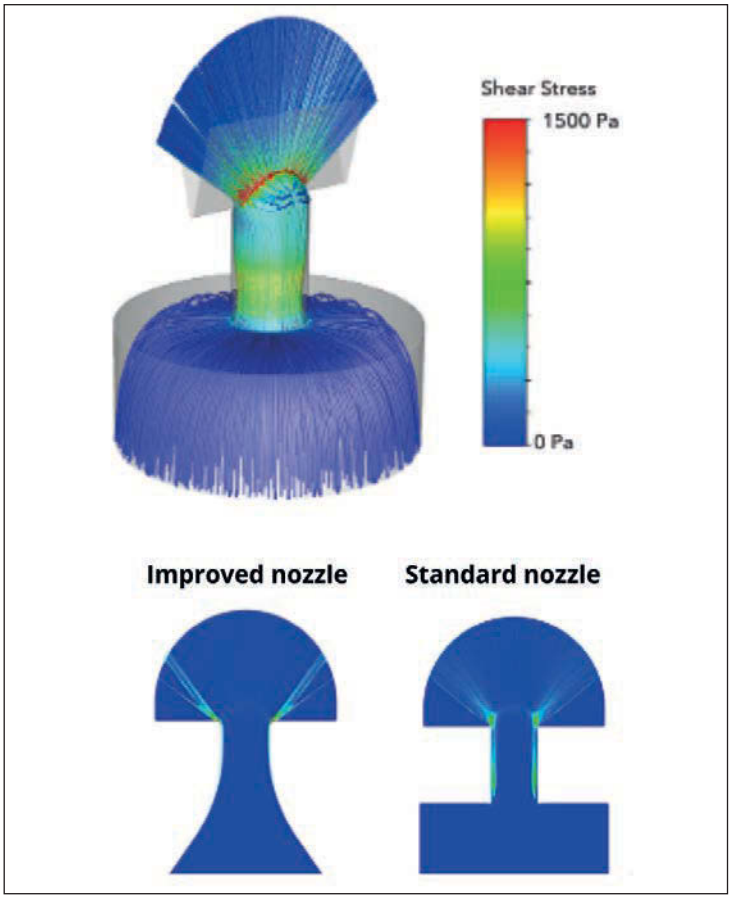
This could be used to create layers of functionality on a seed, for example. Another possibility with microencapsulation is to mix single encapsulated particles with different functions to create a bespoke mix, explains Joanne.

"A mix could have X% of micro particles to help with nitrogen fixation, and Y% to ward off a fungal disease, and could be tailored for different situations on farm."

Once on farm, there's still the question of how to apply them for maximum efficacy in an agricultural system designed to apply synthetic chemistry. This is because the moment you try to force a live biological organism through a system designed for chemistry, it doesn't work out so well, suggests Niall Mottram, head of agri-tech with Cambridge Consultants.

Academic research suggests only 10-20% of microbes survive when sprayed through industry-standard nozzles at high pressures. This led to research by Cambridge Consultants into how to redesign nozzles to make them compatible with biology as well as chemistry, says Niall.

Having analysed shear forces within four off-the-shelf options, which would turn microbes into 'mush', Niall made subtle changes to the geometry at the tip of the nozzle without compromising ▶




**New nozzle design**

**Cambridge Consultants has been undertaking work to design biocompatible nozzles.**

spray performance.

"You go from a nozzle with quite a lot of sharp edges to something that's gentler and more curved which removes the pinch points of shear, and improves survivability by up to 75%." Increased survival should equate to better efficacy and / or allow the use of lower rates, reducing cost, he points out.

Both efficacy and cost were barriers to increased adoption Cambridge Consultants found while investigating the issue for an Agri-TechE report last year. Making an improved economic case for applying biologicals would also speed up adoption, he suggests.

According to Niall, the selective nature of biological products often necessitates multiple doses compared with conventional non-selective chemistry, adding to the cost of products that are usually at a premium to standard options.

"If we can find a way to make the commercials more attractive, for example, through formulation improvements, nozzles that allow reduced rates, or multiple products applied in one pass, then the economics should become more attractive."

Changes to legislation which allow greater concentrations of biological products – or indeed conventional chemistry – to be applied using precision application techniques and spot spraying, could also unlock adoption. "Legislation is holding this back – it hasn't kept pace with technology innovation – but if you're applying biologicals in very specific areas rather than across an entire field, you again improve the economics," concludes Niall.

Joanne Neary from CPI will discuss how on-farm biological manufacture could be a future farm diversification opportunity in a webinar on 24 April hosted by Agri-TechE. To register to attend or find out more, visit www.agri-tech-e.co.uk

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# A sustainable solution for soils, crops, and climate?

*"What's uplifting about this idea is that it offers hope for the efficacy of geo-engineering more generally."*

PROFESSOR DAVID BEERLING

## As growers grapple for climate-smart solutions to improve efficiencies and meet the ever-growing net zero targets, could the unlocked potential in volcanic rock be the answer? *CPM* finds out more.

*By Charlotte Cunningham*

**In the rolling fields of British agriculture, a quiet revolution is taking place – one that could fundamentally transform how the industry approaches soil health, crop productivity, and climate change mitigation. According to the experts, this future of farming may well be written in stone – volcanic stone, to be precise...**

This is because at the heart of this agricultural alchemy lies an unexpected hero: crushed basalt, a volcanic rock with the potential to rewrite the narrative of sustainable farming.

A recent webinar hosted by the Royal Agricultural Society of England (RASE) explored this topic in more detail, giving an in-depth insight into advanced rock weathering and why crushed basalt could be a sustainable source for soil acidity, crop yields and climate.

While the concept of enhanced rock weathering might sound like complex scientific jargon, its fundamental principle is simple, explained Arran Redmond, soil scientist and soil natural resources advisor at Innovation for Agriculture. "Rock weathering is a natural process where minerals break down over time due to exposure to rain and biological activity. When silica and carbonate rocks, like basalt, interact with $CO_2$, they undergo a chemical reaction which transforms $CO_2$ into bicarbonates and carbonates."

Looking at this in more detail, and relaying this in practical terms, the process of enhanced weathering involves applying crushed volcanic rock, primarily basalt, to agricultural land. As the rock breaks down, it captures carbon dioxide from the atmosphere, converts it into bicarbonates, ▶

**Understanding potential**

**Professor David Beerling of the Leverhulme Centre for Climate Change said the centre is aiming to focus on understanding the potential for enhanced weathering to mitigate climate change in agriculture.**


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and ultimately sequesters carbon while simultaneously improving soil conditions.

Arran said this phenomenon has been picked up by both agricultural and wider industries globally and could offer a way of helping UK farmers mitigate against climate change and meet national carbon budgets.

Leading this agricultural innovation are researchers including Professor David Beerling, founder of the Leverhulme Centre for Climate Change Mitigation at the University of Sheffield. The mission of this centre has been a focus on trying to understand the potential for enhanced weathering to be a climate change mitigation option that works with agriculture, he explained.

## IN-FIELD TRIALS

"Our centre is split across four different areas where we do large-scale field trials, trying to understand the performance of this sort of technology in the field. This is as well as earth systems modelling, where we simulate the breakdown of the minerals in soils all the way from individual grains to the entire globe.

"We also do social science work, where we engage in local communities and different publics in different countries, trying to understand its acceptability. The fourth area is focused on sustainability, looking at what the potential for increasing resource provision to deliver this through changing our supply chains is."

David said that utilising carbon dioxide removal technologies – like enhanced weathering – is going to be vital to meet both net zero targets and the terms of the Paris Agreement which the UK is committed to. "The challenge is that we don't fully understand whether it'll work or not yet, so we urgently require long-term in-depth research programmes to figure everything out, but there's certainly opportunity."

While more work may be required, David has been leading a lot of the research into these systems as part of a 10-year £10M project at the Leverhulme Centre. Reflecting on what's been established so

**pH benefits in Hertfordshire**

**Trials looking into the benefits of applying crushed basalt at Rothamsted's Harpenden site have found benefits to pH, increasing it from 6 to 6.5. Unlike traditional liming, the basalt application appeared to provide a more gradual and potentially longer-lasting pH modification.**

far, he said: “There are three main things to consider with enhanced weathering. The first one is it uses natural reactions between volcanic rocks and plants, and these are the reactions that have been stabilising climate over geological timescales. They’re natural reactions. It’s not like direct air capture, for example.

“We also think it could be deployable at scale within a decade or two,” he continued. “This is because humanity has known for a long time how to do quarrying, and has long applied rocks to the landscape, particularly limestone, for pH management. The third thing is that you can co-deploy it with other proposed land-based carbon dioxide removal strategies. So for example, if you were doing reforestation schemes, you could combine basalt with tree planting.

“While it may sound like jargon to say it’s stackable with other CO2 technologies, there are some real benefits. As well as the carbon dioxide removal, there’s great potential to improve food security by increasing yields and improving soil health. It’s a win-win. What’s uplifting about this idea is that it offers hope for the efficacy of geo-engineering more generally.”

Delving into the benefits to soils and crops, at the core of enhanced weathering’s potential is its profound impact on soil chemistry. Traditional agricultural practices have long struggled with soil acidification, primarily caused by repeated nitrogen fertiliser applications. However, basalt application offers a nuanced solution to reverse this, gradually raising soil pH and creating an optimal growing environment, explained David.

It can also reverse the silica stripping of soils, he added. “Many of our food crops are silica-depleted by growing them repeatedly on the same soils and taking the biomass off-site. This leads to the slow stripping of biologically available silica from those soils. By putting a silicate rock on, you’re replenishing those pools.”

Relatedly, by taking biomass off-site, it also strips those soils of essential micronutrients like molybdenum, phosphorus and potassium, noted David. “Again, as the basalt weathers, it can release these nutrients and replenish those stocks; it’s about creating a more holistic nutritional environment. These trace elements support plant metabolism, potentially improving crop resistance to environmental stresses.” ▶

### UK research

**In the UK, Professor Steve McGrath from Rothamsted Research has been leading work into enhanced rock weathering via a project funded by the Greenhouse Gas Removal Programme.**

## CATION EXCHANGE

The final key benefit is the improvement to overall soil health by boosting cation exchange, for example, nutrient holding capacity. "This can stimulate root growth and that in turn produces greater inputs of organic carbon."

In field-scale trials set up in the US Corn Belt to explore how this concept works in different climates and cropping, David said the results have shown some compelling results – particularly for carbon sequestration.

"In the Corn Belt, the typical rotation is maize, maize, soyabean, with two reasons for that. One is cultivating maize requires a lot of nitrogen fertiliser, so after the second year of doing that, growing a nitrogen-fixer like soyabean gives the soil a chance to recover. But also, there's a problematic root pest in maize, and by having the third cycle of soyabean it gives time to break up the life cycle of that root pest."

The trial design comprised four blocks, each one just under 4ha, with 5kg/m2 of basalt applied to two of these blocks every year since 2017. The results showed the capacity to remove approximately 5t/$CO_2$/ha annually, with cumulative removal reaching 20t over four years – something which David said represents a significant breakthrough in natural carbon capture methods.

What's more, further trials on the Corn Belt showed illustrated yield increases of between 8-16% – likely to be a result of all of the secondary benefits, such as pH and improved soil health brought by this approach. "We've also observed a significant reduction in emissions of nitrous oxide which has a much stronger greenhouse gas effect than $CO_2$ during this time; it's a big deal for farmers in the US and the UK in terms of trying to decarbonise agriculture. Although this has varied from year to year, mainly due to variations in climate, it's a very consistent effect, probably linked to that rise in pH."

In the UK, Professor Steve McGrath from Rothamsted Research has been leading similar work via a project funded by the Greenhouse Gas Removal Programme. Enhanced rock weathering is a significant part of this and is being examined at three sites across the UK: an arable site at Harpenden Hertfordshire, a lowland grassland site at the Rothamsted North Wyke platform in Devon, and an upland grazing site in Plynlimon, Wales.

Looking specifically at the arable site in Hertfordshire, Steve said the past three years have provided some interesting results. The research team established six demonstration plots measuring 24 x 24m within a large 3ha flat field, implementing a crop rotation including winter beans, winter barley, and winter oilseed rape. Using specialised machinery, they applied basalt to plots, distributing the rock material evenly and incorporating it into the soil before planting.

In terms of the analysis side of the study, researchers employed an extensive monitoring strategy, tracking multiple agricultural and environmental parameters including crop yields, soil physical and chemical properties, soil pore water composition, greenhouse gas emissions, biodiversity indicators and microbial ecosystem changes.

Looking now at the results to-date, the most significant observable change was a soil pH increase from 6 to 6.5. Unlike traditional liming, the basalt application appeared to provide a more gradual and potentially longer-lasting pH modification, explained Steve. The researchers also noted subtle increases in nutrients like copper and molybdenum within crop tissues.

Yield-wise, while there were no significant increases, the study found no negative impacts on crop yields either. The basalt application maintained agricultural productivity while introducing potential long-term soil health benefits.

## BIODIVERSITY BOOST

There were benefits to biodiversity too, with preliminary observations showing a slight increase in earthworm populations, suggesting no detrimental impact on soil fauna. The research team also conducted molecular-level assessments of microbial diversity, recognising the complexity of soil ecosystem interactions.

Perhaps most important, were the greenhouse gas implications. "We found no increase in $CO_2$ emission, which is a good thing, but we didn't find any significant difference in nitrous oxide and the methane in this case either," said Steve, noting the potential environmental neutrality of the approach.

## Facts on basalt

**Crushed basalt is a type of volcanic rock that's been ground into small particles or aggregates. Basalt is rich in essential minerals such as calcium, magnesium, and iron, making it a valuable resource for agricultural use.**

**When the rock is crushed into fine particles, it acts as a natural soil amendment that can improve soil health and fertility. Unlike synthetic fertilisers, crushed basalt provides a slow-release of nutrients, which are gradually absorbed by plants, promoting long-term soil enrichment.**

**The minerals within the crushed basalt can also help to improve plant growth and support the overall biodiversity of the soil.**

There were increases though in potassium, sulphur, calcium, and magnesium levels in soil and interestingly, there was a slight increase in total carbon in deeper soil layers.

While the Rothamsted study represents just one piece of the enhanced weathering puzzle, it provides crucial empirical evidence of the potential benefits and considerations for implementing this approach in UK agricultural systems, he adds. "We're busy working on final data, with more papers to come out in the near future, but what we can say so far is that using basalt in arable settings provides a strong signal of weathering and also carbon dioxide fixation in soils – while showing no negative impact on yields.

"There's more to come, but so far it's looking like crushed basalt could emerge as a critical tool in sustainable agriculture."

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# Farming for tomorrow: why productivity matters


## In the first of a new series, *CPM* explores with experts the importance of achieving and maintaining productivity in arable businesses.

*By Charlotte Cunningham*

**Productivity is among the many buzzwords regularly thrown about when discussing modern-day agriculture. But when you strip it back and delve into the semantics of the word, it offers an important reminder to growers who find themselves in a challenging era for crop production.**

Put simply, productivity is the state of being productive. The dictionary describes this as the effectiveness of productive effort, especially in industry, as measured in terms of the rate of output per unit of input.

This mention of comparison between output and input is vitally important when it comes to evaluating the overall productivity and efficiency of businesses – and there are a great number of factors that can impact this, explains James Webster-Rusk, senior agribusiness analyst at The Andersons Centre.

"It's a fairly challenging outlook at the moment," says James. "We've come out of a particularly difficult year in 2024 in terms of the weather impacts that we saw, and as we move further into 2025, things have been fairly sluggish.

"The price of wheat in particular has been reasonably suppressed and lacking any inspiration. But equally, costs have continued to rise and we're seeing that from all different sources."

When considering costs, James says

**Eyes on productivity**
**With numerous factors stacked against growers at the moment, James Webster-Rusk, senior agribusiness analyst at The Andersons Centre, suggests the focus should remain on being as productive as possible.**

it's fixed ones which have a particular influence on businesses. "Once fixed costs are built in, they're very, very difficult to remove. It's a ratchet effect – where they click up and it's very challenging to reduce them again."

James says this is being exacerbated by the continued hike in pay, with minimum wage rising again this month (April). "This will increase costs by another 6.7%, plus the the National Insurance contributions that are going to come in at the same time which will bring more change for some businesses."

Adding to this is additional pressure from falling BPS rates, he explains. "We've gone from what we expected to see in terms of the decline in BPS, down to a maximum of £7200 for all farms. That's a significant hit on cashflow, particularly during the coming year, but also on overall profitability.

"This will be a real driver of change. We use model farms at Andersons to try and contextualise, and based on this, that's a change of about an expected £55/ha for this year down to around £12/ha for a 600/ha farm."

With all of these factors stacked against growers, James suggests the focus should remain on being as productive as possible. "This isn't necessarily a straight drive for yield at all costs – it's maximising output while keeping your inputs at a sensible level.

"In other words, it's not about throwing everything at the crop to maximise output and becoming unprofitable; it's about having a real focus on the efficiency of the inputs you're using."

Putting this into numbers, at current prices and using a 'back of an envelope' calculation, James says, crudely, a 10% increase in feed wheat yield, a 10% reduction in N applied and a 10% reduction in fungicide spend, with all other things being equal, would lead to a 16% rise in gross margin.

According to Ceres Rural's Louise Penn, as well as careful selection and usage of the physical inputs, a focus on the long-term sustainability of rotations can help to drive and optimise this efficiency and productivity.

"During recent years I think we've seen a realisation that soils have historically been quite neglected. Previously, many farmers were implementing shorter rotations and yields have stagnated as a result – particularly during the past decade."

Louise adds that part of the reason for this has been a focus on the 'green stuff' rather than soil. "But it's the soil which is going to help growers to make the most gains in the future."

**Delving into diversity**

**Thinking about long-term productivity, Ceres Rural's Louise Penn says something that will really benefit the soil is having diversity in rotations.**

Thinking about long-term productivity, something that should really benefit the soil is having diversity in rotations, says Louise. "The more diversity of crops you have, the more diversity of rooting you have and the more diverse microbial populations are going to be within your soil. Therefore, improving soil health and quality in the long-term will actually increase the productivity of those crops too."

## LONGER-TERM APPROACH

Louise highlights that it's important to take a longer-term view, as improvements will be based on marginal gains rather than huge changes. "However, if you can have a slight increase in yield, or healthier crops from healthier soil which require a little less input, then actually, that's going to give you the longer-term productivity and resilience which growers are grappling for at the moment."

Considering the specifics of rotational components, Louise advises ensuring the cropping approach is wider than just cereals. "We're seeing a lot of different options like maize, rye and pulses at the moment and incorporating these can go a long way to support that long-term sustainability – if grown and harvested in good conditions.

"Wheat remains king when you're comparing gross margins – it does generally give the best returns. But actually, there are a number of steps to take to ensure you're growing a good wheat crop and a lot of that comes down to what else is in the rotation.

"For example, if you can grow a good pulse crop, it's a favourable entry into winter wheat. There are other benefits too such as nitrogen fixation and the corresponding impact on the farm's carbon footprint, all of which add to both productivity and sustainability outlooks."

Taking into account all of the above challenges, as well as the potential solutions and opportunities to improve both the productivity and sustainability of arable rotations, KWS has launched a new initiative – Productivity$^2$. The firm says this should help growers to better understand the critical importance of production, yield and gross margin, while providing the tools to implement it at a farm level.

Productivity$^2$ builds on KWS' previous campaign, Sowing For Peak Performance, explains Kate Cobbold. "Sowing for Peak Performance underlined our commitment to help all growers get the very best from their crop genetics in the face of challenges such as climate change, reduced availability of agrochemistry and the desire to reduce the carbon footprint of production.

"But we've never downplayed the role of outright productivity, and with the rising costs involved in crop production, a new emphasis on the importance of food security and the ongoing pursuit of business sustainability, yield is still very much king."

KWS' commitment to driving productivity forward through its genetics was highlighted in the company's performance in the new 2025/26 RL.

"Significant successes for our new wheat varieties include additions to all of the four quality wheat groups with the new Group 1 KWS Vibe being the highest outright protein yielder and KWS Arnie, KWS Equipe and ▶

KWS Newbie taking the top three placings in Group 2," explains Kate.

"Turning to Group 3, new additions KWS Solitaire, the top Group 3 variety on the new RL with a yield 107% of controls and KWS Flute, another high yielding all-rounder, have the potential to serve all market opportunities be they distilling, export, feed or biscuits.

"In Group 4, where KWS Dawsum's reliability and all-round strength have made it the UK's most popular wheat by area grown in recent years, KWS Scope tops the Group and is the new RL overall with a yield of 108% of control for the UK as a whole.

"Then in barley, KWS' first hybrid variety Inys also takes the top slot for highest winter barley yield overall, together with a new two-row addition KWS Valencis becoming the highest yielding conventional variety on the list."

This focus on productivity extends beyond cereals, and according to KWS UK maize product manager Andrew Cook, average dry matter yields of early maturing KWS maize varieties have improved by 25.8% in between 2005 and 2023.

"In 2005, the average dry matter yield of our varieties with an FAO maturity rating of less than 170 was 15.9t/ha. But by 2023 that had risen to 20t/ha, with starch yields rising by 38.8% from 5.23t/ha to 7.26t/ha.

"This has occurred at the same time as new varieties being introduced with FAOs as low as 150, meaning maize can now be grown in a far wider range of locations with less heat units than ever before.

**Enhanced maize genetics**

**Average dry matter yields of early maturing KWS maize varieties have improved by 25.8% in between 2005 and 2023.**

"Depending on the trait, genetic gains in maize have been in the region of 1.3-2% a year and this is a trend we see continuing into the future."

