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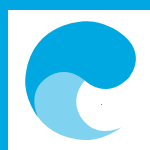


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“We can’t keep mining the earth of its minerals when our soil contains enough for millennia.”



POINT OF VIEW

For me, soil is one of the most valuable resources that a farmer has the responsibility to look after for generations to come. That should be the aim of every caretaker of land, in my opinion.

Yes, finances must come into the equation, since if you’re out of business, you no longer have the opportunity. But soil is a living entity and one that’s always changing, just like our own stomachs – soil is really one giant stomach. It contains minerals, air, water, carbon and oxygen, which all have to be maintained at adequate levels to support a healthy crop.

The major component that we then have to add to that mixture is biology. This provides so many solutions to our problems, if we could just start to understand it and work with it. I’m always amused that we know more about outer space

than the world beneath our feet!

It’s imperative to foster the symbiosis between plants and biology, which is a process called the rhizophagy cycle – discovered by James White back in 2012. Can you imagine how many millions of years this process has been working yet we’ve only just started to understand it?

The rhizophagy cycle is the process where a plant puts out exudates to feed bacteria and fungi in the form of sugars, amino acids, carbohydrates, organic acids and enzymes. Then an exchange takes place in return for that food, as the plant will ask for phosphorous, iron, zinc, potassium, the list goes on. This process will be stopped if we feed those elements through the soil to the growing plant.

Why would the plant waste its valuable energy feeding biology for no reason when it already has what it wants? Now, you may ask

what the problem is? But for me, we can’t keep mining the earth of its minerals when our soil already contains enough for millennia. If we just let biology do its job, you’re never going to wear the earth’s crust out!

Also, can we afford in the current climate to be investing in so much fertiliser when potentially we already have it beneath our feet? Yes, sometimes we need to add kind fertilisers to our soil to get the process working, as we’ve done so much damage, but with careful management, all soils just want to heal.

I’ve been lucky to travel around the world looking at soils and wherever I go they’re all showing signs of abuse over many decades. Cheap food has come at a cost and with consequences; we now have the job of repairing the damage.

By Tim Parton, biological farming advocate



**CROP PRODUCTION MAGAZINE –
FOR FARMERS AND THEIR AGRONOMISTS**



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How a grower cluster in
the Chilterns is making a
difference for nature P.54

August 2026

COVER STORY

Soils special

Digging deeper for insights.
Cover photo: Laura Miller



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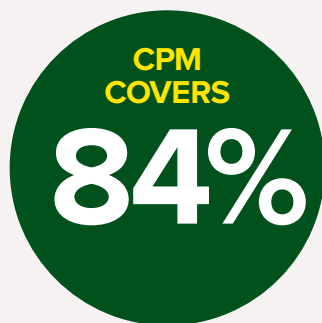


CROP PRODUCTION MAGAZINE

August 2026
Volume 28 No 7



CPM is here to inspire, stimulate and inform, while maintaining a positive outlook for the future.



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Editor

Janine Adamson

Sub editor

Rachael Harper

Writers

Mike Abram, Charlotte Cunningham, Rob Jones, Martin Lines, Martin Rickatson, Mike Saull, Guy Smith, Andrew Watts, Andrew Wilson

Design

Rob Terry

Production manager

Kerry Orriss

Commercial director

Angus McKirdy

Managing director

Fiona Mercer

Advertising sales

Tel: +44 7801 288443 E-mail: angus@cpm-magazine.co.uk

Editorial

E-mail: janine.adamson@kelsey.co.uk

Customer Service

Kelsey Media, Media Centre, Morton Way, Horncastle, Lincolnshire, LN9 6JR, United Kingdom

E-mail: cs@kelsey.co.uk

Tel: 01959 543 747

Reader registration hotline

01959 541444

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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Patience will pay this autumn

“A good stale seedbed and October drilling are the easy wins for grassweed control in cereals.”

CHRIS MARTIN

An early harvest has created a valuable window for weed management, but experts warn that success this autumn will depend less on speed, and more on timing, moisture and discipline. *CPM* reports...

By Andrew Watts and Janine Adamson

Herbicide resistance continues to complicate grassweed control across a range of species, raises Dr Will Smith, ADAS senior weed management consultant. And while blackgrass has dominated programmes for decades, it's Italian ryegrass that is increasingly being viewed as the greater emerging threat.

Unlike blackgrass that's established across much of England, ryegrass remains more regional, with significant pockets in Essex, Kent and South Yorkshire. But according to Will, those boundaries are shifting.

“Ryegrass is starting to spread outwards from these hotspots and onto farms and into regions where it previously wasn't detected,” he says. “Growers have to be mindful

of the routes to transmission, be it on machinery or in straw.”

The cultural controls used against blackgrass — balanced rotations, delayed drilling and strong crop competition — all remain relevant, but ryegrass brings different growth characteristics and how best to manage it is still being understood, notes Will. The challenge is that profitable rotations often rely heavily on winter wheat, leaving weed control competing with commercial priorities.

RESISTANCE CONCERNS

Equally, glyphosate resistance has been confirmed in Italian ryegrass, with cases reported in Kent, Somerset, Essex and North Yorkshire. Then, more worrying for many programmes is reduced



Increasing threat

Ryegrass is starting to spread outwards onto farms and into regions where it previously wasn't detected, highlights ADAS' Dr Will Smith.

sensitivity to flufenacet, raises Will.

“This active is fundamental to most programmes and yet there are instances where it's providing



Balancing act

Agrovista's Chris Martin would rather apply propyzamide in late October or early November and accept reduced control than risk not getting it on at all.

limited control. It pays to know your enemy, so when you suspect reduced performance, send samples for testing."

As widely reported, brome is increasing too, encouraged by establishment changes, narrower rotations and reduced use of spring ALS herbicides such as Atlantis (mesosulfuron-methyl+ iodosulfuron-methyl-sodium). "Brome remains particularly difficult in barley, where tri-allate is likely to offer the most useful control," suggests Will.

Although broadleaf weed resistance attracts less attention than grassweeds, a narrowing choice of herbicide modes of action means the risk is increasing. This is potentially a dormant issue as far as growers are concerned, but the length of time that ALS herbicides have been used on farm means selection pressure has been high, and resistance is starting to be detected in some species.

"Where you suspect that resistance could be an problem then I'd recommend

growers check the status of their own populations with a resistance sample, allowing for proactive management if issues are identified," says Will.

For oilseed rape growers, dry soils are only part of the decision-making challenge, highlights Agrovista's Chris Martin. Pre-emergence herbicides and products with strong residual activity remain the best starting point, but poor establishment and cabbage stem flea beetle risk mean many growers are reluctant to spend before they know they have a viable crop.

"Growers know that pre-em sprays are the best means of weed control, especially in OSR. But the risk of losing a crop means few are willing to contemplate the spend, or the following-crop restrictions, unless they're confident of establishment," he says.

Where there's enough moisture, residuals such as clomazone remain a relatively inexpensive pre-em option for broadleaf weeds including chickweed,

Question everything when tackling grassweeds

Reviewing grassweed populations and management practices will help to stay ahead of evolving threats

Speaking at Hutchinsons' recent Cambourne Grassweed demonstration open day at South Sea Farm near Cambridge, technical manager Dick Neale said changing emergence patterns mean control strategies have to adapt.

"Blackgrass is changing, so you have to question everything, from how and when you move soil, to when crops are drilled, and the timing of herbicide treatments."

Dick said two years of trials at the 40ha site, hosted by the Clear family, were already shaping control strategies and building on a decade of work at Hutchinsons' previous Brampton demonstration site.

The work has shown that blackgrass numbers at Cambourne and elsewhere were generally decreasing, but emergence had become more protracted and individual plants had greater tillering capacity, he explained.

In most trials at South Sea Farm, background populations rarely exceeded 50 plants/m², but some plants produced up to 40 tillers.

Given the more protracted

germination, trials clearly show that sequencing pre- and post-em herbicides is more effective than large stacks of chemistry. In the 2026 herbicide matrix trial at Cambourne, preliminary counts indicate around 80-85% control from a pre-em stack of Sovorna (cinmethylin+ picolinafen) plus Alternator Met (diflufenican+ flufenacet+ metribuzin), compared with 99% from a sequence of Avadex (tri-allate), Mateno Star (aclonifen+ diflufenican+ flufenacet), followed by Sovorna. Pre-em Sovorna alone gave 70% control over the untreated, which had 50 black-grass plants/m².

According to Dick, delayed drilling and spring cropping remain important, but as earlier-emerging blackgrass has been reduced, full autumn cropping and slightly earlier drilling may be possible where populations are manageable and herbicide sequences are effective.

However, healthy soil with good structure, drainage and fertility is fundamental to establishing competitive crops and reducing grassweed pressure.

In that respect, Farmacy's Helen



Evolving challenge

Although blackgrass numbers at Hutchinsons' trials sites are generally decreasing, weed emergence has become more protracted and individual plants have greater tillering capacity.

Huyton said drainage improvements at South Sea Farm had improved crop establishment, blackgrass control and the ability to travel on land for autumn herbicide applications. "Blackgrass doesn't necessarily like wet conditions, but it's far better able to cope than wheat."

Subsequently growers were urged to improve soil health through cover, catch and companion crops, and by reviewing cultivation type, timing and intensity. "Moving less soil definitely helps, but it must be to optimum effect and shouldn't compromise crop establishment," concluded Dick.

hedge mustard and cleavers. However, where soils are dry, many are likely to wait until the crop has established before switching to post-em contact herbicides.

Critically, CSFB pressure will be the tipping point, says Chris. "Given the conditions, most growers will wait for germination. Once they're confident of even establishment, then they may opt for a metazachlor or quinmerac mixture at expanded cotyledon stage before potentially following up with a contact.

"Growers will also want to have a handle on CSFB populations; if there's chance that it'll wreak havoc, then growers may well decide to delay herbicides until it's clear how much damage the crop suffers before either opting for post-emergence contact sprays, or abandoning it and re-sowing it with another crop."

CLASSIC APPROACH

Belkar (halauxifen-methyl+ picloram) remains the mainstay of post-em contact programmes in OSR, while Corteva has introduced LaDiva, which combines halauxifen-methyl with aminopyralid and picloram to broaden options.

"Belkar is the obvious go-to product,"

raises Chris. "Where chickweed is a problem, LaDiva offers some added activity, but the objective has to be control earlier rather than later. After this, it's the propyzamide products such as Kerb or Astrokerb, remembering that they can't be applied before 1 October."

If no pre- or peri-em spray has been used, control may hinge on a small number of fast-establishing weeds. Chickweed,

for example, can become too large for later-applied propyzamide products.

Chris says the lesson from autumn 2025 is to not wait too long for ideal soil temperatures. "For maximum efficacy, soil temperatures have to be at 8°C, but in an open autumn this may not be until December. I'd rather apply it [propyzamide] in late October or early November and accept reduced control than risk not getting it on at all."

Broadleaf weed timing must also be balanced against grassweed control. That's particularly important where Centurion Max (clethodim) is used,

because many other herbicides can't be applied within 14 days before or after it.

Looking beyond the can, in cereals, delaying drilling after mid-September remains one of the simplest ways to improve grassweed control. "For grassweeds, mid-September drilling is a disaster," stresses Chris. "It's tempting after an early harvest, but where ryegrass, blackgrass and bromes are a

problem, early drilling does nothing to help."

Dry soils may limit the value of stale seedbeds, but even early October drilling still improves the chances of success, he adds. "No herbicides work consistently

under high pressure,

but give them a chance and they all work well. A good stale seedbed and October drilling are the easy wins for grassweed control in cereals."

Equally, later drilling usually improves the performance of residual herbicides by providing more moisture in the upper soil profile and cooler temperatures to support persistence.

"Brome remains particularly difficult in barley, where tri-alleate is likely to offer the most useful control."

Future innovation to weed out uncertainty

Performance matters for weed control. Every season presents new challenges, so growers and agronomists need herbicides that can adapt to different conditions, weeds and spray timings.

That's why Bayer Crop Science UK is building on its proven range of cereal herbicides with two new co-formulations anticipated for 2027 and 2028, giving farmers more flexibility to build a robust weed control programme.

Bayer's co-formulation of aclonifen+ diflufenican, anticipated in 2027, brings together two residual actives with strong soil surface activity and good persistence, offering a valuable building block for an effective weed control programme.

Bayer's new three-way co-formulation of bixlozone + diflufenican + mefenpyr anticipated in 2028 contains the only HRAC Group 13 active in UK cereals (bixlozone), adding a valuable mode of action diversity to improve control and support long-term resistance management.

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Multi-mow strategy keeps blackgrass at bay

How Michael Kavanagh has been using a rotary mulcher to prevent seed return

For one farm manager tasked with creating a new enterprise while being faced with problematic blackgrass, little-and-often regrowth topping on end-of-life legume fallows is beginning to pay dividends.

To rewind a step, in early spring 2025, Michael Kavanagh moved 100 miles from a mixed farm manager's role in Shropshire to a new position in Oxfordshire; exchanging an established unit for a newly-formed one, and sandy loam soils for Cotswold brash. While the soils changed considerably, one familiar challenge remained: blackgrass.

Now managing the Chadlington Farming Partnership, Michael says he was initially recruited to help create a business that not only farms profitably, but that works with nature. "Farming with regenerative principles, working with nature to help manage soil and

crop health, is something I've long been interested in," says Michael, co-founder of the Green Farm Collective.

On his previous farm, Michael says he gradually moved to a system using no synthetic phosphate or potash fertilisers, growth regulators or insecticides, while eliminating fungicides across most of the cropped area.

The result was lower costs, maintained yields and access to premium markets. Now at Chadlington, the ambition is similar. Nitrogen use has already been reduced to below 160kgN/ha, while seed dressings, growth regulators and insecticides have been phased out of the system.

Michael acknowledges that he's still learning about the farm and making changes slowly according to circumstances, but has made some considerable adjustments so far.



Cutting to control

In dense blackgrass areas, Michael Kavanagh waits until the weed has formed a seedhead and then goes through with the Cyclone mulcher before they can disperse seed.

Rotations have been broadened to include milling wheat, winter and spring barley, winter oats and winter oilseed rape, plus spring barley. "When moving to farm more regeneratively, it's easy to make the mistake of trying to do too much at once," shares Michael.

Cover crops, herbal leys and legume fallows have also been introduced, with livestock integrated to help build soil health and resilience. Composting

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YEARS

locally-sourced chicken manure is another key initiative aimed at raising organic matter levels and improving water-holding capacity.

He notes that an additional consequence of the changes has been blackgrass suppression. 40ha of problem land have been put into three-year herbal leys, while the worst-affected fields have been entered into SFI legume fallows. "For the legume fallows, mechanical topping with multiple passes is the preferred control method," adds Michael.

To achieve this, Michael invested in a 6.3m Major Cyclone rotary mulcher and uses it to repeatedly remove blackgrass heads before the seed can shed. "In dense blackgrass areas we wait until the weed has formed a seedhead and then go through as high as we can with the Cyclone to destroy them before they can disperse seed," he explains. "Last year, we made three passes, which really helped."

The strategy relies on cutting high initially, encouraging further regrowth that can be targeted with subsequent passes. The mulched residue is then evenly spread and returned to the soil, supporting organic matter build-up while reducing reliance on herbicides.

Michael says the results have been encouraging. "Once sprayed off and drilled, when established with a robust pre-emergence herbicide, the following wheats have been blackgrass-free. It's a suitable example of how good cultural methods can work together with chemical control to best effect."

For Michael, the approach demonstrates how regenerative farming can address weed pressure, drought resilience and soil health while maintaining profitability. His advice to others is simple: "Make small, slow steps rather than attempting overnight changes," he concludes.

- Cinmethylin and aclonifen can be highly effective, but only when conditions allow them to work.

This means in many respects, cultural controls should come first; fields with a high grassweed burden should where possible be drilled later to allow weed flushes to be controlled before sowing.

ACCUMULATION

It's then allowing the smaller gains to add up: choosing vigorous varieties such as Bamford, Beowulf or KWS Arnie, raising seed rates to offset losses from stacked residuals, preparing a better seedbed and drilling slightly deeper. In fact, trials suggest drilling at about 4cm can reduce crop effects from cinmethylin and some other residuals

on crop development.

Programme shape will then depend on the weed spectrum present. Avadex (tri-allate) is often the preferred partner in blackgrass, brome and wild oat situations, while Fundatis (bixlozone+ beflubutamid) is better suited to ryegrass. These will support the main players Luximo (cinmethylin) and aclonifen, with other selective residuals such as flufenacet, prosulfocarb or pendimethalin used according to the species present.

"It's important to use as many modes of action as possible," urges Chris. "Tri-allate, flufenacet and prosulfocarb are from the same mode of action group (Group 15), but they work in different ways, complementing each other, ►

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“With all you have to do, at least one decision is *easy*.”

Partnering up to power up

Use two specific herbicide actives in sequence to deliver maximum grassweed control in oilseed rape

While collaboration isn't necessarily commonplace among ag chem manufacturers, two companies have pooled their product knowledge to help growers get on top of grassweeds.

Both clethodim (as in Centurion Max) and propyzamide (as in Astrokerb and Kerb Flo 500) have their own well-understood and specific benefits, but the message is strong for this season – consider using them in sequence, urges UPL's Tom Wheelhouse.

“With the renewed confidence in oilseed rape this presents an excellent opportunity to reduce seed return for the benefit of the wider rotation,” he says. “For best practice,

according to our stewardship, clethodim should be applied by 15 October to a crop at 6-leaf stage; weeds must also be actively growing. When applied with a true water conditioner such as X Change, trials demonstrate that efficacy can be improved further by 11%. And now, we recommend that applications of clethodim are followed by Astrokerb or Kerb Flo 500.”

Tom also stresses that despite generic alternatives coming to the market, not all clethodim-based herbicides are made equal. “Centurion Max has been proven for more than 10 years. Its formulation is superior with benefits across key attributes such as blooming, dilution, emulsion droplets



Unique action

Having been recently reclassified to HRAC Group 23, propyzamide offers a distinct mode of action within herbicide programmes, says Hugh Guinan.

► so it's worth incorporating them where possible to give yourself the best chance of success.”

From a wider rotational perspective, this autumn may also offer an

opportunity to improve soil structure, adds Chris. “On self-structuring land that has cracked open, a light cultivation to about 5cm can flick small clods into cracks which will

and cold stability.”

As for propyzamide, that's been fundamental to grassweed control programmes for 50 years, says Corteva's Hugh Guinan. During that period, weather patterns have shifted, so he says the best advice in the current climate is to apply as soon as crop and stewardship conditions are met.

“The optimum propyzamide window is typically late October through to early December. That's a sweet spot for persistency, stewardship, and soil conditions. Focussing on soil conditions ensures the active stays where it needs to, as while propyzamide isn't very mobile, soil particles containing it can be.

“Used in sequence with clethodim, growers should see improved blackgrass efficiency.”

In terms of dose rates, Hugh warns growers against cutting back, recommending 850g ai/ha for large blackgrass, brome and ryegrass problems, while rates can drop to 750g ai/ha where grassweed pressure is lower, or wild oats are the target. A 500g ai/ha dose can only be justified for small meadow grasses or volunteer cereals.

He then highlights that the active ingredient was recently reclassified by HRAC, shifting from Group 3 to 23. “This is in response to deeper understanding regarding how propyzamide works. Critically, it's the only registered active ingredient in Group 23 in the UK.



Not all actives are equal

Centurion Max has been proven for more than 10 years and its formulation of clethodim is superior, stresses UPL's Tom Wheelhouse.

“This is positive news because it's recognition that propyzamide offers a distinct mode of action within herbicide programmes,” he says. “It's unique, and that's a vital grassweed resistance management tool.”

To round the discussion further, ADAS' John Cussans highlights that while pre-emergence OSR options like metazachlor may have fallen out of favour recently, they still offer value. “For high pressure situations where the crop was perhaps drilled early, this is an important option.

“And of course, all of this should be supported by the wider ethos of good OSR establishment and management, as promoted by the OSR Reboot campaign recently. For weed management in any crop, it's critical that the whole management package is considered,” he concludes.

lodge at different depths throughout the soil profile.

“As these clods shrink and swell through winter, this can provide more natural structuring than any metal can ever do while also

encouraging a weed flush once moisture arrives. On heavier or high-magnesium soils, it may be the only cultivation required this season, saving fuel and labour,” he concludes. ●

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How do you solve a problem like grassweeds?



“How much are our systems being driven by a need to control grassweeds? That is the question.”

DR WILL SMITH

With potential repercussions of early drilling last autumn raising concerns regarding grassweed control on some farms, how do growers perceive the threat and what have they been doing to keep on top of populations? *CPM* asks its readers for their thoughts during this year's grassweed survey.

By Janine Adamson

For two consecutive years, grassweed control seems to have been effective, but the problem is far from solved, believes ADAS' Dr Will Smith. For one, a general shift towards earlier drilling last autumn may have somewhat compromised long-term efforts, equally, the pressure to cut input costs continues to weigh heavy.

To better understand the reality on-farm rather than simply hypothesise, *CPM* and BASF asked a sample of

growers and agronomists to share their thoughts by filling in a survey – an annual questionnaire aimed at reviewing current weed management strategies.

TIPPING THE SCALE

While the year-on-year results are both positive and reasonably consistent, Will says the data does indicate the scale may have tipped marginally into the weeds' favour this past autumn. “30% of growers said they drilled their winter

wheat in the second two weeks of September 2025, which would suggest a slight move towards planting earlier than we've seen in previous surveys.

“Of course, the fundamentals of weed management indicate the consequence of this can be negative, but equally, the same can be said for those drilling on the edge of too late and into November. The positive is, 68% planted in October, which means messaging regarding optimum drilling dates for grassweed management is still working,” he explains.

BASF's cereal herbicide business development manager, Stuart Kevis, adds that conditions last autumn were conducive to drilling in September, with many hoping to avoid missing the boat, as experienced in 2023.

“But from a pure weed management perspective, delayed drilling is the

most impactful action to help manage grassweeds, otherwise it places a lot of pressure on chemistry,” he raises. “This is especially the case in fields with the worst weed pressure.”

Finding the optimum balance between drilling date and weed control is something that Ceres Rural agronomist Jock Willmott says is underpinned by risk management. “For some, Harvest 2025 was the lowest yielding year on record because the preceding autumn was awful. So when it came to autumn 2025 drilling, growers went for it knowing they’d have to live with the subsequent grassweeds. They just didn’t want to risk not getting the crop well established,” he explains.

Looking at perceived pressure on a per-weed basis, at the time the survey was conducted in July, participants shared that 34% of their winter wheat cropping area had blackgrass present, an increase of 6% on the previous year. Ryegrass came in at 14% (+1%) and brome at 17% (+1%). While relatively minor for the latter two weeds, Stuart raises it does suggest a gradual change.

“Both ryegrass and brome continue to increase in prevalence on-farm. Equally, the rise in year-on-year blackgrass is more significant, and should remind growers that grassweeds aren’t a one-year problem.

“Some fields might not have been winter wheat last year so we may be bringing higher pressure areas back into the rotation. This is because crops such as oilseed rape, barley and



A continuous battle

The rise in year-on-year blackgrass is significant, and should remind growers that grassweeds aren’t a one-year problem, notes BASF’s Stuart Kevis.

beans can easily mask grassweeds under their canopies. Also, it could of course be a result of the increase in earlier drilling,” he proposes.

In a similar question, growers were asked to describe the overall weed pressure in their winter wheat compared with the same time last year, selecting from much higher pressure through to much lower.

Drawing a broad hypothesis, Will says the number of participants that said ‘much higher pressure than last year’ equates to a similar percentage to those who’d shared they’d drilled crops in September. “This shows that we have to balance drilling date versus weed pressure, hence the scale may have been tipped in the wrong direction,” he suggests.

EVOLVING PICTURE

Will also notes that while the blackgrass control ‘recipe’ is well understood, there’s still much to be learned regarding ryegrass and brome. “With these weeds increasing in populations, we probably should reaffirm what it means to keep them successfully at bay.”

For Stuart, a difficult spring may have meant controlling weed survivors with contact chemistry wasn’t necessarily successful. “Most talk during the autumn was that growers were happy with their pre-emergence herbicide applications, but February was wet and then conditions turned dry very quickly. We know in-crop herbicides are less effective anyway, so top-ups may have struggled.

“It’s important to recognise that we also have higher levels of resistant blackgrass in the UK compared with other countries. The weeds are simply tougher,” he adds.

Considering the financial implications, 57% of survey participants shared that they believe they’ve lost winter wheat yield this year due to grassweeds, with 13% strongly agreeing with the statement. Stuart queries what’s understood by yield loss: “Unfortunately, unless 100% control is achieved throughout the growing cycle, yield will have been lost to a degree or so.

“This is because if reactive action such as rogueing or spraying off high pressure areas took place, then the damage has very much already been done. Weeds are competitive with the crop from day 1,” he stresses.

Will agrees, stating that while most growers evidently connect



Financial implications

ADAS’ Dr Will Smith stresses that the cost of weed management isn’t just the loss of yield in a single year, rather the legacy of not achieving sufficient control.

poor grassweed management with yield loss, the discussion is more complex. “How much are our systems being driven by a need to control grassweeds? That is the question.

“The cost of weed management isn’t just the loss of yield in a single year, rather it must include the legacy of not achieving sufficient control – a change in cropping plans or additional cultivations to remove seeds from the system. This larger cost around grassweed management isn’t always fully considered,” he argues.

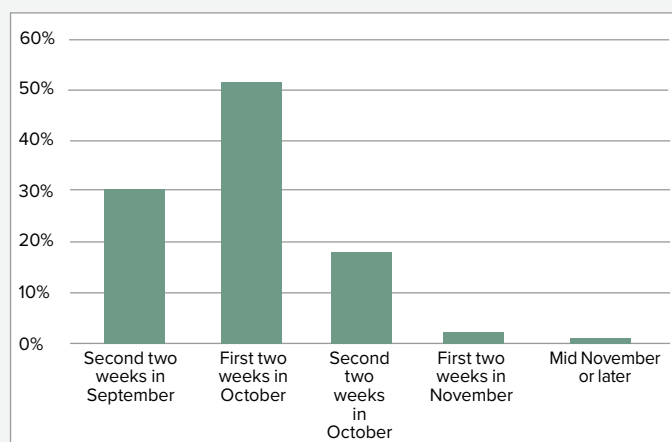
For Jock, regarding potential yield loss, more will become apparent after harvest. “But even so, more than half of those surveyed are recognising that their grassweed problem equates to competition and therefore potential yield loss, which unfortunately is the stark reality.”

Looking at application timeliness, the survey reveals that in autumn 2025, 81% of growers were able to apply their planned pre-emergence herbicides on-time, compared with 70% from the season prior. According to Stuart, this is unsurprising given the improved autumn conditions.

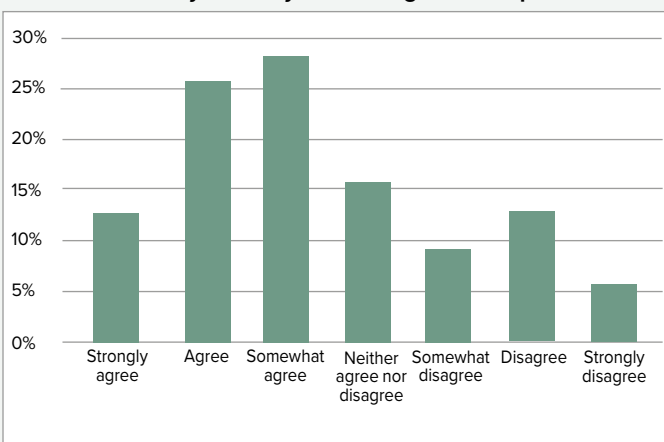
“I suppose the only query is what products were actually used to achieve an optimum level of control,” he comments. “The first grassweed flush is always the most significant; there’s also the risk that the first application ends up being your only chance if inclement weather then occurs.”

Will advises growers to take time to

When did you, or your growers, drill the majority of winter wheat in autumn 2025?



To what extent do you agree with the following statement: I have lost winter wheat yield this year due to grassweed pressure.



reflect on what factors came together to enable that timeliness. "Of course external conditions play a key role, but equally, how did you approach this important component of weed management? Did you do anything differently to prepare in readiness for a good spray day? It all adds up and should be factored into the plan so the good work can be repeated."

IPM

When asked about in-crop IPM techniques implemented pre-harvest 2025 versus those used this year, the data remains static across the likes of rogueing, spraying off worst patches, mapping high pressure areas and spraying off whole fields.

However, for preventative IPM measures, it's a slightly different story. Versus the season just gone, more growers said they intend to delay drilling (+8%) and rotationally plough (+7%) ahead of this upcoming season.

Will notes that ploughing is an effective technique for brome control, while the increase in later drilling is likely in response to current weed pressures. "It's all relative – drill early and weeds increase, therefore the next year's crops have to be planted later to maximise the stale seedbed and get back on top of control."

Jock agrees: "The most effective control method for brome is ploughing, and growers may feel that more of these weed species are starting to creep into rotations. There's only so much you can achieve with pre-em chemistry for brome, so to me, this is no surprise."

According to Stuart, what's most encouraging is that just 2% of those surveyed have no intention of undertaking any preventative IPM

measure for grassweed management. "So nearly everyone is aiming to do something, which is very positive.

Not only is this having a significant impact on reducing weed populations, but it also reduces the pressure on essential chemistry," he highlights.

As for specific herbicide products, the quantity of growers using Luxinum Plus (Luximo (cinmethylin)), continues to rise. In fact, 64% of those surveyed said they'd used it in their winter wheat area this season, compared with 60% last year. For Jock, this is again unsurprising. "With the earlier drilling, growers knew the risk and that they'd likely require an insurance policy, in this case, quality chemistry. Cinmethylin-based products are currently the best."

Stuart believes the product has established itself as the backbone of cereal herbicide programmes. "It's best-in-class and has consistently been proven as the most effective chemistry

for in-crop weed control. Programmes are built around it; for many, it's a non-negotiable," he proposes.

He does, however, raise that while it can be downplayed, Luximo is effective at controlling autumn-germinating sterile brome too. "Residual control of these types of weeds is more difficult,

but Luximo does offer activity."

Will adds that he recognises why the product has become a success. "It's the strongest single component currently available so it's understandable that it's become popular. I just wouldn't lose sight of the importance of

supporting it with both cultural control methods and alternative modes of action within the herbicide stack."

This is a point that Jock reinforces: "We're lucky to have Luximo in our armoury and we desperately want to keep it that way, so I'm conscious that we don't break the chemistry," he concludes. ●

"Half of those surveyed recognise that their grassweed problem equates to competition and therefore potential yield loss."

Winner announcement

Congratulations to prize winner Helen Daniels from Ilfracombe who responded to the CPM/BASF survey and provided insight on grassweed pressure and subsequent control measures, thus winning an iPad Air.

Helen was chosen as the winner having completed the tie-breaker question and sharing what she perceives to be the biggest future threat to effective grassweed control. Helen noted weather challenges impacting herbicide choices and efficacy, and that weed pressure should be managed accordingly in the run up to harvest to minimise the impact ahead of this autumn.

To engage with future surveys, visit the CPM website and sign up to the newsletter.

Why P doesn't have to be a problem



“Phosphorus supplies are not fully available to the crop, they are stored in multiple forms which are strongly controlled by soil chemistry and conditions.”

DR CHRISTINA BAXTER

A new guide has been launched to help growers improve the efficiency of phosphate fertiliser to not only maximise crop performance, but protect the environment too. *CPM* takes a look at the science behind P, as well as the recommendations from the guide.

By Janine Adamson

The curious case of P – an essential nutrient for crop growth that in many cases, is already abundant in UK agricultural soils, yet much of it isn't in a plant-accessible form. In fact, up to 90% of phosphate fertiliser applications can become locked up within days, resulting in a nutrient that's as elusive as it is inefficient.

According to ADAS' Dr Christina Baxter, this is because large pools of phosphorus are often stored in inorganic and organic forms, which includes P fixed to positive ions in the

soil. Only the P within the soil solution is immediately available to plants, which is a small proportion of the total soil P reserve. This means the crop struggles to access a large proportion of soil P, including what's been applied.

“Essentially, phosphorus supplies are not fully available to the crop, they are stored in multiple forms which are strongly controlled by soil chemistry and conditions,” she explains.

Among the influencing factors are pH, with 6.5-7.0 being the optimum range. Temperature also affects root



Plant availability

Only the P within the soil solution is immediately available to plants, which is a small proportion of the total soil P reserve, explains ADAS' Christina Baxter. ►



Risk management

According to Hutchinsons' Tim Kerr, if soil P can be mined more effectively, the UK's reliance on imported fertiliser products could potentially be reduced.

- ▶ activity and availability, while sandy soils can hold less P due to lower organic matter. Then, moisture has an impact and controls uptake, because as a mineral P is immobile, relying on water to diffuse through the soil.

"Phosphorus has a very low diffusion rate," highlights Christina. "This means that it tends to remain where it's been placed due to its low solubility, unlike nitrates which move more freely through the soil. To compensate, roots must physically grow into contact with P, meaning fertiliser applied away from the root zone is more difficult for plants to access."

Critically, research has shown just why P access matters – evidence from the Yield Enhancement Network (YEN) has shown a significant variation in grain phosphorus content, despite soils containing sufficient reserves.

Furthermore, the data indicates that up to 60% of cereal crops fall below the critical grain P concentration (0.32%). In real terms, this suggests crop performance is limited by poor uptake of P, rather than a lack of supply.

And during a time when every drop and ounce of crop input counts, this can have a significant impact on the bottom line. "It's widely recognised that phosphate fertiliser represents a significant input cost on farm, with applications typically ranging from 20-100kg/ha, depending on the crop and soil status.

"If only 10-20% is being taken up by the crop during the year of application, and crop response is often inconsistent, this is a major efficiency problem for growers. Equally, repeated applications leads to build-up of unused 'legacy P', which poses significant environmental risks," says Christina.

Hutchinsons' Tim Kerr believes in some instances, soils may have several years' worth of P in reserve. "With a current fertiliser industry that's high risk and beholden to geopolitics beyond our control we have to understand how to access the nutrients that are already present in our soils," he stresses.

RISK MANAGEMENT

"As a system, soil is a reserve that's currently relatively rich in P. If we can 'mine' that more effectively, we could potentially reduce our reliance on imported fertiliser products and therefore manage those risk levels better."

So what's the answer? Rather than simply ask growers to 'do better', De Sangosse has collaborated with Christina and the team at ADAS to create a phosphate stewardship guide. Launched at Cereals, its purpose is to raise awareness around poor phosphate efficiency and highlight the various ways growers can address it.

The guide has a bold strapline – 'Protect it. Place it. Unlock it.', which De Sangosse's Rob Suckling hopes will reinforce the message that to truly solve the P-problem, a full system approach is required.

"Phosphorus management is a system, not a single input, and will require a chain of actions to help manage availability, access and reserves,"

he states. "This means maintaining its availability after application, improving early root access, and finally, utilising the existing soil reserves."

However for Tim, the first step before even thinking about the behaviour of phosphorus, is to check soil pH. "If you look at a map of the UK, there's a band of high-pH soils across the main arable growing region, therefore, checking pH is a must. While for those with low pH, liming will help, although it's concerning that lime use on-farm has been decreasing recently," he notes.

Rob adds that then, it's important

to understand whether P is actually being limited, which can be achieved through grain analysis. Equally, the visual signs of this can be clear, he says. "Early P supply is critical as it helps to set the foundation for the crop's final performance. Without it, root systems can be small and underdeveloped, there can be a loss of early plant vigour versus what's expected, and consequently, yield potential is reduced.

"Because later applications often can't compensate for these effects, it means improving early P availability is critical. But remember, supply does not guarantee uptake," he stresses.

As for calculating what P is currently being held in soils, methods such as Olsen P can be used to assess phosphorus status in calcareous types, while the Bray method is used in acidic situations. These results then form the P Index and can guide what action is taken next.

Christina raises that depending on the resulting indices, this will inform what aspects of 'Protect it. Place it. Unlock it.' are required. "For high P indices, this means improving the access to that nutrition (unlock and protect). Conversely, for low P indices and maintenance scenarios, the solution is to better protect what's being applied (protect and place)."

For the 'protect' aspect of the guide's recommendations, Rob highlights that one way to achieve this is to use phosphate protection technologies

(PPT). These work on the proviso of reducing the fixation by soil minerals to maintain P in its plant-available form, he says.

"One delivery mechanism for PPT is to use a coating which is applied

to the surface of starter fertiliser granules. When the granules dissolve and phosphate moves into the soil water, it's the coating that enters the water first, sequestering cations that fix phosphate in the soil. These cations are then unavailable to react with the phosphate, extending its window for crop uptake," explains Rob.

Then for 'place', this involves better targeting of P from the off, to increase early root interception and boost subsequent crop establishment. "These are typically protected microgranular fertilisers such as De Sangosse's

"Formalising a strategy and stewardship for phosphorus is a great way to devise an effective framework."

Primary P, PrimeStart or the Microstar range. Placed underneath the seed within the developing root zone, this helps to overcome the fact that phosphate is immobile once in the soil.

“And of course, by improving early establishment and rooting, this increases the crop’s ability to capture phosphorus and other nutrients from the soil throughout the rest of the crop’s life,” he highlights.

When it comes to ‘unlock’, this can be achieved by using products such as soil nutrient activators. Applied at the same time as conventional plant protection products such as pre-em herbicides, Rob says when applied to soil, cations preferentially bind to the product components, rather than phosphate or soil particle surfaces

“The cation complexes formed allow more phosphate to enter into the soil solution, but these complexes also enable plants to assimilate other cation nutrients such as zinc, copper and manganese that may be unavailable due to chemical fixation or multi-dentate bonding with soil particles. Soil nutrient activators are particularly relevant in moderate- to high-P index soils,” he notes.

Finally, other aspects such as in-season targeted nutrition, protected P seed treatments, biological stimulants and bacteria-based products can also be used to support the improved uptake of P and complement the soil-based supply.

For Christina, an essential part of the guide is that it highlights the impact of legacy P in soils, and its potential to be lost through run-off, erosion or drainage pathways. “Phosphate is an environmental concern as well as agronomic, and should be tackled head-on rather than simply accepted,” she stresses.

“P that isn’t captured by a crop remains in the system, and when it’s in surface water, it becomes a pollutant driving a process called eutrophication where excessive algal and plant growth degrades aquatic ecosystems. These are commonly known as algal blooms,” explains Christina.

Currently, 25-40% of phosphorus entering watercourses comes from agriculture, predominantly from soil erosion. Preferential flow sources include from mole drains, field drains and macropores in clay soils. Equally, high risk scenarios include applying P to bare or recently

cultivated soil before rainfall, fields with steep slopes or compacted soils, and soils with a P Index of 3+.

For Tim, both the agronomic and environmental negatives associated with poor P uptake require a shift in behaviour from the whole sector. “But, I believe we’re starting to recognise the challenge and act accordingly. If we consider the story of placement fertiliser for example, 10-15 years ago that was barely in practice, while now, it’s commonplace. We require consistent cross-industry messaging to achieve a similar outcome for phosphorus use,” he stresses.

This all loops back to the demand for stewardship guidance, believes Rob. “By being proactive – testing soils, conducting grain analysis and using the techniques in the guide – phosphate applications can be better targeted and the crop’s access to the nutrient will be improved.

“It’s also critical that all mandatory buffer zones are adhered to, as well as Farming Rules for Water, plus general best practice for application. This will mean that as an industry, we can get phosphorus management right, for better crop performance and to protect water quality.”

To conclude, Tim believes the stewardship guide has the potential to make a significant impact. “Formalising a strategy and stewardship for phosphorus is a great way to devise an effective framework. The better we all understand how phosphorus behaves in the soil is a win-win for me, reducing our reliance on inefficient P and capitalising on existing soil resources.” ●



High impact

Without early P supply, root systems can be small, there can be a loss of early plant vigour, and consequently, yield potential is reduced, says De Sangosse's Rob Suckling.

Action to take after harvest

Before making autumn phosphorus decisions, conduct the following:

- Review crop performance field-by-field
- Consider grain analysis to assess phosphorus capture and offtake
- Compare performance of higher and lower P index fields
- Review establishment and rooting performance
- Check soil pH and phosphorus status
- Consider whether access, availability or soil reserves may have limited uptake
- Use harvest insights to guide future phosphorus decisions

This is because stewardship starts with understanding what the crop actually captured.

Sponsor's message

The challenge isn't P supply – it's P availability, and that's something De Sangosse is striving to address through its recently launched phosphate stewardship guide.

Delivered in conjunction with ADAS, the guide's goal is to support growers to maximise crop performance while protecting water. 'Protect it. Place it. Unlock it.'

CPM would like to thank De Sangosse for sponsoring this article and for providing privileged access to staff and the material used to help bring it together.

To access the guide and the new Phosphate Stewardship Hub, visit the De Sangosse website:



DE SANGOSSE
by DSG

Don't sleep on slugs



"The assumption is often that a dry summer means fewer slugs; but reduced activity and reduced risk aren't necessarily the same thing."

PHIL CARPENTER

While a dry spring and summer might suggest slugs should be of no concern, experts warn that all it takes is one rain event to change the threat level considerably. *CPM* reveals why slugs shouldn't ever be downplayed.

By Janine Adamson and Rob Jones

Of all the pests to thrive in dry, drought-like conditions, logic would suggest the lowly slug wouldn't be one to come out fighting fit. And although the mollusc requires moisture to remain active – of which there's been very little this year so far – the story isn't quite that simple.

That's according to managing director of De Sangosse UK, Phil Carpenter, who suggests while growers may presume slug pressure will be lower heading into this autumn, the

reality could be very different.

"The assumption is often that a dry summer means fewer slugs," he continues. "But reduced activity and reduced risk aren't necessarily the same thing."

These thoughts are based on slugs being survival experts, adds Phil. While hot, dry conditions reduce surface activity, many slug species are adept at surviving adverse weather. They can seek out cooler, protected environments and remain

inactive until conditions improve.

According to Benoit De Schepper, global R&D manager for baits at De Sangosse, it's also worth noting that slug pressure develops over time. "The populations growers encounter in autumn are often the result of survival and reproduction during a number of seasons, not simply what's happened over the previous few months," he explains.

"Even where visible activity has been low, surviving adults can remain present in soil cracks, beneath residues and in other protected refuges waiting for conditions to improve. One thing we see consistently across Europe, is that periods of low slug activity shouldn't automatically be interpreted as low risk."

As such, it isn't what necessarily happens in June and July, it's what

occurs when moisture returns and vulnerable crops start emerging, says Phil. For example, a period of rainfall around harvest or drilling can quickly alter conditions at the soil surface, encouraging renewed movement and feeding activity. “A dry summer might tell us less about autumn slug pressure than the first meaningful rain after harvest,” he highlights.

“The danger is assuming the risk has gone away just because conditions have been dry and activity has been low. In reality, the slugs haven’t disappeared – they’ve simply been sitting tight and waiting for conditions to improve. That’s when we may start to see the real picture emerge.”

For Adama’s Catherine Whaley, not only may slugs re-appear as soon as there’s rain, merely a heavy dew can be enough to kick-start slug activity overnight. “And given the lack of cold weather during the past winter, it’s likely that pressure is higher than it would have been in years where we’ve experienced significant frosts. Being hermaphrodites, the reproductive potential of slugs is huge, in fact, any stress from drought would have the effect of causing them to produce eggs,” she raises.

Rather than relying on assumptions based on seasonal weather patterns, Phil urges growers to return to the fundamentals of risk assessment: field history, soil type, cultivation strategy, crop choice and active monitoring.

SEASONAL CONTEXT

Equally, this season’s earlier harvest could add another variable, notes Phil. “Many growers are expecting an extended period between combining and autumn drilling, creating opportunities for volunteers, crop residues and green



Not all is what it may seem

While growers may presume slug pressure will be lower heading into this autumn, the reality could be very different, suggests De Sangosse’s Phil Carpenter.

bridges to develop.”

In particular, one watch-out is the combination of an earlier harvest and chopped straw. This is because where straw is left on the soil surface and rainfall arrives after harvest, it can help to create a cooler, wetter environment beneath the residue layer.

Add in potential volunteers, grassweeds and other green material beginning to chit, and conditions can quickly become favourable for slugs, warns Phil.