Andrew believes such gains are exemplified by the latest varieties from the KWS stable, such as early variety KWS Reo (FAO 170) and KWS Portabello (FAO160/70).

"Then there's the later maturing KWS Zimo (FAO 190) which delivers high dry matter yields as a maincrop and is suitable for both ruminant feeding and AD use. Again, its excellent early vigour provides rapid establishment and promotes a longer growing window.

"Whereas Agrolino (FAO 200) is another great example of maize productivity in action, with its suitability for favourable sites enabling it to deliver heavy yields for both forage and biogas segments, where a long growing season is available."

It's the same situation in sugar beet, notes sugar beet product manager, Martin Brown, with KWS breeders delivering a range of varieties combining outright yield, high sugar content and strong functionality. "Katajana KWS, for example, is the highest yielding beet cyst nematode tolerant variety available to UK growers while Chyma KWS provides a new level of tolerance to cercospora through our CR+ trait. It's the only variety with this in the UK at the moment.

"Cercospora leaf spot (CLS) is one of the most destructive leaf diseases in sugar beet and can reduce crop yields by 50%. With CR+, the spots appear later and disease progression is slowed down considerably, so it's a highly valuable trait for growers.

"Often with beet varieties the introduction of new traits means these 'novel varieties' aren't on par with the elites and have a significant yield lag, however Chyma bucks this trend."

Smart Uma KWS – a Conviso Smart variety – is another example of how genetics and technology can work together to deliver higher productivity in sugar beet production, adds Martin. "It's a sound choice for growers with its Conviso technology not only helping with weed control, but also with workloads across the rotation.

"Developed by KWS and Bayer, the system reduces herbicide applications through the development of specific varieties, like Smart Uma KWS, which are resistant to the Conviso One herbicide.

"With only one application required for highly effective control of a broad spectrum of weeds in sugar beet, it simplifies herbicide choice while also freeing up time for spray operators across all crops, helping to apply chemistry at the time it's most effective."

**Committing to the future**

**KWS' Kate Cobbold says the firm's new Productivity$^2$ initiative is evidence of their commitment to identifying and developing the genetic components of yield required to fast-track the super-varieties in demand to build a sustainable, secure and resilient food supply chain.**

Kate concludes: "These varieties are first in a pipeline of what's been achieved so far. Productivity$^2$ is evidence of our commitment to identifying and developing the genetic components of yield required to fast-track the super-varieties in demand to build a sustainable, secure and resilient food supply chain."

## Productivity Matters

In this new series, Productivity Matters, *CPM* has teamed up with KWS to examine the breadth and depth of how optimum productivity can be achieved within arable rotations.

# Breeding resilience to CSFB


**With growers pinning hopes on plant breeders finding a solution to control cabbage stem flea beetle, could the answer lie in stacking characteristics which create an overall resilience to the pest? *CPM* investigates the latest oilseed rape R&D.**

*By Janine Adamson*

**The headlines surrounding oilseed rape this season don't make for the most positive of reading. For one, the UK is facing its smallest crop since 1983, meaning a lofty rapeseed import figure of 1.3M tonnes.**

Although this notable decline in home production can't be attributed to one single reason, a significant contributory factor is undoubtedly pest pressure during establishment, namely cabbage stem flea beetle and slugs. Simply put, in many cases, OSR has become a high risk crop.

With a rapidly depleting chemical armoury – including CSFB's increasing resistance to pyrethroid insecticides – plus a drive towards more sustainable, cultural control methods, can the industry secure a viable future for OSR in the UK?

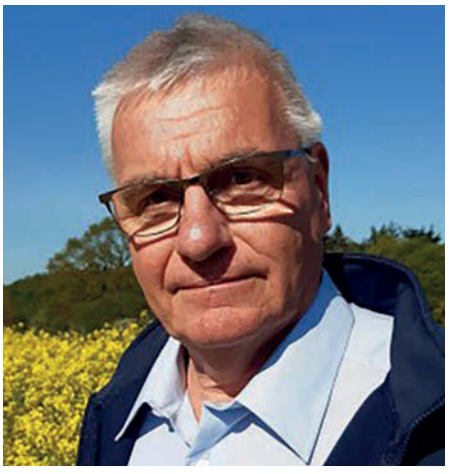
Niab's break crop specialist, Colin Peters, believes the crop still has potential providing scientists can further understand the lifecycle of CSFB and therefore unlock the benefits of integrated pest management.

## TRIGGER POINTS

He says it's currently believed that the pest's development is as follows: adults migrate to young OSR crops and feed on foliage in the early autumn; eggs are laid in the soil with larvae hatching and feeding on the plants including the main stem behind the growing point, up until spring if temperatures permit; larvae drop into the soil and pupate in late spring; a next generation of adults then hatch and feed on the crop's stems and pods during the summer; adults aestivate in sheltered areas until the autumn when they migrate into the newly emerging crop.

"This has formed the basis of understanding for some time now, however, we still have to learn the pest's lifecycle trigger points better, to know exactly what causes them to do what they do, behaviour-wise," suggests Colin.

This is important in helping growers to better utilise cultural control methods, he adds. "For example, anecdotal evidence suggests spatial cropping is beneficial, and although we don't ▶



**Knowledge gap**
**Niab's Colin Peters believes there's still work to be done to understand CSFB's lifecycle trigger points.**

**Varietal perfection**

**Limagrain has spent thousands of hours phenotyping in the field, seeking out the ideotype to de-risk the threat of CSFB, says the firm's Ron Granger.**

currently know exactly how far adults can fly to migrate, it's generally accepted that 2km is a sufficient buffer.

"In essence, it's better to grow OSR as far away from its previous location in the rotation as possible, as well as avoiding proximity to neighbouring farms' crops to mitigate risk."

Despite questioning the currently assumed lifecycle for CSFB, Colin accepts there's a general pest peak in mid-September. "Therefore, there should be an opportunity to control using shallow cultivations – around 50mm – as research has shown this can reduce adult populations significantly [see March issue of *CPM*, page 30].

"We can also utilise methods which hide the emerging crop from the adults, such as a taller stubble from the previous cereal crop, or, considering options such as cover and companion cropping," he advises."

While conventional, home-saved seed may still suit some, could new hybrid genetics help give the crop a better chance of survival?

Delivering genetic traits which help to boost the success rate of OSR is something that Limagrain has long been focusing on, says the firm's arable technical manager, Ron Granger. "Our breeding programme has been centred around the continuous improvement of yield and disease resistance by offering fully-loaded varieties, bringing in TuYV, PoSH, SClero-Flex, N-Flex and more."

He acknowledges that contributing to the establishment issues experienced by growers is climate change – dry soils at the desired time of sowing and subsequent lack of rainfall. This has placed greater emphasis on the firm's OSR breeding station at Rothwell in Lincolnshire, to evaluate how potential new varieties react in UK conditions, he says.

"However, we recognise that one of the most significant challenges that UK OSR growers currently face is CSFB and therefore, our breeding efforts are now concentrated on finding a potential solution.

"We've spent thousands of hours phenotyping in the field, seeking out the ideotype to de-risk the threat of CSFB. The pest has been a problem in the UK for more than a decade, but we're now starting to see the results of our concentrated breeding efforts."

## LG CSFB RESILIENCE

The culmination of this work is presented as LG CSFB Resilience – a novel genetic approach that tackles the pest at key crop stages, for use as part of an integrated pest management strategy, highlights OSR product manager, Florentina Petrescu.

"Despite external factors such as climate change and pest pressure, we want to continue the drive towards consistency in OSR," she says.

So what's the science behind the LG CSFB Resilience approach? According to Florentina, work has been based on understanding how to best arm OSR with the ability to overcome two pest pinch points – adult feeding in the autumn and larval feeding in the spring.

"We want OSR plants which can utilise an escape mechanism where autumn growth limits adult attacks and stem elongation in the spring reduces larvae damage. Plus with less larvae in the plants altogether, we can reduce the overall severity of CSFB and achieve a greater yield potential," she explains.

Starting with the adults, because the beetles feed on cotyledons and first leaves with symptoms exhibited as shot-holing, the impact is significant leaf area loss and in some cases, total crop destruction. However, this can be mitigated by identifying varieties which demonstrate dynamic autumn growth, says Florentina.

"This is the key to escaping those early CSFB attacks during the establishment phase. To quantify this vigour, varieties are assessed at three stages: BBCH 11-14, 14-17 and 17-20," she explains.

Then, to combat the larvae damage, work focuses on evaluating varieties based on their growth behaviour in the spring during stem elongation stage. "In a contrast to the adults, larvae damage the petioles which are the stalks that attach the leaves to the stem of the OSR plant. As well as presenting access points for fungal pathogens such as phoma, this feeding also results in bushy, heterogeneous plants," highlights Florentina.

"As such, larvae damage can have a direct correlation with yield loss – research conducted in France suggests this can be up to -1300kg/ha, based on an average yield."

Interestingly, says Florentina, while undertaking this R&D explorative work it became apparent there could be a way to limit the number of larvae which develop in OSR stems full stop – an additional characteristic to the autumn vigour and spring stem elongation detailed above.

"Using Berlese test methodology [also known as the Berlese funnel extraction method] to detect insect presence, we've been able to assess the number of CSFB larvae in the stems of infected plants.

"What we've noted is there appears to be the capacity to limit larvae populations using genetic differences, although exactly how this works is still being investigated," she comments.

As a collective, these characteristics are what Limagrain believes will help OSR to overcome CSFB and reclaim its position as the most profitable break crop. "One attribute simply isn't enough, they have to all be stacked together in one variety.

"However, our approach isn't based on an isolated trait or gene, rather a series of characteristics which make a variety better equipped to escape

**Damage mitigation**

**Shot-holing symptoms caused by adult CSFB can be mitigated by dynamic autumn growth.**

# Fully-loaded Avenger

As well as offering the new LG CSFB Resilience characteristic, LG Avenger provides:

- Exceptional autumn and spring vigour
- High yielding especially in the North [106]
- High oil content 46%
- Lodging resistance [8.0]
- Stem stiffness [8]
- Pod shatter resistance
- LLS score of 7
- Sclerotinia tolerance
- TuYV resistance

**New for 2025 plantings**

**LG Avenger offers a host of benefits, as detailed on the AHDB RL.**

**Escape mechanism**

**The aim is to identify OSR plants which use an escape mechanism – where autumn growth limits adult attacks and stem elongation in the spring reduces larvae damage, explains Limagrain's Florentina Petrescu.**

the pest," stresses Florentina.

This benefit can't be at the expense of the genetic traits growers have become accustomed to either, she adds. "A variety must continue to offer good disease resistance traits, rounded agronomic benefits and strong yield potential otherwise it could be perceived as a backward step."

With this assessment work taking place behind the scenes during 2022-24, Limagrain has already started to identify suitable varieties within its portfolio which offer LG CSFB Resilience, one of which is LG Avenger.

"Avenger is the result of our new methods for breeding OSR varieties which take into consideration all limiting factors for the crop's development, including CSFB. Although the only variety with LG CSFB Resilience on the 2025/26 AHDB Recommended List, it's just the start, with new material being developed as we speak."

For UK growers, Avenger is commercially available in readiness for planting later this year and offers a host of benefits, says Ron. "It's high yielding particularly in the North [106] with an [8] for stem stiffness, [8.0] for lodging resistance, has pod shatter resistance, a LLS score of 7 and offers high oil content of 46%.

"With exceptional autumn and spring vigour, it's just the latest in a long line of developments that have helped to improve yields in LG's 'fully loaded varieties', he adds.

CSFB is a major pest in many other European countries including France, where CSFB resilience has been a characteristic on the French Recommended List since 2020. Independent data from the French equivalent of AHDB (Terres Inovia) places Avenger as one of the highest rated varieties for CSFB resilience (7.2) compared with a susceptible control (4.5).

This backs up three years of Limagrain Europe assessments in 2022-2024, where Avenger significantly outperformed the sensitive control variety and came close to the most resilient control, LG Aviron, points out Florentina.

"Interestingly, the sensitive control did show good spring stem elongation, but the severity of CSFB symptoms ended up being quite high, illustrating that one characteristic isn't sufficient on its own; everything has to come together," she says.

Despite offering a highly appealing package, Florentina concludes that it won't be enough to purely rely on varieties such as Avenger to make OSR a UK success again. "There has to be an integrated management approach throughout an entire cropping rotation.

"Varieties will never be a magic solution to a problem – they're a tool which when combined with best practice for crop establishment and appropriate chemical use, can now contribute towards CSFB control."

## Inside traits

**With plant genetics playing an increasingly important role in how growers manage crops in today's agricultural systems, *CPM* has teamed up with Limagrain to reveal the company's latest developments within plant breeding.**

**Through privileged access to staff and their expertise, the 'Inside traits' series investigates the genetics behind Limagrain's latest varietial releases, to help understand what makes a successful crop suitable for 2025 and beyond.**

**As seasons and conditions continue to challenge, Limagrain strives to rise to the challenge by offering solutions which help growers to build resilience into their farming businesses.**

# Keeping a finger on the pulse


**By identifying key stress points and applying appropriate interventions at the correct time, UK farmers could have the opportunity to improve the consistency and profitability of home-grown protein crops. *CPM* explores some of the products which promise to up the ante when it comes to pulses.**

*By Janine Adamson*

**The benefits of growing pulses as part of an arable rotation are well documented – from improving soil health and delivering nitrogen fixation to re-balancing farm workloads and boosting the potential of the following crop – and that's before considering wider gains such as reducing the UK's reliance on imported protein sources.**

However, it's inconsistency of yields which has so far hampered their potential, believes NPZ's Michael Shuldham. "During recent years, pulses haven't necessarily met expectations yield-wise, and this can mostly be attributed to challenging, dry conditions during the spring months.

"But based on the significance of their benefits – particularly an ability to replace imported soya – pulses should be among the UK's most important crops and top of the tree. Therefore it's vital that the industry comes together to identify ways to optimise the critical establishment phase, enabling plants to push roots down and overcome potential high stress periods," he says.

## ROTATION STAPLE

With a shift away from oilseed rape due to the perceived risks associated with the crop, Cambridgeshire grower, Russell McKenzie, says despite the lure of environmental schemes, pulses have a firm place in his farm's rotation.

"This year is the first time we've not grown OSR in my entire farming career, but conversely, we've always tended to make pulses work. Previous to the recent announcement, SFI would have been the absolute last option.

"With pulses, yes they have to perform in their own right, but it's the bigger picture benefits which really stack up. For example, a wheat crop after a pulse always yields superbly whereas the legacy pitfalls post-SFI aren't worth it, in my opinion," he explains.

Having experienced crop inconsistency first-hand, particularly when it came to pod set in winter beans, Russell says

**Delivering winter bean yield**

**By using Calfite Extra in winter beans, Russell McKenzie has achieved a yield uplift of 0.7t/ha compared with the farm standard.**

he wanted to investigate whether a biostimulant could be the answer. "The crop would pod up but on closer inspection, they'd actually be blind.

"So we decided to use two applications of Unium's Calfite Extra (calcium phosphite+ L-PGA) – one early in the season and one pre-flowering – to see if we could achieve a better pod set. It seems that by going early and kick-starting growth including rooting, the result has been more consistency in the crop."

To investigate this more formally, Russell conducted an on-farm winter bean trial comparing an early application of Calfite Extra versus untreated (all otherwise received the farm-standard input programme). "Harvest results indicate we achieved a yield uplift of 0.7t/ha by using Calfite Extra.

"Beans are relatively low input, but Calfite Extra is a cost-effective product which means what we are spending is being targeted effectively and delivering results," he adds.

To explain why Calfite Extra is having such a positive effect in pulses, Unium's Andrew Cromie says it's down to how the product improves crop rooting. "It's a foliar-applied stimulant which essentially tricks a plant into scavenging for nutrients and therefore boost its roots and exudates."

Having already successfully tried another Unium product in his cereal crops – 3ALO T6P – Russell now plans to utilise this in winter beans too. "This would be at the later timing of during or just after flowering, to help overcome any potential abiotic stress," he says. "We know it works well at T3 in winter wheat, it's just understanding how to replicate that performance in beans."

Russell isn't alone in using biostimulants to improve the performance of his pulses – data produced by Kynetec's National Farm Research Unit (via LOCUS market information system) suggests that in 2023, more than 85% of growers were either using or considering using biostimulants on legume crops. In 2022, this figure was around 62%.

A grower well-versed in the benefits of using biostimulants across all crops is Bedfordshire-based Matt Fuller from 1000ha Heathcote Farms, who says the main reason he uses them in pulses is to overcome plant stress events. Like Russell, he's also been conducting on-farm trials using Unium products.

"Pulses have become an important part of our rotation, mainly as an entry crop ahead of milling wheat to help improve its yield and quality.

"But looking at how to boost the profitability of the pulse crop itself led us to trial alternative sources of nitrogen in winter beans. We've been investigating two foliar products based on endophytic bacteria – one of which is Unium's Tarbis – compared with untreated," he explains.

The trials are now in their third season of replication, although Matt highlights that last year's challenging conditions may have influenced 2024's results somewhat. "Last season, although very wet, was a positive year for beans overall – there wasn't as much stress in the crop as you'd usually expect if there'd been a dry spring, which is why you'd want to be using these products."

## YIELD UPLIFT

Even so, averaging the data for the two harvest years so far (2023 and 2024) indicates Tarbis delivers a yield of 5.48t/ha compared with 4.55t/ha for untreated. "I anticipate that in a more usual year for beans, you'd see an even greater uplift from using Tarbis," suggests Matt.

Andrew adds that similar to Unium's endophytic seed treatment, Tarbis combines endophyte strains which enable crops to fix nitrogen, sequester phosphorous, potassium and zinc, and better withstand drought, making it an ideal solution for high-stress conditions.

"By improving nutrient use efficiency you can create a more robust pulse crop which can handle abiotic stress better, resulting in the yield uplifts as seen at Heathcote Farms," notes Andrew.

Matt has also been exploring 3ALO T6P across all crops, observing particularly positive results in peas when used alongside Unium's Kirol PGA (amino acids+ pidolic acid). In fact, an application of 3ALO T6P plus Kirol PGA in combining peas delivered around +2.5t/ha yield uplift compared with untreated.


**Uplifting combining peas**

**Applying 3ALO T6P plus Kirol PGA in combining peas delivered around +2.5t/ha yield uplift for Heathcote Farms' Matt Fuller.**

"An added benefit of 3ALO T6P is it's quite flexible in its application for when weather conditions are stretching spray timings. It also has a good tank mix profile which is essential when you're limited to when you can travel," he says.

"Ultimately, we want to make pulses work because without them, we're left with OSR, oats or SFI [dependent on the government's recent announcement] as our break crops, which all come with their own distinct management challenges. Biostimulants are helping us to not only achieve better pulse crop establishment, but also keep plants greener for longer which translates through to performance.

"You lose most yield potential in pulses during high stress, droughty conditions. As long as we can make money growing conventional break crops, then that's the approach we'll continue to take," he concludes.

# Bioscience in practice

**As the chemistry toolbox continues to shrink, an array of new biosolutions are being launched which strive to offer a range of benefits while complementing existing solutions. Evaluating how effective these products are and where they're best placed within management programmes can be tricky, however.**

**This series of articles opens a window on the science behind the latest innovations from Unium Bioscience, with *CPM* exploring how these products have been developed and the trial results to justify their positioning.**

**Learn more by joining the Unium Bioscience technical group https://www.uniumbioscience.com/unium-technical-group**

# Carving opportunities with pumpkins

*"We could see a conventional mixed farm wasn't going to work long-term and therefore had to offer something different."*

RICHARD BOWER

**Halloween-related festivities have experienced exponential growth during recent years, with a visit to the local pumpkin patch becoming an annual tradition for many families. *CPM* explores the opportunities this winter squash can offer.**

*By Janine Adamson*

**Ask a more 'experienced' generation about their Halloween memories and at best some may recall donning a black bin liner and a warty plastic nose as part of a homemade costume, accompanied by a spot of apple bobbing and a neighbour begrudgingly offering up their toffee bonbon stash.**

Perhaps 31 October involved carving a ghoulish face into a turnip, or in some cases, a last minute baking potato. But one thing's clear – by today's standards, the memories of old are rather basic – Halloween has become big business.

When you dig into the history of the day, it was celebrated in Ireland and Scotland for centuries, making its way over to North America in the 1800s. The tradition of pumpkin carving (making jack-o'-lanterns) originates from an Irish folk tale about a chap called 'Stingy Jack' – turnips were carved to ward off evil spirits.

Having taken off in America where the turnips were switched to pumpkins, Halloween quickly became a global festivity with engagement rocketing ever since. In fact last year, UK Halloween spending hit an estimated £775M, and perhaps even more surprising, a quarter of Brits name Halloween as their favourite holiday.

But, it's only during the past 10-15 years or so that the concept of a pumpkin patch (pick your own pumpkins/PYO) has been on the radar for British families. Even so, the sector has seen exponential

## Business assessment

**As with all new projects, it's essential that a business assessment is carried out prior to embarking on a PYO pumpkin enterprise, stresses CLA's John Greenshields.**

**Pumpkins per hectare**

**Hutchinsons' Peter Waldock says growers should aim for between 12,350 and 17,300 plants/ha – the bigger the required pumpkin fruit size, the lower the crop density.**

growth during this time, meaning coupled with the wholesale market, around 15M pumpkins are grown annually in the UK.

It's therefore unsurprising that those farmers in a position to do so, have cottoned-on to this popular diversification opportunity, but is the market already saturated? John Greenshields, surveyor for the Country Land and Business Association (CLA), believes not.