Then another factor to consider is the amount of surviving oilseed rape stem material present in some harvested crops. With conditions so dry, some growers chose to not desiccate crops before harvest and as a result, green stems can remain in stubbles after combining.

According to Phil, although fields may appear dry from above, those stems can provide both shelter and a source of moisture for slugs during hot conditions. “At first glance a field might

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Accumulated numbers

Slug populations encountered in autumn are often the result of survival and reproduction during a number of seasons, highlights De Sangosse's Benoit De Schepper.

look pretty hostile. But when you have green OSR stems, chopped residues and some moisture underneath, you've potentially created somewhere slugs can sit out difficult conditions."

RIGHT HERE, RIGHT NOW

This brings home the importance of noting exactly what's happening in the field right now – if favourable conditions return after harvest, these may support slug activity and egg laying. Equally, given the reproductive potential of slugs, it doesn't take many surviving adults to generate significant juvenile pressure ahead of crop establishment, notes Phil.

"Historically, we tend to focus on adult slugs because they're easier to find. But from an establishment perspective, juvenile activity can be just as important. If conditions are right for egg laying after harvest, you could find juvenile slugs emerging just as autumn

crops are becoming vulnerable."

And while the current renewed confidence in OSR is positive overall, it does have implications for practical slug control, reminds Phil. "Slugs remain one of the most significant establishment threats facing emerging OSR crops, despite the industry having learned a lot about the crop's establishment during the past few years," he comments.

"Growers are placing more emphasis on drilling conditions, nutrition, variety choice and establishment strategy, but, slug pressure remains a key consideration."

Catherine agrees: "It's really important that growers stay alert for slugs, monitor the situation and be prepared to protect vulnerable crops like OSR as they're drilled. Damage sustained at emergence of the crop can result in the loss of entire seedlings. This situation can get out of control very quickly as soon as the rain

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comes, so everyone has to be prepared,” she stresses.

In fact, in many scenarios, protecting crop establishment is far more valuable than reacting once damage is already visible, believes Phil. And it's this shift in thinking that's changing the way many growers approach slug management.

Rather than viewing control as a response to visible damage, there's increasing interest in reducing the risk before problems develop. As such, Phil highlights that the De Sangosse ferric phosphate label permits applications from seven days pre-drilling. “Applying before crop emergence also offers an important advantage – there's no competition from seedlings, allowing bait to remain the most attractive food source available to slugs.”

Early intervention allows growers to reduce populations before seedlings emerge, giving crops the best possible start, adds Benoit. “Monitoring remains essential, both before and after application, to ensure bait remains available



Watch out

Adama's Catherine Whaley says not only may slugs re-appear as soon as there's rain, but a heavy dew can be enough to kick-start slug activity overnight.

and to determine whether a follow-up treatment is required,” he urges.

For Phil, as farms continue to operate at larger scales, pellet quality and spread performance are becoming increasingly important.

“Every pellet application is an investment; growers want confidence that they're achieving reliable coverage and giving every slug the opportunity to encounter bait,” he concludes. ●



Attractive proposition

While the current renewed confidence in OSR is positive overall, it does have implications for practical slug control.

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The law of attraction

“It’s an enabling technology rather than a straight solution.”

PROFESSOR TOM POPE

A new beneficial insect attractant is promising to bolster the IPM toolbox to help growers combat aphids and therefore reduce the threat of the viruses they can transmit. *CPM* learns about *Apthena*.

By Janine Adamson

Instead of developing a product to directly control insect pests such as aphids, a new concept is aiming to achieve the same results, but by making the most of what already exists in nature.

The solution – a beneficial insect attractant – flips the concept of control on its head. Rather than being a new ‘icide’, or even a biological equivalent, it works by manipulating the behaviour of natural enemies, helping to entice them into the crop earlier.

Launched by BASF, *Apthena* contains the organic signalling compound (E)- β -farnesene (EBF) – an alarm pheromone used by aphids that also attracts beneficial predators and parasitoids, including ladybirds, lacewings and some parasitic wasps.

“EBF was first discovered in the 1970s,” explains BASF’s Rob Storer. “It operates between aphids, between the aphid and the plant, or between the aphid and its predators.”

At a basic level, EBF signals danger,

prompting aphids to flee or stop feeding. It also acts as a semiochemical kairomone where EBF is released by aphids but instead attracts natural enemies. “Because beneficials can use this to their advantage, exploring EBF as a kairomone has been our primary interest,” adds Rob.

However, while Mother Nature can easily apply the benefits of EBF, recreating this as a practical solution for on-farm use was a different matter, notes Rob. “EBF is a volatile compound and degrades rapidly, meaning we had to find a successful delivery mechanism.

“So what makes *Apthena* unique is its proprietary formulation – it’s been developed using microencapsulation technology for controlled release over 20-30 days. By encapsulating EBF in its vapour phase, it’s then released into the air by diffusion,” he explains.

Initial field trials suggest in sugar beet, *Apthena* can reduce the presence of aphids by more than half (from 2% to 0.5%). Then in peas, the product



Compatibility

Compatible IPM tools are those that deliver the best outcome for a profitable crop while posing the least impact on the environment, says Harper Adams University’s Professor Tom Pope.

increased the quantity of plants containing beneficial insects by 18%.

Equally, in controlled laboratory conditions, ladybirds exhibited a significant preference for air containing *Apthena* – opting to move toward the source of this odour more frequently than for the controls.

Harper Adams University’s Professor Tom Pope believes *Apthena* has the potential to either draw natural enemies into a crop early, or, encourage them to

continued on page 28 ►

Casting the net for dual protection

An innovative leaf protection coating is not only minimising disease penetration, but also helping to reduce drought stress

Among the many challenges facing modern day crop production, minimising disease threats and reducing the impact of drought conditions remain among the most pressing. However, could the answer to both lie in one innovative technology, specifically, cellulose nanofibre?

Suggested to be the world's most advanced biomass material, cellulose nanofibre is derived from plant-based pulp. It's also the primary component of Nanomesh – a leaf protectant that when applied to a crop, forms a micro-structured network that acts like a fine net.

This physical barrier helps to limit fungal penetration into the crop, while moderating transpiration out of the plant leaf.

The product is part of



A physical barrier

Nanomesh reduces vulnerability at the plant's infection points, while also protecting against transpiration that occurs through the stomata of the plant leaf, explains Agrovista's Chris Martin.

Agrovista's innovation range, highlights the firm's Chris Martin. He says by using Nanomesh, growers can achieve a two-fold outcome. "It reduces vulnerability at the plant's infection points, while also protecting against the transpiration that occurs through the stomata of the plant leaf," explains Chris.

"Together, this can support overall leaf condition and crop resilience, particularly when used alongside conventional plant protection products. The aim is to maintain a healthy, functioning leaf area during key growth stages."

When demonstrated at Agrovista's Lampport AgX site this year – which experienced drought conditions like much of the country – Chris says plots treated with Nanomesh remained greener for longer, despite the lack of moisture.

Critically, rather than coat the leaf surface entirely, Nanomesh is breathable and transparent, allowing standard plant processes such as photosynthesis and gas exchange to take place.

Recognising the unique properties of cellulose nanofibre led Marubeni – Agrovista's parent company – to work alongside Chuetsu Pulp and Paper and Tsukuba University in Japan to further understand its application within crop production, and ultimately develop



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► Nanomesh, explains Tomomi Otsuka.

“The product is manufactured by a Japanese producer using a proprietary process. During this, pulp suspensions are collided with each other at high speed through opposing nozzles, mechanically fibrillating the fibres down to the nanoscale. This defibration method is achieved without chemical additives or chemical modification,” he explains.

According to Tomomi, because these nanofibres are produced from naturally-derived raw materials, this aligns perfectly for applications in areas such as cosmetics and agriculture. “It was through

plant-application trials and other evaluations that their true potential for agricultural use was identified, and the underlying mechanism was subsequently investigated through collaborative research with universities and research institutions.

“In the UK, agriculture is facing a changing environment driven by factors such as increasingly irregular rainfall patterns associated with climate change, soil degradation, and tighter fertiliser regulations. As such, we believe Nanomesh has the potential to contribute to yield improvements in crops such as wheat, barley, and oilseed rape,” he concludes.

► remain in the area for longer. However, it shouldn't be used in isolation. “We have to make intelligent selections of compatible IPM tools – those that deliver the best outcome for a profitable crop while posing the least impact on the environment,” he says.

“Aphena can't provide crop protection alone, but used alongside other methods such as wildflower margins and buffer strip habitats, can attract more beneficial insects into the crop at a potentially earlier time than they'd ordinarily migrate. It's an enabling technology rather than a straight solution,” stresses Tom.

According to Rob, Aphena should perform particularly well in scenarios where there are already high levels of beneficial insects. “Then it's a case of manipulating their behaviour with EBF, which should then help to suppress aphid populations.”

With this in mind, the product should be applied when natural enemies are already present and active. Equally, growers should be mindful if using non-selective insecticides in the rotation.

In the main, Rob believes the main barrier to its success will be grower acceptance. “It fits across all cropping systems, but the biggest challenge will be the willingness to adopt the technology on-farm. It's likely the protected horticultural sector will be its initial breakthrough, as these growers purposefully release mass-reared populations of beneficials so have an instant use case.”

BASF recommends applying Aphena at intervals of 14 days at 0.3-0.5 l/ha with water rates of 100-300 l/ha. It's rainfast within 24 hours, requires no buffer zone or maximum application limit, and so should prove a flexible addition for existing IPM strategies, concludes Rob. ●



Optimising populations

According to BASF's Rob Storer, Aphena should perform particularly well in scenarios where there are already high levels of beneficial insects.

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WITH GUY SMITH

Smith's SOAPBOX

The Spanish harvest of 2026

“It's said the reason us British are obsessed with the weather

is because it's unpredictable and in a state of constant change, hence it's in need of comment. If that's the case then the 'groundhog day' weather of the long hot summer of 2026 would merit little conversation. Day after sweltering day, the weather was much the same – it was as if the Sahara had moved 3000 miles north and settled over south and east England.

You'd suspect the easiness of this year's harvest might have caused a cultural revolution in the mindset of arable farmers. UK harvests are usually vexed 'snatched' affairs clouded by a sense of angst, where much of August can be spent sheltering in barns waiting for the rain to clear. Usually, once the sun eventually appears, teams of combine and trailer drivers scramble into action like squadrons of Second World War spitfire pilots ready to take on the Luftwaffe.



But not so in 2026, when 'bringing in the sheaves' was the most relaxed and leisurely affair I can remember. We even took weekends off in late July, smugly confident that on Monday morning the crop would be as dry and fit as when we left it on the Friday evening. There was no constant, anxious checking of the weather forecast, but rather a benign assumption that every day would be for combining.

Usually if we have a combine breakdown during harvest it's treated like a medical emergency – fitters are rushed to the ailing patient with parts in hand as if any delay could prove fatal. Not so during 2026, when if a shaft or a pulley did go awry, there was no sense of panic. Repairs could be done in their own sweet time.

Another re-evaluated issue was combine capacity – our old CX is getting to an age where I've wondered if our harvest demands might be too much for it. It's similar to me playing tennis – I'm good for the first set but after that some of the working parts start to wear badly. But this year, in terms of combine capacity, I think I'd have been comfortable if all we had to complete the harvest was dad's old Class Dominator with its 12-foot reel.

In my smug way, I could almost look on with disdain at neighbours with their state-of-the-art 100t/hr machines. There can be nothing worse than seeing £500k-worth of kit parked up in the shed by 1 August with nothing to do. But I suspect a return to a catchy harvest next year might wipe the smile off my face.

And so Harvest 2027

hoves into view and suddenly that blissful prolonged sunny harvest weather becomes a worrying drought that could curse the following year. Things will change if and when the rain returns, but at the moment we can't get the plough in and sub-soiling is off limits because of the indestructible boulders it would bring up.

I enclose a picture of the roadside headland of my neighbour's maize crop. What's remarkable is the stunted and shrivelled state of it underneath the chestnut trees while most looks remarkably healthy given its barely had 2" of rain since it was sown in April. It suggests the combination of trees and crops as promoted by the devotees of agro-

forestry might not be so syllogistically happy as some may suggest. On the other hand, the healthy state of the maize compared with my drought-afflicted spring wheat that was barely worth cutting, suggests it might be the crop of the future. ●

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

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Sprinting to the finish line with Pace



"It's a nice fit and a useful tool for if the malting barley market remains depressed."

MICHAEL WILTON

Neither a true winter or spring variety, STR Pace is a high-yielding Group 1 option that delivers the best of both worlds. *CPM* uncovers what makes this Sprinter wheat stand out, and why it's causing growers to question what they know about vernalisation.

By Janine Adamson

Agrovista's Lamport AgX site has long been a haven for agronomic R&D – whether that's related to the topics of grassweed control, soil health, or alternative approaches to crop nutrition. However this year, eyes were focussed on one corner of the site – the firm's variety trials.

While comparative variety plots always pique grower interest to a degree, in this case, there was something truly different to behold – STR Pace – the first 'Sprinter' wheat to be launched to the UK market.

Although it's officially featured on the AHDB Recommended List as a Group 1 spring wheat, it can in fact be drilled as early as mid-October, explains Agrovista's Ted Williams. He adds that in crossing different wheat types and blending genetics, Pace boasts the benefits of early vigour and winter hardiness, plus a wide drilling window.

"Choosing a Sprinter wheat like Pace provides security in knowing that if a drilling window is missed, the variety can still perform as expected when drilled later, even in late spring,



Facilitating the rotation

Because STR Pace is quick to emerge, establish and develop, it's ideal to follow late-lifted break crops such as sugar beet, maize or potatoes, suggests Agrovista's Ted Williams.

unlike winter wheat varieties where there's a vernalisation requirement.

"This is important because in scenarios where later drilling is the preference – to help combat blackgrass or other pest/disease threats – weather becomes more unpredictable and days become shorter. Pace is an agronomic tool that helps to overcome those pressures."

And because Pace is quick to emerge, establish and develop, it's ideal to follow late-lifted break crops such as sugar beet, maize or potatoes, suggests Ted. "But critically, it has been bred from a milling quality-focused breeding programme, therefore delivers enhanced protein content (13%), grain quality and robust specific weight (80.6kg/hl). These factors make Pace the earliest maturing Group 1 milling spring wheat on the RL, and one of the earliest maturing overall."

MINIMAL DISRUPTION

Unlike more conventional-type spring wheat varieties which can be late to harvest, because of its early maturity, subsequent cropping options can be established in a timely manner, minimising rotational disruption, he points out.

Equally, the reason why Pace sits in the spring category and not winter, is because its earliest drilling date is mid-October. This would mean the variety would have been too forward if tested within the AHDB RL protocol for winter wheat.

Taking a look at disease resistance scores, Ted believes Pace offers a respectable overall package, scoring [8] for mildew, 5 for yellow rust, 7 for brown rust, and [6] for septoria. "Its only weakness if you had to pinpoint something, would be it doesn't have orange wheat blossom midge resistance.

"However, in every situation, Pace presents a brilliant management tool that can overcome challenges such as heavy blackgrass, having a late-drilled slot and weather unreliability; but it also yields well and has excellent spec weight."

At two contrasting sites – Lamport and Haddenham in Cambridgeshire – Agrovista has been comparing Pace with a popular late-drilling variety. Last year on the heavy soils at Lamport, Pace yielded nearly 1t/



Showing potential

Having now grown STR Pace, Michael Wilton says it's a strong variety with a good overall disease resistance package and deep green colour. *Photo: BASF.*

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Where did Pace come from?

Sharing the background of one of this season's most talked about varieties

With roots firmly embedded in a German plant breeding programme, STR Pace has been developed with a different mindset, notes RAGT's Andrew Creasy. "Over on the Continent, autumn varieties have to be drilled by the end of October because conditions are harsher than in the UK where we have the potential to plant later," he continues.

"Then, the spring can quickly switch from icy cold to hot, meaning spring wheats too can struggle. However, now bridging that gap and being brought to the UK is a wave of alternative wheats – also known as 'Sprinter' varieties – that can be planted from mid-October through to early March."

Part of the Strube breeding pipeline, which was recently

acquired by RAGT, Pace is the result of around 15-20 years of development work into alternative wheats, highlights Andrew.

"And what really is the icing on the cake is not only does it have a wide drilling window, but it's made it through the Recommended List process as a Group 1 spring wheat variety. But equally, trials have consistently demonstrated that it also fits into the autumn slot, because its growth habit isn't too forward despite being vigorous," he explains.

For Andrew, if growers require a later sowing date, Pace could be an ideal risk-management option. "However, it's not about replacing a true winter or spring wheat, this is a different concept and should be perceived accordingly," he concludes.



Alternative wheat

Rather than replacing a true winter or spring wheat, STR Pace is a different concept and should be perceived accordingly, highlights RAGT's Andrew Creasy.

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► ha more from a November drilling, while on the high-yielding silt soils at Haddenham in Cambridgeshire, uplift was almost 0.6t/ha.

With this year's trial yet to go through the combine at the time of writing (mid-July), so far, Pace appears to be well ahead of its competition at various drilling dates and seed rates, notes Ted.

Over in Norfolk, Michael Wilton has been growing a 36ha seed crop of Pace at the Stody Estate. He says he decided to give the variety a try because he was looking for an alternative to spring barley to follow sugar beet.

"I was initially intrigued because of Pace's wide sowing window and the flexibility to choose when it's planted. Equally, we're growing hybrid winter barley for seed and that has a wider isolation requirement, so planting a spring wheat fits better than a spring barley in some scenarios," he explains.

According to Michael, the farm has also struggled with volunteer barley in its winter wheat seed crops, making the drive to find an alternative even more important.

Having committed to Pace, he says the weather turned against him when it came to drilling the crop in mid-autumn, resulting in it being planted around the beginning of March into light, sandy soils. "Ultimately, this means it's presenting as a spring wheat crop," he notes.

SPEEDY ESTABLISHMENT

Despite this, Michael says Pace has shown good vigour considering the challenging dry conditions this spring. "All of our crops have been irrigated, including Pace, with the aim of moving nutrition into the plant at the right time.

"I imagine that will have helped, but even prior to this, the crop established quickly with good ground cover and plenty of biomass by early April," he highlights.

As for disease pressure, the season has proven relatively clean, although Pace did exhibit some yellow rust symptoms, says Michael. "It's a strong variety though, with a good overall disease resistance package and deep green colour. It hasn't retained tillers

quite how I'd expect it to, but this could be down to the drilling date and seasonal conditions and would be overcome by increasing the seed-rate.

"I'll reserve full judgement until the combine has rolled, and then it'll be a case of comparing its gross margin with other crops that fit in that place in the rotation. But for us, it's a nice fit at this moment in time

and is a useful tool for if the malting barley market remains depressed."

Having grown other spring wheat

varieties in the past, he believes Pace has performed better, and that it should be an exciting opportunity for many growers, particularly those with sugar beet in the rotation. As such, he's planning to stick with the variety for this coming autumn.

"If the yields are good then I'll likely increase the area up to 80ha, but crucially, aim for an earlier drilling date, ideally in October. However, knowing there's the flexibility there, it's not a problem to go after late-lifted beet in December, should conditions allow," he concludes.

Pace will be commercially available from this autumn onwards, with further Sprinter varieties coming through the pipeline for future launch. ●

"Pace presents a brilliant management tool that can overcome challenges such as heavy blackgrass, having a late-drilled slot, and weather unreliability."



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Transforming soils for the ultimate mixed system



Managers of a 2400ha mixed farm have developed an approach that's boosting soil resilience and stabilising crop yields to help maintain a closed-loop circular production system. *CPM* learns how improving soil health has kept them on track.

By Mike Saull

With an impressive 2650 cows housed all year-round, the goal for Grosvenor Farms is an efficient circular production model whereby waste streams are exploited to help maximise the crops grown to feed its livestock.

Based on the North Wales/Cheshire border with 2400ha of cropped land, the farm uses a six-year rotation, comprising grass, maize, winter wheat, winter rye and winter barley. Organic manures are used to help offset artificial fertiliser, while a new gas-to-grid AD plant is

being constructed to add another revenue stream to the business.

In total, the aim is to produce around 9000t of grain and 50,000t of forage annually, the latter made up of around 50/50% split of grass silage and forage maize.

Assistant arable manager, Caleb Cousins, has been at Grosvenor Farms for three years and says while the circular economy system is efficient and builds in strong business resilience, the farm has struggled with its soils which has had a knock-on impact. This



The challenge at head

While the circular production system is efficient and builds in strong business resilience, the farm has struggled with its soils which had a knock-on impact, highlights Grosvenor Farms' Caleb Cousins.

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Chemical imbalance

Hutchinsons' Ian Robertson identified a chemical imbalance as a major factor behind the farm's physical soil challenges.

► is because aside from 300ha of sandy land, the rest of the farm is on clay loams that are inherently unstable.

"In current volatile climatic seasons, this has become a major issue, limiting yield and increasing input costs," says Caleb. "In the recent, wetter autumns it was almost impossible to get winter cereals established well and compaction was becoming an increasing challenge with all crops struggling to reach the farm's rolling average yield.

"We were increasingly being pushed into spring cropping to recover from poor winter establishment waterlogged crop failure, with significant yield and cost penalties. That in turn meant importing more grain and straw for feed and bedding, moving the business further away from its circular economy and more closed-loop approach," he explains.

The farm has been operating a min-till cultivation system for more than 20 years, but on its 'two-day soils', drilling timeliness is critical, adds Caleb. "In a kind season they drilled well, but where we were increasingly utilising delayed drilling to help manage blackgrass, wet weather could quickly cause the soils to slump and lose structure.

"As a result, min-till wasn't always enough to keep us on track and, increasingly, we were forced back to the plough and combi-drill to salvage crop establishment."

During an open day at the farm, the team was introduced to Hutchinsons' soils specialist Ian Robertson. As part of the event, a 'healthy soils gold standard' investigation was undertaken alongside a soil pit, which

provided an in-depth analysis on the chemical constituents of the soil.

Consequently, Ian identified a chemical imbalance as a major factor behind the farm's physical soil challenges. He then demonstrated a number of practical remedial measures that could be adopted, marking the start of a new close working relationship.

"We've all largely been brought up to use horsepower and soil physics to solve our structural problems," suggests Ian. "However at Grosvenor, excessive cultivations followed by wet winters and dry summers were exacerbating the problem.

"The soil tests highlighted a number of issues and by working with the farm managers, we've helped to lead the farm down a completely different approach helping to breathe vibrancy and life back into their soils."

DOMINANT MAGNESIUM

Ian adds that first and foremost, there was a significant nutrient imbalance in the farm's clays with magnesium the dominant cation; some had quite high potassium content as well. In essence, this magnifies the effect of sodium in the sodic soils which disperses and disturbs soil aggregates, explains Ian.

"In addition, there were varying levels of organic matter ranging from just 2% on the sandier soils and fields further away from the dairy which didn't get regular applications of manure, to a farm average of 4%, and up to 9% on good grassland."

While soil health can be measured

by the ratio of soil organic carbon to clay content, Ian's view is that this wasn't relevant in this situation. "The suggestion is that by adding manure and improving the ratio of organic matter to clay, this will improve soil workability and structural strength. In the case of Grosvenor Farms the ratio was good at 1:8, but this alone wasn't solving the structural stability problem.

"Although most advice is to build organic matter as it's your soil's battery, raise levels too high – as was the case at Grosvenor Farm – and it'll bind potassium and other cationic elements too strongly, with consequent problems of low soil bulk density and low available water content.

"So the first remedial step was to use gypsum to introduce calcium at a colloidal level – this helped to replace magnesium on clay particles, reducing slumping and increasing pore space. It's a little like creating a soil with the structure akin to a chocolate sponge cake, compared to that previously, which resembled a tight, chocolate brownie texture," explains Ian.

The gypsum also helped to bind fibres from the manure, and at the same time, provide some calcium and sulphur to promote a healthier growing crop. However, according to Caleb, this wasn't an complete instant fix.

Following an exceptionally dry year which encouraged cracking and fissuring in the clay soils helping the restructuring process, the farm has adopted targeted mechanical intervention encouraging strong crop establishment and enabling better root development.



Measuring to manage

As part of an open day event at Grosvenor Farms, a gold standard investigation was undertaken alongside a soil pit, to provide an in-depth soil analysis.

"It's clear that weather still has a major influence," says Caleb. "But as soil resilience has improved, so too has the farm's ability to reduce cultivations. In many situations, a light stubble cultivation will now be enough to incorporate manures and create a workable seedbed."

OPTIMISED CULTIVATIONS

Deeper loosening is reserved for where it's genuinely required; usually tramlines, occasional headlands and fields struggling from ageing drainage systems, he adds. "This year, we anticipate that around 90% of the farm won't require deeper loosening, bringing clear savings in diesel and wearing metal."

"It took a leap of faith to reduce cultivations so quickly and break from the way we knew after doing it for so long, but even some of the farm's arable operators who were cynics initially are slowly becoming converts after observing results and increased worm activity," notes Caleb.

Ian recalls summoning the farm's 15 operatives into a room for an hour's basics on soils and then out into the field to dig holes. "Three years on and they're seeing the changes – this is a massive win for how the farm is managed; all of the staff are buying into the new approach," he says.

According to Caleb, the farm is still at the mercy of the season but the soils are more forgiving than they were. "However, there are still pressures in the system, for example, heavy application kit is required to handle manures, our five-cut grass silage traffic can compromise soil structure in a wet season if timing isn't kind, and a difficult maize harvest doesn't help either."

A further important part of a wider soil management approach is to establish forage maize following first cut grass in its third year, using strip tillage. By disturbing only the planted strip and leaving the soil between the rows intact, the system helps preserve structure and reduce the risk of slump; a major advantage in wetter harvests when machinery compaction damage is at its greatest.



Team work

Ian Robertson (L) has been working with Caleb Cousins (R) and the Grosvenor team for several years to help improve the farm's soils.

That resilience is strengthened further by the root mass from the previous grass crop, which helps to hold the profile together and leaves a better platform for the following crop. "It fits well with what we're trying to do," says Caleb. "It's not just about the maize crop – it's about improving and protecting the soil for the next crop as well and when conditions allow, wheat can then be direct drilled after maize."

As such, the results are measurable – physical VESS assessments show that the farm's soils are around 1.5 points better than they were before Ian came on board. "Visually, there's less coarse aggregation and fewer large cracks of the size that you could lose pheasant chicks down," raises Ian. Equally, plant counts are now more consistent with fewer bare patches across headlands, and

yields are being achieved more evenly across whole fields. More importantly, Caleb believes the greater stability now means the drilling window is less impacted by weather than it used to be with more consistent crop establishment pushing yields upwards again.

Critically, as the soil began to respond to the changes, Grosvenor Farms found it could start trimming back nitrogen without sacrificing crop performance. "On soil with such a tight poorly aerated structure, a lot

of the nitrogen the farm was using to promote crop growth was being stolen by microbes to stay alive, and these microbes were doing little to improve agricultural stability," explains Ian. "In essence, the bacteria that dominated the microbiome respire quickly using nitrogen and releasing carbon dioxide from the carbon supplies in the soil."

However, this reduction in nitrogen applications came from a lot of work behind the scenes, notes Caleb, with Ian and his team analysing data from on-farm nitrogen rate trials, tissue tests, plant, tiller and ear counts, together with crop establishment and yield data. Where deficiencies showed up in the tissue analysis, these were addressed with targeted micronutrient applications.

"That's allowed us to build a model that refines nitrogen recommendations through the season using tissue results and other measured components," adds Caleb. "The result has been a 25% reduction in applied nitrogen, with improved nitrogen use efficiency and higher yields."

For the future, Ian sees no reason why the farm shouldn't eventually look at sources of high protein crops with the right amino acid profiles to replace brought-in livestock feed and close the circular economy loop further still. "While yield is still king, the aim would be to cut the amount of cake or protein the farm has to source," he suggests.

As for Caleb, he says the land is starting to offer improved resilience to volatile climate changes with less fluctuation in yields year-on-year. "This enables more accurate budgeting and planning," concludes Caleb. ●

"The first remedial step was to use gypsum to introduce calcium at a colloidal level – this helped to replace magnesium on clay particles, reducing slumping and increasing pore space."

Making informed nutritional decisions



"It'll pay to get soils analysed more regularly and have the information in front of you before tweaking any fertiliser plan."

DAVID BOOTY

High prices and supply issues mean most growers are reassessing fertiliser use, and while many will tailor rates accordingly, could the solution actually lie in using available tools more strategically? CPM tackles the topic...

By Mike Saull

Continuing geopolitical tensions and volatility in global energy markets are pushing up fertiliser costs and adding pressure to margins that are already tight. Subsequently, it should come as no surprise that growers are currently questioning the investment they're making in inputs such as nitrogen, suggests AHDB's Bek Hirstman.

However, there are tools to make decision making a little easier, she adds. The last time fertiliser prices spiked in similar fashion was 2022. In response, AHDB developed a nitrogen fertiliser adjustment calculator, based on the nitrogen recommendations for cereals and oilseeds from their RB209 Nutrient Management Guide. The takes into account fertiliser and grain/oilseed prices to give a suggested adjustment

in the amount of nitrogen to apply.

To aide this critical decision-making further, AHDB now publishes fertiliser prices weekly instead of monthly. At the end of March, the price of imported ammonium nitrate (34.5% N) was £522/t with new crop wheat at £182/t. In this scenario, RB209 and the calculator suggested reducing nitrogen rates by around 35kgN/ha.

DOING THE NUMBERS

It was a similar picture at the beginning of July – with the same nitrogen source priced at £473/t and new crop feed wheat at £178/t, the calculator proposed a 30kgN/ha cut in nitrogen.

For Bek, it's all about personalisation. She suggests plugging in supplier quotes for nitrogen and target grain prices and yields into the nitrogen fertiliser

adjustment calculator. Based on the prices and product information, the calculator then suggests the break-even-ratio for the crop – the kgs of grain required to pay for a kg of nitrogen fertiliser.

While the same data is set out in RB209, this spreadsheet looks at a specific farm scenario and cropping pattern, giving a



Adjustment calculator

Bek Hirstman suggests plugging in supplier quotes for nitrogen and target grain prices and yields into the AHDB's nitrogen fertiliser adjustment calculator.



Core indicators

The AHDB soil health scorecard uses soil analysis results for core indicators, such as soil structure (VESS test), plus pH, extractable nutrients (P, K and Mg), earthworm numbers and soil organic matter.

break-even scenario and likely loss if rates aren't adjusted as indicated by the model.

But it doesn't end there, with much onus on application timings, highlights Bek. "What it boils down to is, if it's going to be dry, nitrogen won't be taken up, so time applications so that N is applied in sufficient time to access the moisture it requires for uptake," she adds.

"Be careful though, as too much nitrogen applied too early promotes vigorous growth and excess tillering which can't be supported. If it looks like a dry spring, apply a larger proportion of your total N on at a second split, but also be aware that at this timing, it could be drier still for a longer period."

Growers using soil and past cropping maps could variably apply fertiliser to good effect adjusting rates where the nitrogen fertiliser adjustment calculator suggests cost-savings can be achieved. Furthermore, research at AHDB's Strategic Cereal Farm at Morley in Norfolk suggests overall yields align with historical performance, so targets should reflect what's expected from the field.

However, the economic optimum varied substantially within fields when they were split into smaller nutrient management zones, as identified by technologies such as the use of an N-sensor. Arguably, this is where the story takes a twist as a relatively poor-performing area saw no yield benefit in applying nitrogen above 150kgN/ha, whereas a more productive area in the same field showed yield increases from applications up to 275kgN/ha.

In fact, the trials indicated that an application of 110kgN/ha yielded only 0.25t/ha less than the 150kgN/ha rate in the poorly performing zone, but rates could be cut by around 100kgN/ha in the higher-performing zone, while only sacrificing a similar yield (0.25t/ha).

"This clearly shows the benefit of understanding how crops respond to nitrogen across and within fields, and the trial suggests it could be worthwhile holding back on nitrogen in the traditionally better-performing parts of the field, depending on individual experience and market expectations," explains Bek.

With fertiliser prices high and milling wheat premiums pressured, farmers may also be asking if it still pays to chase protein? RB209 guidance is clear – protein response is highly variable, influenced by the yield potential, season and premiums.

Where milling contracts are secure and realistic protein targets are achievable, late nitrogen may be justified, but the economics can be far from guaranteed. "Without that certainty, some crops may be better managed for yield and margin, rather than risking additional spend for an uncertain return," suggests Bek.

BALANCING UP

Alongside nitrogen rates, growers should take into account the crop's complete nutritional requirements to ensure that sulphur, phosphorous and potash, for example, are also in balance. With fertiliser prices high across the board and supplies limited, checking soil indices before establishing nutritional plans for next year's crops will be critical.

"While it's tempting to concentrate spend on the nutrient known to have the biggest influence on yield and cut back elsewhere, focusing solely on nitrogen is a little like trying to cook chips by adding more oil to the pan but never turning on the heat. The input is there, but the conditions required for it to work are not," says Bek.

"If just one nutrient is deficient, others will be less effective and you must maintain or correct the balance accordingly. So now may not be the time to cut basal fertilisers or take a micronutrient holiday," she warns.

Equally, Bek suggests that growers



Early action

Omex trials during the past 10 years indicate that for feed wheat, there's rarely a disadvantage from front-loading nitrogen early in March, says David Booty.



Liquid benefits

Growers who switch to liquid fertiliser products can find a better, even spread across the field compared with granular options, according to Omex's David Booty.

- ▶ should look to maintain or improve levels of soil organic matter wherever they can. However, improving organic matter and a soil's ability to hold nutrients more effectively takes time to fix.

She highlights that the AHDB soil health scorecard – which assesses physical, chemical and biological soil health indicators – is a good starting point in assessing general soil health and fields that require attention. Her advice is to reevaluate them every five years, or at the end of a rotation to monitor effects.

This Excel-based scorecard uses soil analysis results for core soil health indicators – soil structure (VESS test), pH, extractable nutrients (P, K and Mg), earthworm numbers and soil organic matter. These are compared with typical ranges for UK soil types and climate regions. A completed scorecard automatically produces a 'traffic-light' snapshot of soil health to guide management decisions and highlighting fields to focus on.

Considering assessable soil health factors such as earthworm numbers is a good place to start, believes Bek. "It means you can gain a clear picture of where soils are lacking and target improvements accordingly."

David Booty, head of R&D at Omex, believes growers should dust-off and revise nutrient management plans, going over the principles once again. "While many will sample soils typically before a potato or vegetable crop in the rotation, it'll pay to get soils analysed more regularly and have the information in front of you before tweaking any fertiliser plan," he suggests.

He adds that RB209 is a reliable guide for soil types and crops, so decisions can be based on the tables in the document, or by using the calculators AHDB provides. However, he believes that even with fertiliser at more than £400/t and grain at £185/t, the recommended reduction in nitrogen use for optimum productivity could be relatively small.

"On top of this it's important to remember that nitrogen doesn't act in isolation – just half a point swing in pH value can have a significant effect on nutrient availability, so it'll be worth checking for lime requirements and acting accordingly this summer.

"We're also seeing declining sulphur levels in the spring, partly due to zero atmospheric deposition, but wetter winters are also contributing to leaching of sulphate.

"It's also a case of ensuring both N and S are available throughout the growing season, so rather than just applying sulphur in one dose with the first spring application, consider using them together at each split. In addition, ensure manganese, magnesium and potassium are all in balance," outlines David.

Once crops start growing, tissue or SAP analysis should help to pick up any in-season problems in supply, allowing growers to top nutrients up if required. But when it comes to efficient nitrogen management, David is a fan of mineral nitrogen testing. "Coming out of winter a

"The trial suggests it could be worthwhile holding back on nitrogen in the traditionally better-performing parts of the field."

SNS Plus test will not only assess current availability, but also provide a picture of what could be mineralised. Testing is particularly important where you've changed farming systems, for example, after a switch to minimum cultivations or the adoption of cover crops.

"On the back of our own trials we've been advocating putting more nitrogen on in the first split and using two, rather than three, applications in feed wheat. The work indicates that during the past 10 years, there's rarely a disadvantage from front-loading early in March, perhaps with 60% of total nitrogen. This way, more of it is immediately available for uptake in wetter soils, should April and May be dry," he explains.

ADDED BENEFITS

The twin-split approach can also save an application cost, and if applying liquid fertiliser, free-up the sprayer for pesticide applications, notes David.

"While some would see this as adding to the risks of early leaching losses, it's rarely a reality on medium textured soils unless there's serious flooding.

"During a season, most leaching of nitrogen comes from the residues left from the previous crop and occurs during the winter. Unless you're on the lightest textures, any new crop root system will take up most early-applied nitrogen, so risks are low."

David points out that Omex's UAN contains three forms of nitrogen – urea,

ammonium and nitrate – to provide a three-phase, slow and steady release of crop-available nitrogen that can help to protect earlier-applied fertiliser. Equally, nitrogen inhibitors can also help to ensure what's applied is better utilised.

Growers who switch to liquid products often find a better, even spread across the field compared with granular products, raises David. "Also, at wide tramline widths, it's less easy to get an even distribution of solid fertilisers, and underapplication at the edge of the field when looking to protect water courses can cut yields by around 1t/ha on smaller-sized areas. We also find in very dry conditions that liquid works more quickly; it's a water soluble and this carries nitrogen into the soil more easily," he concludes. ●

Fertiliser: setting up to succeed

"We want to know that what's being applied is actually making a difference."

MARTHA RACEY

Actioning soil sampling insights, using variable rate nitrogen and considering products that enhance the bigger picture, have the collective potential to improve fertiliser efficiency and in some circumstances, make savings. *CPM* reveals more...

By Janine Adamson

There's much value in the old adage: fail to prepare, prepare to fail. In the case of fertiliser use and crop nutrition, it's the work that takes place now post-harvest that can in many ways have the greatest impact.

For Rhiza product manager Ben Foster, a non-negotiable in preparation is soil sampling, particularly checking pH, and it's this that forms the foundation of what happens throughout the season, he stresses.

"Soil pH is essential for the

accessibility of soil-based nutrients," continues Ben. "And without a 'full balanced diet', a crop can't effectively utilise the main nutrients such as nitrogen."

Perhaps fortuitously, right now could prove the perfect opportunity to undertake soil sampling ahead of the autumn drilling campaign, believes LimeX's Glenn Carlisle. This is because according to AHDB, Harvest 2026 has been the earliest since records began in 2006.



Non-negotiable

Checking pH forms the foundation of what happens throughout the following season, stresses Rhiza's Ben Foster.



Don't delay

Right now could prove the perfect opportunity to undertake soil sampling ahead of the autumn drilling campaign, believes LimeX's Glenn Carlisle.

- ▶ Glenn adds that rather than rushing in and potentially compromising wider rotational challenges such as grassweed control, the additional time could indeed be used to soil sample and correct pH. "Now is the ideal opportunity to take stock of soils, sample each field and prepare for the following crop," he says.

RELIEVING PRESSURE

"While in a conventional season there are often workflow and time management challenges at this time of year, an early harvest can ease that crunch somewhat."

Then, once results have been returned, if the data suggests pH needs rectifying, it's also a prime time to consider applying lime, suggests Glenn. "LimeX in particular is created using a chemical process, so has a very small particle size. This means it's fast acting once it's spread onto a field, starting to correct pH in just 4-6 weeks whilst remaining long lasting, typically at least 3-4 years before retesting is required. No other agricultural liming products are as fine in particle or fast in action."

Glenn believes that correcting pH can sometimes be unintentionally overlooked during more protracted seasons, yet is critical in enabling the uptake of nutrients, maximising yields and enhancing overall soil health.

"We know pH has a huge impact on nutrient availability and uptake by the crop, particularly affecting phosphate, nitrogen and potassium

in acidic soils. Equally, because of its origins in the sugar filtration process, LimeX has nutrient value beyond its liming credentials. Each tonne of product contains 9kg of phosphate, 8kg of magnesium and 7kg of sulphur," he highlights.

For Ben, the next step is to consider using variable rate applications, but rather than using the technology to potentially make cut backs or savings, the goal should be to improve NUE. "Variable rate is about making sure what's applied is actually utilised by the plant and targeting spend accordingly. Essentially, more of the 'fuel' is then converted by the crop into yield," he explains.

In the case of Rhiza, electroconductivity soil scanning and satellite data can be used to inform variable rate maps within the Contour digital farming platform. As many growers will be aware, in-depth soil sampling such as this is a paid-for service, but Ben believes it's possible to off-set the initial investment and mitigate concerns regarding spend. "For variable rate, the SFI action PRF1 is worth £27/ha for each year of the agreement.

"If we consider the gold package including electroconductivity soil scanning costs around £30/ha once

every four years, with the annual resampling between costing £15/ha, there should be a small financial benefit to the grower, before considering any potential yield uplifts."

For Huntingdonshire-based grower Martha Racey, maximizing SFI payments was the driver behind the 300ha farm's move towards variable rate. She says with the farm having a technology-ready spreader already in action it seemed like an obvious step to take, with the payments an added bonus.

"My dad John was already manually switching rates as he went along, as farm experience often informs which areas require more nutrition and which don't. Whereas before it was quite a simplistic approach, thanks to variable rate, it's now precise," she explains.

Working collaboratively with both her Agrii agronomist and wider members of the Contour/Rhiza team, she says last year, the farm grew its most even crop on the fen thanks to variable rate. This was achieved using the canopy levelling function in Contour along with zonal soil sampling, to inform key nutrient applications.

"We have different soil types within each individual field, ranging from heavy through to peat. As such, it's important to be efficient with what's applied, reducing where it isn't required particularly on the fen. We want to know that what's being applied is actually making a difference," she says.

In terms of results from last season, the farm was able to reduce nitrogen on peatland areas of winter wheat fields, with an average final application targeted at 160-200kgN/ha total. Across all winter wheat fields, the average was 173kgN/ha, presenting a reduction in total N use.

"We know pH has a huge impact on nutrient availability and uptake by the crop, particularly affecting phosphate, nitrogen and potassium in acidic soils."

Martha is also looking at other ways to reduce the farm's reliance on bagged fertilisers, including trialling alternative foliar nitrogen sources, using seaweed blend products and introducing

sheep to graze cover crops. The goal is to reduce nitrogen applications on the fen without compromising crop performance, she notes.

While both her and John are fully on-board with variable rate, Martha



Agronomic benefits

Having tactically used variable rate nitrogen, grower Martha Racey says the farm's crops are more even, plus, blackgrass isn't being fed anymore.

says she believes it works for them because it's been supported by agronomic and farmer knowledge. "We've always wanted to vary application rates and now the technology is allowing us to achieve that. As a result, our crops are more even and we're not just feeding blackgrass anymore. However, it has to be ground-truthed by humans, tweaking the plans accordingly."

Considering what's actually in the tank, another means of improving fertiliser efficiency could lie in carbon, highlights QLF Agronomy's David Maxwell. "Adding a carbon source to any foliar feed helps with adsorption as it binds the nutrients to enhance uptake and reduce the chance of lock-up."

"When added to foliar nitrogen, carbon plays a particularly important role in protein synthesis and is a requirement to build amino acids from urea. Equally, if we're providing carbon to a plant through a foliar application, it doesn't have to run down its own stocks," he explains.

An added benefit is that the carbon from the molasses in products such

as L-CBF Boost is used by all aspects of the soil food web, supporting the health and productivity of soils. "Crop roots don't just pull nutrients straight from the soil, they also work with microbes living around them in what's called the rhizophagy cycle."

"In simple terms, roots draw certain microbes inside, take nutrients from them, then send them back out into the soil. The cycle keeps turning, providing the plant with a steady flow of nutrients but to keep that running, you want plenty of active, healthy microbes in the root zone. That's where L-CBF Boost comes in – it feeds that soil biology," says David.

However, while technology and supporting products exist to achieve potential fertiliser savings, Ben urges that nothing is guaranteed. "It comes down to the current system, environmental conditions and what the potential productivity of that field is. If an area yields 7t/ha, then feed it accordingly."

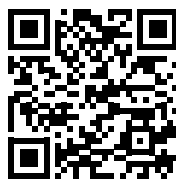
"Importantly, reflect back on what's worked – keep records, and use yield maps and gross margin analysis to form a reference point for the future," he concludes. ●



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Beyond the headline crop

“There’s increasing recognition that some of the biggest gains come from carefully selected break crops.”