"Pumpkin patches continue to represent a profitable enterprise, particularly if it can work in conjunction with other diversification projects such as Halloween-related product sales, food and drink, spooky walks, and then maize mazes, Christmas trees, fruit picking and so on.

"However, as with all new projects, it's essential that a business assessment is carried out prior to embarking on the enterprise," he says.

This includes exploring the local competition, if any, and considering whether there's significant unmet demand to warrant such an enterprise. Then it's a case of calculating the costs including labour, insurance, health and safety plus crop production inputs, before finally calculating a suitable price to charge, adds John.

"There are also additional infrastructure-related costs if the site isn't already engaging in public-facing events, such as toilets, car parking and signage."

For those taking the plunge, growing squashes may be 'frighteningly' new territory, particularly for those accustomed to a combinables-based cropping rotation. However, Hutchinsons' agronomist and technical lead for vegetables, Peter Waldock, has built a wealth of specialist knowledge having worked with pumpkins for the past 25 years.

He says key to note is crop management all depends on the chosen end market, be that commercial wholesale or PYO. "If you're looking at PYO or farm shop produce, pumpkins are mostly direct drilled around mid-May as they aren't frost hardy. Otherwise, they can be raised as glasshouse seedlings and planted out as plugs; there's also the option to grow through black plastic for weed control, or early planted can be put under fleece.

"Regardless, you're looking at between 12,350 and 17,300 plants/ha – the bigger the required pumpkin fruit size, the lower the crop density," explains Peter.

While planting earlier might feel like the right thing to do, he says waiting for optimal conditions will be beneficial because pumpkins don't fare well in waterlogged soils at the germination stage. This is also important to ensure birds don't predate the seeds or pull out the plants.

He adds that growers should aim for locations on rich, well-drained land which can be kept moist. "RB209 for the base nutrition is a good starting point and then follow up with foliar feeds. It's worth noting that calcium nitrate is often used in the base because pumpkins are prone to blossom end breakdown if there isn't enough calcium available in the fruit."

## WEED CONTROL

As with most niche crops, herbicide options are limited and because of this, a good stale seedbed is a must, urges Peter. "Even when herbicides are used in the programme, they're not that effective against the likes of redshank, pale persica, fat hen and nettles. These weeds pose a significant problem because they can grow above the pumpkin crop and shade.

"Consequently, many growers supplement herbicide use with mechanical weeding methods such as inter-row hoeing."

Disease-wise, pumpkins can be vulnerable to a range of pathogens including powdery mildew, phoma, botrytis and fusarium. Although some fungicide options are available, Peter advises checking their registration status before proceeding. "For powdery mildew, wetting agents considerably improve the performance of products if approved for use."

Then, Peter perceives the main insect pest threat at germination to be bean seed fly, which lay eggs near the base of the crop with the larvae feeding on seeds, roots, and stems. And despite many pumpkins only being carved and therefore not perceived as an edible, they mustn't be managed following protocols used in ornamental crops, he stresses.

"As tempting as this is because there are more plant protection product approvals in the ornamental market, pumpkins are being sold to consumers who may assume they're safe to eat should they desire, therefore MRLs must be respected.

"There are also VAT implications when you cross into the ornamental market; ultimately, pumpkins and squashes are edible vegetables."

Given the level of food waste associated with Halloween – WRAP's Love Food Hate Waste campaign states 12.8M pumpkins bought for Halloween each year are likely to be left uneaten – there's been a steady rise in the promotion of their use in culinary scenarios.

From soups and pies to bread and curries, it's hoped that by encouraging ▶

**Maximising marketing**

**Capitalising on digital marketing including social media platforms has helped Richard Bower to elevate Lower Drayton Farm's events business, including PYO pumpkins.**

**Charity donations**

**Lower Drayton Farm works with local food banks and FairShare food redistributors to ensure no pumpkins are wasted.**

their consumption, the rate at which families throw pumpkins away will be reduced. This undoubtedly confirms the importance of Peter's stance regarding managing pumpkins as edible crops.

And while the flavour of individual pumpkin varieties varies considerably, cultivars also have different response times, says Peter. "From drilling to harvest this can be 85-135 days, which of course will be a major consideration given Halloween is a rigid calendar date."

Classic pumpkin varieties include Jack O'Lantern, Munchkin, Rouge Vif d'Etampes and Atlantic Giant. Equally, with consumers always on the hunt for something different, options such as Grey Ghost and Crown Prince offer blueish-grey skins, whereas close relatives, gourds, come in a vast range of colours, sizes and skin finishes.

## LOWER DRAYTON FARM

One grower who's become fully accustomed with offering a plethora of pumpkin options to punters is Richard Bower of Lower Drayton Farm in Staffordshire. With an expected footfall of 25,000 visitors this coming autumn, he plants around 20 varieties for the PYO market.

He says his journey into Halloween festivities began some years ago, although he only started planting his own pumpkins in 2017. "What was less than 1ha back then has now become 12ha for this season.

"We plant the crop as seed at the end of May with the varieties all mixed together. I take the approach of we never want to run out of pumpkins, so this means sowing 125,000 seeds based on our projected visitor numbers and taking into account a percentage of crop failures," he explains.

Visible directly from the M6, Richard says this has helped to quickly build the family's events business – which includes a soft play barn, café and various other seasonal events – although there remains a substantial commercial aspect to the farm. "We've really capitalised on our location, and as such, have made sure the pumpkin patch is visible as cars pass on the motorway.

"October half term is our busiest time of year but we sell the PYO pumpkin tickets from March onwards. How it works is, the ticket price includes access to the patch and one free pumpkin, which are all left on the vine. By August, we expect to have sold enough tickets to have covered the seed costs," he continues.

Conscious there's always a risk of over-planting, Richard has a plan in place to avoid waste. "Once it's 1 November, no one wants a pumpkin. So, we invite Lions Club volunteers to come and harvest the remainder which are then sent to local food banks and FairShare food redistributors. Finally, we invite a neighbour to bring sheep in to graze the site to ensure nothing's wasted."

According to Richard, the main challenge during the years has proven to be weed control, whereas in the past, he's struggled with ground conditions due to a combination of inclement weather and heavier soils.

"You have to balance visitor experience with practical farming – as such, we find growing pumpkins on our sandier soils is preferable, mainly because the public are walking those fields throughout October. A patch can soon become inaccessible if the ground isn't right."

Having experienced significant growth since Covid-19, Richard continues to have his target set on being the best in the business, capitalising on digital marketing including social media platforms like Instagram. "Yes we still farm – with around 300ha of owned, tenanted and contracted land plus livestock – but I see us primarily as an events business, and it's that which has turned around our overall profitability.

"It's been an evolution with the pumpkins – we now offer a pumpkin village and carving barn, refreshments, fairground rides, PYO vegetables such as potatoes, sweetcorn and carrots, spooky walks and our staff dress up in Halloween costumes.

"Because we invest in marketing, families travel from as far as Manchester and Liverpool to visit us, and having built a following with the various events and soft play, we employ 70 employees both full-time and seasonal," he adds.

However, none of this would have been possible if it hadn't been for the trust instilled in him by his father Ray, highlights Richard. "We've pushed on by working together – we could see a conventional mixed farm wasn't going to work long-term post-BPS, and therefore we had to offer something different.

"And it doesn't stop there, this year we've planted our first immersive tulip walk – 30,000 bulbs of 20 varieties – which will no doubt bring about its own challenges," he concludes. ●

**Family business**
**Ray Bower has been integral in supporting the evolution of Lower Drayton Farm.**

## Harvest deliberations

### Having successfully grown a crop of pumpkins, leaving the fruit on the vine for as long as possible – the next question is, how to harvest?

**According to the CLA's John Greenshields, there are various options. "Although some leave the fruit on the vine, others choose to harvest the pumpkins themselves to negate the public having to do so. The pumpkins are then laid out, usually on straw, in lines for visitors to choose from.**

**"This can reduce waste, maintain more control and limits individuals from accessing the farmland," he comments.**

**And rather than use machinery to do this task, growers often choose to hand-cut the crop to mitigate any impact on the appearance of the pumpkins, says John.**

**"Equally, if there's frost or extreme weather on the horizon in the lead up to an event, it may be wise to harvest early and store the pumpkins in a dry shed if there's space on the farm.**

**"But regardless of harvest method, you'll certainly require sufficient numbers of wheelbarrows to cater for those visiting and looking to pick pumpkins," he concludes.**

# Matching maize's requirements


**Much of what maximises the potential of maize occurs in the spring, with the emphasis being on getting the crop off to the best start. *CPM* takes a look at the role of nutrition and how best to match the crop's requirements.**

*By Janine Adamson*

**With last year proving difficult for much of the UK's maize due to cold conditions and a lack of sunlight, could this spring flip its fortune? If growers ensure crops are off to the best start including finessing nutrition, KWS' Andrew Cook, believes so.**

He reminds that most of maize's potential is built and set in the spring, therefore planting when soil temperatures are right into good seedbed conditions should be the priority.

"Warm soils – 8°C on light soils to 10°C on heavier soils, for 4-5 consecutive days – are the best, drilling into an environment where nutrients can be used well. Because maize is very uncompetitive in its early stages, this means weed control is critical to avoid nitrogen being robbed from the crop," he says. "As such, pre- and post-emergence herbicide treatments really do pay for themselves."

However, rewinding a step, he highlights that variety selection is paramount and the aim should be to choose a maize variety based on the constraints of each individual system. "It's about harvesting at the right time for your rotation, but also when that particular variety has reached its maturity."

## VARIETY SELECTION

"For those with shorter growing seasons this might mean a very early maturing variety such as KWS Temprano (FAO 150) which is in the ultra-early segment. Others may want to grow a larger crop so early maincrop varieties would be most suited, such as KWS Reo (FAO 170) and KWS Papageno (FAO 190). Then at the other end of the spectrum is KWS Granturismo (FAO 220) which is best suited to lighter soils and the highest yielding variety on the maize descriptive list for favourable sites."

Maize Growers Association (MGA)'s Jon Myhill says with current conditions ▶

**Seedbed conditions**

**Because most of maize's potential is built and set in the spring, planting when soil temperatures are right into good seedbed conditions should be the priority, says KWS' Andrew Cook.**

**Nitrogen stabilisers**

**High input prices are among the reasons behind growing interest in nitrogen stabilisers, believes Corteva Agriscience's Clare Stapley.**

being improved compared with this time last year, some growers are contemplating drilling now (start of April) – which is at least two weeks ahead of convention.

"Despite last year being a little off-putting, mainly due the late drilling many experienced, we continue to see increased interest in maize from both a forage and grain perspective. In addition, with SFI on hold and a rising demand for suitable break crops, maize could fill that gap," he believes.

"With improved genetics coming through from breeders it means maize can be harvested at a more sensible time in the year to mitigate previous environmental risks such as flooding or soil erosion; it really is holding its own now."

He echoes Andrew's sentiment regarding ensuring conditions are optimum. "Soil testing will provide more in-depth analysis, paying particular attention to pH with 6.5-7 being the ideal range for maize and the uptake of soil-based nutrients.

"Then once you know what the crop requires, it's a case of delivering those nutritional requirements as they're in demand, rather than loading early in the season," he advises.

To explain further, Andrew adds that the peak nutritional demand in maize can occur months after a seedbed fertiliser has been applied. "With maize, around 50% of nitrogen is required between 6-leaf stage and tassel emergence; prior to this, uptake is very slow.

"Applying organic manures or slurries are a great way to supply nutrients which are slow-release and are often a good match for the crop's demand. But regardless of the delivery mechanism, preventing both leaching and volatilisation is key to ensure adequate nitrogen is available to the growing crop, and to also mitigate any environmental concerns," he says.

One way to achieve this is to use a nitrogen stabiliser, suggests Corteva Agriscience's Clare Stapley. "The use of nitrogen stabilisers in the UK is growing, but is still reasonably limited. However, high input prices across the board and pressure on demand are bringing their use to the fore."

The company has been trialling its product Instinct, which has shown a reduction in leaching of around 50%, plus lowering denitrification through greenhouse gases by approximately 45%. How it works is, it slows the conversion of ammonium to nitrate, keeping nitrogen in the root zone for longer.

## COMPATIBILITY

Instinct can be incorporated into slurry or digestate before field application or sprayed onto soil independently afterwards. It's also compatible with various nitrogen sources, requiring a single rate of 1.7 l/ha and good soil contact for effectiveness, adds Clare. "Applying before ploughing or ahead of rainfall ensures proper incorporation."

Agrovista's head of soil health, Chris Martin, says when it comes to farms using both slurry and digestate, nitrogen stabilisers are a no-brainer. "I honestly think their use should be legislated and in time it may be. Many maize farmers use a lot of digestate, which has up to 80-90% of its nitrogen in the ammonium form. Instinct keeps nitrogen available but in its stable form for longer."

With an NMAX limit of 150kgN/ha, maize often receives less nitrogen than it ideally requires, believes Corteva's Ryan Came-Johnson. "But by applying Instinct, farmers could potentially apply less artificial nitrogen because they're getting more from what they are applying and achieving increased nitrogen availability from their manure applications."

He agrees that maize often receives most of its nitrogen inputs at drilling, yet has a large nitrogen requirement later in its growth stages. "By keeping nitrogen in its most available form for longer, you're making it more available at the time when maize requires it the most," he says.

Jon raises that with recent advancements in foliar fertilisers, more options are now available to growers, to ensure maize receives a slow-release of nutrients. "New urea polymer-based products are low-scorch, which is something maize requires which cereals don't.

"And rather than applying to the seedbed and expecting the crop to find those nutrients months later, you're feeding it when its most hungry," he says. "Although seedbed nitrogen is still required, research conducted by the MGA indicates such foliar applications can displace it by up to 20%.

"This is a positive in terms of carbon footprint by reducing potential volatilisation, while proving a cost-effective solution which could save on input spend."

He says applying fertiliser later in the crop's life cycle can have a positive impact on yield, plus boosting quality attributes such as dry matter content and starch, as indicated by MGA trial work.

To conclude, Jon highlights that although nitrogen will remain a key factor in maize performance, his watch out for this season is in fact sulphur. "Air conditions are much cleaner now so less sulphur is taken up by plants naturally. For maize, the recommendation is 30kgS/ha along with a nitrogen application."

**Delayed applications**

**MGA's Jon Myhill says applying fertiliser later in maize's life cycle can have a positive impact on yield, plus boosting quality attributes such as dry matter content and starch.**

# Overcoming regen frustrations


**Farming following regenerative agriculture principles isn't always sunlit uplands, as shared by speakers at the recent BASE-UK conference. *CPM* provides insight into their challenges and the solutions they've identified to overcome them.**

*By Mike Abram*

**Growers frustrated by a seeming lack of progress following the adoption of regenerative agriculture principles often comes back to not adding enough carbon into the system, according to US soil scientist, Dr Kris Nichols.**

Speaking at the BASE-UK conference, she noted experiences in North America where farmers and ranchers became frustrated after employing regenerative agriculture for a few years, even decades, and not finding the improvements they expected.

"Why is that?" she asked. "Part of it goes back to carbon and not thinking about the role that it has within the system."

Many experience a leap forward when they switch to a no-till approach but then find the system stagnates, said Kris. "Stopping tillage stops the bleeding – the carbon loss – but it doesn't add any.

"We tell ourselves that leaving

**Carbon in the system**

**US soil scientist, Dr Kris Nicholls, said farmers should understand whether a field activity adds or takes away carbon.** ▶

**Moving over to regen**
**Northumberland farmer Stuart Johnson said he could relate to initially being frustrated with the results from a switch to a soil-health-focused system.**

residue will add carbon, but it doesn't add soil organic matter carbon. Most of the carbon formed goes back into the atmosphere as carbon dioxide within a year or two," she explained. "The job of residue is to provide armour and protection for the soil surface."

Midwest US growers could tick the boxes for other regenerative agriculture principles, for example, by occasionally growing a rye cover crop after soybeans, or having a neighbour sporadically graze land with cows. Some even consider corn followed by soybeans as a diverse crop rotation, suggested Kris.

"But none of those are adding a significant amount of carbon. What you have to think about all of the time is how you can drive photosynthesis."

It's this which provides food for soil microbes, she added. "That's the one thing you have to do as then they'll do a job and help you out. The more we stimulate biological activity, the more we get carbon that matters – the active carbon that helps to prevent nutrient loss and improve water holding capacity."

Kris emphasised that farmers should understand whether a field activity adds or takes away carbon. "And if you're taking carbon away or not adding it, think about what you can do to start adding it – what's your recarbonisation plan?

"You're not always going to be adding carbon – that's the reality – but understand what is it that you're doing to add it into the system to drive forward momentum."

Northumberland farmer Stuart Johnson could relate to initially being frustrated with the results from a switch to a soil-health-focused system. Initially motivated by cost savings, especially for inputs, he experimented with cover crops and no-till on what had been a predominantly conventional mixed farm operation.

"The early years as I call them, between 2012 and 2018, we were very scattergun in our approach – just trying different things," he explained.

"We had some good successes but we were also doing things we thought were helping but actually doing more damage. It was two steps forward, and three steps back.

"We were incredibly economically-focused, saving as much as possible to generate margin, but there was very little thought process for the health of the soil which ironically is the keystone in earning the right to reduce inputs.

"We'd designed a system for how we wanted to farm and then were forcing our will – our way of farming – on the environment without necessarily considering if it fitted the system."

## PRINCIPLE-BASED SYSTEM

The turning point was following Understanding Ag's principle-based system created by Gabe Brown, Allen Williams and Shane New, said Stuart. That moved him from a place where he was drowning in the science of soil function and microbiology to one where he could adopt principle-led practical solutions to drive ecosystem function, he explained.

That included daily movement for the beef herd and changing breeds to stabiliser cattle, Innovis forage-based sheep genetics that suited his system better, going to a full no-till system with a SimTech drill rather than using a Claydon, and growing multi-cover crops or diverse swards.

"I can't advocate enough how important livestock are in terms of building soil health," he said. The benefits include higher grass growth which reduces the feed requirements of his arable crops – allowing the farm to switch to a 5:2 rotation of five years of legume herbage swards to build soil health, before cashing in with two years of arable crops.

"We've gone from fairly high input to low inputs – we've not applied bagged P or K for seven years, no fungicides or insecticides for five years, and reduced total N applications from 70-80t/year to less than 10t.

"It boils down to at a very basic level, having living roots to build soil aggregates at depth, to make the soil work for us and allow the reduction of inputs. Yields are slightly back, but the margins are there still and we're more resilient to price changes and weather extremes," he shared.

> ***"We've not applied bagged P or K for seven years, no fungicides or insecticides for five years, and reduced total N applications from 70-80t/year to less than 10t."***

Integrating livestock into an intensive vegetable production business was certainly challenging, along with implementing the other core principles of regenerative agriculture, explained John Sansome, farm manager at G W Revill & Son in Worcestershire.

Growing eight different vegetable crops from tenderstem broccoli to niche offerings such as baby courgettes, plus combinable crops, John was finding some principles easier than others to introduce at the Vale of Evesham-based business.

However, among his successes has been reducing soil disturbance using a Horizon SPX strip-till cultivator for crop

**Livestock integration**
**Integrating livestock into an intensive vegetable production business has proven challenging, explained farm manager, John Sansome.**

# Trial compares regen system with conventional

## Understanding the differences between conventional and regenerative approaches is the aim of a research trial by Harper Adams University post-doctoral student, Joe Collins

The systems-based research compares 24m tramlines – five from each management system – on two fields in North Shropshire, explained Joe, during the BASE-UK conference.

In contrast with conventional research methods which isolate one variable such as tillage or use of a cover crop, and make no other changes, his research looks at the entire management system and allows for multiple adjustments.

Consequently, the work reflects what happens on-farm when growers introduce a regenerative system, said Joe. "You don't just buy a new drill, you change your management approach – your whole farm ethos. And it gets away from the problem where practitioners look at trials and say you'd never drill a crop on that day in a particular system or manage the crop that way."

Each approach is managed by a separate agronomist. In the conservation agriculture approach, three principles are followed: minimal soil disturbance with no cultivation, maintenance of soil cover by chopping straw residue, and a diversified rotation including use of cover crops and companion crops.

In contrast, the conventional system uses tillage when deemed necessary, removes straw when financially beneficial, and doesn't grow cover crops.

For the first two years, the rotation has been the same in both systems – spring beans followed by winter wheat. Yields favoured the conventional system in both years, but expenditure – both machinery costs and inputs – were also higher, explained Joe.

That meant for the spring beans, gross margins were virtually identical, while for winter wheat there was a statistically significant higher margin for the conventional system. For year three, oilseed rape was the intended crop.

"Unfortunately, in the conservation ag plots, we had poor seed-to-soil contact and the OSR was written off pretty quickly to be replaced by spring barley. In hindsight, it might have also been better to have written off the conventional crop as it underperformed," he commented.

Both systems made a loss from these crops but it was higher in the conventional system, wiping out some of the gains made in the previous wheat crop. During the three-year period, both systems had similar gross margins.

As well as the economics, yields and input costs, Joe is also monitoring soil properties and biology, available nutrients and greenhouse gas emissions.

"So far, we've seen no significant differences in pH, soil biology, soil carbon or soil nitrogen. Bulk density within the conservation treatment has been steadily rising, while there have also been significant increases in the availability of P and K in that treatment."

**Collecting trial data**
As well as economics, yields and input costs, Harper Adams University researcher, Joe Collins, is also monitoring soil properties and biology, available nutrients and greenhouse gas emissions.

In-field greenhouse gas emissions from the wheat suggest a higher global warming potential from the conservation ag system, especially when taking into account the lower yield, reported Joe.

"But this is only half the dataset, and doesn't include the manufacture of the products and fertilisers used. I'm now conducting a life cycle analysis to take those into account – my hypothesis is that it'll reverse these results."

The trial is continuing with funding from BASE-UK into a fourth cropping season and potentially beyond, added Joe. "It's important to keep trials like this going to provide the long-term trend data that help farmers with their businesses," he concluded.

establishment. "When we get it right, the results are exciting. We can spray off a cover crop, then mow and strip-till in one pass before, for example," he said.

"There's no bare ground between rows – the soil is protected. We have a diverse cover crop, keep a living root and move the minimum amount of soil to establish the crop. The only thing missing is livestock integration," said John.

Sheep from a neighbour graze some cover crops and cash crop residues on the farm, but Red Tractor rules add complications. "Depending on the following cash crop, there are different periods of time that must elapse between grazing and drilling," he noted.

Furthermore, drilling into a cover crop or previous cash crop residue hasn't been straightforward in all veg crops at the farm. "Balanced against protection of the soil surface, we must get tiny seeds into the ground with a high level of accuracy as spacing is so important for a consistent crop," highlighted John.

"Current veg drills can't cope with trash and block, so sometimes our regenerative system falls down at the end because we can't get our cash crop in the ground effectively."

In that situation, John has reverted to the plough, although the area worked is now just 15% compared with around 130% in the past, when land was sometimes ploughed twice in one year for two veg crops. "A veg drill that can cope with trash would help us to make the next leap forward," he said.

A more balanced rotation allowing greater use of cover crops would also help, but a combination of the market-led nature of the business plus soil types and water availability make that difficult, shared John.

Ultimately, balancing profitability and sustainability would remain a difficult act until supermarkets became more genuinely interested, he suggested, with final decisions likely to prioritise price, and length and security of supplies.

# The development of machinery data management


**The principle of telemetry is well established for enabling wireless transfer and cloud storage of machine operating and field data to allow monitoring and later analysis. Now machinery firms are launching apps designed to do much more, as *CPM* reports.**

*By Martin Rickatson*

**Go back 30 years to the early days of precision farming, and the memory card technology introduced in early GPS signal-governed terminals pioneered the automated recording of field data from tractors, sprayers and, most commonly, combines.**

Capturing the results and making them available for analysis and action was a fairly long-winded process, though. Extract the card from the machine terminal upon job completion, take it to the farm office and insert it into a desktop PC. The result: a delay before analysis could take place, the risk of data corruption from physical handling of the card, and limited opportunity to act on what was historical rather than real-time data.

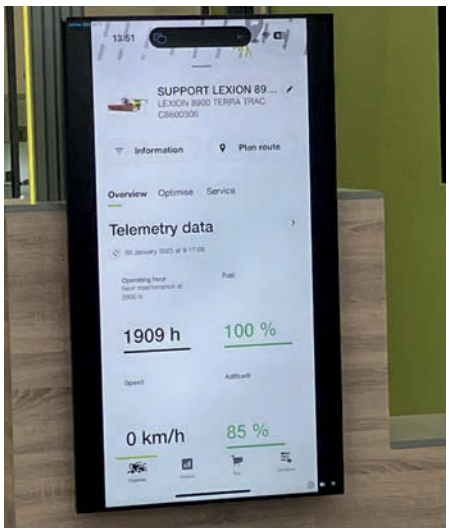
For the major farm equipment firms, the answer to many of these issues lay in harnessing wireless technology or 'telemetry' to enable remote data collection. Moving into the 21st century, this enabled the adoption of telematics, or the use of telemetry to track and monitor machines and facilitate analysis of both real-time and historical post-job data to enable informed decisions to be based upon it.

This also made for swifter two-way data transfer, meaning information such as prescription/variable rate application maps could be sent directly to a tractor operating a drill, sprayer or spreader.

But with the rapid adoption of smartphones from the late 2000s and the development of applications or 'apps' which allowed all types of businesses to create company-specific software for such phones, machinery manufacturers have been able to make data produced by their customers' machines instantly accessible.

Not only can machines be monitored in real time, but decisions based on the data they produce can be made instantly too. That includes not only information such as location and fuel levels, but also critical performance and maintenance issues such as engine temperatures, oil pressures and service timings.

Claas is among the companies to have recently brought together machine management, service planning, yield mapping, application maps and more onto one cloud-based platform. The firm's new Claas Connect app aims to coordinate the communication between




**Claas Connect app**
**Like others of its type, the new Claas Connect app puts machine data in the user's pocket via their smartphone screen.**

the customer and those behind their machine, including manufacturer and dealer, as well as third-party partners such as agronomy firms.

"Our aim was to broaden our Claas Telematics offering and develop a common platform linking all relevant portals, parts shops and functions with a simple, easy to navigate, user-friendly interface, and one ID to access all areas and information," says Wolf-Christian von Wendorff, senior vice-president of digital business at Claas in Germany.

"This is what we believe the new Claas Connect delivers, combining machine and digital fleet management as a whole while retaining the established functions of our existing digital platform."

The value of Claas Connect begins before a machine is even purchased, at the stage when the best model and specification to suit a farm's requirements is being selected, claims James Walsh, off-board product manager at Claas UK.

"It starts with a potential customer registering with Claas Connect at the time of first investigating machine options, which creates their own page on the Connect website," he says.

"Having done this, it's then possible to access the Claas configurator to help 'build' a machine according to the specification they require. Once this is done, they can request a quotation and book a demonstration – instructions which are acted upon by their local dealer."

James adds that should the customer then choose to make a purchase, the data of their machine – model specification, delivery date etc – is uploaded upon delivery to the customer's Claas Connect portal. "In terms of machine information particularly vital for this stage, they then have access to a digital operator's manual for their exact machine specification, as well as information such as the specific lubricants it requires and access to the Claas online parts shop, aiding ordering via the dealer for maintenance planning.

"And with the five-year Machine Connect licence that's supplied, the relevant maintenance intervals are automatically uploaded, providing an overview of upcoming maintenance requirements and helping owner and dealer to plan schedules and requirements in advance."

Claas Connect features a number of other new tools and additional functions developed to expand on the abilities of Claas Telematics, which was launched 30 years ago, and from which existing users' data is automatically transferred to Claas Connect.

Its functions now make up the Machine Connect element of the whole Claas Connect package, for which a five-year licence is supplied with a new machine – after this a renewal is necessary. Further optional elements include licences for Farm Connect for whole farm data management, Field Connect for individual field data, and Fleet Connect to record the data from each machine.

In addition to Claas products, any connected machine can feed into the system and its single interface, enabling multi-brand management of machinery fleets, licences, documentation and precision farming applications, says the company.

"As with Claas Telematics, machine performance data can be processed, documented and analysed via the Machine Connect element," explains James.

"If the user chooses a Fleet Connect licence to cover a Claas machine(s) and other-brand third-party connected machines in a mixed fleet, these are joined to the farm's Claas Connect portal via a DataConnect interface, enabling the display of data such as location, machine status and current fuel levels. In addition, machine data can be transferred to partner companies via a data interface."

## INTEGRATION

A development of the long-established CEMOS Automatic operator assistance software, Claas also integrates CEMOS Advisor into Claas Connect. This means performance data and settings for all Claas machines stored on the platform can be viewed and compared, enabling adjustments to be made to maximise overall fleet performance. It also provides a licence management overview that shows users their licence coverage and runtime.

> ***"The benefits of Connectivity Included are accessible with no subscription or access fees throughout the lifetime of the machine's modem."***

"The add-on licences for Farm Connect with Field Connect and Fleet Connect provide further options for precision farming applications," says James.

"Field Connect supports the functions

**Performance data**

**Claas' James Walsh says Claas Connect enables performance data and settings for all stored Claas machines to be viewed and compared.**

users require to create application maps from information such as satellite images or soil analyses, and to import information such as field boundaries and other data as Shape or ISO-XML files. It's also possible to incorporate yield maps from other manufacturers' machines.

"Whereas Fleet Connect automatically documents field task data such as yield, constituents or application rate, and through this the progress of a job can be tracked on any smart device or PC, with the job logged as complete as the machine leaves the field," he adds.

"It's also possible to create reference lines and plan paths based on field boundaries using this element of the app, or through the CEMIS 1200 terminal that is now the standard Claas machine user interface."

A Connection Manager function allows other compatible farm management information systems to work with Claas Connect via Connection Manager, and Claas says it's working on making it possible to share data between different Claas IDs, to further simplify task planning, implementation and documentation. It says it sees particular benefits here for contractors and contract farmers in aiding accurate job measurement and subsequent invoicing.

"We're also working on an Autonomy Connect function for the platform, to allow users to plan autonomous operation tasks not only for tractors but also for machines such as those from AgXeed, our autonomous vehicle partner," highlights James.

Among other machinery firms to have recently launched a farm, field and machine data management app aimed at easing data collection, analysis and decision-making across all connected ▶

**FieldOps benefits**

**CNH's Simon Toepfer says FieldOps allows machine owners and farm managers to monitor machine location and work progress, plan refuelling support and ensure security.**

machines in a fleet is CNH. Downloadable free from the App and Google Play stores, its FieldOps development was released late last year under its New Holland and Case IH divisions, plus – elsewhere in Europe – its Steyr brand.

Succeeding the New Holland PLM Connect and Case IH AFS Connect packages, FieldOps is accessible from smart devices and PCs via a single login. It monitors and automatically records machine performance and field data, providing not only an instant overview of field operations to enable decision-making based on agronomic information, but also securely-recorded data for longer-term analysis and planning, says CNH.

"All of this is possible across not only New Holland and Case IH tractors, but other brands too, provided they have connected capability," says Simon Toepfer, responsible for precision technology product marketing at CNH.

"With FieldOps, machine owners and farm managers can monitor machines to assess location and work progress, plan refuelling support, decide on the next job, and ensure security thanks to the ability to set machine boundaries. It's also possible to remotely view the machine's terminal screen, allowing them – and their dealer, if granted permission – to connect to the terminal and remotely provide advice on tractor and activity operation, eliminating having to travel to the field."

Simon adds that the FieldOps home-screen can be tailored by preference, to allow adjustment of settings, and the setting of notifications, parameters and alarms for each machine. "Because these features are fully integrated and compatible with third-party application programming interfaces (APIs) that allow seamless data transfer between FieldOps and other farm management systems, a full view of farm operations can be formed.

"This spans factors such as machine productivity, fuel consumption and location, with continuous updates for real-time and long-term decision-making for everything from labour management to maintenance scheduling."

## CONNECTIVITY INCLUDED

A new 'Connectivity Included' feature that eliminates time-based subscription charges to connect its tractors to FieldOps is also now integrated into larger New Holland and Case IH tractors, eliminating ongoing costs. It's also available on existing tractors with compatible telematics modems and a FieldOps or New Holland PLM/ Case IH AFS account, with activation possible via a one-off subscription purchase through an approved dealer.

"This simplifies subscription management throughout the lifetime of a customer's machine, provides continuous access to connected technology, and enhances the resale process," suggests Simon.

"Connectivity Included helps to gather the data that provides agronomic insights to then help boost overall yield potential and optimise management practices to boost margins. Machine-wise, real-time machine and telematics data can help reduce idle time, improve efficiency of field path planning, and co-ordinate multi-machine tasks.

"And from a machine health monitoring aspect, it enables owners and dealers to ensure any potential operating/service issues are identified and addressed promptly."

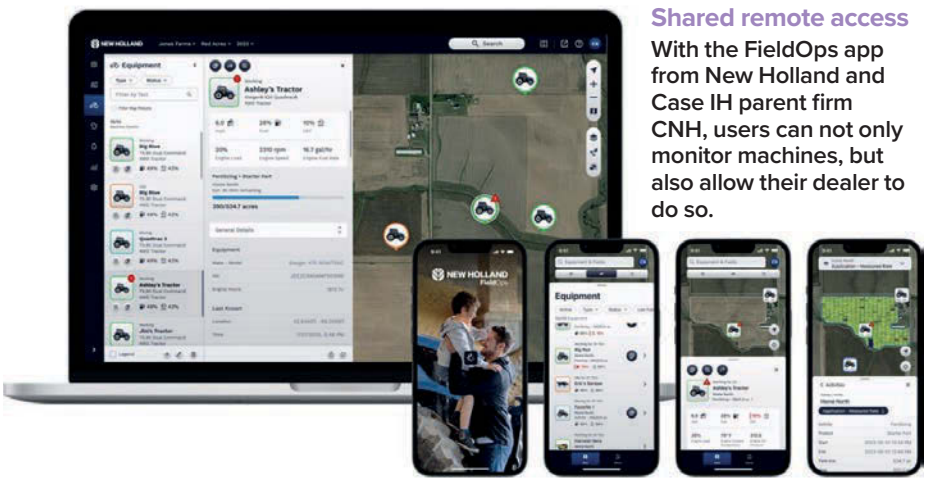
With Connectivity Included, connected equipment, and modems, there are no subscription or access fees for the lifetime of the equipment's modem, he explains. "It enables users to access agronomic/ field data, machine data and telematics, and proactive dealer support to address identified or potential issues helping minimise potential downtime and cost.

"The benefits of Connectivity Included are accessible with no subscription or access fees throughout the lifetime of the machine's modem, and this covers models from 200 to 340hp, with nothing additional to pay when purchasing a tractor in this power bracket."

As with other manufacturers, CNH is keen to help customers to upgrade to the new technology if they are already users of the existing New Holland PLM Connect or Case IH AFS Connect data management systems.

"Users already operating New Holland PLM Connect or Case IH AFS Connect machines equipped with a PCM or PCMF modem with an existing or expired subscription can be upgraded for free to a Connectivity Included extension upon purchase and delivery of a new qualifying machine.

"With this development, users can extract further value from the connected features available on both new and existing tractors. The productivity of individual machines and complete fleets can be monitored in real time, and users have instantly-recorded data available to help make both short and longer-term planning decisions on managing machines, jobs and fields," he concludes. ●



**Shared remote access**

**With the FieldOps app from New Holland and Case IH parent firm CNH, users can not only monitor machines, but also allow their dealer to do so.**

# Why dry matters


*"It's a universal sensor across machines providing customers with extra value and useability."*

TOM MEAD

The times when determining silage quality meant seeing how full the clamp was and testing it afterwards are long gone, with modern foragers able to analyse yield, dry matter and constituents in real-time. *CPM* explores the capability of different machines and what value this can add.

*By Melanie Jenkins*

**Having real-time harvest data allows forager operators to make decisions on the spot and can provide farmers with the knowledge to produce the best feed possible for their livestock. Advances in technology from a number of manufacturers are making this increasingly accessible and intelligent.**

## CLAAS

Claas has a number of different harvest monitoring options available to its forager customers. Its Quantimeter is a yield monitoring system which is the base of the firm's data capturing system on its Jaguar foragers, explains Claas' Conor Trimble.

"The system looks at the volume and speed of the material that's entering the machine and calculates the crop yield which can be used to create maps. It's also possible for the machine to determine accurate additive applications depending on yield."

Additionally, the optional dry matter sensor allows data capture to progress a step further, he notes. "In conjunction with the Quantimeter, this sensor can calculate the dry matter of grass, wholecrop and maize."

It monitors the conductivity, temperature and volume of the crop to calculate and record the dry matter, explains Conor. "The data can then be augmented onto a dry matter map. Having this sensor will also allow the machine to apply additives depending on the crop itself. This permits the operator to vary the rate of additive application to make sure the recommended amount is applied for the correct conditions."

An optional NIR sensor can also be included to provide the same functionality as the dry matter sensor ▶

with the additional benefit of analysing the content of the crop. "Using Near Infrared Spectroscopy the system can give readings for dry matter, starch, fibre, protein, ash, fat and sugar.

"The information collected by the Quantimeter, dry mater sensor and the NIR sensor is all transferred via telematics to the Claas Connect system," he concludes.

## FENDT

Partnering with Polispec, Fendt has worked to provide its latest Katana with an onboard analysis solution, says the firm's Ed Dennett. "This third party optional NIR sensor has calibrations for silage, forage, wholecrop and grains. The mobile unit can be used as part of the Katana and can be removed for portable use on farm, enabling operators to manually analyse forage from a clamp or bales, while also analysing freshly cut material as it's fed into the Katana."

Data from the NIR sensor, along with operational information such as fuel and time, can be fed back to the farm office and interpreted using management software such as Next Farming. "Reports and yield maps can be generated with such software, but more basic data can be processed and reported in Fendt's own portal shared with other Fendt machines.

"Using FendtONE offboard online portal, Fendt users can store, input and send jobs to machines in Fendt's range using this data to improve fleet efficiency," explains Ed.

**Measure and manage**

**Claas' Quantimeter system looks at the volume and speed of the material that's entering into the machine and calculates the crop yield.**

Using the NIR sensor to ascertain the quality of the crop, and an optional silage additive system, this provides operators with the potential to improve silage quality in the clamp. The silage additive dosing technology is fully integrated into the vehicle and has a tank capacity of 215 litres.

Chop quality and length are handled by six pre-compression rollers on the feed intake, which ensure optimum forage pre-compression. Metal and stone detectors on the first pre-compression rollers prevent damage to the chopping cylinder, these sensors are placed 970mm away from the drum. The crop volume/ throughput can be recorded through the feed rollers with simple calibration once a trailer mass is known. This data is then available for documentation of each job the machine carries out.

**New partnership**

**Partnering with Polispec, Fendt's latest Katana has an onboard NIR sensor to measure for silage, forage, wholecrop and grains.**

## NEW HOLLAND

Most common in terms of harvest monitoring on New Holland FR forager cruisers is a conductivity sensor within the machines which provides wet and dry matter readings, while GPS determines distribution across a field, explains the firm's Tom Mead.

"The limitation with this is the accuracy provided when compared with using an NIR sensor," he notes. "However, New Holland's NutriSense NIR sensor can be factory ordered or retrofitted across our range of foragers and is capable of providing additional constituent analysis in real-time as the crop flows through the machine. This includes starches, ADF, NDF ash, protein and fat."

As standard, the sensor is capable of reading values across 10 different crops but individual customers can request to add speciality crops too, says Tom. "Dinamica Generale, who manufactures the NIR sensors, is able to work with customers to

# Value adding data

## Providing customers with real-time yield and dry matter data

Operating a contracting business in the Scottish Borders, David Wood and his brother Kenny have been using harvest monitoring technology on their foragers since 2016 to provide their customers with up-to-date and accurate information.

While R Wood and Sons offers a number of services from cultivations to drilling, baling and bale chasing, silaging is by far the most significant part of the operation. Covering all of the Scottish Borders, East Lothian and parts of Northumberland, the business runs three foragers which are used to cut grass silage and wholecrop. "We cover around 4050ha of grass and 1010ha of wholecrop for dairy, beef and sheep farms as well as for an AD plant," explains David.

David's father Robert started the business in the mid-1980s, with chopping silage and wholecrop incorporated in 1996. "We started out using a modified combine header before moving to a dedicated wholecrop header in 2002 and a disc bed header in 2005. We now run three foragers, two of which have wholecrop headers."

All three machines are John Deere and include an 8400, an 8500 and a recently purchased wide bodied 9500. "All of the foragers have John Deere's HarvestLab which is something we first invested in in 2016 when it was introduced on the then new 8000 range," explains David.

"John Deere approached a number of its larger customers about the technology at the time and we decided to invest with the idea that it could potentially offer more to our customers. However, we started cautiously because we wanted to prove to ourselves and our customers that it worked before we offered it as part of our service."

**Investing in the future**

R Wood and Sons first invested in John Deere's HarvestLab on its foragers in 2016, but wanted to test the accuracy of the data before offering it to customers.

To test the accuracy of the technology in terms of tonnage of grass and dry matter, David would compare the HarvestLab data with that produced from some of his customers' weigh bridges and their samples. "Once we'd been able to do this and the results matched up, we knew it was reliable."

He now finds that if a customer hasn't requested HarvestLab's data by the time he's left their farm, he'll more than likely get a message requesting it the following day. "In the past we'd get asked about how much diesel we'd use but the priority for most of our customers now is to know yield and dry matter content. However, there are other benefits to HarvestLab such as being able to quickly determine if a cut requires another pass with a tedder or comparing the wilting characteristics of one variety of grass against another using the yield monitor."

> *"The priority for most of our customers now is to know yield and dry matter content."*

Using the data collected by HarvestLab, David's customers can far more accurately use additives in their silage based on yield mapping, he adds. "I've noticed that more of my dairy customers are trying to produce the best quality product, so the more data they have to be able to accurately apply additives, the better their silage."

The technology also has the ability to alter chop length depending on the dry matter content going through the forager, says David. "If the crop is drier, it'll automatically shorten the length, and if it's wetter, it'll lengthen in to achieve a better consolidation in the clamp."

Although HarvestLab comes at an additional cost to the base price of a forager, because the data is something his customers want, David has been able to include the cost of providing this extra service in his price per hectare. "It's difficult to quantify how it pays for itself, but it was only last year that I traded in the original machine I had HarvestLab on, so during the lifetime of that forager I'm sure it's covered the initial investment."

**Customer service**

R Wood and Sons runs three foragers and offers customers the option to receive real-time data on their grass silage or wholecrop using information recorded using John Deere's HarvestLab.

He'd originally hoped to be able to provide a further service of analysing silage that came out of the clamp, but because feed companies do this for free, there wasn't a marketable opportunity.

More recently he's been approached to work with someone who's using historical data to build an AI which will calculate feed rations. "All of our data is stored in Operations Center and this goes back to when we started with Harvest Lab in 2016, so we have plenty of information."