HARRY COTTON

As margins tighten and rotations come under increasing pressure, growers are looking beyond individual crops. *CPM* explores how well-chosen break crops can unlock productivity across the whole rotation.

By Charlotte Cunningham

For many growers, ‘resilience’ has become one of the most overused words in agriculture. Yet after another season shaped by prolonged dry conditions, fluctuating commodity markets and continued uncertainty around future support payments, it’s arguably never been more relevant.

Independent agronomist Harry Cotton says the challenge is that resilience isn’t something which can be engineered through variety choice or fungicide programmes. Instead, it’s built over time through carefully considered rotations, with every management decision contributing to the long-term performance of the farming system.

“Resilience is about building a system that performs through wet years, dry years, volatile markets and all the ups and downs that come with producing global commodities. Every crop should have a purpose, whether that’s financial, agronomic or environmental. There has to be a reason why it’s there.”

THE BIGGER PICTURE

It’s a philosophy that reflects a broader shift in thinking across many arable businesses. Rather than judging crops purely on the margin they generate in a single season, there’s increasing recognition that some of the biggest gains come from carefully selected



Finding favour for OSR

According to KWS product manager Rory Hannam, favourable establishment conditions last autumn, lower CSFB pressure and stronger market returns have encouraged many growers to reconsider the crop.



Barley benefits?

Although winter barley isn't traditionally considered a break crop, judging its contribution purely on grain price risks overlooking much of the value it delivers elsewhere in the rotation, suggests KWS' Kate Cobbold.

break crops and the way they influence the wider rotation, says Harry.

"Whether that's improving soil health, disrupting weed, pest and disease cycles, or creating opportunities for the following crop, their value often extends well beyond the year in which they're grown."

As he points out, diversity almost always reduces risk. "Whether that's growing different crops, introducing companion cropping or simply increasing diversity within the rotation, every additional crop gives you another tool in the toolbox," he explains. "It helps break disease cycles, disrupt pest populations, improve nutrient cycling, alter rooting patterns and gives you more management options. Monocultures generally increase risk, whereas diversity spreads it."

That diversity extends beyond crop choice alone. Longer rotations can improve soil biology, organic matter and moisture retention over time, while different drilling and harvest timings help spread workload and reduce operational bottlenecks. "Soil resilience underpins crop resilience," he continues.

"Over several rotations you should be seeing improvements in organic matter, biological activity, earthworm populations, nutrient cycling, water infiltration and soil structure. Those are the things which ultimately support more consistent crop performance."

Few crops perhaps demonstrate the value of a well-managed break crop better than oilseed rape. Following

several difficult seasons dominated by cabbage stem flea beetle pressure, many growers questioned whether the crop still had a future within UK rotations. Yet experts believe the picture has started to change...

According to KWS product manager Rory Hannam, favourable establishment conditions last autumn, lower CSFB pressure and stronger market returns have encouraged many growers to reconsider the crop.

"Around 285,000ha of OSR was drilled last autumn, which represented around a 30% increase," he explains. "People who had moved away from the crop decided to give it another go, while others who'd stayed with it increased their hectareage. Crops looked fantastic through much of the season and, although yields and oil content have been a little mixed because of the dry finish in some areas, in most cases the crop should provide a reasonable margin this season."

While profitability will inevitably vary between farms, Rory believes recent seasons have reminded growers just how valuable OSR can be within a predominantly cereal rotation. "I think people who've moved away from OSR have tried alternative break crops with varying degrees of success, and that's probably reinforced just how important it is within the rotation," he suggests.

FIRE-BREAK

However, its contribution extends far beyond gross margin alone. As one of the few true broadleaf break crops available to many arable businesses, Rory says OSR provides valuable opportunities to disrupt cereal disease cycles while helping tackle problematic grassweeds such as blackgrass and, increasingly, ryegrass. It also spreads workload throughout the season and, with harvest typically beginning ahead of wheat, creates valuable time for seedbed preparation ahead of first wheats, he adds.

Of course, establishing a successful crop remains management dependent and Rory believes variety selection now plays an increasingly important role in reducing risk before the crop even emerges. "Getting the basics right is still essential, but choosing varieties with the right traits helps de-risk the crop," he explains.

"Strong autumn vigour supports

plants to establish quickly, produce a robust taproot and grow away from early pest pressure, while good spring vigour helps the crop to recover after winter and continue developing even if conditions become challenging."

Modern breeding has also introduced additional characteristics designed to improve reliability under increasingly variable conditions. "Traits such as TuYV resistance and pod shatter resistance have become important," he highlights. "If it's a high aphid year, TuYV resistance provides additional protection, particularly if growers are looking to reduce insecticide use. Likewise, pod shatter resistance helps to protect the crop right at the point where it's at its most valuable, reducing the risk of losing yield through adverse weather immediately before harvest."

Perhaps most importantly, Rory stresses that success starts well before drilling. "Attention to detail is key – you can't simply decide at the last minute to grow a break crop and expect it to deliver. Planning ahead, and making sure the crop has the best possible start will ultimately help to deliver a stronger first wheat and a more productive rotation overall."

Looking at other break options, and although winter barley isn't traditionally considered a break crop, judging its contribution purely on grain price risks overlooking much of the value it delivers elsewhere in the rotation, suggests KWS' head of product management and agroservice, Kate Cobbold.

She says its value also lies in the opportunities it creates for the crops that follow. "The grain price isn't wonderful at the moment," admits Kate. "But when we're looking at barley, we have to look beyond just grain yield."

"The most resilient rotations aren't those chasing the biggest yields every year."

For many businesses, that starts with straw, she says. While yields vary between seasons and regions, straw can provide an important additional

income stream – particularly where livestock demand remains strong.

Yet Kate believes some of barley's greatest benefits are far harder to quantify – one of the most significant being its ability to spread workload. "All of the key timings are slightly different for barley compared with wheat," she explains. "If we have a catchy spring, for example, having



Opportunities for maize

Although often associated with mixed farming systems, KWS' Andrew Cook believes maize is another increasingly attractive option for arable businesses prepared to identify the right market.

- ▶ different spray timings helps to spread risk rather than needing everything to be completed within the same narrow window."

Harvest timing delivers similar advantages. As one of the earliest cereals to be cut, winter barley can ease pressure when combines roll while creating earlier marketing opportunities, helping relieve cashflow pressures at a time when many businesses face significant expenditure, she adds.

Perhaps more importantly, harvesting barley early also creates opportunities elsewhere in the rotation. "The early harvest frees land up sooner," comments Kate. "Historically, winter barley has been the ideal preceding crop for OSR because it allows growers to establish the crop in good conditions. Increasingly, it also creates opportunities for cover crops or other management decisions. The earlier that land becomes available, the more options growers have."

While confidence in OSR is beginning to recover, the challenges of recent seasons have also encouraged growers to explore alternative break crop options and among those quietly gaining momentum is rye.

Currently occupying around 47,000ha nationally, the crop has traditionally been associated with anaerobic digestion, with wholecrop production accounting for the majority of the market. However, Rory believes interest is continuing to grow across several sectors.

"There are more AD plants being built, and operators are looking to diversify because of increasingly variable

weather," he explains. "Rye gives them a winter sown crop which is harvested much earlier, while also providing farmers with a reliable contract and a more consistent income stream."

For livestock producers, forage rye is also attracting greater attention for example in recent seasons forage crops have been tested by climatic conditions he adds. Harvested during April or May before maize drilling, rye provides valuable early forage while making efficient use of the growing season.

Then agronomically, it offers several advantages, particularly on lighter land where drought resilience has become increasingly important. "It has the deepest rooting system of all the cereals, allowing it to scavenge both nutrients and moisture much more effectively," highlights Rory. "It also requires around 25% less water than wheat or barley to produce 1t of grain, which becomes valuable as dry springs and summers become more common."

Input requirements are similarly modest, and with nitrogen rates typically lower than wheat, fungicide programmes are less intensive, and the crop often produces high straw yields bringing in extra income if being sold externally or adding value for internal livestock bedding – helping strengthen overall gross margins, he adds.

CONTRACT SECURITY

The caveat to this is securing a good market, warns Harry. "Alternative crops can improve resilience, but only if there's a secure market," he stresses. "Growing niche crops without contracts simply swaps one risk for another."

Although often associated with mixed farming systems, KWS' Andrew Cook believes maize is another increasingly attractive option for arable businesses prepared to identify the right market. "The opportunities for maize continue to increase," he raises. "And the important thing is understanding why you're growing it before you plant it."

Whether destined for forage, anaerobic digestion, crimped grain or dry grain production, Andrew says market planning should always come

before variety selection. "Growers must identify the opportunity first and make sure they have an agreed outlet before committing to the crop."

Once that market has been secured, maize offers several rotational advantages, he explains. Spring drilling provides another opportunity to tackle blackgrass, while the crop breaks many cereal pest and disease cycles. Nitrogen requirements are also relatively modest, helping reduce input costs at a time when fertiliser prices remain volatile. "It occupies different drilling and harvest windows too," adds Andrew. "That helps to spread labour requirements and makes better use of machinery and existing overheads."

Selecting the correct maize variety is equally important and rather than focusing solely on yield, Andrew says growers should consider site, drilling date, target harvest timing and intended end market, ensuring crops reach maturity consistently within their own farming system. "It's always better to take a slightly lower yield from a crop that reliably reaches maturity than chase maximum output from a variety that doesn't quite fit your farm," he says.

"Take advice, understand your environment and choose varieties that complement the rest of your rotation."

For Harry, that's ultimately the thread connecting every successful break crop. Whether it's OSR improving first wheat performance, barley creating valuable establishment opportunities, rye introducing greater drought resilience or maize opening new market options, no single crop provides the answer in isolation. Instead, it's how those pieces fit together that determines the long-term strength of the rotation.

"Resilience isn't just about agronomy," he concludes. "It's about soils, marketing, environmental management and building a system that's tailored to your own farm. The most resilient rotations aren't those chasing the biggest yields every year; they're the ones delivering consistent profitability season after season because every crop has a purpose and every decision supports the wider business." ●

Productivity matters

In this 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.



Sharing knowledge for greater soils power

“After years when it was only available commercially, it’s high time it was free for all to access to help drive land management decisions.”

PROFESSOR STEPHEN HALLETT

Baseline soils information collected since the 1970s is for the first time freely available for anyone to use. *CPM* talks to the custodian of the data to assess its significance.

By Mike Saul

With more than 250,000 observations and 30,000 soil samples from 12,000 profile pits, the UK’s largest soils database is now just one click away from a farm computer.

Thanks to collaboration between Defra and Cranfield University, all data collected as part of a major mapping programme started around 60 years ago, is now in the public domain. As a result, farmers, advisors and scientists can dig deep into a national archive detailing a host of soil properties from land right across England and Wales.

Originally produced by a dedicated group of soil surveyors – who worked actively across England and Wales to map and describe soil types and list their characteristics – the data has been digitised, so should now prove more useable.

Many farms may have an original soil map that’s faded and tucked away in an office drawer. This gave a host of details, for example, texture, organic matter, drainage and soil water availability – in

fact, all the baseline information on the varied soils across the farm’s landscape.

Cranfield University’s ‘Land Information System’ (LandIS) is the digital representation of all of this painstakingly collated information. According to its custodian, Professor Stephen Hallett, chair of applied environmental informatics at Cranfield’s Environment Centre, this poses the best and most comprehensive data on the top 2m of the UK’s land resource, and is a highly valuable record.

“It’s an exciting moment when a collection of national importance is openly available for free,” comments Stephen. “After years when it was only available commercially, it’s high time it was free for all to access to help drive land management decisions going forward.”

Access is via the LandIS Open Soil Data portal. To interrogate the data, individuals create a free account with a username and password. Farmers should then be able to locate their holding easily, then check on the

properties of their soils in further detail.

“Drill down into the map and you’ll discover the details of your soil type – either listed as a Soil Series or Soil Association,” explains Stephen.

Properties listed include each soil’s seasonal drainage risk or susceptibility to drought, the typical crops it can support, its inherent fertility and organic matter content and the types of natural habitats associated with the landscape being farmed.



Valuable tool

Professor Stephen Hallett says the LandIS soils database poses the best and most comprehensive data on the top 2m of the UK’s land resource.

New soil and landscape maps released

The UK Centre for Ecology and Hydrology (UKCEH) has developed a set of new high-resolution soil and landscape maps for Great Britain

The aim of a new series of soil and landscape maps is to provide additional data for current online tools used by farmers, land managers and scientists, that's more detailed, harmonised and easily updated.

The maps provide data from the AgZero+ research programme which helps to ensure domestic food production is sustainable, carbon-neutral and has a positive effect on nature.

In total, the maps divide the UK into 13 different soil classes such as 'freely draining light soils', 'heavy clays' and 'alluvial and coastal soils' (see image). Each class is derived by interrogating and overlaying a number of third-party datasets, including information such as soil organic carbon content and extent of peatland, terrain maps, and depth to groundwater and parent material.

"While looking at the bigger data sets on how land is managed nationally, we have to consider the drivers of production and environmental impacts at a farm level as well, and soils are a key part of this," says UKCEH spatial ecologist, Dr John Redhead.

Healthy soils play a critical role in supporting biodiversity, improving climate resilience and food production. But without accurate up-to-date mapping, land management practices risk contributing to soil erosion, compaction and the loss of organic matter – all key threats to long-term soil health, and ultimately, society and the wider environment.

John adds that by overlaying and interrogating different maps, they can be translated into useful insights for those managing or farming the landscape, supporting a wide range of other applications.

"We see them helping researchers to develop new datasets to better understand our landscapes and the risks to soil health. Also, by

UKCEH soil types

The maps divide the UK into 13 soil classes.

Soil Natural Capital Classes of Great Britain

- Light free-draining soil
- Light moderate to poorly draining soil
- Medium free-draining soil
- Medium moderately draining soil
- Medium poorly draining soil
- Heavy clay soil
- Shallow calcareous soil
- Shallow non-calcareous soil
- Alluvial and coastal soils
- Organo-mineral free-draining soil
- Organo-mineral moderate to poorly draining soil
- Peat
- Significantly disturbed or excavated soils

enhancing digital decision-making tools, the data will help farmers and other land managers to compare their soil health against nationally representative benchmarks and so consider improvements," he says.

UKCEH land-water systems scientist, Chris Feeney, explains: "We wanted a simplified, but harmonised, soil classification for England, Wales and Scotland and had hoped to do likewise for Northern Ireland as well."

In this instance, baseline soils information used for the different classes is derived from British Geological Society (BGS) surveys, purely because soils data from England and Wales is held in a separate database from that of Scotland and derived differently.

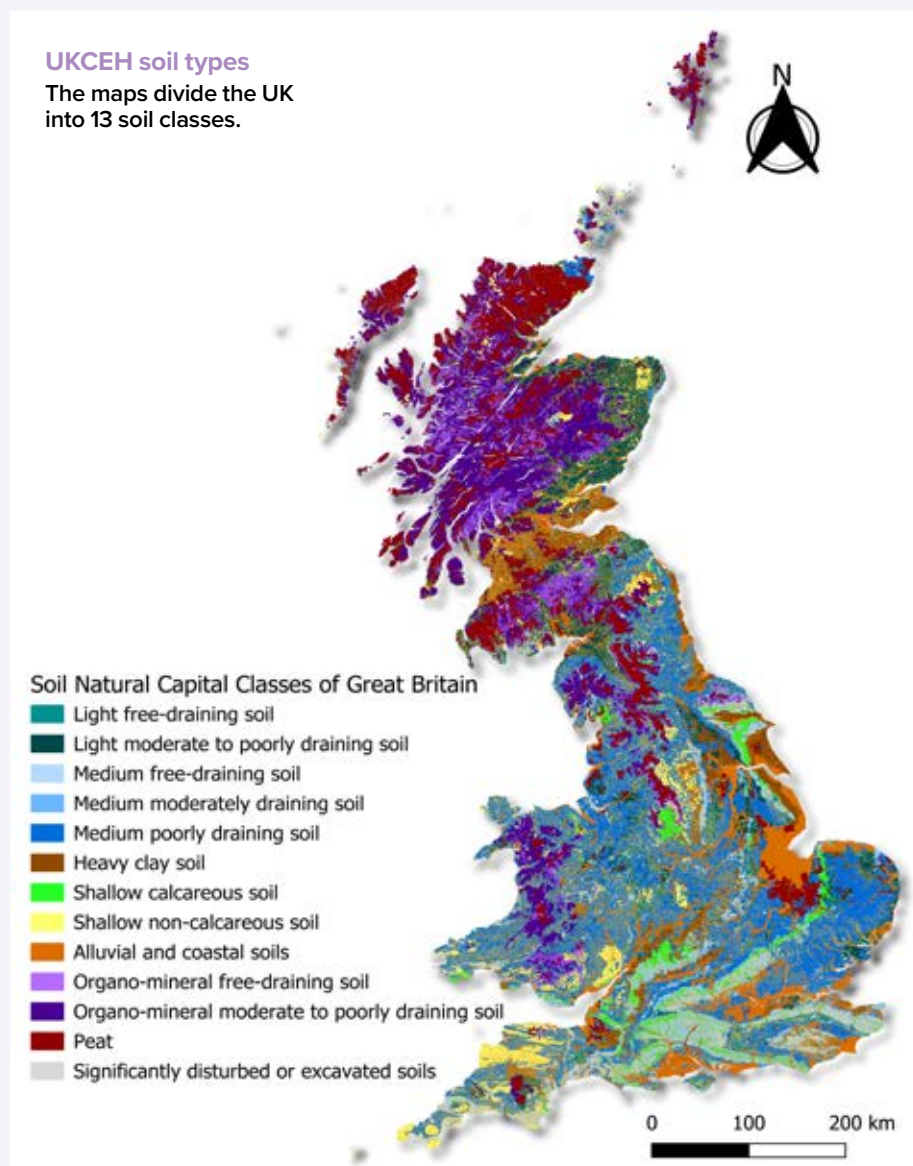
While accepting that the UK already holds extensive soil data, the new maps offer easy-to-interpret information at a finer level of spatial detail across Great

Britain and have a greater capacity for regular updates as environmental conditions change. This helps to ensure their long-term relevancy.

For several decades the BGS has been mapping bedrock and surface geology at 1:50,000 scale across all areas of GB and since the mid-2000s, it's been translating this raw data into classes of soil depth and texture, which have direct relevance to how soils function and by extension, can be managed.

The BGS data used for the new maps modelled soil classification related to depth, texture, calcium carbonate content, permeability, whether they are alluvial or coastal in nature, and their depth to groundwater.

The process also looks at broad textural and drainage differences and the risks of different cropping options, and digital terrain data on landform types from the Ordnance Survey Terrain





Versatile tool

John Redhead says by overlaying and interrogating the different maps, they can be translated into useful insights for those managing or farming the landscape.

data and occurrence of peatland.

“From a farming point of view, for example, if you’re on a medium soil with poor drainage, you’ll have to be aware of compaction risk on land that easily pools run-off water. Soils will also be heavier to work with than lighter soils that could occur in the same field,” says Chris.

“Those on lighter textured, free draining soils have different risks. For example, here you’re likely to have greater leaching of nutrients and pesticides into groundwater, as well as greater drought risk on these soils which may dry out more quickly.”

Chris argues that the classification of soils and landscape into 13 different classes is more functionally relevant for day-to-day management than previous maps. “The next step is to integrate it into the e-Planner tool available on our website which provides fine-scale maps of the suitability of land for environmental enhancement.

“This tool helps land users identify which areas of a farm can be managed differently to produce environmental opportunities, for example, that might suit the creation of flower-rich habitats for pollinators, where water resource protection could be carried out to reduce runoff, or maybe woodland created.

“By adding in the new soil and landscape data, users would have greater confidence in what land is suited for and the environmental risks that should be considered,” concludes Chris.

The new dataset is available for non-commercial use via the Environmental Information Data Centre on the CEH website.

► Detailed chemical and hydrological analyses are also available down to a sub-group level, and there’s even data on any original individual auger or soil pits taken across the area by each individual surveyor, including texture, colour, stoniness, depth of the different soil horizons and subsoil matrix colour and mottling.

While some of these characteristics will change over time, much of the baseline data is linked to the physical properties of the soil, notably its texture and position on the landscape and so should remain highly relevant, points out Stephen.

“By zooming in on an area you can look at the potential for the land and its pros and cons, giving you an insight into the natural order of soils,” he says. “We understand farmers know their own land better than anybody, but this data is a valuable source of information, helping to explain why, for example, one area lies wet for longer, or is quicker to dry out. It will also give perspective, placing individual blocks of land in a regional and national context.

“Hopefully, agronomists working across a wider region can log in to look at their area and be able to provide clearer advice that mirror local soils. Defra and other government agencies will be able to zoom out further and look at land-use frameworks.”

Stephen highlights that his team has been working with various companies and government bodies for some time, including those working in precision farming, helping to develop many soil-related products and turn-key assessments.

“Now, everyone can gain access to and customise the data which should help create a range of applications, and potentially attract new businesses who can apply it to the farming industry. In the first month of the release of the newly available map data, despite little publicity, more than 1000 users logged in, so there’s clear interest,” says Stephen.

He adds that in addition, Cranfield University will continue to offer other services, helping to utilise the data to its best advantage, drawing on the team’s deep-rooted soils knowledge. “Environmental consultants, geotechnology firms, policymakers and others with a broad interest in what’s the foundation block for all life, should also value the data.”

Dr David Smedley, head of soil and peatland science at Defra, heralds the widespread release of the soils data,



New dawn

Defra’s Dr David Smedley heralds the widespread release of the soils data, perceiving it as a significant milestone in how soils can be factored into policy, research and decision-making.

perceiving it as a significant milestone in how soils can be factored into policy, research and decision-making.

He points out that the new Land Use Framework recognises soil as one of society’s greatest and most consequential natural assets. “Around 95% of our food depends on it, it regulates our water, and is arguably our most biodiverse ecosystem and our largest terrestrial carbon store,” he says.

The Land Use Framework also specifically commits to improving access to high-quality data, and for good reason – six of the 10 goals in the government’s Environment Improvement Plan make reference to soil, further underlining its importance in tackling a broad range of environmental challenges.