He also values the communication between Operations Center and his machines, which automatically transfers field boundaries and identifies where a machine is. "I can send an operator out at the start of the season, the system recognises where they are and uploads the data – it's very user-friendly."

Other than one hardware issue in 2019 whereby one of the lenses in the technology was moving, HarvestLab has consistently performed. To pinpoint the issue at the time, David ran both foragers side-by-side and could determine that the dry matter and sugar readings were coming through inaccurately.

One feature David would like to see in future is the ability for the technology to read the constituents of wholecrop. "We can read the constituents for maize and grass but not wholecrop yet," he concludes.

adjust the sensor's calibration so it can be used on additional crops."

Operators can access data from the sensor as a live read out on the forager's screen, or a report can be generated at the end of operations which will be sent to New Holland's FieldOps management system. "FieldOps receives this data in the same way it would for machinery data and it can break down the information into individual fields, analyse the constituents in a crop, or generate more in-depth reports," explains Tom.

The NutriSense NIR sensor isn't limited to being fitted to New Holland foragers, it can be switched between manufacturers' combines and can be used to measure slurry applications as well, he says. "This means it's a universal sensor across machines, providing customers with extra value and useability."

It's also possible to automatically adjust the chop length depending on the moisture, says New Holland's Cian O'Leary. "Active Length of Chop, or ActiveLOC, can be set up in the toolbox menu so the forager will change the chop length dependent on the configuration set by the operator."

**Useable data**

**New Holland's FieldOps receives crop data and it can break down the information into individual fields, analyse the constituents in a crop or generate more in-depth reports.**

Additionally, customers can select to include an on-board additive tank and the flow rate can be adjusted from the cab's display screen, he adds.

New for 2025 is a CropSpeed sensor located on the underside of the spout which measures the ejection of material, explains Cian. "The operator can adjust the sensitivity of this and if it falls below the CropSpeed ejection, the feedrolls automatically stop to reduce the chance of a blockage."

# Nature NATTERS

WITH MARTIN LINES

## A future of haves and have-nots

**Defra's sudden closure of the SFI scheme has divided farmers into two main camps: those who'd entered the schemes and are being rewarded for delivering public goods, and those who hadn't yet hit 'apply'.**

Those who have, will continue to be paid for what they deliver whereas those who missed out may have to wait 12-18 months to receive payments for managing the countryside and delivering public goods.

Last harvest year wasn't a great one for many arable farmers. The impacts of climate change and poor commodity prices left many with a cash shortage moving into 2025. Combine this with the accelerated reduction of decoupled payments last autumn, and many farmers now have little opportunity to be paid and rewarded for the public goods they're delivering. They'll see a significant reduction in revenue coming into their business from the public purse.

The reality is, we've moved away from a farming budget which pays the farmers who manage the land. The current government wants to pay public money for public goods that provide environmental and climate improvements. No doubt they'll now be looking closely at the value for money these schemes offer, and we may see certain SFI actions disappear as a result.

The 'broad and shallow' approach of SFI hasn't delivered on environmental impact or farm business resilience. Consequently, SFI may look very different in its next iteration – we might find out later this year what changes have been made, but further details haven't yet been released and the timeframe is unknown.

All farmers have to get the best return from their investment in growing crops; those not in schemes will have to look very closely at production costs to get the best return, especially in unproductive areas of the farm. Equally, the option to take these areas out of crop production and put them into environmental stewardship is no longer available.

But is it viable to crop some of these areas when the forecast budget with high input costs and low returns shows a negative income? Will these areas earn us any money for all of the hard work invested? Several supply chains offer payments for regenerative actions, but these are usually for growing areas not for areas taken out of production.

Government decisions affect every farmer and farm differently. It's therefore critical that every individual acts on this announcement and understands what it means for their land; we must plan ahead, as these decisions won't be overturned no matter how angry we get.

With a changing climate and water management increasingly impacting farming, I don't think it'll be the government that we'll lean on to support our industry, but the supply chain, as they begin to understand the growing risks to product availability – they also have their own green targets to meet.

Longer contracts that protect from the risks of fluctuating input costs, poor market returns and climate impacts will have to come from the supply chain, or many farmers may choose to not invest in the capital infrastructure to produce crops in the future.

Difficult financial choices and a perceived lack of stability and trust are why many farmers are angry with the government and Defra. But, the previous government didn't prioritise farming either!

The only way to influence the future is through constructive dialogue and engagement. It's critical that we clearly demonstrate the value of the public goods we deliver to both the Treasury and society – now and into the future – or risk losing that pot of money.

If we could channel our frustrated energy into positive engagement and focused efforts towards a fair deal from the marketplace, supply chain and society, we would have an industry better equipped for the future. ●

**An example of what we believe nature-friendly farming truly looks like – biodiversity recovery and food production at the same time. How will this be rewarded in the future?**


**YOUR CORRESPONDENT**

Martin Lines is an arable farmer and contractor in South Cambridgeshire with more than 500ha of arable land in his care. His special interest is in farm conservation management and demonstrating that farmers can profitably produce food in harmony with nature and the environment. He's also chair of the Nature Friendly Farming Network UK.
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# A positive sting in the tail

*"Parasitoid wasps are a much-overlooked apex predator."*
GAVIN BROAD

**Curiously gruesome in behaviour, parasitoid wasps are often coined the body snatchers of the insect world. *CPM* shines a spotlight on this fascinating group of beneficial insects.**

*By Janine Adamson*

**With all the will in the world, it can be difficult to look favourably on a certain striped creature, particularly when they're dive-bombing a summer picnic, flying head-first into a pint of cold cider, or delivering an angry sting.**

However, among the 7000 species of wasp found in the UK, the majority are in fact parasitic, or parasitoid – a group of small insects which are mostly harmless to humans, says Natural History Museum's wasp specialist, Dr Gavin Broad.

"Lots of different looking insects are classed as a wasp – there's huge diversity within the group and they often don't look alike. Parasitoid wasps in particular play a significant role in ecosystem management, parasitising and thereby controlling a wide range of hosts including agricultural insect pests," he explains.

Contrary to the renowned striped black and yellow social type, the majority of parasitoid wasps are very small – some less than 1mm in length – with certain species even jewel-like in appearance. But, what they all have in common is their general behavioural style, highlights Gavin.

## MODE OF ATTACK

The adult wasp lays their egg on or inside the host, with the then hatched larvae consuming and killing it. Similar to other pollinators, most adults feed on nectar, pollen and honeydew, although some also feed on a host, consuming bodily fluids.

According to Gavin, caterpillars are a common target for parasitoids, as are beetle and fly larvae. "Whereas specialist groups attack aphids because they're a very nutritious food source.

"Interestingly, you can observe a 'Russian doll' effect whereby certain parasitic wasps parasitise each other, with up to five levels of wasp feeding off a single aphid. This is complicated further, as we know aphids have telescoping generations, so give birth to live young whose offspring already have their young inside them."

He says parasitoid wasps are highly clever in the level of control they exert over their host. "It's very much a symbiotic relationship, with the wasps a much-overlooked apex predator."

**Target hosts**
**According to Natural History Museum's Dr Gavin Broad, caterpillars are a common target for parasitoids, as are beetle and fly larvae.**

# CSFB control, from the inside out

## Researchers hope to harness the potential of a parasitoid wasp which targets cabbage stem flea beetle

It seems that one particular species of parasitoid wasp – *Microctonus brassicae* – has a penchant for adult cabbage stem flea beetle, with work now taking place to further understand its behaviour and how to harness its pest control potential in oilseed rape.

First discovered in 1996 during work at Rothamsted Research, it took around 12 years to formally describe the beneficial insect because parasitoid taxonomy is very difficult, explains Dr Sam Cook.

Then, while sourcing CSFB adults for a separate Rothamsted Research project, it became apparent that many of the samples submitted from UK farms were infested with *M. brassicae* – resulting in a PhD project led by insect ecologist, Dr Patricia Ortega-Ramos.

Patricia's work has involved collecting samples of adult CSFB for the past six years, to understand the prevalence of *M. brassicae* and its level of parasitism. "The project centres around mapping the spatial distribution of this particular parasitoid wasp.

"Although work is still taking place to analyse the data, it's fair to say that *M. brassicae* is prevalent across the UK, although this varies depending on the year and environmental conditions," says Patricia.

In fact, broadly speaking, it seems *M. brassicae* can offer up to 30% parasitism rates of adult CSFB, she suggests. "And of the samples submitted, there have been only a few which didn't have any level of parasitism at all."

As well as submitting pest samples, farmers involved in the project have also provided insight into management practices such as tillage approaches. This should enable Patricia to identify any further trends related to *M. brassicae* populations, such as which actions may help to increase their prevalence. She's also looking at the relationship between *M. brassicae* and pyrethroid resistance.

According to Sam, this is valuable work which addresses a significant knowledge gap and has since led to further research collaborations. "Patricia is also contributing her expertise to Rothamsted's five-year Growing Health Project.

"This work aims to understand the trade-offs and co-benefits of delivering healthier agroecosystems. So in this case, Patricia is looking at the impact of plant diversification – inter-cropping, field margins and buffer strips – on the parasitoid effect."

**Cabbage stem flea beetle control**
Parasitoid wasp species, *Microctonus brassicae,* can offer up to 30% parasitism rates of adult CSFB, according to data collected by ecologist, Dr Patricia Ortega-Ramos.

Rothamsted's work has also identified parasitic wasp *Tersilochus microgaster,* which targets CSFB larvae. Although present in the UK, its on-farm impact is likely to be less than M. brassicae, explains Sam. "This is because larvae mortality post parasitism doesn't occur until the pest has exited the OSR stem when damage has already occurred," she concludes.

Growers interested in supporting Patricia's research are invited to send samples of adult CSFB to Rothamsted Research. For more information, e-mail patricia.ortega-ramos@rothamsted.ac.uk

AHDB's lead crop protection scientist, Dr Sacha White, says when it comes to an agricultural setting, for every crop pest there's likely to be a parasitoid species ready and waiting. "It's reasonably easy to identify an aphid that's been parasitised – they gain a silky coat and are almost mummified. It's certainly something to look out for, particularly in the spring and summer when activity levels are high."

He says even where aphid pressure is extreme, within weeks a population can be heavily parasitised by wasps. "Defra's pest survey has started to monitor beneficial insects in the spring and autumn. This has already noted significant numbers of mummified aphids even late into the autumn."

Aside from aphids, other arable pests controlled by parasitoid wasps include orange wheat blossom midge, frit fly, cabbage stem flea beetle (see box), seed weevil and pollen beetle.

However, understanding how to encourage parasitoid activity is still a work in progress, suggests Gavin.

"It's a very under-studied and under-monitored area – we're having to work hard to build basic datasets and understand behavioural traits. What we do know is, they require a healthy population of hosts."

### GIVE AND TAKE

Given farmers are aiming to eradicate crop pests rather than encourage them, could this be perceived as counterproductive? With this in mind, Sacha points out it doesn't have to be a binary choice.

"With any natural enemy there's always a lag in activity, it isn't an instant fix. There has to be time for the parasitoid wasp to be attracted to an aphid colony, for example, to lay their eggs and for the larvae to kill the host.

"The impact of this lag all depends on what you're growing and at what point that crop is at within its life cycle. Consequently, there's potential scope to be more tolerant of the delayed effect beneficials can exert," he stresses.

To illustrate further, Sacha provides the example of BYDV in winter cereals: "Crops can get to a point in the summer where infection no longer impacts yield. Equally, if natural enemies are indeed active in the autumn and slow down aphid activity, it should also reduce the amount of crop infected with BYDV.

"Unlike fresh produce crops where appearance impacts marketability, cereals and oilseeds can tolerate a good level of pest damage before yield is affected. So in some ways, it's okay to have pests if it means we can also foster those natural enemies."

As with most beneficials, parasitoid wasps are susceptible to insecticides, particularly pyrethroids. "In OSR this means if you're spraying for CSFB ▶


**Increasing pest tolerance**
**There's potential scope to be more tolerant of the delayed effect beneficials can exert, believes AHDB's Dr Sacha White.**

beetle but there's resistance, the beetles won't die but the wasps will," warns Sacha. "Crop management also plays a role - some parasitic wasp pupae develop in the soil, so tillage will impact their survival, as confirmed by work conducted by Rothamsted Research."

Gavin adds that fragmented habitats don't help either, whereas providing linkages across farm between refuges is a key factor in promoting all types of biological control.

And as with most creatures in nature, climate change is a critical factor. "New species of parasitoid wasp seem to be appearing in the UK as temperatures increase," comments Gavin.

"Presumably this is because their host insects are colonising, or in some cases, because hosts have longer and more generations per year thanks to the warming climate. Warmer conditions can also mean species which were southerly now have more warm weather for active host searching, and better conditions for overwintering."

**Tiny predators**
**Contrary to the renowned striped black and yellow social type, the majority of parasitoid wasps are very small – some less than 1mm in length.**
*Photo: Rothamsted Research.*

At a global scale, proactive interventions have taken place using parasitoid wasps to save key crops. Examples include overcoming mealybugs in African cassava and wheat stem sawfly in North American cereals, adds Gavin.

Whereas more locally in the UK, companies are already established which rear colonies for use as biological control in glasshouse crops such as tomatoes.

But whatever the desired outcome, it's all about the host-predator interaction, says Sacha. "Parasitoid wasps are very in-tune with the life cycle of their target, therefore, they're a highly effective natural enemy," he concludes. ●

# Putting trust in nature

## Creating a whole-farm ecosystem which not only boosts biodiversity, but supports an efficient approach to crop production

Having been in stewardship schemes since 2007, mostly Higher Tier agreements and SFI, Patrick Barker says his aim is to find a balance between running an efficient farm business and respecting the natural environment. And rather than targeting one outcome specifically, he believes in achieving this overall aim, nature will respond accordingly.

Patrick, who oversees Lodge Farm in Stowmarket with his cousin Brian, farms around 545ha with additional area under contracts. The rotation centres around commercial cereal crops including milling wheat and spring barley for malting, with oilseed rape recently being re-introduced.

With a commitment to boosting wildlife on the farm, they've been working with ecologist David Basham, to monitor and record insects, particularly bees and wasps. Patrick says what's become apparent during the farm's years in countryside stewardship, is that in many ways, it's hard to quantify biodiversity.

"But if you want integrated pest management to work effectively, you have to proactively manage the whole-farm ecosystem, starting with creating a healthy landscape through a focus on soil health. Whether that's actions such as direct drilling or planting cover crops, we perceive these as being best practice for our business which also contribute to a much bigger picture."

Patrick stresses when it comes to biodiversity, there's no quick fix, as confirmed during their time as an AHDB Strategic Farm. "There are so many contributory factors, you just have to hope that nature can respond quickly enough once crops are being well managed."

In terms of fostering beneficials, the farm is now insecticide-free which he says doesn't come without risk, albeit the reward has been worth it. "I think what helps in making that decision is having a true handle on the cost of production including all fixed costs and labour.

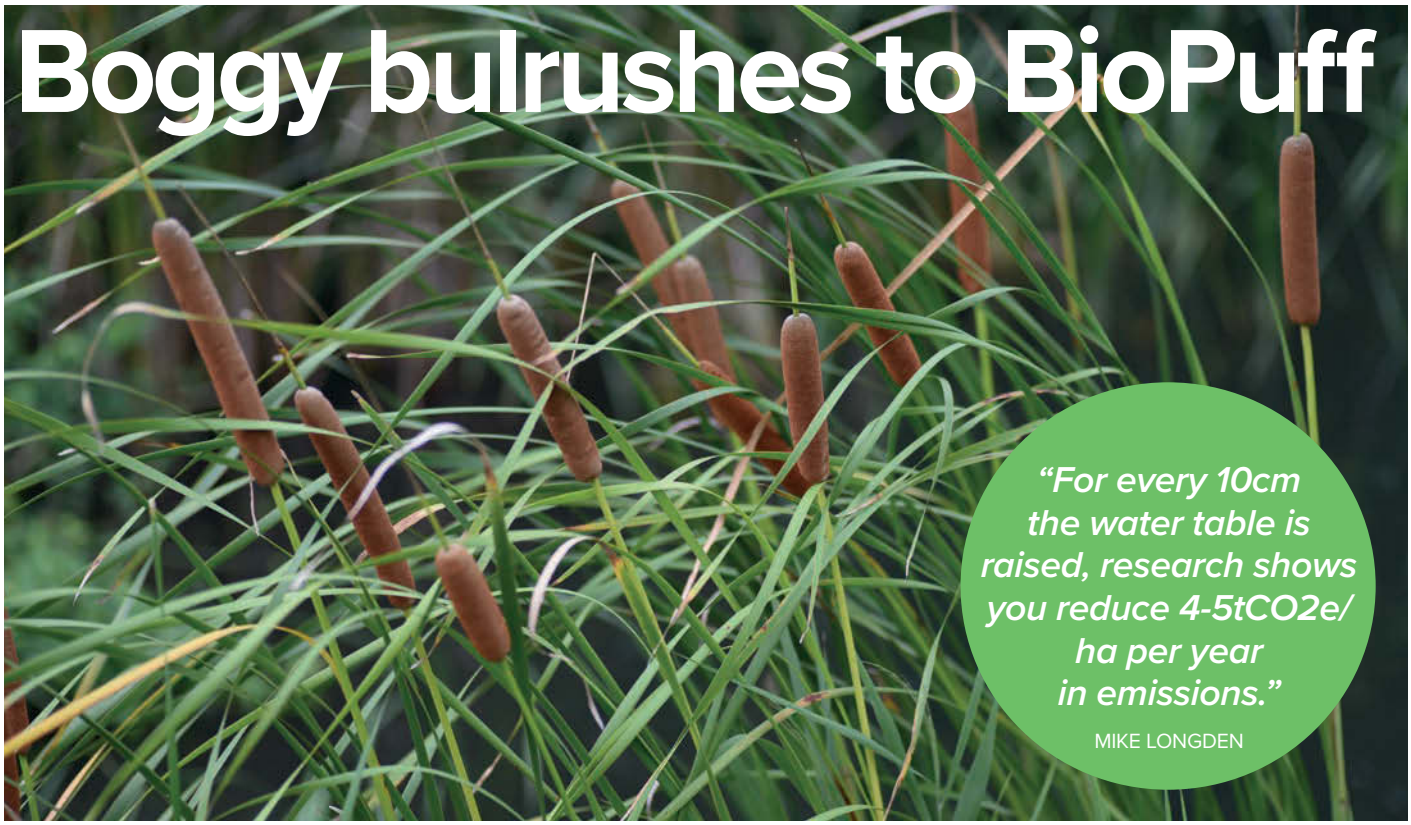
"In doing so, you can weigh up the return on investment from inputs – so whether a solution from a can versus waiting for nature to be effective, is worth it at harvest."

Regarding both bees and wasps, Patrick admits he still has learning to do. "The more I learn, the more I realise exists within our farm's ecosystem – many of which I had no idea were even there.

"In some ways, the specifics don't matter. It's about providing habitats on farm which are attractive to a range of beneficial insects which then become a food source for birds – a target of ours being to increase grey partridge numbers," he concludes.

**Decision making insights**
**Patrick Barker says by understanding the cost of production, it can help weigh up return on investment from inputs – whether a solution from a can versus waiting for nature to be effective, is worth it at harvest.**

# Boggy bulrushes to BioPuff




**Is it possible to grow a commercially-viable crop of typha on re-wetted agricultural peat that not only makes sense financially and reduces greenhouse gas emissions, but also helps address the sustainability credentials of the fashion industry? *CPM* investigates.**

*By Janine Adamson*

**Typha, commonly known as bulrush, is a perennial species which has found itself in the spotlight of late, namely due to its tolerance of a range of growing conditions, including depleted peatland.**

It's part of the mounting paludiculture movement – an approach which involves growing profitable wetland crops on areas with raised water tables, thus providing a sustainable alternative to traditional drainage-based peatland agriculture.

It's also a concept that's piqued the interest of Lancashire Wildlife Trust, and as such, backed by £400,000 funding from the Government's Paludiculture Exploration Fund, the 'Boggy bulrushes to BioPuff' project was born.

Taking place in Chat Moss, Greater Manchester, the project aims to deliver a field-scale typha trial on land which was formerly part of one of the largest lowland raised peat bogs in the UK. The aim is to hopefully prove that commercially-viable typha can be grown at scale on agricultural peat that's been re-wetted, says the Trust's Mike Longden.

"The fluffy seed heads are then harvested and used by a company called Ponda to create BioPuff – a sustainable eco textile used as a filling for padded jackets in replacement of synthetic fibres or goose feather down," he adds.

## FARMER INPUT

Central to the project's delivery is current tenant, mixed farmer Steve Denneny, who with support from the project's partners, is overseeing the typha crop from raising the water table through to harvest.

He explains that the 5ha field was drained and converted to farmland more than 100 years ago but continual waterlogging meant growing a profitable cereal or root crop was becoming increasingly difficult. The land was then used as a mix of permanent pasture and set-aside, with other, more profitable areas of the farm concentrating on arable cropping.

"But productivity at the farm has slowly been declining during the years, we were already having to take the least productive areas and reassess our approach," says Steve.

This meant when he was contacted by Lancashire Wildlife Trust about paludiculture, he felt he had little to lose by re-wetting the site, a process which began in autumn 2023.

To do this, blocks were installed within the field's existing perimeter ditch and

**Machinery demands**

**Lancashire Wildlife Trust's Mike Longden believes there's scope to adapt existing farm machinery – similar to that which operates within orchards – to work in paludiculture fields.**

deep underground trench bunds added to break through historical field drains – this prevents water from running from the field and is supplemented by a 0.5m-high perimeter bund, explains Mike.