“Put simply, a resilient, sustainable food system and thriving natural environment can’t be achieved without healthy soil. Allowing access to the best soil data sets available is critical to ensuring soils are properly embedded in our thinking and decision-making, not just within government, but wherever land management decisions are made. Releasing the National Soil Map and LandIS datasets is a major step forward in achieving this.”

Releasing these datasets should unlock significant benefits for environmental management, research, innovation, and policy, and enable the development of new tools and decision-support systems to help deliver multiple Defra objectives, he concludes. ●

Working with biology's natural rhythm

"You potentially have beneficial microbes and negative, deleterious microbes, and then you have the power to do something about it."

PROFESSOR GARY BENDING

A deeper understanding of what happens around crop roots – and crucially, when it happens – could eventually offer new ways to improve nutrient efficiency, manage disease and make better use of soil biology. *CPM* visits the University of Warwick Crop Centre to find out more.

By Charlotte Cunningham

The challenges facing crop production may look very different today than they did 75 years ago, but at the University of Warwick Crop Centre, there's a certain familiarity to the questions researchers are attempting to answer.

Based at the university's Wellesbourne campus, the centre traces its origins back to 1949 when the site was established as the National Vegetable Research Station in response to post-war concerns around food security and domestic production.

Today, climate change, geopolitical uncertainty, rising production costs and pressure on natural resources have once again put the resilience of UK food production firmly under the spotlight, says Professor Miriam Gifford, former head of Warwick's School of Life Sciences. "We can't just grow our way out of these problems. We need

to be able to research and develop new varieties of crops and new ways of growing them which can help us."

PLANT-MICROBE INTERACTIONS

Central to that is the site's combination of experimental farmland and laboratory capability, allowing researchers to study crops under field conditions while also unpicking the biological mechanisms influencing their performance.

And among the relationships being investigated is one which takes place quite literally beneath growers' feet. Professor Gary Bending has spent much of his career studying plant-microbe interactions, with a particular focus on the rhizosphere – the interface between a plant's roots and the surrounding soil. "It's where you have water uptake by the plant, nutrient

uptake by the plant, and also a huge microbial population," he explains.

In fact, much of the active microbial population in soil is concentrated immediately around the root, largely because plants themselves create the conditions for it to thrive, he continues. "Through photosynthesis, plants fix carbon which can then be released from their roots as compounds including soluble sugars and amino acids. Somewhere in the region of 5-8% of the carbon fixed by a plant can be exuded into the root zone."

Scaled across a crop or wider ecosystem, Gary says that represents a considerable flow of carbon directly into soil – and effectively provides food for the microorganisms inhabiting the rhizosphere.

Some of those organisms remain around the root, whereas endophytes can enter and live within the root itself. Others form familiar beneficial associations with plants, including the root nodule bacteria responsible for nitrogen fixation in legumes and mycorrhizal fungi involved in plant nutrition. But the microbiome also contains organisms which can negatively affect crop performance, making understanding its composition – and

what shapes it – particularly important.

One of Gary's previous projects investigated exactly that in oilseed rape, examining how the crop's rhizosphere microbiome varies across space and time and whether those changes could help explain the yield decline associated with growing a crop too frequently. "Soils have different microbes and the environment can affect them – how cold or warm it is, whether it's dry, soil type, water availability and nutrient availability. Then the plant host itself has an effect; wheat will have a different microbiome to OSR, for example."

Researchers undertook landscape-scale sampling across England, profiling fungi, bacteria and protists within the crop microbiome while accounting for factors including soil, environment, cultivar and rotation. Importantly, farm records also allowed the researchers to connect those microbial communities with crop yield.

One organism in particular emerged from the work – the fungus *Olpidium brassicae*. "The shorter the rotations, the more you had a reduced yield compared with one-in-four, one-in-five or one-in-six rotations, and we found it was the abundance of *Olpidium brassicae* which affected landscape yield of OSR," says Gary.

The research also found that other pathogens could still be important at an individual farm level, but their relationship with yield was localised rather than apparent across the



Resilient food production

Climate change, geopolitical uncertainty, rising production costs and pressure on natural resources have once again put the resilience of UK food production firmly under the spotlight, says Professor Miriam Gifford, former head of Warwick's School of Life Sciences. *Photo: George Archer*



Proven in the lab and the field

The University of Warwick Crop Centre, based at the Wellesbourne campus, combines experimental farmland and laboratory capability, allowing researchers to study crops under field conditions while also unpicking the biological mechanisms influencing their performance. *Photo: University of Warwick*

wider landscape, he adds.

At the other end of the spectrum, higher crop yields were associated with *Tetracladium* spp fungi, highlighting the potential importance of both beneficial and detrimental members of the microbiome.

For growers, rotation provides an obvious example of how that knowledge could influence management, believes Gary. "You potentially have beneficial microbes and potentially negative, deleterious microbes, and then you have the power to do something about it.

"You can look at genotype – can you select a genotype to recruit more beneficials or fewer deleterious microbes? Can you alter management practice? Rotation is an obvious one. If you know shorter rotations are going to result in more *Olpidium*, you can be more careful about rotation frequency."

AMPLICON SEQUENCING

The ability to investigate microbial communities at this level has been transformed by advances in DNA sequencing. Gary's earlier work used amplicon sequencing, which effectively produces a fingerprint of the microbial community. Researchers amplify a particular marker gene across groups such as bacteria or fungi, with differences in DNA sequences allowing individual organisms to be assigned a taxonomy. The result was the ability to characterise incredibly diverse communities which, just 20 years ago, would have been impossible to examine in comparable detail, he says.

But having developed better tools to understand which microbes are present, Gary and colleagues have now turned their attention to another question – *when* are they present and active?

The premise stems from the fact that plants, like humans, have a circadian clock or rhythm, says Gary – adding that somewhere around 30% of plant genes are regulated by that clock, allowing the plant to anticipate and respond to

regular changes between day and night.

Crucially, the supply of carbon into the rhizosphere also appears to follow this daily cycle. "We know plants fix carbon in the daytime, and there's evidence that exudation largely takes place during the day. So you think, okay, that's feeding the microbes in the root zone. How are those microbes responding over daily timeframes?"

To find out, the team grew plants under controlled light-dark cycles and sampled their roots every three hours for 72 hours. DNA was extracted and amplicon sequencing used to track changes within bacterial and fungal communities.

But simply finding differences between day and night wouldn't necessarily demonstrate a genuine circadian response, warns Gary. "A circadian rhythm should continue even when the environmental cue responsible for synchronising it is removed. Much as a human body clock continues to operate if someone is placed in constant darkness, a plant's internal clock can continue to run without the normal light-dark cycle."

Researchers therefore also used plants with an impaired circadian clock and moved plants into constant light conditions. The results showed that a proportion of both fungal and bacterial communities followed clearly defined cycles, increasing and decreasing in abundance over the course of the day. "Some were more abundant in the day and some were more abundant at night, but they showed true rhythms," explains Gary.

For most of the organisms displaying those patterns, rhythmicity continued under constant light, indicating a connection with the plant's circadian processes rather than microbes simply responding directly to daylight. "Around 10% of the microbial community displayed these rhythms. So we know the rhizosphere is chemically rhythmic because exudation happens largely in the day and you don't have those soluble sugars and soluble carbon available as



A career below the ground

Professor Gary Bending has spent much of his career studying plant-microbe interactions, with a particular focus on the rhizosphere – the interface between a plant's roots and the surrounding soil.

Credit: George Archer

► much at night. But we now know it's also a microbially rhythmic environment."

And it isn't simply microbial abundance which changes. Among organisms favoured during the daytime, Gary says a relatively large proportion were anaerobic or facultatively anaerobic, whereas organisms becoming more abundant at night tended to be aerobic.

He believes that provides another clue about what's happening within the root zone. "During daylight, plants supply carbon to the rhizosphere. Microorganisms utilise that carbon and, in doing so, consume oxygen, meaning the environment immediately surrounding the root can become increasingly oxygen-depleted."

This becomes particularly interesting when viewed alongside nitrogen cycling, he adds. "Nitrous oxide emissions from agricultural and other ecosystems have been shown to display daily rhythms, while plants themselves don't take up nitrate and phosphate uniformly throughout the entire day and night."

Together, Gary believes it raises the possibility of a chain of interconnected processes – the plant's circadian clock influencing carbon exudation, which drives microbial activity and oxygen consumption, which in turn affects microbial processes involved in nitrogen transformations.

It's these relationships which Gary's latest research, supported through a European Research Council Advanced Grant, will investigate in greater depth. "The idea is to

redefine the rhizosphere as a rhythmic compartment within the soil," he says.

Carbon supply is one possible driver, but it isn't the only one, he adds. "Plant immunity also changes over diurnal timeframes. Defence pathways involving salicylic acid and jasmonic acid fluctuate through the day, and says there's evidence that some pathogens can exploit periods when plants are more vulnerable because of the crossover between these immune responses."

Consequently, changes in plant immunity could be another factor shaping which organisms colonise the rhizosphere – and when, he adds.

The project will also investigate what causes microbial populations to decline after they've proliferated. "If you give a microbe carbon in the daytime it'll grow, so you can

understand why you might get increased growth during the day. But what's driving the turnover? What's driving the reduced abundance at night?

And equally, what about microbes which are more abundant at night and decline during the daytime?"

One possibility involves bacteriophages – viruses which infect bacteria. Gary points to marine ecosystems, where phages are responsible for turning over a substantial proportion of cyanobacterial populations on a daily basis, creating a microbial loop which operates over diurnal timeframes.

As such, he says the research will investigate whether comparable phage-driven turnover occurs within the rhizosphere.

At the same time, sequencing capability is taking another considerable step forward, adds Gary. Rather than examining only individual marker genes, the new research will use long-read sequencing technology to assemble whole microbial genomes.

This means researchers can investigate the genetic repertoire of organisms showing rhythmic behaviour, as well as studying gene expression to establish which genes are actually active at different points through the day. "In simple terms, the science is moving from identifying who is there, towards understanding what they're capable of doing – and when they're doing it."

Barley will be used within the project, with research moving beyond controlled

laboratory systems into the field to investigate how strongly these biological rhythms persist alongside changing temperature, sunlight and soil moisture.

As with all research, proving it in a laboratory is one thing, but making it work commercially can be entirely another. So where could that eventually take crop production?

Gary is clear that understanding the mechanisms comes first, but the potential applications are significant.

"If you understand how the plant is directing the soil around it and the microbes around it, probably to sustain its own nutrition, then potentially you can manage that.

"You might be able to manage it through plant genotype – selecting plants with particular traits which allow

them to harness those microbes better, or time the processes going on in the rhizosphere better to reduce fertiliser applications and increase fertiliser efficiency."

"The idea is to redefine the rhizosphere as a rhythmic compartment within the soil."

Timing inputs could eventually provide another opportunity. "If particular pathogens become active at predictable points in a daily cycle – or plants themselves become more susceptible at certain times – crop protection applications could potentially be timed to coincide with those periods."

Likewise, understanding when plants are taking up nutrients and when microbial communities are driving nitrogen transformations could help inform strategies to improve fertiliser-use efficiency and reduce losses, he says. "It's an emerging area of chronobiology – considering when biological processes occur rather than simply whether they occur."

There could even be opportunities for plant breeding, and Gary says research with plant circadian biologists suggests some of the rhythmic characteristics found in wild populations have been lost from modern crop plants during breeding.

Whether future genetics could make better use of those characteristics – potentially producing crops better able to synchronise their biology with beneficial microbes, nutrient availability or environmental conditions – remains to be established. But for Gary, that's precisely why understanding the mechanisms taking place within the rhizosphere now matters... ●



WITH MARTIN LINES

Nature NATTERS

From dust to robust: Papley Grove Farm's soil journey

“ With this month's issue focusing on soils, I thought I'd reflect on my own farm's journey. Papley Grove has seen some changes during the past few decades, and I've done a lot of learning, made a lot of mistakes, but overall, I've improved the health of my land and the farm bank balance.

I'm old enough to remember burning stubble to remove crop residues – we'd create a fine tilth in the soil afterwards. When burning was banned in the early 1990s, we went back to ploughing the whole farm instead of just the odd field here and there. This more meant investing more – bigger ploughs, bigger tractors, bigger machines to break down our sticky, clay-based soils after ploughing. During a number of years, the soil we used to plough over became more workable.

Several years ago we employed a student and they kept complaining that the plough wasn't working properly – it was repeatedly coming out of the ground and not ploughing straight behind the tractor. So I spent several hours walking alongside it while in action, trying to work out what was wrong and making adjustments. I was becoming increasingly frustrated that I couldn't figure it out.

It was only when I sat on the beam of the plough going back up the field that I spotted the student moving the steering wheel a lot. Instead of looking to the horizon to keep a straight line, he was looking down at the tyre and steering to every little wiggle; these movements

also moved me side-to-side as I sat on the back. It was then I realised there wasn't an issue with the plough, but an issue with the driver.

Before hopping off at the end of the track, I was absent-mindedly gazing into the bottom of the furrow, watching the soil heave and turn. I was surprised to see tractor-tread prints in the bottom of the furrow from when we last ploughed the field a year ago. Surely not?

My soil was compacted! My brain started whirring – I thought about everything that happens to our fields. This was my fault – we were using heavy machinery and running in the furrow, repeatedly compacting and masking it with a bit of loose soil.

That was a lightbulb moment for me – we were causing most of the soil compaction on our farm, it wasn't the soil type making it tricky. The following season we dragged an old Dowdeswell DP2 crawler plough out of the nettles and began using that instead. Gradually, the layers of compaction we'd forced into the soil loosened as we ploughed the soil over.

My next train of thought was: if I'm causing this myself with our heavy machinery, we have to change some of our wider approaches. It was costing us a lot of money to fix the soil compaction we'd caused. So over a few years, we moved all trailers from super single tyres which used to sink 4-6" into the ground, to floatation tyres which only sink 1-2". We also put our combine onto tracks, and moved to vary-flex tyres on tractors.

It was a comment from our

agronomist that made me realise things were improving. He turned up and took off his muddy wellies to put his regular boots on. I said: 'we're going for a walk in the field, not out for coffee!'. To which he replied: 'your soil doesn't stick to my boots like some of your neighbours', so I only need leather boots!'. That sparked me to realise quite how much had changed, and that we were indeed travelling on it much better than we had in the past.

We decided to make a new rule: the spade is the first piece of metal to enter the field after harvest. Digging holes and actually looking to see where we had compaction issues around the farm helped us move less soil and only disturb the areas that needed it.

Digging out a block of soil the depth of a shovel blade and observing its structure and moisture content gives you a good idea of the compaction status of that area. Infiltration tests are another quick and reliable way we've gauged where the problem areas are – using a steel ring hammered half way into the ground to see how long water takes to soak into the ground from the ring.

The next step was to look at machines that could direct drill: we'd get fewer weeds as we hadn't disturbed the stale seedbed. I also wanted to add cover crops into the system. In my head, I likened the use of cover crops to walking across a grass field: it feels spongy underfoot and you don't leave any footprints.

When we walk across bare, fluffy soil that's been cultivated, we often leave footprints, which contributes to the compaction. So I hoped the cover crops

would nurture the structure of my soil for me, with deep roots, managing the flow of water through the soil at different depths and drawing up nutrients from the deeper earth.

As our knowledge of sustainable practices increases and our processes have improved, we're now looking at the finer functioning of soil systems. What makes them work and what's holding them back? We're now at the point where we're testing soil for biological indicators like bacteria, fungi and protozoa, as well as nutrient levels. We're aiming for our farming practices and inputs to not deplete, but to build soil biology.

With the research trials we're involved in we're starting to see clear links between a healthy, functioning soil rich in biology, and healthier crops that require fewer inputs... which happily for me, also means cutting costs.

I see soil as a bank account. If we invest in it, it gives us better returns, and we can draw on that investment in challenging years. I'll continue to invest into this account and the biggest asset on my farm: my soil. ●

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. @LinesMartin martin.lines@nffn.org.uk.

How one farming cluster is making a difference for nature



“The cluster has helped us to better understand the wildlife on our farms and how we can support it to thrive.”

IAN WALLER

A group of farmers in the Chilterns with a shared passion for wildlife are taking proactive measures to help boost nature recovery in their region. *CPM* finds out what’s behind their success so far.

By Janine Adamson

For the Central Chilterns Farmer Cluster, it all started with a shared desire – an urge to learn more about the wildlife on their farms, to become excited by it, and to understand how to help it to flourish. And now, seven years later, evidence suggests the proactive measures they’re making are having a tangible impact.

Undoubtedly, the Chilterns National Landscape is a special place – a chalk escarpment covering 660m² of Oxfordshire, Buckinghamshire, Hertfordshire, and Bedfordshire. However, with 60% of its area being farmland, this places the majority of its stewardship in the hands of farmers.

Recognising the significance of their role in nature recovery led 18 of

these individuals to form the Central Chilterns Farmer Cluster, spanning 6500ha of the Buckinghamshire area of the Chilterns. Farmer-led, the group is chaired by passionate local farmer Ian Waller and facilitated by the Chilterns National Landscape.

The cluster has been successful in securing significant funding to support its work – starting with the National Lottery Heritage-funded Chalk Cherries and Chairs Landscape Partnership Scheme, and more latterly by the Rothschild Foundation, Farming in Protected Landscapes and other supporters.

Nature recovery manager for the Chilterns National Landscape, Nick Marriner, says the original goal of



Purposeful collaboration

Nick Marriner says the original goal of the cluster was to break down any perceived barriers to engaging with environmental measures.

the cluster was to break down any perceived barriers to engaging with environmental measures such as providing supplementary winter bird food, coppicing hedges or installing owl boxes. “There was



Insect training

As well as improving understanding of nature and accessing appropriate support, the cluster is about connecting with others and sharing ideas.

an evident gap,” he continues.

“Farmers were interested and passionate about learning, but they required practical, responsive support and education. Equally, it had to be on their terms, when they were ready, and to fit in with their wider farm plans,” he explains.

According to Nick, at the point the cluster was formed in 2019, there was some support available, but it wasn’t necessarily joined-up or tailored to individual farming businesses. This made it difficult to implement and make solid plans, he suggests.

“If properly supported, farmers have the potential to make the huge difference we require for wildlife, environment and rural communities,” stresses Nick.

The cluster members range from a small 40ha beef farm to 900ha arable systems. However, there’s one characteristic they all share – a willingness to work together. “They’re bound together by the desire to make positive change for wildlife, while improving their farm businesses and producing high-quality food,” says Nick.

“Through the cluster, peer support and an element of competitiveness are married with expert advice, training and farmer-led initiatives. This is backed by a supportive community of more than 90 organisations, experts and contractors.”

Landowner Eleanor Cave from Old Callowdown Farm joined the cluster for help and advice on how best to manage the farm for wildlife, including its Site of Special Scientific Interest (SSSI). Working in partnership with Natural England and Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC), a long-term chalk grassland

restoration project was instigated.

For this, the cluster offered a package of support including a full SSSI management plan; inviting tenders, awarding contracts and project management of an eight week scrub clearance project; and arranging installation of new stock fencing, a stock pen and water supply to site. It also helped to facilitate a Whole Farm Plan which was used as the basis for successful Higher Tier Countryside Stewardship and SFI agreements.

“The cluster has connected us to all sorts of people: the consultant who helped to pull together our CS application, a wildflower expert for our wildflower meadow (see box), and Nick himself is an expert on birds,” explains Eleanor. “All of this support has been a massive help as it would have taken me much longer on my own.”

For the cluster members, the benefits stretch far beyond the obvious too, highlights Nick. “As well as improving their understanding of nature and accessing appropriate support, it’s about connecting with others and sharing ideas. Equally, it’s helping to champion farmers in the Chilterns – tracking the difference they’re making and shouting about it,” he says.

And critically, the results are tangible, he raises. “The local volunteer-run Bucks Owl and Raptor Group (BORG) has partnered with the farmers for several years. Together they’ve increased available nesting sites by installing

more than 80 nest boxes made from recycled farm plastic. Annual checks have revealed around 35% of boxes are in active use, with barn owls and kestrels responding well,” says Nick.

Then, new Countryside Stewardship agreements should provide more than 60ha of habitat for small mammals to support the owls and raptors further.

Other highlights from the cluster include major projects to create new and rejuvenate more than 35km of hedgerows, and to establish and better manage over 75ha of species-rich grassland habitat.

The group has been engaging with the wider community too, notes Nick. Around 250 people have been helping to support the farmers’ work through a citizen science project that covers everything from bird, butterfly, plant and reptile recording, to bird ringing, botanical surveys and hedge laying.

The results can then be used to compare with regional and national trends, he adds. “This insight is a vital piece in the puzzle – enabling examination of the impact of farmers’ individual and collective efforts ‘on the ground’.”

In terms of bird surveys, the community volunteers have undertaken annual winter studies at a number of cluster farm feeding sites. Already, data suggests an increase in the abundance

of yellowhammers during the past six years, contrasting the long-term national population decline, highlights Nick.

Now, it’s a case of getting other clusters in the region to adopt a similar model, believes Professor Kate Heppell, head of landscape for Chilterns

National Landscape. “The great work of the farmers in the cluster has provided a blueprint and catalyst for our wider work with farmers.

“We’re excited by the opportunities this brings, not only for farmers, but for our wider nature recovery and climate adaptation plans. The opportunities to work at landscape scale are significant, and we’re working to secure resources to scale support packages for all farmer clusters.”

This is something that chair of the Chilterns cluster and member, Ian Waller, hopes will become a reality. ►

“Farmers were interested and passionate about learning, but they required practical, responsive support and education.”

of yellowhammers during the past six years, contrasting the long-term national population decline, highlights Nick. Now, it’s a case of getting other clusters in the region to adopt a similar model, believes Professor Kate Heppell, head of landscape for Chilterns

National Landscape. “The great work of the farmers in the cluster has provided a blueprint and catalyst for our wider work with farmers.

“We’re excited by the opportunities this brings, not only for farmers, but for our wider nature recovery and climate adaptation plans. The opportunities to work at landscape scale are significant, and we’re working to secure resources to scale support packages for all farmer clusters.”

This is something that chair of the Chilterns cluster and member, Ian Waller, hopes will become a reality. ►

Farming insects project

Monitoring six sites across the Central Chilterns Farmer Cluster helps to understand insect behaviour on-farm

Having expressed an interest in increasing farmland insects to support populations of grey partridges, the Central Chilterns Farmer Cluster began a two-year project funded by the Rothschild Foundation, working alongside Marek Nowakowski from the Wildlife Farming Company.

Supported by the UK Centre for Ecology and Hydrology (UKCEH) and independent invertebrate consultant Steve Falk, data was gathered from six of the cluster farms across a range of habitats. This was achieved by using pitfall traps to assess populations of ground beetles, as well as replicated transect walks to count bees, butterflies, hoverflies and daytime-flying moths.

The habitats monitored were the following: 30-year-old areas of wildflower natural regeneration on chalk soils; high quality seven-year-old native sown grass and flower mixtures; medium-quality sown grass and flower mixtures; low-diversity sown grass and flower mixtures; tussocky grass; and crop-to-field edges.

Explaining the results, Marek says not only did they compare favourably with national datasets, but the older habitats contained greater species diversity as well as larger populations. In fact, the pitfall traps that were out for seven days in June caught 13,449 invertebrates – carabid beetles and spiders totalled 6602 with the rest being species such as spring tails.

“Interesting to farmers was the black clock beetle (*Pterostichus madidus*), which is a beneficial predator and scavenger that feeds on aphids, slugs, and snails. This represented 63% of the total beetles caught,” he explains.

“However, it was the 30-year-old areas of wildflower chalkland natural regeneration that caught most of the nationally scarce invertebrates, which demonstrates the value of habitat quality and age.”

During the transect walks – where consultant Steve walked the same areas that had pitfall traps and recorded observations – 1349 pollinators were counted from 72 different species. “This shows that the margins provide suitable habitat for a diverse



Quality wins

The greater the habitat diversity and age, the greater the variety of invertebrates supported, explains Marek Nowakowski.

population of pollinators and other beneficial insects,” notes Marek.

He adds that although the project was a mere snapshot in time, the overall results indicate that habitat quality, not quantity, is key. “The greater the habitat diversity and age, the greater the variety of invertebrates supported.

“Ultimately, quality habitats and species richness generally go together, but do take time to develop. So when it comes to delivery, perhaps SFI could note the value of habitat age and quality?

“Regardless, it was great to see the interest and enthusiasm farmers showed when they received the results; the insects became their insects, rather than farmland insects. It also seems to have created a competitive fun element to wildlife delivery within the cluster.”

Marek believes many farmers lack the time, help and money to improve habitat quality and delivery, however, the Central Chilterns Farm Cluster addresses that gap. “Seeing is believing. There’s no substitute for visiting demonstration plots as well as other farms,” he concludes.



► “The cluster has helped us to better understand the wildlife on our farms and how we can support it to thrive; we have a support team we trust and the resources on offer are invaluable, getting expert advice, help designing

projects, accessing funding and ongoing monitoring,” he says.

“The power of the cluster really comes through opportunities to work together on projects at scale. We each form a small part of the wider

Chilterns jigsaw and by working together, are making an impact. I hope that in the future every farmer in the Chilterns has access to a similar support package – what a difference that would make,” he concludes. ●

Loosen-up or lose yield

With 'leave alone and minimally cultivate' in vogue, many subsoilers may be rusting in the nettles. However, while the era of recreational shake, rattle and roll in those lazy, hazy days of summer 1975 is long gone, CPM finds out whether there's still a case for deep loosening.

By Mike Saul

It's likely that Dick Godwin will be a name familiar to many farmers across the UK and cultivation experts worldwide. Now a visiting Professor at Harper Adams University, he and colleagues including the late Gordon Spoor nurtured a host of students at what was the National College of Agricultural Engineering and then Silsoe College, many whom are among today's top machinery manufacturers.

Critically, his view is that the deep loosening fundamentals developed back then haven't changed. And while today's arable farmer may wish to leave the topsoil relatively unscathed and stable, soil compaction at any depth will cut production and compromise long-term soil health.

"A compact soil restricts root development, impedes air and water movement, and increases the risk of anoxic conditions," he points out. "Unless action is taken to counteract compaction, then long-term soil health will deteriorate and consequently yields suffer."

He urges that identification is key and while there may be ways of detecting compaction using remote sensing or penetrometer techniques, Dick believes nothing beats a visual assessment when the crop is actively growing. "We've yet to master the digital spade.

"It isn't difficult to identify areas of poor crop growth in the spring and summer, so check these out looking at restricted rooting, the occurrence of large, difficult to prize apart 'slabs' in the soil, and impeded water movement through the profile.



"Do what's necessary, where necessary, and no more."

PROFESSOR DICK GODWIN

"Sending up a drone can help to map out the extent of these areas, then it's a case of focusing on putting things right after harvest and before the next crop."

He suggests that growers should 'box clever' when it comes to correcting compaction if they're practicing minimal cultivation. "Getting it wrong, using inadequate or poorly adjusted equipment, could add to your problems by re-compacting the looser, weakened soil during subsequent field operations.

"Equally, it's important to have a plan before hitching up the subsoiler and starting to burn diesel. Tillage where it isn't required causes more damage than good, disrupting natural root and water movement pathways.

"You can also increase surface soil cloddiness, put at risk any well-structured surface soil to depth, and increase waterlogging in situations where subsurface drainage is inadequate."

To maximize success rates, Dick stresses it's important to identify the type of soil disturbance required to alleviate the problem at hand. Then, check whether it's been a success by digging deep again and taking care with subsequent field operations to prevent re-compaction.

He adds that compaction problems occur at different depths, take different forms and require different treatments. Causes may be natural, or, the result of field traffic from machines or animals.

Regardless, it's important to identify their depth and extent throughout the field.

Surface layer problems usually arise through surface trafficking and on weakly structured soils, through soil slumping. Here, more general soil loosening and breakup of the soil units, or a gentle easing of the compacted soil, will allow the natural soil structural units to separate and reopen structural pores.

In other situations, compaction may be relatively localised in the form of a pan because of implement or tyre action at that depth. Here the aim should be to



Consequences

Unless action is taken to counteract compaction, long-term soil health will deteriorate and yields suffer, says Professor Dick Godwin.

MACHINERY Soil loosening

- ▶ disrupt the pan or create fissures through the compacted zone to allow root, air and water penetration, notes Dick.

Deeper problems usually take the form of more 'massive' structural conditions with zones of soils containing minimal or zero macro-porosity. These are commonly caused by very high surface loadings, excessive, untimely soil working, or through natural consolidation over time. In these scenarios, remediation is more difficult, involving reopening of any natural structural pores where they're present, or securing a more thorough break-up of the large structures into smaller soil units.

While ploughing can remove compaction, successful loosening that creates more minimal disturbance involves kit with narrow tines and a

leading foot, plus/minus wings. By using tined loosening at shallower depths, the soil is moved forwards and upwards along a succession of failure planes which develop from the foot tip as the tine passes through the soil.

As the tine works deeper, the resistance to this upward soil movement increases to the point where it becomes easier for the soil at depth to flow laterally around the foot rather than move upwards, which can leave the compacted zone relatively undisturbed and offer a channel through the soil.

The transition depth between these two types of disturbance is termed the critical depth and represents the maximum useful working depth of that tine for soil loosening.



Greater depth

By bolting on wings to the subsoiler leg, more soil can be disturbed.

By bolting on wings to the subsoiler leg, more soil can be disturbed and greater depths can be operated at. Wing lift height has a significant influence on soil movement, with the degree of disturbance increasing with increasing lift angles.

Wings also tend to boost the reorientation of the soil units at working depth – the greater their lift, the greater the possibility of tension cracks developing in the disturbed zone above.

In trials, the addition of wings commonly loosens approximately twice the volume of soil, with a corresponding increase in draught of just 20-30%. This means that more compaction is taken out with each pass, and less passes are required across the whole field.

Soil loosening efficiency can be further improved by operating with shallow leading tines which virtually doubles the volume of soil disturbed for little or no increase in draught force. However, Dick bemoans an apparent lack of kit that takes advantage of this effect. "Growers can get around this by carrying out a pre-subsoiling shallow cultivation, but it's a shame most manufacturers don't include forward leading tines to the subsoiler frame."

The degree of soil disturbance and clod size at the surface is affected by the lift height of the wings and the tip width of the subsoiler leg, and this is important for those looking to minimally cultivate and then drill, he adds.

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disturbance would be to adjust the existing wing lift height and use shallower wing angles, but again there appears to be little if no commercial equipment available that allows these simple adjustments.

“In order to ensure a good, level soil surface, it’s a case of adjusting tine spacing, using low-lift winged tines and attention to working depth. Choosing kit with narrower tines will also help to minimise surface clod problems,” says Dick.

More seasoned readers of *CPM* may remember ICI’s/Howard Rotovator’s introduction of the Paraplow – a soil loosener which gently restructured using slanted tines at 45° over which the soil flowed. “This caused a virtually uniform lifting of the soil leaving a near level surface disturbance. We could really do with a machine of that nature available today,” suggests Dick.

In similar fashion, the Flat lift – developed in the 1980s with shallow-lift wings – also reduced soil surface disturbance, posing a major advantage for minimum cultivation. Leading discs operating ahead of the tines of both the Paraplow and Flat lift type subsoilers



Clay soil structures

Dense, angular and blocky aggregates with fewer roots indicative of a poorly structured soil (L) versus an improved more granular and loose soil with better porosity and more roots at depth (R).

should help to minimise soil disturbance in addition to cutting surface residues.

Once loosened, soil is prone to re-compaction and in certain instances, one sequence of field operation including mouldboard ploughing with a tractor wheel in the plough furrow, could restore the soil to the same if not greater density than it was prior to loosening, adds Dick.

As a result, growers should consider one-pass systems that incorporate deep loosening, surface cultivation and drilling, using controlled wheelings in a bed

management/controlled traffic system, plus lightly-loaded tractors equipped with low ground pressure systems particularly on deep loosened surfaces.

Where set tramlines are in place, utilise these same passageways when loosening, advises Dick. “If you have a map of where tractors and combines have travelled, focus on removing these wheel marks if that’s where compaction is an identified issue. Do what’s necessary, where necessary, and no more,” he concludes. ●

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The best drill for the job



There's no one-size-fits-all approach to direct drilling, with every farm adapting its establishment strategy to suit its own soils and system. *CPM* finds out how two arable businesses have taken different routes to achieving consistent crop establishment.

By Charlotte Cunningham

Moving towards direct drilling is rarely straightforward, particularly on heavy clay soils where maintaining consistent establishment can prove challenging in less-than-ideal conditions.

At FRW Farrington & Son near Wellingborough, Northamptonshire, the transition has involved a gradual shift towards regenerative farming, with lower-disturbance establishment, cover crops and soil health forming the backbone of the system. But, as farm manager Stuart Tabernor explains, reducing cultivations is only part of the equation – success also depends on having machinery capable of working reliably within that system.

Farming 295ha of predominantly Hanslope clay, the business grows winter wheat, oilseed rape, winter beans and spring oats, alongside cover crops where opportunities allow. “We generally combine, stubble harrow and drill,” says Stuart. “The business has been moving towards a no-till approach and that’s something we’re continuing to build on.”

Reducing soil disturbance has also become an important tool in managing grassweeds. “We still have blackgrass and we have a bit of a brome problem as well, although that’s something we’re getting on top of,” he explains. “The move towards direct drilling is definitely helping.”

Although the farm had already

adopted direct drilling, Stuart felt there was room to improve establishment consistency. “The Hanslope clay didn’t particularly suit a disc drill,” he says. “The discs could create smearing rather than producing a clean slot, so we started looking at alternatives.”

The aim wasn’t simply to replace one direct drill with another, but to find a machine capable of drilling directly into cover crops and surface residues while maintaining accurate seed placement across a range of crops and conditions. “We wanted something that could go straight into cover crops, straight into our stubbles and do a good job,” says Stuart. “Ultimately, you can have the best system in the world, but if you don’t establish the crop properly, you’re on the back foot from the start.”

The search led the business to the Simtech TS480, a 4.8m drill combining leading cutting discs with four rows of staggered tine coulters. While Simtech was already familiar to Stuart, it wasn’t initially a brand he’d associated with

continues on page 64 ►



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Achieving more with less in Norfolk

How moving from full plough tillage and non-inversion techniques to direct tine drilling has transformed crop establishment for one large-scale farming business

The move towards no-till looks different on every farm, but one principle remains the same – successful establishment depends on matching the drill to the system. At A.J. Alexander & Son in Norfolk, that has meant adopting the Claydon Opti-Till Crop Establishment System, which the business says has improved soil structure, reduced fuel use and increased establishment consistency across 2000ha of owned and contract-farmed land.

Growing a diverse rotation of winter wheat, barley, peas, beans, OSR and both forage and grain maize, Rob Alexander says the objective throughout has been simple – do less while achieving more.

The business farms predominantly sandy clay loam soils, which Rob says are easily damaged if overworked. Reducing cultivation intensity has

therefore become just as important for protecting soil structure as improving operational efficiency. “Our loams collapse if they’re overworked, so the fact we can leave the soil in a stable condition until we’re ready to drill is very beneficial,” he explains.

The move towards direct drilling followed an earlier transition away from conventional plough-based establishment. At its peak, the previous cultivation system required more than 55 l/ha of fuel before drilling could even begin. “When we transitioned to non-inversion – basically tines followed by a disc drill, by keeping the topsoil on the top, the subsoil underneath and the drainage open – our costs came down. That saved around 20 l/ha of fuel, labour and machine hours, which represent a major cost.

“Subsequently we looked for a more risk-averse approach to

crop establishment which would maintain soil structure right up to the point of drilling. That meant it was better able to support machinery, but once the seed had been placed, those drainage channels underneath remained in place.”

The business initially introduced a second-hand Claydon direct tine drill, which quickly became established within the rotation. “We started by drilling around 10% of the cropped area with it and within a few years that had increased to more than 60%,” recalls Rob.

Five years later the drill was replaced with a new 6m Claydon Hybrid T, providing greater capacity alongside increased precision through integrated control of the NutriSeeder and separate seed and fertiliser hoppers. “Now we do a lot of variable-rate applications and can vary rates across the seed, fertiliser

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and NutriSeeder by linking everything to John Deere GreenStar,” he explains.

One of the most noticeable improvements has been establishment consistency, he says. “The evenness of establishment is very noticeable, including on the headlands because now we turn on firm ground and the last pass over those areas loosens the soil and drills the crop. Undoubtedly that has helped to increase yields.”

The change has also delivered significant improvements in operational efficiency. “Fuel use for our seeding process is about 17 l/ha, and the 6m Claydon Hybrid T easily covers 40ha/day,” notes Rob. “Now we’re doing far more with the same operator and less machinery, so the Claydon System has enabled us to reduce production costs and be more profitable at a time of low commodity prices.”

Alongside the operational benefits, improving soil health has remained a key priority. The business has worked closely with neighbouring livestock enterprises through long-standing straw-for-muck agreements, however Rob admits incorporating



A core part of the system

A. J. Alexander & Sons’ 6m Claydon Hybrid T direct drill is part of the Claydon Opti-Till System which provides a range of benefits.

bulky organic manures was initially a concern when moving to direct drilling.

“When considering direct drilling, one concern was whether we’d be able to incorporate manure and get it through the drill, but that’s not been a problem,” he points out. “It’s important to use a good spreader and break the material down when it’s applied, but then the drill incorporates it well. The levelling boards at the back distribute it over the rows which concentrates nutrients where they’re needed.”

Since adopting direct drilling,

biological activity has increased noticeably too. “Worm numbers have risen dramatically,” says Rob. “We wouldn’t have seen many 25 years ago when power harrows were following the ploughs, but now every spit of soil contains handfuls of them.”

Improved biological activity, combined with reduced soil disturbance, has in turn helped to create a more stable soil structure capable of carrying machinery while maintaining natural drainage, he believes. “The interaction between

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- what we're doing to the soil and what it is doing itself with the worms and organic matter, has made the structure more resilient and stable. The natural drainage channels allow water to pass through during heavy rain, while the fine crumb structure on the surface breaks down nutrients and residues making them available to the crop."

Like many arable businesses, grassweed control remains an ongoing challenge. However, Rob believes reducing cultivation intensity has helped minimise weed germination by leaving buried seed undisturbed. "We still have the same challenges as all farms in this area, including grassweeds, but that's a battle we're winning. Direct drilling produces less disturbance so grassweeds remain underground, and now we have an option that's not the can or sprayer – our Claydon TerraBlade inter-row hoe."

Looking back over the farm's transition from ploughing, through non-inversion cultivation and ultimately to direct drilling, Rob believes the cumulative improvements in soil structure are now becoming increasingly evident. "We still have balers, muck spreaders and trailers running over our fields, but the excellent soil structure supports them so remedial action isn't required to loosen everything up."

With soil structure continuing to improve, the business has also been able to reduce the working depth of the drill's leading tines, lowering draft requirement and creating opportunities to further increase output in the future. "We also find that now we don't have to run the drill's leading tines as deep, this reduces the power requirement, so in future we may end up with the same size tractor pulling an even wider drill to further improve efficiency."



The low disturbance equation

When moving to a lower disturbance system, Northamptonshire farm manager Stuart Tabernor says reducing cultivations is only part of the equation – success also depends on having machinery capable of working reliably within that system.

- large-scale arable drilling. "I'd mainly thought of them as a grassland drill manufacturer," he admits. "It wasn't until we started researching direct drills more seriously that we looked at what they offered."

He adds that the coulter design immediately stood out. Rather than relying solely on a disc opener, the TS480 uses leading discs mounted within the frame to slice through residues ahead of the tine coulters, helping create a clean seed

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slot while maintaining low soil disturbance, explains Stuart. "It was the front discs built into the frame that really appealed. At the time, it was the only drill we looked at that offered that combination."

A demonstration during autumn 2024 confirmed the coulters concept suited the farm, although exceptionally wet conditions exposed an issue with the original rear-mounted hopper configuration. "It was one of the wettest drilling seasons I can remember," recalls Stuart. "With the hopper on the back, if the tank was full the drill would sink in wetter patches and we were putting wheat in at around 100mm depth, which obviously isn't ideal."

Rather than dismissing the machine, Stuart worked with Simtech to develop a specification better suited to the farm's conditions.

The rear-mounted hopper was replaced with a front-mounted split hopper to improve weight distribution between tractor and drill, while the rear roller was replaced with four depth-control wheels to improve depth consistency and

reduce the risk of the machine sinking in softer ground. The chain on the rear was also swapped for a harrow bar to reduce residue dragging behind the drill. "We ended up with a much better-balanced machine," he says. "With the hopper on the front and the toolbar on the back, the weight is spread much more evenly, which suits our soils far better."

The resulting machine arrived in time for the 2025 drilling season and has since established the farm's entire rotation. "We've drilled everything from OSR right through to beans with it," says Stuart. "Depending on the crop, we're drilling anywhere between 10mm and 100mm deep."

The split hopper and twin distribution system also provide flexibility for companion cropping and establishing multiple crops at different seed rates, supporting the farm's continuing move towards more regenerative practices.

Meanwhile, the four rows of staggered tine coulters provide generous trash clearance, allowing the drill ►



A machine with many hats

The search to find a machine capable of drilling directly into cover crops and surface residues while maintaining accurate seed placement across a range of crops and conditions led FRW Farrington & Son to the Simtech TS480.

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- ▶ to cope with heavy crop residues and high-biomass cover crops. “Residue flow has been very good,” says Stuart. “That’s important because we’re increasingly drilling into situations where there’s plenty of material left on the surface.”

Power requirement has proved lower than expected, too. The 4.8m drill is operated behind a 185hp tractor, with engine load typically sitting at just 35-40% while drilling. Running at around 1400rpm and travelling at approximately 8kph, the outfit comfortably achieves around 4ha/hour while using roughly 6 l/ha of fuel.

But the main benefit has been establishment. “It was a good drilling season, but the crop establishment

was fantastic,” says Stuart. “Everything came through evenly and looked good throughout the year.”

Those establishment benefits are now being reflected in crop performance.

At the time of writing (end of July), wheat, OSR and winter beans had all been harvested, averaging around 8t/ha, 3.5t/ha and 3.5t/ha, respectively. “Considering the seasons we’ve had during the past few years, they’re probably the best results we’ve achieved during that period,” he says.

“The spring oats, drilled into cover crop, are also achieving around 5t/ha on the AWH10 low input cereals.”

While Stuart is careful not to credit those figures to the drill alone, he

believes consistent establishment underpins every subsequent management decision. “If you don’t get the crop established properly, it makes everything harder afterwards,” he says. “Getting that crop away well is one of the most important jobs you’ll do all season.”

He also highlights the aftersales support received from distributors Opico since taking delivery. “It’s been absolutely fantastic,” he says. “Every machine has little snags and questions when it’s new, but anything we’ve needed has been sorted quickly and efficiently. They’re also just good people to deal with.”

As the farm continues refining its regenerative system, Stuart expects the drill to remain central to the establishment strategy. “We wanted a drill that suited our soils and the way we farm,” he concludes. “So far, it’s delivered exactly what we were looking for.” ●

“The business has been moving towards a no-till approach and that’s something we’re continuing to build on.”

What’s new in drills?

As drilling technology continues to improve productivity and performance on farms, here’s a look at just a couple of the newest drills to hit the market



Amazone used the recent Cereals Event to preview the new Condor 02 direct drill ahead of its official UK launch, with the machine forming part of a wider display of drilling, crop protection and cultivation equipment.

Replacing the original Condor introduced in 2013, the Condor 02 is available in 8m and 9m working widths and retains the manufacturer’s narrow ConTeC tine coulters, designed to minimise soil disturbance while maintaining accurate seed placement across varying ground contours.

One of the main updates is the addition of a rear harrow, introduced to improve seedbed finish and broaden the drill’s suitability across both direct drilling and minimum tillage systems. Amazone says this should provide more consistent seed coverage while supporting higher operating speeds where conditions allow.

The drill also features a triple split hopper, precision metering system and MultiSwitch segmented distribution head, enabling individual row shut-off to reduce overlaps and improve seed placement accuracy.



Lemken has introduced the Saphir XMR mechanical seed drill, replacing the long-standing Saphir 10 with a machine designed to improve precision, ease of use and work rates.

A newly developed metering system sits at the heart of the drill, featuring tool-free removable metering wheels to simplify seed changes, cleaning and maintenance. Different seed wheels allow accurate metering across a range of seed sizes, while a double-sided electric drive with half-width section control comes as standard to reduce overlaps on headlands and irregular field shapes.