Two 1.5m deep water storage areas were created at the lowest end of the naturally-sloping field, where the water table is naturally at its highest. By collecting and holding rainwater, these are used to irrigate the field during dry periods using solar-powered pumps.

Further 0.5m-high, 4m-wide bunds were then added to divide the field into cells, and act as tramlines for standard farm machinery while delivering a network of valved irrigation pipes. Mike says irrigation is a critical aspect of maintaining the water table height. "Equally, a series of drainage pipes and weirs flow water back into the system from each individual cell as required," he comments.

When it came to sowing the typha, seed was broadcast using a large, agricultural drone. "Because bulrush seed is very fine and at high risk of being blown away, different areas of the field were sown using different methods. Some were encapsulated in small clay pellets similar to Beebomb seedballs, whereas others were suspended in a cellulose gel.

"Both methods dissolve in water and allow the seed to slowly sink, replicating natural germination," explains Mike.

Now successfully established, the perennial crop will be harvested within 12-18 months (anticipated 2026), although exactly how is yet to be deciphered, he points out. "That's part of the project – developing mechanised production of typha at scale. However, we believe there's viable scope to adapt existing farm machinery – similar to that which operates within orchards – to work in paludiculture fields.

"So rather than buying a new, expensive piece of machinery, can we do something with more of a Scrap Heap Challenge, farmer-friendly approach?"

As well as the commercial aspects of the project – which include signing up to recently introduced SFI actions for raising water table levels (CSW17 and CSW19) – carbon dioxide, methane and nitrous oxide readings are being taken to evaluate how effective re-wetting is on reducing the greenhouse gas emissions associated with drained peat.

"This is because draining boggy peatland causes the oxidation of carbon which was once safely stored, instead being released as $CO_2$. In fact, 3% of UK greenhouse gas emissions come from drained lowland agricultural peat," highlights Mike.

"Whereas for every 10cm the water table is raised, research shows you reduce 4-5t$CO_2$e/ha per year in emissions. This is why it's so important to manage and maintain water table depth."

**Boggy bulrush project**

**The project at Chat Moss, Greater Manchester, is a field-scale typha trial on land which was formerly part of one of the largest lowland raised peat bogs in the UK.**

## WATER FILTRATION SERVICES

The sustainability gains from typha don't end there either, he adds. "Research suggests bulrushes can provide effective natural water filtration for wider ecosystem benefits such as increased biodiversity."

However, as the project progresses, Mike says it's uncovering some sticking points to resolve – for one, weed control during the crop's establishment. "We'd also like to find a way to use the whole plant rather than just the seedheads, exploring exactly when to harvest to achieve that."

He also understands a common question surrounding wetter farming is how it might affect surrounding fields and whether there's a subsequent flooding risk. "The answer so far has been no, and is one of the reasons why we have an adjacent control field as a means of monitoring that risk.

"The installation of bunds means any water that's on the wetter field stays there. Even so, on the surrounding drained fields drone imagery shows there remains areas of standing water. This confirms how difficult many areas of lowland agricultural peat are becoming to farm conventionally," explains Mike.

So far, the work alludes to a positive outcome, he says, and once complete, a business case will be created based on stacking the benefits of all of the associated nature-based outcomes. "That includes the carbon, biodiversity and water purification gains, with the final document being pitched to Defra as a lowland agricultural peatland code.

"Of course, this would be in addition to the income Steve can achieve by harvesting the seed heads for BioPuff and applying for SFI actions," concludes Mike.

For more information about wetter farming and working with the trust, contact info@lancswt.org.uk

# Putting the puff in puffers

**Believe it or not, puffer jackets date back to the 1920s in the guise of a down jacket. However, it was in the 1980s that the trend truly took off, shifting the garment from a piece of technical clothing to a mainstream staple.**

**But, whether a puffer jacket is sustainable all depends on the fibres used to produce it and whether agriculture agrees or not, feather down isn't for everyone.**

**Equally, man-made fibres aren't necessarily the answer either – from micro-plastics to a lack of biodegradability, petrol-based synthetic fillings are having an impact on nature too.**

**That's why the Lancashire Wildlife Trust believes the market is strong for BioPuff, claims Mike Longden. "It doesn't have to stop at puffer jackets either, with many potential applications from construction insulation to lining the bags of takeaway deliveries. We see this as a vibrant, growing market," he says.**

# Optimising functionality


**If there's one machine where technical accuracy is of paramount importance, it's on the sprayer. *CPM* explores some of the newer technologies and features available on machines to optimise performance and chemical usage.**

*By Melanie Jenkins*

**The subjects of resistance management and reducing chemical usage are never far away, and with increasing pressure to make these a focal part of spraying operations, manufacturers are continuing to invest in developing technologies which improve accuracy to help growers optimise their spray applications.**

## AMAZONE

With growers looking to increase output capacity, the trend in the sprayer market is for increased tank size – but not necessarily boom width as field size dictates what's practical in that respect, says Amazone's Simon Brown. "However, more liquid on board to reduce fill-ups and quicker turnround times is key to increasing output."

The single axled high-capacity UX 7601 with a tank size of 8000 litres and the UX 8601 with 9030 litres, are becoming increasingly popular, he notes. "The unique feature in the 7601 and 8601 design is the weight transfer from the tank to the rear of the tractor ensuring better traction, less fuel usage, higher stability and reduced ground pressure as well as ensuring that road legality on one axle is maintained."

New from Amazone for 2025 is an update from AmaSwitch to AmaSwitch plus. "The beauty of AmaSwitch was the solenoid on each individual nozzle body, which can be specified as either a triple or quad body with a manual changeover to each nozzle," explains Simon.

"The quad body can also be used on a 25cm nozzle spacing as well. The solenoid isolates each 50cm section individually meaning less overlap (up to 85% less) and reduced wastage, no chemical resistance build up and no yield penalties. With AmaSwitch plus, the complete hardware has been made more durable to withstand the rigours ▶

**Targeting buffer zones**
**The DirectInject addition to Amazone's self-propelled Pantera and the UX 01 allows an additional chemical to be fed into the spray line on the move so buffer zones can be treated differently.**


The AutoSelect Pro curve compensation system adjusts application rate when cornering, increasing the quantity on the outside of the curve and reducing on the inside.

of the harsh spraying environment."

More common on the UX 01 is AmaSelect, the flexible individual nozzle control system, he says. "The quad nozzle body is controlled by an electric motor which can send spray liquid to any of the four nozzles individually, or a combination of three pairs of nozzles, or one combination of three nozzles, giving a total of eight nozzle combinations on the move.

"This has huge agronomical benefits where the nozzle output – which may be from more than one nozzle – is matched to the application rate and droplet size. The range of adjustment possible is much greater compared with PWM systems. AmaSelect can be used at both 50cm and 25cm nozzle spacings."

DirectInject is the most novel addition to the self-propelled Pantera and the UX 01 where an additional chemical can be fed into the spray line on the move so buffer zones can be treated differently, says Simon. "The concentration of the chemical can be also be increased on the move, for use in applications such as growth regulator or fungicides in higher yielding areas, or in pockets of fields with bad grassweed issues. There's no wastage of the additional chemical and no cross-contamination of the main tank mix."

Also new this year on the UF 02 mounted sprayers, Amazone offers the ContourControl boom guidance system on 21m and 24m booms. "This is ideal for growers running a mounted sprayer and farming on undulating terrain where the boom sometimes has to go below horizontal as well as above.

"The system was introduced on 27m, 28m and 30m booms in 2023 and has now been extended due to demand on the narrower boom widths," he adds. "And it's that instantaneous response to changes in target height that owners of trailed and self-propelled sprayers wax lyrically about, which is now proving its worth on the mounted models. The system also self-levels when one boom is folded in to go around a pole which makes for better driver comfort."

Finally, the UF 02 sprayer has new contactless flow meters that give increased metering accuracy for better rate control and improved reliability. "We also have the AmaTron Share App now to connect to the AmaTron 4 for sharing application maps and job data between Farm Management Information Systems and the sprayer," concludes Simon.

## HORSCH

Horsch has released further precision crop care technological developments to its Leeb sprayers in the form of AutoSelect Pro and Spot Spraying, giving users the opportunity to update existing machines.

AutoSelect Pro is the latest update to the well-proven automatic nozzle control system and adds curve compensation to the current set of features. This system automatically switches the nozzles with the operational speed to help ensure a consistent application rate. It also automatically adapts the working height of the boom, removing workload from the operator and improving performance.

The AutoSelect Pro curve compensation system adjusts application rate when cornering, increasing the quantity on the outside of the curve and reducing on the inside. Horsch sprayers which already have AutoSelect can be upgraded to AutoSelect Pro.

With the intensive focus on spot spraying to help make plant protection even more efficient, Horsch is developing its own technologies based on its pulse nozzle system, PrecisionSpray. Because this system is in widespread use, it offers a practical upgrade path as spraying technologies develop in the future.

Spot spraying means that an individual plant is assessed and treated instead of the whole field, allowing sprays to be used in a more efficient and effective way. Horsch is currently researching different methods such as green-on-brown and green-on-green detection, and carrying out field tests with different camera manufacturers.

The firm says its objective is to adapt the new technology to suit different environmental conditions and meet the requirements of farmers around the world.

Green-on-brown plays a major role in dry regions such as Australia, to remove

# Here's an idea

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# Farm favourite

## Chafer's latest Sentry proves a hit on Cambridgeshire farm

Chafer sprayers have been a stable sight at Potash Farm near March in Cambridgeshire during the past 11 years, with the farm taking delivery of its third Sentry machine last season.

Run by Mick Mottram, C J Mottram and Sons covers 567ha of owned, rented and contract farmed area. Growing wheat, barley, potatoes, sugar beet, mustard and beans, he has a number of crops to manage, meaning he requires a sprayer that's up to the task. "With the variety of crops we grow, it's important that we can clean the sprayer out and turn it around quickly to go straight back onto fields," he explains.

Other than sugar beet harvesting, all management is done in-house, with cultivations ranging from full inversion with a plough to min-till.

Before first purchasing a Chafer machine, the farm ran two 24m sprayers to help avoid cross contamination with sugar beet inputs, but 11 years ago Mick decided to opt for a single 36m machine to tie in with the existing wheelings on the fields.

"By operating a larger sprayer, we don't travel through the crops as many times and can cover fields faster – I was surprised at how much more I could do in a day with a 36m machine than with a 24m one," observes spray operator, Barry Glover.


**User friendly**
Barry Glover and Mick Mottram have been equally impressed with the ease of use and improved features of Chafer's latest Sentry model.

**A performance boost**
The latest Sentry has a Norac system which demonstrates significantly improved performance compared with the previous system used by Chafer.

### SPARES PROVISION

Although Mick considered the idea of a self-propelled machine, he couldn't justify the cost. "I decided to visit Chafer to see the spares store and was impressed that the firm carried nearly every spare part the Sentry could possibly require. The site is also only just over an hour away, so I knew that if we had a breakdown, I could collect the necessary parts and be back on the farm in under three hours.

"Since then, we've had very few problems – Chafer has never let us down with parts and are always at the end of the phone. The firm is only made up of a small team, but it provides a personal touch that's followed up with service."

Running a policy of trading in his sprayer for a new one every five years, Mick's latest purchase of a 5000-litre Sentry G Series is what he and Barry coin as a 'step change' in performance. "The first and second Sentry machines we had were similar, but this time we've noticed a real difference in capabilities and performance," says Mick.

Two of the most significant improvements operationally have been the boom flow and steering. "The boom levelling is a hundred times better than before, making the job so much better and easier," says Barry. "The first two Sentrys we had included Chafer's own contour levelling system, but the latest machine has a Norac system and it's tremendous – hovering just above the ground exactly where you want it to be.

"Section control on the boom is now split into 2m sections with two 6m sections in the middle, which has made a lot of difference in reducing overlaps, helping us to reduce chemical usage," he adds.

> *"The latest machine has a Norac system and it's tremendous."*

According to Barry, steering has been vastly improved, making his job easier. "On the last sprayer, if you backed it into a corner you'd have to flick a button to make it go straight, but now the sprayer locks the steering into a straight position."

He's also been impressed by how easy it is to change water volumes on the new Sentry. "The sprayer has two lines which you can use variable rates on, whereas the previous machines had a single line. If one of the lines is struggling for pressure, then both lines cut in.

"Now we're working with higher water rates than previously, this works really well. The machine has two smaller fine droplet nozzles and this also makes a noticeable difference, we can use a weaker mixture without compromising our efficiency."

As a result, both Barry and Mick anticipate they'll be using less chemicals. "This will all be down to the sprayer, so it's helping us get ahead of the game as far as reducing inputs is concerned," comments Barry. "We can use anything from 100-400 l/ha and where we used to typically apply 100-120 l/ha this now averages 200 l/ha."

Having two separate lines has made the increase in typical water volumes a simpler process. "Because of the two lines and the different nozzles, it's now an instant change, saving a lot of time. Before I'd have to change all of the nozzles to apply a different rate, and with 72 nozzles, this could take 20 minutes. Because there are fewer ideal spray days, any time saved is useful," adds Barry.

With an improved rinse facility, it's now much simpler and easier for him to thoroughly clean the sprayer between jobs, he believes. "It's a case of going into the control box and selecting the type of rinse, and with the ePlumbing, I simply select how many litres of water to use from the clean water tank, press the button and it does it itself."

The sprayer also features Chafer's AirPurge which uses pressurised air to remove all liquids from the system. "Not only does this thoroughly clean the lines, it also helps with frost protection," says Barry.

## TOPCON SCREEN

Additionally, the in-cab set-up has been vastly improved through the introduction of a TopCon screen, rather than having an entirely separate box to control guidance and boom controls. "With the last two sprayers I couldn't see out of the right hand window because of all the different displays, but this has now been consolidated. A lot of thought has gone into how to make it easier to operate the sprayer from the tractor."

However, Barry does note that other tractors have in-built displays of sufficient enough size to remove the requirement for a TopCon screen altogether.

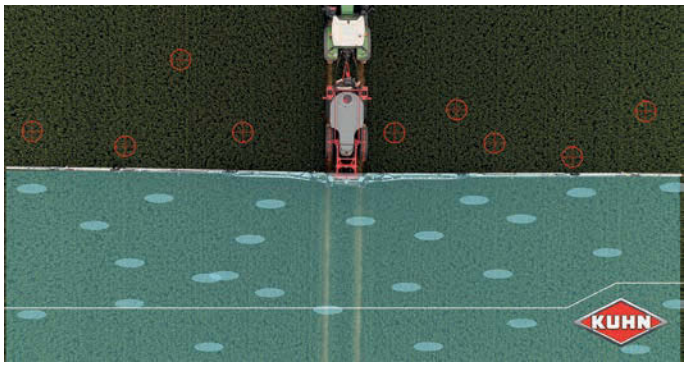
Regardless, even some of the finer details and finishing touches to the latest Sentry have impressed Barry. "Chafer has added protective stainless steel plates to a lot of the wear spots, to prevent damage to the paint and the machine. There are plates at every join and a protective sheet behind the tyres to stop mud hitting the nozzles, proving the firm does listen to feedback.

"It also has better boom lights which makes working at night much easier because the tractor lights just aren't enough by themselves."

Mick notes that there are a lot of sprayer options available on the market but he's been suitably impressed with Chafer's approach, machine performance and build quality. "Chafer provides us with great service, and with smaller weather windows to work in, this is so important to help us be operational as quickly as possible."

**Finer details**

Chafer has added protective stainless steel plates to a lot of the wear spots, preventing damage to the paint and the machine, and has even added a sheet to prevent mud from the tyres reaching the nozzles.




**Enhanced spot spraying**

**Kuhn's I-Spray spot spraying system has been developed in partnership with Carbon Bee to offer different applications depending on the crop, with green-on-green spot application designed for weed detection.**

individual weeds from the stubbles, while green-on-green is far more difficult to implement due to the small differentiation between weeds and emergent crops and is proving a challenge for experts across the agricultural industry, it adds. But green-on-green is most important in northern Europe, for example, for the application of herbicides or fungicides.

## KUHN

The latest updates to Kuhn's sprayer range include future technology that's designed to help users apply crop protection products with greater precision, protect the environment and reduce input costs.

The firm's I-Spray spot spraying system has been developed in partnership with Carbon Bee to offer different applications depending on the crop. A key benefit of the targeted system is reducing product use and cost compared with current methods, by up to 95% in some crops, according to Kuhn's Edd Fanshawe.

"Furthermore, the environment is better protected as applications are targeted to the plants that require it, whereas blanket applications are avoided. This also helps to reduce the chances of herbicide resistance."

The system works from live data fed via hyperspectral sensors positioned along the boom. These are lightweight and use a wide-angle view, so the number of sensors required is reduced, he adds. The control module uses the data to activate individual nozzles to target the specific plants or areas.

Three application modes are possible; green-on-brown spot application to target weeds on stubbles; green-on-green spot application for weed detection in growing crops and, green-on-green using variable rate application.

"This allows a low volume spray across the width with targeted individual dosing when weeds are detected," explains Edd. "This is particularly useful to treat whole fields that could require a smaller dose but increased rates to specific plants. Variable rate application of fungicides, growth regulators and nitrogen will be possible using crop biomass measurements."

> *"The environment is better protected as applications are targeted to the plants that require it."*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**TOGETHER FOR A HEALTHY AGRICULTURE**

# No more chasing around


*"With a chaser bin it can help trim down on trailers, redistribute staff and increase the productivity of combines."*

MARTIN JENSON

**There's hardly enough time, hands or weather windows during harvest to go around, meaning everything can become rather stretched. *CPM* explores how investing in a chaser bin could improve timeliness, staff distribution and help consolidate capital expenditure as this busy season approaches.**

*By Melanie Jenkins*

**It may only be spring now, but it won't be long before fields are full of combines and the roads are busy with the cycle of tractors carting grain. But what if operations could be streamlined via one simple addition to the farm's machinery line-up?**

Chaser bins may not be a regular sight on UK farms, but their popularity is increasing as the benefits they can bring to busy operations are realised. After buying a Kobzarenko chaser bin for his operations a few years back and seeing how useful it was to his own business, Martin Jenson has now expanded into importing them to sell in England.

"The direction UK farming is headed means there are increasingly larger farms or contracting businesses," he says. "Although farms in England aren't large-scale in the way some are in other parts of the world, the expansion here means travelling greater distances to transport grain with tractors and trailers.

"But it's not always feasible to transport grain with a tractor and trailer, which combined, could cost £100,000. But with a chaser bin, this offers another leg to operations that can help businesses to trim down on trailers, redistribute staff and increase the productivity of their combines," he explains.

## BUSINESS VENTURE

Martin operates several farms with one based in Norfolk, another in Cambridgeshire and a third in Ukraine. His latest venture into chaser bins includes importing and selling them, as well as providing the option to rent at a day rate, for a season or a year.

"Not only did I see the scope of use, I also felt they were likely to become a necessity for some farmers, especially those operating across more than 1500ha. Chaser bins are here to stay and I think we'll see more of them on UK farms every year.

"For us, adding a chaser bin to our system was the first step towards introducing controlled traffic farming (CTF). Although we aren't fully CTF across the ▶

**Informed investment**

**After researching chaser bins, Martin Jenson (right) invested in one for his own business and now imports them for sale, working with his sales manager, Latham Geer (left).**

# A LONG WAY TOGETHER


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# Bought at first sight

## How a single day using a chaser bin persuaded one farmer to invest

Situated a short distance away from Martin Jenson's farm in Norfolk, Rick Perry-Warnes, at JW Perry-Warnes and Sons, was immediately convinced of the advantages a chaser bin would add to the farming operation at Pages Farm, Wood Dalling.

Working in partnership with his dad Peter, uncle Tom and mum Anne, Rick farms 1900ha of the family's own land, works across four contract farms and is a tenant on a large estate. As well as this, Rick has an agreement with neighbouring farmer Ben Plumb who operates Tipple Farm and Orchard Farm, where machinery is shared between him and J W Perry and Sons.

"It's an informal set up but we've been friends all our lives," says Rick. "It makes things simple for both of us, and prevents Ben from having to invest in machinery.

"We have our own grain store on the farm and have usually worked in close proximity to it, but during the past four years we've expanded a lot and are now operating further away from base," adds Rick. "Plus, a local contractor has built a 5000t wheat store where we now send a lot of crops using lorries. We find using lorries is great because it keeps our trailers off the roads, but to load a lorry properly requires a chaser bin."

Although Rick had seen a number of chaser bins before, it was only when one appeared on Martin's yard and when he saw it demoed at the Royal Norfolk Show that he realised the potential of having one of his own.

As a result, he decided to demo Martin's chaser bin on farm and subsequently decided to purchase it.

**The ideal fit**
The benefits of using a chaser bin at W J Perry and Sons became apparent on the first day of demoing one.

"It didn't take us long to realise how much of an asset it was – after day one Ben and I looked at one another and said, 'that was awesome'.

"Having the chaser bin at harvest really opens your eyes because it's always with the combine. We used to fill the combine tank and would have to wait for a trailer but now the chaser is always there, it buys you so much more time, as well as removing the fatigue from the trailer drivers."

The farm has its own combine but hires a neighbour contractor who brings in a second combine to cover at least 300ha each harvest. Rick says one form of measuring the benefits of having a chaser bin has been assessing the capacity of the combines per hour and looking at how having a chaser bin would impact this hourly output. "In the past the combine could be sat still for 40 minutes waiting for a trailer, but we hardly had to stop for a moment since using the chaser bin."

Ben operates the chaser bin and is mindful to keep the combines empty. "It's meant a lot more communication between combine operators and myself but it made such a difference to productivity immediately. For anyone operating a chaser bin, they have to be switched on, but that's what makes it a game changer."

> *"After day one Ben and I looked at one another and said, 'that was awesome'."*

Before running a chaser bin, there could be as many as five trailers being used for one field, but now there's only 1-2 lorries and one trailer, explains Rick. "Plus, when we're using lorries these aren't operated by our staff, so it means members of our team can be doing other jobs such as cultivating fields for the next crop."

Whereas previously the harvest team could be made up of as many as nine people, it's now around 3-4 in-house staff. "It certainly works out more economical to use lorries because they carry more and can travel faster than a tractor and trailer outfit.

"We used to struggle to find enough staff and would often have to stop cultivating during harvest in order to complete combining jobs but using the chaser bin, and therefore freeing up staff, has meant we've invested in a muck spreader and now have the ability and manpower to do this ourselves rather than contracting it out."

**Working together**
Friends and neighbours, Rick Perry-Warnes and Ben Plumb, have an informal arrangement to share machinery.

Fortunately, A and B Clark haulage is situated only a few miles up the road from Pages Farm, which Rick works closely with to coordinate jobs. However, he says it can be a case of having to estimate how much haulage is required which isn't always an exact figure.

Another key factor at play for Rick is minimising compaction across the farm, with the system planned to help protect soils as far as is possible. "We aren't able to run a full controlled traffic farming system but the combines are on tracks so it's nearly always the trailers which do the most damage. Now we have the chaser bin it always stays on the tramlines and is running on such large tyres this minimises damage."

Although the chaser bin is being run on its original tyres, Rick is hoping to fit even larger tyres. He runs it behind a 300hp Case Optum but has also pulled it with a John Deere 6250 and believes 200hp would be sufficient.

As far as suitability goes, Rick has found the 24t chaser bin to be an ideal fit with the system. "It's certainly value for money when we compared it with other brands and is perfectly suited to our requirements. One thing it didn't have was cameras, but this is something Martin is going to arrange for us."

He estimates that for J W Perry and Sons the chaser bin will produce a return on investment within around three years. "Plus, it's helped to minimise compaction, allowed us to redistribute labour and to save money by not having to employ as many extra hands at harvest."

holdings, we've gone into it by degrees and are at the point where we've renewed our entire cultivation fleet to tie it all up – but we've had to do this incrementally because of the costs involved."

## OPERATIONAL SAVINGS

The decision to go in this direction was made to reduce compaction and improve operational savings. "We'd studied chaser bins operating on other farms before investing ourselves, and having looked at all the different manufacturers available throughout Europe, we settled on Kobzarenko. Now having run one myself, I can vouch for the quality of the equipment."

Kobzarenko has the widest range of chaser bins in Europe – from 9-50m$^3$ / 7-40t – with the smallest even likely to appeal to pig farmers for moving feed. "The range on offer was something that I really liked," says Martin. "Not just the quality of the products but the volume of machines the firm manufactures, as well as the price point. For example, the 24t machine is on the market for £30,000 less than a competitor's equivalent."

For those familiar with chaser bins, most manufacturers offer similar features across the board, such as the option of cell weighing, but Kobzarenko's machines have hydraulic sliding gates which open at the bottom and feed grain into the auger, and the feed can be adjusted when loading seeding machines. It's also possible to fit several magnetic cameras onto the body of the machine to aid with health and safety.

"One thing I like about Kobzarenko's chaser bins is that they have the added advantage of an auger extension – up to 5.5m – giving it capacity for a wider range of uses," says Martin. "The extended length means the chaser bin has further use in the autumn and spring because it can empty into seed drills in bulk.

"Rather than having to load 12t of seed into a trailer and move this with a telehandler or tractor, you can just empty 18t of seed directly into the drill. Alternatively, the extended augers could ▶

**Multiple benefits**

**Chaser bins can allow businesses to trim down on trailers, redistribute staff and increase the productivity of combines.**

be used for bulk fertiliser which helps reduce handling. Whereas a chaser bin could spend nine out of 12 months in the shed, this opens up the possibilities for using it throughout the year."

Plus, the range of crops that it can handle works for any system, highlights Martin, having used his chaser bin for a wide variety including maize. "I don't think there's anything I'm aware of that it couldn't handle."

He recommends they're stored indoors and notes it's pertinent to wash them out after they've finished being used for a specific purpose, especially if it's had fertiliser through it. "It's not high maintenance but it's advisable to wash it out, removing grit from bearing areas and using a knapsack system to thinly spray oil on the turning parts."

Additionally, before delivery, all Kobzarenko machines are sent to a local firm for brake testing to ensure they're safely operational ahead of use. And for those who prefer a colour-coordinated fleet, the chaser bins can be specified in any colour.

When making the decision on whether to invest in a chaser bin, Martin believes it's down to the amalgamation of benefits. "They can help reduce soil compaction, saving on cultivation costs; can help limit capital expenditure; provide diversified usage and increase the operational capacity of combines. If you could increase your combine's productivity by 10-15% then this equals a huge saving in capital expenditure and operational savings.

"For those looking to hire a machine, this can be a stepping-stone to determine how one might fit into your business. Most people who hire one come to the conclusion that they can't manage without one," he concludes.


**Customisable options**

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# Talking TATIES

WITH ANDREW WILSON

## Glorious spring

**Isn't it grand to have a decent spring? In the past month I've sown spring malting barley after sugar beet, and also in place of second wheat on heavier land. This strategic move is to get two consecutive spring crops (spring oats will follow) as another tool in the armoury against blackgrass, but also because a poor second wheat on heavy wet land costs the same to grow as a good crop, with less yield to pay for it.**

I've also planted oats after beet where there's a chance of a first wheat in 2026, plus instead of some poor wheat that was drilled with our power harrow drill combination after potatoes last October. The heavy rain that followed was too much and the soil ran together, suffocating the crop. The strip-till drilled wheat after potatoes looks far better on adjacent land, so that'll be considered more in future.

We had some broiler manure spread on the field post-glyphosate, worked it in, then I drilled with our 'prairie drill' (6m tine drill) before 14mm of rain followed. It's up and away now – I might have been a bit fussier with the seedbed had it been barley.

Our wheat-bean bi-crop also was also axed, or 90% was. I've left a tramline at the better side of the field to annoy my combine driver – I mean, test the principle of two crops growing side-by-side. A mixture of a drainage issues, crow frenzy and a wet winter rendered the rest of the field unviable.

I've drilled the bulk with spring beans which will be followed by a first wheat in 2026 and then potatoes the year after. The BPS used to just about pay our rent, but now that's been significantly reduced, our experiments have to be smaller scale to reduce risk and allow the ever increasing pile of bills to still be paid.

Speaking of the jumpy government, the proverbial goalposts appear to now have motorised wheels fitted, but with no effective means of steering. We've been facilitating environmental stewardship here since the early 1990s but given my Mid-Tier agreement didn't end until February, it was a real pain to overlap it with SFI.

As we were told we'd have six weeks' notice of major changes, I let it run its course. How foolish was I? Hindsight is marvellous and arguably I ought to have started an agreement for the policy side of SFI and a few extras like cover crop funding, but being a man and a half down in our regular farm team was draining as it was.

Consequently, 30+ years of habitat creation looks to be in vain, because those areas for all they are less productive, now generate cost without revenue and so change has had to happen. For example, some of the bird cover areas have gone back into the main of the fields and will in future be sown with a combinable break crop when the larger lighter areas of those fields are producing root crops. It's all hassle and may be subject to change, but doing nothing isn't viable at the moment. Two of the AB1 plots will be grassed down for hay given they border water and flood regularly in winter. What a mess the system is.

On a positive note, Tom (my recently recruited apprentice) and I have rehashed our beet establishment rig and it's worked well. I didn't feel seed placement was as good as it could be previously, but some elements – particularly placed fertiliser – had to stay.

After a few years of min-till beet, we've reintroduced the plough, which also buried the Sylvinte, Limex and FYM. 40% of the nitrogen was then broadcast as urea onto the pressed ploughing, along with some polyhalite, which was incorporated with the tine drill as it sowed the nurse cereal.

The low disturbance tine/power harrow/precision drill rig then followed to complete the job in the last days of March, a full five weeks earlier than last year. We placed another 30% of the crop's N as liquid down the back of the leading tines of the drill rig, along with some mollases.

Last year's beet crop deliveries were complete by early March with a performance just above our five-year average, and favourable sugar and dirt figures which makes a refreshing change after the depressing stats of 2023.

The wanderer has returned – my globe-trotting right-hand man has spent the past few months working in New Zealand and has brought back lots of ideas and even more enthusiasm than he went out there with – it's great to have him back.

My team and I were also part of Ben's send off and take some solace in that he's now at peace. He's much missed but we must continue, time stands still for no man.

It's tough out there for all of us and we're stronger together, but sometimes it's easy to forget that when politics, weather, uncertainty, breakdowns and whatever else descends. Don't be alone – it's always good to 'compare disasters' with comrades – problems seem to shrink after a rant or natter.

As I write this on April Fool's Day we're about to start planting spuds in these parts, but more on that next time. Look after yourselves, and here's to a decent harvest. ●


**YOUR CORRESPONDENT**

Andrew Wilson is a fourth-generation tenant of the Castle Howard Estate in North Yorkshire. He has a strategic approach to direct drilling on his varied soil types and grows a wide variety of crops. He's passionate about the potato industry and having been utilising cover crops to reduce cultivation and chemical use since 2011, dipped his toe in the water of regenerative potatoes in 2021. @SpudSlingsby


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# PCN varietal resistance promise

> *"Resistance is the ability of a variety to affect the multiplication of PCN, which ultimately should lower numbers at the end of the season."*
>
> MICHAEL RODGER

## Trials results highlight the role that newer varieties could play in mitigating potato cyst nematode damage. *CPM* headed to Hutchinsons' potato day at Worth Farms in Holbeach to reveal more.

*By Mike Abram*

**Varietal resistance against potato cyst nematode (PCN) will be increasingly important for potato growers following news that it could be the last season of use for Nemathorin (fosthiazate) in Europe, concentrating minds to life without the last mainstay granular nematicide.**

While nothing has changed from a GB regulatory perspective for the product, which has a current expiry date of 2029, the impending withdrawal of approval in the EU has led to further nervousness about its future in the UK, said Simon Faulkner, an independent potato agronomist from South Lincolnshire.

Speaking at a recent Hutchisons' potato meeting, he advised growers that if they own land infested with PCN then they should treat and consider using a resistant variety as well, to make the most of Nemathorin.

On the topic of resistance, Hutchinsons has been conducting potato variety trials supported by Richard Austin Agriculture trials manager, Michael Rodger, at Worth Farms in Holbeach.

While presenting at the meeting, Michael highlighted that progress is being made with varieties that offer good resistance and/or tolerance to PCN. However, resistance and tolerance aren't linked, he reminded. "Resistance is the ability of a variety to affect the multiplication of PCN, which ultimately should lower numbers at the end of the season.

"Whereas tolerance is how a crop can withstand an attack from PCN and still yield well. The downside is that a crop can yield positively but have a much higher infestation at the end of the season."

### VARIETY TRIALS

Cara is a typical example of a potato variety which exhibits excellent tolerance but has no resistance, he suggested.

In terms of the Hutchinsons trial, the work tested 26 varieties across three replicates with and without Nemathorin, with 40-50 soil cores tested for PCN from each plot before and after the experiment. The population was 100% Globodera pallida and ranged 0.5-20 eggs/g/soil.

A PF:PI ratio – which compares the final PCN population with the initial population – of less than one suggests varieties with very good resistance that reduce *G. pallida* populations, explained Michael, with examples found in packing, processing, chipping and crisping varieties.

Most importantly, there are also varieties that exhibit both good resistance and tolerance to the strains of *G. pallida* found in the trials field, although this doesn't necessarily mean there'd be similar results to other *G. pallida* pathotypes or *G. rostochiensis*, he added.

Promising options include processing varieties Amanda and Elland, chipping type Lady Luce, and crisping variety Cinderella, alongside some coded entrants including one suitable for


**Quantifying varietal resistance**
**A PF:PI ratio of less than one suggests varieties with very good resistance that reduce *G. pallida* populations, explained Richard Austin Agriculture's Michael Rodger.**

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the packing sector, said Michael.

He added that the trial will be repeated next year using a stratification approach to bring more depth to the findings – because stratification helps to minimise the impact from PCN levels in plots varying across the field.

"Instead of randomising the plots after sampling, we'll purposefully put each variety in three different infestation levels – high, medium and low – so we can see where resistance or tolerance drops off. Sometimes a variety will start performing worse when you have more than 5-10 eggs/g/soil," he explained.

Hutchinsons has also been investigating varietal tolerance to post-emergence herbicides Shotput (metribuzin), Basagran (bentazone) and Titus (rimsulfuron), as demonstrated through two years of trials.

## SEASONAL CONDITIONS

In 2023, conditions were perfect for post-emergence herbicides at application and very little damage was seen whereas in 2024, conditions were more marginal with temperatures of 20ºC when sprayed near midday, said Michael.

That contributed to much higher levels of chlorosis and necrosis with some varieties exhibiting high levels of sensitivity. In particular, processing variety Armedi was very sensitive to all post-em herbicides, he highlighted, while varieties Lady Luce, Amanda and Buster were among those sensitive to metribuzin.

Furthermore, varieties including Lady Luce and Cardyma were also sensitive to full rate Basagran; in some treatments quite severe chlorotic and necrotic symptoms were being found 21 days after application, noted Michael.

In addition, damaged plots were more susceptible to botrytis infections. "We had almost no botrytis in the untreated, but where there was herbicide damage, plots were riddled with it," he said.

To extend the trial work further, each variety is now being stored under two storage regimes, added Simon.

The pre-pack store is held at 3ºC with the use of ethylene treatment, Biofresh Safestore, as the sprout suppressant. The processing store is maintained at 8ºC, with sprout suppressant two-fold – a 20ml/t DMN application followed by ethylene at 5ppm.

"Fry colours were tested before storage and will be re-tested as they come out with the result available at our storage event on 21 May at LFP's Fleet Lodge farm," concluded Simon.

Also presented at the Hutchinsons event was work which has been taking place to investigate potato harvesting dates as a means of mitigating wireworm damage.

Independent agronomist, Martyn Cox, shared that Cambridge University Potato Growers Research Association (CUPGRA) trials in two different years at two sites with different varieties have highlighted how damage from wireworm reliably doubles in the six weeks between mid-August and the end of September.

"We achieved a 75% reduction in wireworm damage using a combination of variety and early harvest in 2024, and there wasn't that much of a yield difference," he said.

It's calendar date rather than the duration the crop has been in the ground that's important with early harvest, he added. "It's down to the activity of the pest – at that time of the year they have a low period where they don't eat much," said Martyn.

**Wireworm trials**

**Independent agronomist Martyn Cox shared that damage from wireworm reliably doubles in the six weeks between mid-August and the end of September.**

# Attention to detail when spraying for blight

## Paying attention to application technique for blight sprays is critical, as once the disease is in the crop it's difficult to control resulting in higher input requirements, warned Hutchinsons root crop technical manager, Darryl Shailes

"It's all about coverage – if we have a little septoria in a wheat crop because of boom-bounce where we've not covered the crop effectively, we can get away with it. But with blight in potatoes we're forever chasing."

Green areas in fields after a pre-emergence / burn-off herbicide has been applied could be used as an indicator of where blight risk might be highest, he suggested. "We know those areas are where the sprayer isn't marking up."

Sprayers with GPS systems could also be a risk for blight, added Martyn Cox. "We've found blight at one end of the field where the sprayer went in and not at the other where it came out of work again.

"The reason was, the sprayer was getting up to speed and the variable rate control was ever so slightly out," he explained.

The same could also apply if a sprayer is backing into a field corner and then driving off with the GPS not switching quite fast enough, said Martyn. "My advice to growers is to be on manual as much as you can and if you're backing into corners, take your time."

With only stocks of mancozeb already in farm stores available to use this season, more pressure is likely to come on blight control products, noted Darryl. "We have to reduce inoculum sources and have a good anti-resistance strategy.

"Be aware of the different groups and alternate products with different modes of activity – don't trust singular actives and stick to seven-day intervals," he advised.

**Sprayer coverage**

Green areas in fields after a pre-emergence / burn-off herbicide has been applied could be used as an indicator for where blight risk might be highest, suggested Hutchinsons' Darryl Shailes.

# Tackling blight through strategic fungicide management


**As growers face the final months of use-up for stalwart fungicide mancozeb, devising a robust late blight programme is about to become even trickier. *CPM* learns how early use of a dual-active product could help simplify decision-making while bolstering the approach to resistance management.**

*By Janine Adamson*

**With regulatory goalposts frequently being moved plus the constant threat of new resistant strains from Europe, it's no wonder potato late blight management is being likened to a strategic game of chess, but without all of the pieces.**

However from a UK potato grower's perspective, battling the disease is far from fun and games – the mission is about to become even more difficult, as the industry enters the final few months of mancozeb use-up.

Scottish Agronomy's senior agronomist Eric Anderson says although the principles of resistance management haven't changed, as new strains of resistant late blight become apparent, strict adherence to FRAC guidelines is critical.

"Research suggests late blight has a very flexible genome, therefore it will always be at risk of fungicide resistance which can be heightened by inappropriate use of products.

"As such, we must re-visit the fundamentals: no repetitive or solo use, always mix actives with appropriate partners with alternative modes of action, avoid eradicant applications by going hard and strong early in the programme, and apply at, or close to, the manufacturer's dose rate."

This staunch warning is evidence-based – in autumn 2024, independent monitoring by the Fight Against Blight (FAB) initiative confirmed two UK cases of EU_46_A1, the first findings of this aggressive genotype in the country. A growing issue on the continent, EU_46_A1 has demonstrated resistance to group 49 oxysterol binding protein inhibitor (OSBPI) fungicides.

**FRAC guideline adherence**
**Scottish Agronomy's Eric Anderson says although the principles of resistance management haven't changed, as new strains of resistant late blight appear, strict FRAC guideline adherence is critical.**

**Dual-active product**

**Privest was specifically developed with resistance management in mind due to it being a unique combination of two modes of action, says BASF UK's Paul Goddard.**

Then there's EU_43_A1 which is present in Ireland, and has developed resistance to group 40 carboxylic acid amides (CAA) fungicides including mandipropamid, benthiavalicarb and dimethomorph, in addition to OSBPI fungicides and metalaxyl (group 4) resistance. It's also well recognised that UK-present EU_33_A2 and EU_37_A2 are no longer controlled by fluazinam (group 29).

However, a primary concern remains around the highly aggressive strains which are prevalent across much of the UK. Eric says many of these have high sporulation rates and short life cycles meaning they spread rapidly. "Not all samples in a clonal lineage of late blight share the same phenotype. As such, life has become much more complicated and we can no longer think about a direct link between genotype and resistance status to a specific fungicide group."

He advises that fungicides with a single-site mode of action act at a specific point in a biosynthetic pathway in the pathogen, and are at risk for resistance development because a change in the pathogen at this point can render the fungicide less effective or ineffective.

"A simple change of just one base pair in the DNA molecule can be sufficient to lead to full resistance; it only takes one mutant spore for potential selection pressure to occur. And, this pressure favours spores which have developed or acquired mutations, conferring resistance to the applied fungicide."

In the presence of fungicides that inhibit susceptible strains, resistant strains are more likely to survive and be amplified within the population. "EU_36_A2 can produce up to 800,000 spores/cm2 after only seven days and has a latent period of just four days. So once infection is created, it quickly produces spores.

"Few chemical options have anti-sporulant activity meaning going hard and strong early is the only choice. It also means we have to work very hard to maintain our effective modes of action," he stresses.

Although UK samples of EU_36_A2 have appeared sensitive to most fungicides, there have been reports of isolates collected in Denmark and the Netherlands with resistance to OSBPI fungicides.

All-in-all, this heightened threat from late blight has led to revised product stewardship guidelines issued by manufacturers, says Eric. "It's become a complicated picture, even more so as we're in the final season of mancozeb use which concludes on 30 November this year.

"For example, UK manufacturer guidance states CAAs must be applied in strict alternation and mixed with fungicides with an alternative mode of action. There's also a maximum of up to six applications in a programme which make up no more than 50% of the intended total number of sprays.

"With other products having stringent guidelines too, namely the group 21 quinone inside inhibitor (QiI) class and OSPBIs, it's not only complex, but necessitates dynamic decision making from both growers and agronomists," he comments.

## PRIVEST

One recently launched product – Privest (ametoctradin (Initium)+ potassium phosphonates), was specifically developed with resistance management in mind due to it being a unique combination of two modes of action, says BASF UK's Paul Goddard.

"Initium is classified under the quinone inside and outside inhibitor, stigmatellin binding mode (QioSI) chemistry group, setting it apart from all other actives including traditional CAA and QiI options. This is then combined with potassium phosphonates which act as an elicitor, priming the plant's natural defence mechanisms to protect itself from fungal threats," he explains.

BASF's crop manager for arable crops in the Netherlands, Henco Bouma, raises that Initium was first introduced in 2010 to the Dutch market. Now, with 15 years under its belt, it's become a well-known and trusted active ingredient.

"Whereas potassium phosphonates were originally used as a fertiliser which also offered fungicidal activity. Due to new regulation meaning they're classed as a plant protection product, BASF decided to combine the two actives into one formulation to bolster the options available in late blight control.

"Furthermore, potassium phosphates aren't vulnerable to resistance in the same way as other fungicides while presenting valuable added plant health benefits," says Henco.

According to Paul, because Privest offers non-clashing chemistry with both actives being in different groups, it acts as a 'fire break' when devising a late blight control programme, with no need for a mix partner either.

Eric says this undoubtedly helps when planning a fungicide programme. "There are no simple blight programmes these days but it's useful that Privest doesn't require a second fungicide product in the tank, especially given the impending loss of mancozeb which was a go-to mix partner.

"For the seed market, it can also be mixed with mineral oil Crop Spray 11E and systemic insecticides, as part of Potato Virus Y (PVY)and Potato Leaf Roll Virus (PLRV) control – this is an important consideration."

Paul agrees that it's becoming increasingly challenging to devise a robust fungicide programme for

**Potassium phosphates benefits**

**According to BASF's Henco Bouma, potassium phosphates aren't vulnerable to resistance in the same way as other fungicides while presenting valuable added plant health benefits.**

late blight while respecting FRAC guidelines and enhanced product stewardship, plus having a dwindling list of approved actives to choose from.

"And given seasonal conditions are so variable, it's hard to know exactly how many blight sprays will be required. But by using Privest early in the programme, this frees up other products to be used mid-late season when issues such as tuber blight may also be of a concern," he adds.

Positioned as a protectant fungicide, guidance states Privest should be used during the rapid canopy stage to best protect vulnerable new growth. Paul highlights that although having the added benefit of assisting with fungicide programme planning, its positioning is actually based on Privest being truly systemic.

"In the past, we've managed with translaminar or local systemic-type products but it's clear that resistance issues are continuing to appear, as demonstrated with metalaxyl and oxathiapiprolin. Privest is the only product which offers systemic action against all blight genotypes.

"Equally, potassium phosphonates elicit a defence response, so are most effective when targeted early doors, working with a plant to help it to grow stronger," he points out.

Eric supports this timing: "In both ware/processing and seed crops, I envisage growers using Privest as spray one and three within a programme. In the case of ware, which can receive up to 14 blight sprays, it's very useful to have another active in the armoury to select from.

"However, ensure it's used early- to mid-season; don't hold back. With very limited material offering eradicant activity we mustn't misuse protectant solutions."

He also emphases the financials involved in potato production. "If you take the gross output of a Maris Piper crop at around £13,000/ha and express a fungicide programme spend against it, you're looking at only 3.5-5% of that final output.

"So it's a relatively small but very necessary investment to protect the crop when the alternative outcome could be potential crop loss."

According to Paul, there's only been one situation where Privest performed sub-optimally and that was in 2021 when blight entered the crop late in the season, as plants were beginning to senesce. "This actually proved positive learning for us as it supports the early season, preventative use technically, which works alongside the actively growing potato crop," he suggests.

"Otherwise, having assessed Privest in UK trials since 2019, it's consistently performed as 'top drawer' chemistry."

## FORMULATION INNOVATION

Among the reasons behind Privest's success is the fact it's been created using an innovative approach to formulation development, he believes. "It's the first of a new generation of plant protection products which combine the two active ingredients using Syn-Tech formulation technology for an added synergistic performance."

BASF's technical product adviser, Bert Westhoff, is based in the Netherlands and has been trialling Privest for the past eight seasons. He says because the two actives in Privest are of different formulation types – one oil-based and one water – developing Syn-Tech has played a pivotal role in the product's success.

> *"There's a genuine synergistic effect from Privest because the improved, stabilised formulation is able to get the actives to exactly where they should be within the potato plant."*

"Syn-Tech is what enables us to combine and stabilise the two active ingredients, but most importantly, trials here in the Netherlands have shown the dual-active product offers up to 10% better efficacy compared with the solo tank mixed equivalents.

"There's a genuine synergistic effect from Privest because the improved, stabilised formulation is able to get the actives to exactly where they should be within the potato plant," explains Bert.

**Performance in trials**

**Trials in the Netherlands have shown dual-active Privest offers up to 10% better efficacy compared with the solo tank mixed equivalents, explains BASF's Bert Westhoff.**

Having seen a major resistance break down in the Netherlands in 2023, and with Privest being available for use in the country from this season onwards, he hopes a uniformed approach to stewardship will assist in fighting late blight across Europe.

"EU_36_A2 is the main genotype present in the Netherlands, together with EU_43_A1 with its multiple resistance to both CAAs and OSPBIs, and EU_46_A1 with resistance to OSPBIs. Continuing with the strategy of combining and alternating active ingredients will be essential to protect the new chemistry in Privest," says Bert.

To conclude, Eric stresses that preparation is key. "However you choose to cut it, it's imperative that growers and agronomists plan a late blight fungicide strategy ahead of the season with a plan B and C ready in their back pockets.

"You can no longer just apply the first product which comes to mind as there'll be significant consequences later in the season." ●

# Product in focus

**Privest is a protectant fungicide best used during rapid canopy to early stable canopy growth in potato crops, as part of a preventative approach.**

**Due to being a unique combination of two active ingredients – Initium (ametoctradin) and potassium phosphonates – Privest gives growers more choice and flexibility within their blight programmes.**

***CPM* would like to thank BASF for kindly sponsoring this feature, and for its assistance in providing access to the relevant experts and contacts required to produce it.**

# Steps to success in potatoes


**What makes a successful potato business? According to Nuffield Scholar, Harry Barnett, there are five key areas which can make or break an enterprise. *CPM* shares his thoughts.**

*By Mike Abram*

**Successful global potato businesses stand out in how they manage five core areas, according to conclusions drawn by Nuffield Scholar, Harry Barnett, following 10 weeks of international travel.**

The Holkham Emerald director visited farms and potato businesses in Poland, Germany, Belgium, France, Ireland, USA and Canada to research how to counteract the agronomic and market challenges facing the UK potato sector.

He says the experience gave amazing insight. "And the following five core areas are what I think make the best businesses around the world – where they stand out compared with their rivals and even their neighbours."

The first is water, which Harry believes will shape the global potato industry during the next few decades. "This is because too much water when we don't want it during planting and harvesting, and not enough during growing periods, is defining where we are today," he continues.

## INVESTMENT IN IRRIGATION

It's one of the reasons why Holkham Emerald – a joint venture between the 10,000ha Holkham Estate in north Norfolk and Emerald Produce, a produce marketing company specialising in importing and exporting potatoes including growing its own – has invested heavily in irrigation infrastructure during recent years, says Harry.

Formed in 2009, the business has grown considerably off the back of extending irrigation infrastructure to allow potato growing on new blocks of land in Norfolk. It's also been a part of a shift in the business's strategy, moving from what was a cash-orientated enterprise with no storage or other capital assets to one that's invested heavily in machinery and a 6500t storage and grading facility.

The investment in irrigation is helping to maximise marketable yields, while machinery and storage mean the business is better positioned to take control of weather-related and other operational challenges than when relying on contractors, he comments. "It's vital we take control of those risk areas and have an ability to affect change."

That includes managing soils more effectively to build resilience to more extreme weather events, while also helping with the next core area Harry has identified – operational timing and capacity. "The best businesses have great timing and most of that's driven by having the infrastructure and


**Nuffield Scholarship tour**

**Harry Barnett travelled to farms and potato businesses in Poland, Germany, Belgium, France, Ireland, USA and Canada as part of his studies.**
*Photo: Beanstalk Global.*

capacity to operate on the right day.

"With tighter weather windows, it's vitally important to plant potatoes and harvest them in the best conditions to maximise outcomes. It's why we took the plunge to move away from contractors and third-party storage to putting facilities onto the farm so we can hit timings. The difference in yield potential if you get good timings is huge," says Harry.

But switching away from contractors didn't come without its challenges, he highlights. "We underestimated what good value we had from contractors – they could do things cheaper than we could in the first couple of years and we made rookie errors as new operators of machinery," he admits. "But, I think we had to go through that process to get to where we are now – it's been a huge step forward."

Taking more control of the rotation is another success factor, as per all the best businesses, believes Harry. "I've seen farms in North America and even Belgium to some extent where they're growing potatoes every year, or every other year, and the model is very fragile – it's propped up by ag chem use, but you can see cracks starting to appear."

Although such rotations are very infrequent in the UK, Harry says potato businesses have to look at how individual crops in a rotation complement each other to help avoid pest and other agronomic challenges, which can be often linked to poor rotational management.

## WIREWORM PRESSURE

He shares that wireworm in particular has been a challenge at Holkham, exacerbated by the introduction of cover crops and leys into the rotation. And with a zero tolerance to wireworm damage in the high value set skin salad potatoes the business mostly specialises in, it's meant they've decided against including leys in the rotation, says Harry.

"Controlling the rotation is a challenge for many potato growers as they don't have full influence on it. But as an industry, money talks, so we have to step into our landlord's rotation and try to offer some form of control.

"If landlords aren't receptive, we don't have to rent that land. That's the message we have to put across to get better rotations."

At Holkham, one of the first farms to adopt the Norfolk four-course rotation, land and soil management remains important to the landowner, Lord Coke, shares Harry. "We're even toying with the idea of a 'potato holiday' to rest land for long periods because Lord Coke wants to hand land on in ▶

the same or better condition than it is today. He doesn't want to be known as the one who degraded that soil."

Seed and breeding make up the fourth pillar identified by Harry. "The best businesses are able to procure seed early and have a clear plan of what they require – building relationships with their end user and seed grower, so you can trust the quality of seed that's being delivered onto farm and that is has an end market."

He says he's encouraged by the advances in technology which breeders are using to generate new varieties. "It's making it so much easier to bring through material with resistance [to agronomic challenges] even than five years ago. But as an industry, we have to make our voices heard regarding what we want in the varieties of the future. I don't think we've been clear about that and talking to breeders, they're a little unsure."

One thing Harry is sure about is the importance of people – his fifth and final area which successful businesses excel in. "It's overlooked too much in agriculture, but the best potato businesses around the world have the best people.

"It doesn't matter what soil type they're working with or the challenges they have to overcome on the farm, the best people can react, recognise problems and resolve them," he concludes.

Material for this article was obtained during the CUPGRA conference in December plus subsequent interviews. ●

**CUPGRA conference**

**Harry Barnett (L), shared his learnings at the CUPGRA conference in December. Pictured with Greg Colebrook, John Bubb and Jack Smith.** *Photo: Beanstalk Global.*

# A core approach to business

## Simplifying the business structure to focus on the most profitable core activities is helping potato grower and supply chain group, Greens of Soham, to take the enterprise forward

Following a period where there was an emphasis on growth, financial and historic yield data analysis highlighted some areas of Greens of Soham were less profitable and proving to be a distraction.

That's according to the firm's farming director Greg Colebrook, who says as such, they went back to basics. "We looked at what we excelled in and removed the aspects we were less good at, whether that be varieties, soil types or crop types."

Not only did that mean focusing solely on potatoes and red beet, but also simplifying what was grown, stopping higher risk activities, while continuing to innovate. "We dropped some potatoes grown for long-term storage and on soil types that are difficult to manage. The cost and risks of these crops wasn't being rewarded," adds Greg.

Wireworm in particular is a challenge, which led to the business pivoting away from some rented land blocks. Instead, more focus has been placed on salad potatoes on Breckland soils which are direct supplied. "Our USP [unique selling point] with these is we can always harvest through the summer, and maintain a good capacity to serve lots of customers during that period."

The second largest market for the enterprise after salad potatoes is seed. Greg says most of these crops are now grown in Northumberland and Scotland to reduce virus risk while helping to bring high quality seed into the business.

"We have a good understanding of the quality we're growing – higher health status seed is one of the factors we consider for yield improvement along with varieties, irrigation management and cultivations."

No longer growing the lowest performing 5% of varieties would perhaps be the easiest way for the business to improve average yields, he points out. "There's more than a 100% difference between the best and worst – that range is too big."

But rationalising variety choice isn't easy, with long-term decisions required within seed production, he raises. "We're growing fewer varieties than we did, but across all the different crop types it's still 30 plus varieties, rather than the 50 we used to grow.

"We're very specific about either growing a variety we can market more widely, or being tied into a supply chain where the end user, ourselves and the variety are all linked."

According to Greg, both routes have advantages – a relationship growing a unique variety ties the customer into any problems so Greens isn't managing that risk alone. Equally, a variety the business can sell more widely can be selected based on yield, quality and marketability attributes which Greens can assess.

The disadvantages are the risk of if a variety isn't given exclusivity, it doesn't get used, while partnering with the wrong customer can leave the variety going nowhere, notes Greg.

It might be easier to grow 1300ha of potatoes with a blanket approach, but it's attention to detail that brings success, he says. "We're bespoke with how we grow each crop and make decisions based on what's best for that crop on that soil type."

The firm works closely with its landlords to manage decisions which affect the potato crop, whether that's irrigation – where Greens is taking on management that traditionally would have been the landlord's responsibility – cultivations or cover crops.

Decisions regarding cover crop species and destruction timings are often made in collaboration, particularly with various schemes incentivising landowners to include them in rotations, shares Greg. "In the past we might have drilled them ourselves at our own risk and cost. Now it's more advice to avoid unintended consequences."

Mitigating wireworm pressure remains particularly important, he says, with a short brown bridge between cereal harvest and cover crop drilling, plus a decent kill before potato planting in the spring, helping to reduce risk.

Greens also partners with landlords on long-term infrastructure projects, for example storage, which guarantees the landlord an income while giving Greens some decision-making power. "We're looking for long-term relationships which are sustainable rather than transactional," comments Greg.

As with any successful business, innovation is also at the fore – Greens has been involved in projects in the processing sector using low carbon fertilisers to understand the practicalities of growing crops with slow-release type products, while it's also investigated different planting patterns after successfully innovating a similar change in its beetroot crop.

"We're keen on the idea of a 50cm quad arrangement where every potato is exactly 50cm away from each other. But the cost of developing bespoke machinery is a barrier, while we also can't afford to fail on any of the area we grow because of the tight margins we operate under," he concludes.

**Rationalised approach**
By going back to basics, the farm could cease aspects it was less good at, whether that be varieties, soil types or crop types.

**Business analysis**
Financial and historic yield data analysis highlighted some areas of Greens of Soham were less profitable and proving to be a distraction, explained farming director, Greg Colebrook.

# LASTWORD

WITH JANINE ADAMSON

## Blissful ignorance, 95% of the time

**I don't usually profess to have an opinion regarding political issues, but the government's recent announcement – well, blog – regarding SFI has caused even me to shift in my seat.**

Firstly, political understanding was conventionally never my strength, in fact I think I barely scraped through that particular module during my journalism training. Perhaps that's being harsh, I recall I managed the equivalent of a 'C'.

Back in 2008 when asked who the Chancellor of the Exchequer was during a particularly important conversation, his name persistently evaded my lips, resulting in me proclaiming: "the man with the big bushy eyebrows", while a bead of sweat appeared on my own furrowed brow. It was in fact, Alistair Darling.

It's not that I have no interest in politics, far from it. It's more the concept that a group of somewhat privileged individuals in Whitehall have the power to sculpt the scope of my future life. It's completely out of my hands – mind blown.

As such, I take the ignorant approach of burying my head deep in the sand; I am an ostrich. If I don't think about it, it cannot keep me awake at night – a strategy which I use for any 'big ticket' societal issue. Otherwise it's an overwhelming, highly emotional and anxiety-laden battle with my own thoughts.

It's rather absurd really, isn't it? That we've landed where we are; forced to choose between a bunch of how I perceive it, non-options, during the recent General Election. Knowing that in some instances, it'd be completely wasted and no amount of tactical voting strategy could box our way out of it.

Don't get me started on the global landscape, I might as well start building my personal underground bunker immediately. Remind me, how many cans of tomato soup and rice pudding is a feasible stash to last me, say, 45 years? Best case scenario, of course.

Perhaps I sound a little defeatist, but how do we actually get ourselves out of this chaotic cluster-fudge of a situation? I don't mean in agriculture, I mean in general society. Despite what people may wish to profess, there have been no 'glory days'. Simply different levels of daily challenge for us mere workers.

Regardless, the future of life as we know it depends on someone finding a solution to our spiraling dystopia, and I'm very curious as to where that might come from, given our current political offerings. In the meantime, I'll continue to avoid musing over it too much.

So SFI, or SF-Sigh as I might now call it. I really hope it doesn't become yet another boulevard of broken dreams and that we can retain some positives from it all. If nothing else, I can't hack writing another reactionary article about it – I've been on a rollercoaster with the topic for the past 18-months or so, and I can't say I'm a huge fan of the Big Dipper.

SFI wasn't perfect by a long stretch, but there was tantilising potential. And I get it, if they'd given adequate warning that the tap was about to be switched off, all Tom, Dick and Harry would have been filling their troughs.

As much as I abhor the exertion of control on my life, sometimes society does require robust parameters in which to operate. As such, it's felt as though government perhaps should have measured at least twice and cut once, on a few aspects of the scheme (hello ALH2, I'm looking at you). Instead, British agriculture has been on the receiving end of a Pritt Stick approach to policy – other child-friendly glues are available.

Did it ever have long-term potential, was that the actual intention? Or was it more, that'll do, chaps. Well, when it comes to food production – which when I last checked was an essential basic need and requirement for human life – it won't do, will it? Agriculture deserves better. As does nature.

We have so many trusted, informed experts in our industry – use them, and I don't mean the handful of vocal folks on social media. In fact, given much pertinent insight features in this magazine, perhaps I ought to send a copy of *CPM* to Number 10 for some light bedtime reading? This issue especially!

The husband suggested that SFI closing can mean everyone can get back on board with producing food, however, I don't know a single farmer who doesn't want the best for the wildlife on their farm. Equally, as the primary custodians of our countryside, why shouldn't they be suitably renumerated for boosting up biodiversity?

The system is broken on so many levels. Living in Staffordshire for one, showcases that most farmers who rely upon food production as their primary income, are not making it rain with the readies. Whereas those with a little more cash in their pockets have likely diversified and sought alternative income streams, heck, some even have a full-time non-farming job!

I have no solution, I usually don't have an opinion either – the number one rule of journalism – but I'll raise my head above the parapet in this instance. Feel free to shoot me down. ●

**YOUR EDITOR**

**Janine Adamson began her journalistic career writing obituaries for a local newspaper but fast found her stride within agricultural communications. Now, more than 15 years later, she finds herself at the helm of *CPM*. A proud Staffordshire girl from the Moorlands, Janine takes pride in tackling subjects which although aren't exclusively farming, affect everyone.**

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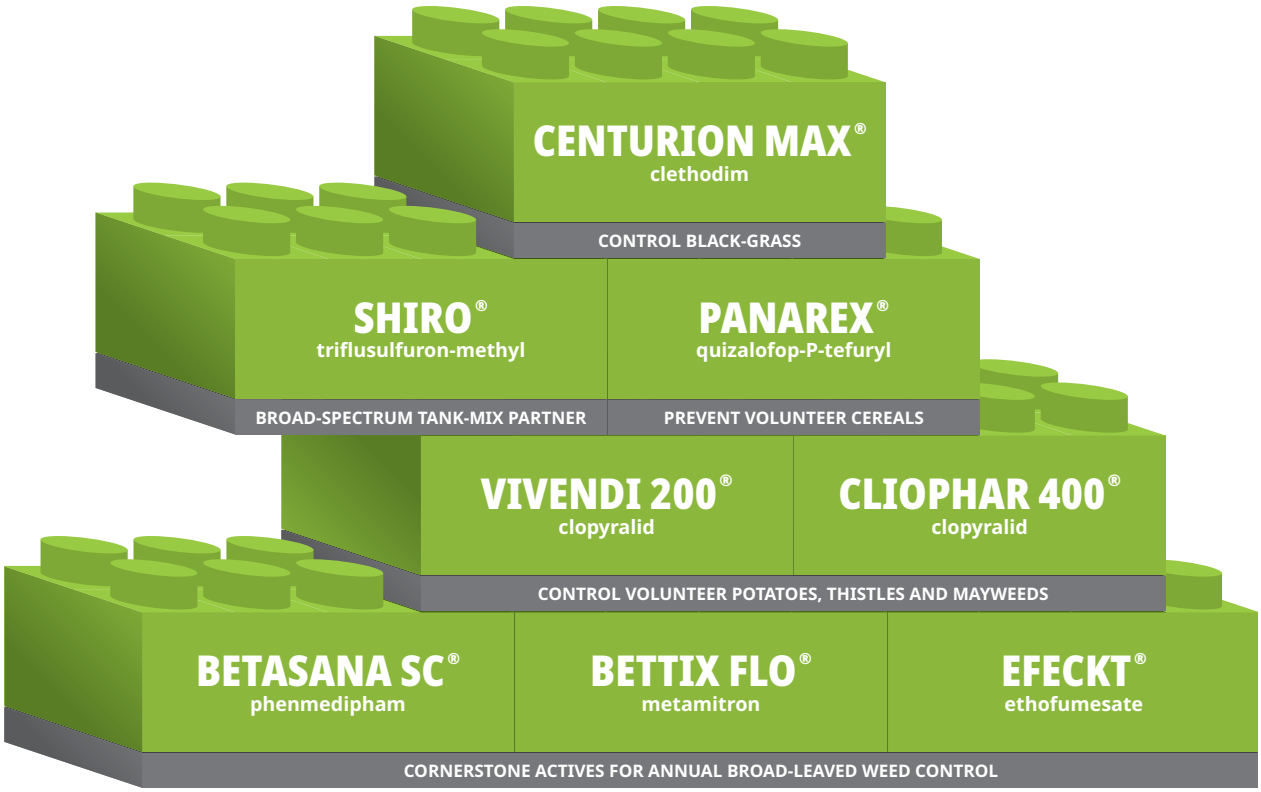


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