Machine setup has also been simplified, with central depth adjustment alongside independent coulters pressure and sowing depth settings. Operators can also select different tramline patterns and working widths through the patented tramline control system, while the ISOBUS-compatible iQblue drill terminal provides digital support for functions including calibration and residual seed emptying.

Seed placement is handled by Lemken’s parallelogram-guided double-disc coulters with pressure rollers, with coulters pressure adjustable up to 45kg. The drill is available with 12.5cm or 15cm row spacings and tank capacities range from 900 to 1500 litres – with an optional 200-litre MultiHub auxiliary tank available for micro-granules or catch crops.

Managing the middle ground



“The important thing with a properly set-up low disturbance subsoiler is that you really shouldn’t be able to tell it’s been through.”

JOHN MILES

Reducing soil movement has transformed establishment systems on many farms, but heavy land continues to present unique challenges. *CPM* explores how research and on-farm experience suggest low disturbance subsoiling can relieve compaction, improve rooting and maintain the benefits of reduced tillage.

By Charlotte Cunningham

For growers farming heavier land, direct drilling has often presented something of a contradiction. While the benefits of reducing soil movement are well understood – improving soil structure, conserving moisture and lowering establishment costs – maintaining crop establishment, managing blackgrass and overcoming compaction without reverting to more intensive cultivations has proved considerably more difficult.

It’s a balancing act many businesses continue to grapple with – leave compaction unchecked and rooting, drainage and crop performance can all suffer, but tackle it with aggressive cultivations and there’s a risk of undoing years of progress by disturbing weed seeds, drying the soil profile and

compromising the surface structure that reduced tillage systems rely on.

Finding that middle ground has become a major focus at Agrii’s Stow Longa technology centre in Cambridgeshire. Situated on the heavy, high-silt soils that account for an estimated third of England’s arable land, the site’s long-running cultivation trials have spent more than a decade exploring how growers can alleviate compaction while preserving the benefits of reduced cultivation.

According to Agrii’s John Miles, Stow Longa’s findings are relevant well beyond the trial plots themselves. “Stow Longa is representative of an estimated 30-35% of the arable area,” he explains. “You’re looking at heavier soils with impeded drainage,

relatively high silt and clay contents, which are common across much of the Midlands and Eastern Counties.”

Those soil characteristics create a unique set of establishment challenges, adds John. Heavy soils naturally hold more moisture, making drilling windows tighter, while high silt contents can wash down through the profile to create a naturally occurring compacted layer beneath the surface.

Add machinery traffic, crop residues and blackgrass into the equation, and successful establishment becomes increasingly difficult. “Direct drilling has always been more challenging on heavy soils because it’s moisture- and tilth-related,” says John. “Compaction, whether it’s mechanical or caused by the silt layering down, is always going to be prominent – and then residue management has a huge impact as well.”

He adds that blackgrass is often the factor that turns a small establishment problem into a significant financial one. “When you have those heavy soils with a blackgrass burden, the last thing you want is a suboptimal plant stand. You lose twice over because the crop won’t yield, and because the blackgrass has an absolute field day in

MACHINERY Low disturbance subsoiling

► the light, heat and space that's created."

That understanding has evolved through the Stow Longa rotations project, which has compared a range of cultivation systems over more than 12 seasons. Originally centred around continuous ploughing, deep one-pass cultivation and direct drilling, the trial has evolved as the team's understanding of residue management, soil structure and establishment has improved.

"In the early days, the plough always came out on top," recalls John. "But that wasn't because the plough was inherently better. It dealt with the structure and the trash and gave us a good establishment, while the way we managed it meant we minimised any further soil movement before drilling."



12 years of cultivation research

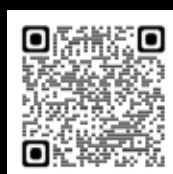
Agrii's Stow Longa rotations project has compared a range of cultivation systems over more than 12 seasons – introducing low disturbance subsoiling during the 2020/21 season.



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As the project progressed, the focus shifted from comparing cultivation systems in isolation towards understanding why direct drilling sometimes struggled on these heavier soils. Over the years, the team worked through virtually every variable affecting establishment – from straw management and cover crop destruction to slug pressure, drilling technique and residue handling. "We've learnt all the lessons there are around these variables," says John. "Once we'd improved those areas, we started looking much more closely at the underlying soil structure."

One recurring issue was the combination of machinery traffic and the site's naturally high silt content. Around 60% of the trial area experiences some level of trafficking each year due to research activity, while fine silt particles gradually wash down through the profile to create a dense layer approximately 13-15cm below the surface that restricts rooting and drainage.

To tackle that without undoing the benefits of reduced tillage, Agrii introduced low disturbance subsoiling during the 2020/21 season. "The key was finding a way to address those structural issues without making the blackgrass worse," explains John. "As soon as you start moving the soil and bubbling it up, you unlock the perfect conditions for blackgrass."

Instead, the objective was to fracture the compacted layer while leaving the soil surface largely untouched. "The important thing with a properly set-up low disturbance subsoiler is that you really shouldn't be able to tell it's been through," he says. "If you can see lots of disturbed soil on the surface, you've

probably moved too much.”

However, Stow Longa’s work has also shown that timing is equally as important as machinery choice.

Ideally, John recommends operating immediately after harvest while some moisture remains within the soil profile. That allows sufficient fracturing beneath the surface without creating excessive disturbance above it, while leaving time for any weeds that do emerge to be controlled before drilling.

Last season provided exactly that lesson, he says. “We knew it was too dry and didn’t really think compaction would be an issue because we hadn’t had the rainfall,” he explains. “But we decided to use a low disturbance drill on one block as a learning point.”

John adds that while establishment improved thanks to better drilling conditions, the downside was equally clear. “We nearly doubled our blackgrass ear numbers where we used the LD compared with where we didn’t in the direct-drilled plots. They were still relatively low numbers, but the difference came purely from moving too much soil.”

While at the Huntingdon site, where previous work has shown every 100 blackgrass ears/m² can equate to around 1t/ha of lost wheat yield, even relatively modest increases matter, he adds.

For John, the key lesson from more than a decade of work at Stow Longa is that successful establishment on heavier soils depends less on committing to a single cultivation system and more on understanding when intervention is genuinely required. “We’re not really talking about direct drilling anymore,” he says. “We’re talking about an adapted establishment system.”

That means combining careful residue management with targeted soil loosening where necessary, while



National relevance

According to Agrii’s John Miles, Stow Longa’s findings are relevant well beyond the trial plots themselves, with the land there representative of an estimated 30-35% of the arable area in the UK.

recognising there’s still a place for a rotational plough when blackgrass pressure or soil condition demands it. “It’s about using the right tool, in the right conditions, for the right reason.”

This is a philosophy increasingly reflected in machinery development, with manufacturers focusing on relieving compaction where it’s required while leaving the soil surface largely undisturbed.

That thinking prompted Weaving Machinery to develop its Low Disturbance (LD) subsoiler in 2017. According to managing director Simon Weaving, the aim wasn’t simply to produce another subsoiler, but a machine capable of fracturing soil beneath the surface without excessive movement above it.

“We felt that by using a smaller point and wing to lower disturbance, you needed the legs to be closer together because you want the fracturing underneath the ground,” he explains.

Unlike many conventional designs, the LD subsoiler dispenses with a front cutting disc, instead relying on two rows of legs set 1.2m apart. According to Simon Weaving, the wider spacing reduces draft requirement ▶

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Not just another subsoiler

According to managing director Simon Weaving, Weaving's aim with the LD Subsoiler wasn't simply to produce another subsoiler, but a machine capable of fracturing soil beneath the surface without excessive movement above it.

- ▶ while limiting interaction between the legs, helping to achieve the desired underground shatter without unnecessary surface disturbance. "The legs aren't fighting against each other," he says. "You get the fracturing underneath, but you're not bringing a lot of soil to the surface."

A 700mm press roller behind each leg then gently reconsolidates the disturbed strip while leaving most of the surface intact.

As more businesses adopt reduced tillage and direct drilling, Simon Weaving believes growers are increasingly looking for ways to improve soil structure without reverting to full-width cultivations. However, he cautions against viewing low disturbance cultivation as an overnight route into no-till. "If you're someone looking to lower your disturbance on farm, going from moving a lot of soil to no cultivation is like turning off a tap," he says. "For good crop establishment, you still require tillth."

Instead, he sees low disturbance subsoiling as part of a gradual transition, relieving compaction while maintaining surface residue and moisture. "Our best customers use it as part of a rotation," he explains. "They're just going into the soil, getting a bit of air in, lifting it like a carpet, gently rolling it back down and then drilling into it."

He adds that many growers now operate a low disturbance subsoiler alongside shallow discs, selecting whichever tool best suits field conditions rather than relying on a single cultivation strategy. "If there's plenty of natural ground fracturing, you might just use a short disc," says Simon Weaving. "Whereas if there's enough tillth on top but compaction underneath, you'll just go in with an LD."

As with any cultivation, success depends on understanding soil conditions before entering the field. "It's very important that customers assess their soil first," he advises. "Look where the compaction is, make sure the machine's set correctly and make sure it actually needs doing."

That measured approach is one Simon Cottle has adopted on his mixed farm in Wiltshire – a 324ha arable enterprise plus 243ha of grass supporting a 300-cow suckler herd.

Historically, the business ploughed and power-harrowed virtually every hectare before drilling across its mixed soils, ranging from Cotswold brash through to sandy loams and heavier clays. However, rising establishment costs prompted a gradual reassessment of the system and Simon Cottle says the arrival of the LD subsoiler marked a significant step forward.

"It's just a marvellous piece of machinery," he says. "It moves the ground underneath with the micro wings, but doesn't break the top too much so you don't lose your moisture."

That's proved particularly valuable on

the heavier clay areas of the farm, he notes. "If you have some clay ground, it doesn't bring all of those hard clay lumps to the surface which can then dry out. It's moving everything underneath without creating surface disturbance."

The farm operates a 4m LD subsoiler behind a 240hp Case Puma, typically working at 8-9km/h and depths of around 18-25cm depending on field conditions. Rather than maintaining a fixed working depth, Simon Cottle deliberately adjusts it to avoid creating another cultivation pan lower in the profile.

This season, the machine has already been used behind winter barley, where retained residues have helped protect soil moisture despite the dry conditions. "It's done a fantastic job," he says. "We were literally down to 10 l/ha with the 4m machine, which was great."

Following cultivation, the farm allows volunteers to chit before drilling directly with its Weaving Sabre Tine drill. "I think people misconstrue the idea of a tine drill," says Simon Cottle. "When you've loosened the soil properly, you can run the tines a bit deeper and create a rooting zone for the crop rather than just scratching the surface."

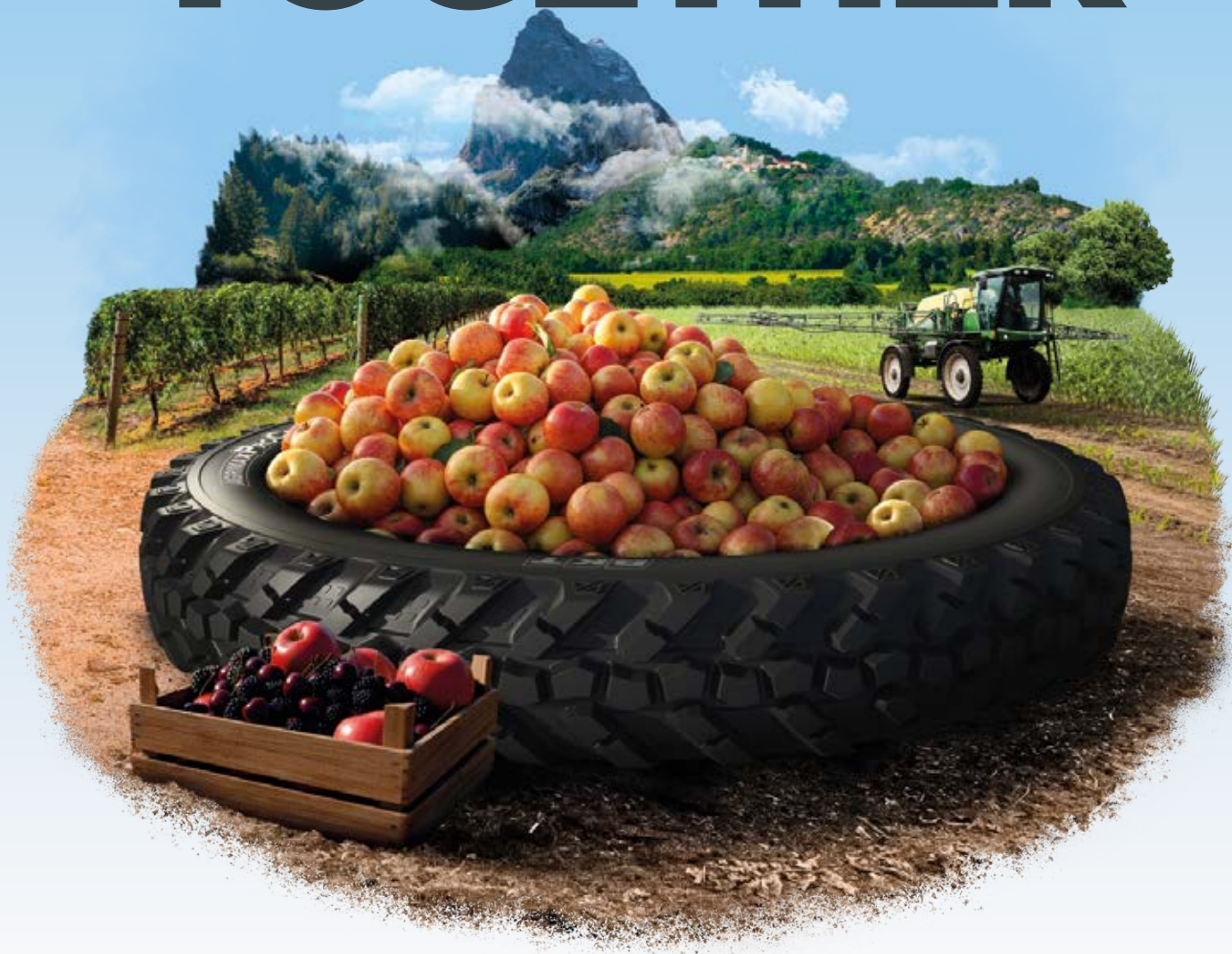
Importantly, despite reducing cultivation intensity, crop performance has remained consistent. "I don't think the yields have dropped off," he concludes. "We've reduced our cultivation costs, conserved moisture and we're still maintaining productivity, which is exactly what we wanted to achieve." ●



A significant step forward

Wiltshire farmer Simon Cottle says the arrival of the LD subsoiler marked a significant step forward for reducing cultivations on farm.

A LONG WAY TOGETHER



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"The shorter sidewall reduces flex, delivering smoother transport, less bounce and safer handling at higher speeds."

SCOTT SLOAN

Boasting 'exceptional' flotation properties to enable easier travel on wet soil, Titan's exclusive low sidewall technology is now available in supersize, following the UK launch of the largest agriculture tyre in the world. CPM treads in on the discussion.

By Janine Adamson

While engaging total beast mode isn't for all farms, even the largest machines in the business deserve something a little finessed from time to time...

And right on cue, in rolls the largest agriculture tyre in the world, recently given the green light to be used in Britain and Europe. However, while its size may be giant, its performance is altogether quite refined.

This is because to take full advantage of increased horsepower and greater load capability, it all comes down to the correct wheel and tyre assembly. For those at the bigger end of the scale, this could mean the LSW1400/30R46 from Titan, parent company of Goodyear Farm Tires.

Designed for the largest-scale vehicles in farming, the LSW1400/30R46 boasts the firm's exclusive low sidewall (LSW) technology. The main benefit of this is exceptional flotation

properties, achieved through a larger rim diameter and smaller sidewall than a conventional type, explains Titan's LSW specialist, Scott Sloan.

"LSW technology is a unique innovation designed to enhance tractor performance in the field and on the road. The shorter sidewall reduces flex, delivering smoother transport, less bounce and safer handling at higher speeds. Then, the reduced power hop minimises vibration under high torque, improving traction and reducing stress on driveline components," he adds.

In terms of the tyre's impact on the ground, Scott notes that its larger footprint lowers ground pressure, which helps to protect soil structure and optimise crop yields. "Equally, enhanced flotation and traction allow machinery to operate more effectively on wet soils in particular, and enter fields sooner in the season," he says.

Because the tyres are specifically

designed for heavy machines, they support higher loads without compromising field or transport performance, highlights Scott. Equally, operator comfort matters too. "Reduced vibration lowers operator fatigue and enables more consistent, efficient working."

Available in a range of sizes, the current most popular LSW combination sold in the UK is the Optitrac LSW1100/45R46 rear with LSW1000/45R32 front. While



Going for it

Enhanced flotation and traction allow machinery to operate more effectively on wet soils in particular, and enter fields sooner in the season.

the supercharged LSW1400/30R46 is unlikely to appeal to many, Goodyear Farm Tires is looking forward to having the conditions required to put them to the test, says marketing manager Natalie Dukes.

"The LSWs are a true flagship of the Goodyear Farm Tires offering, and to have approval for the European market for the biggest tyre of them all is fantastic.

"Those farmers who have the machinery to utilise the LSW1400/30R46 will see a long list of unrivalled benefits, with the size and scale of the tyre combining with the exceptional technology of the LSW," she comments.

LSW tyres are engineered and sold as complete wheel and tyre assemblies, purpose-built by Titan. According to Natalie, they've proven a huge success for farmers across the world. "Operating at up to 40% lower inflation pressures than standard tyres, they should help to reduce potential soil compaction," she adds.

At the moment, the dry arid weather experienced across the UK hasn't been conducive to farmers exploring tyres for inclement conditions. However, if

the situation does turn wet, Natalie believes Goodyear has the solution, particularly with the largest of its tyres.

This is because the LSW1400/30R46 also boasts the deep R-2 tread, part of the Custom Flo Grip line, which spreads machine weight across a wider footprint to help prevent sinking and damage. "With the Custom Flo Grip, this is a self-cleaning tread action promoted by 45° tread lug angles. It's ideally positioned for applications where there are heavy, wet soil conditions," explains Scott.

"Custom Flo Grip brings the best of both worlds in terms of flotation and traction, as well as smooth roading."

For one Goodyear Farm Tires customer, the LSW technology has been 'game changing'. Running a combination of LSW1250/35R46 on the rear and LSW1000/45R32 on the front of the farm's largest tractor, James Peck of P.X. Farms says it's all about minimising compaction and subsequent yield loss.

"We're working with controlled traffic farming (CTF) and want to run 12m-wide drilling equipment, hence we require a big horsepower tractor. But to tread lightly, this meant



Opening up options

With LSW technology, suddenly a heavy tractor can essentially be lighter and more multipurpose across the farm, notes James Peck (L), pictured with Scott Sloan (R). *Picture: P.X. Farms.*

finding a manufacturer that could produce wide tyres," he explains.

"With LSW, suddenly it meant a heavy tractor could essentially be lighter and more multipurpose across the farm. We use a tine drill to minimise disturbance in wetter conditions, and these tyres allow us to achieve that goal."

For James, the point of CTF is to reduce compaction across the farming area, which he believes is directly equating to improved margins. "It's a complete game-changer; we have full confidence in this technology," he concludes. ●

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WITH ANDREW WILSON

Talking TATIES

Anyone sick of irrigators and irrigating yet?

“Our irrigators have tested my patience this time, enough to force a rethink about how we do things here. We’ve adapted over time and will continue to do so, but growing root crops without water looks increasingly unviable, so we’ll have a review of the situation this winter in an attempt to ease the pain a bit.

A look back is often helpful to identify the way forward. When I left school in the 1990s we were ploughing muck down pre-Christmas, burying it in what became a pretty useless anaerobic layer beneath the finished bed. We’d then drag it a few times with the then-industry-standard Bomford superflow, ridge, bedtill a couple of times, sieve it down fine with an old web destoner and plant the crop. It’d then receive water in 25-30mm doses as often as we could, with inevitable ponding in the low spots. Slow, expensive if we put today’s costs to yesterday’s methods, and somewhat compromised regarding getting the best from the muck or the water, maximising the crop or enhancing weather resilience.

After tweaking and experimenting over the years things are different now. Cover crops stepped us forward 15 years ago, and on some farms have transformed the soil health from an almost barren, metallic smelling medium to something that can actually produce a meaningful crop.

It’s not just cover crops alone though. Muck – be it from pigs,

cattle or broilers – strategic variety choices, row damming via a tractor with bespoke wheels, lower irrigation doses in cooler weather, or a high capacity star-based destoner with underweb running at a courser grade than before, all feature. But the most significant change came in 2012, which was as near to a polar opposite season to the present as far as rainfall goes.

We pulled a drag through what was a mucked cover crop stubble in an attempt to get it dry enough to plough; it was quite effective. What we later found was physical organic matter in the planted rows which retained moisture yet allowed percolation, less row slumping than normal, less cracking and greens, and easier harvesting in what was bodied land. The superflow was eventually replaced with a Simba TL, but the practice remains our standard start to operations. Bedtilling is less than a quarter of what we did in time gone by, which reduces the expense and enhances soil life in equal measure.

This year has seen us tweak how we use muck, dive back into the world of drip irrigation, and try a different approach to biostimulants – measuring the magic will be interesting in a few weeks’ time.

Across all of our crops my cultivation strategy is as little as possible but as much as necessary. Admittedly, we can lean too far towards the former, but compared with my teenage years of flat-out in second gear power harrowing clods round after ploughing slumped setaside in August, we’re moving in the right direction.

I find cultivation diversity is as important as cropping diversity. One fixed system isn’t unlike a continuous run of

any one crop – effectiveness invariably reduces as time passes. In a dry summer like the current, we can see parallel cracks in fields that have had a few years of the same operations, which can create problems of runoff, inaccurate sowing depths and reduced grassweed control if we don’t pay attention.

Appreciably, almost everything is cracked this year, but some are in a random mosaic pattern, whereas others are more of a created grid formation. Our land types, cropping and systems – coupled with normal rainfall (whatever that is) – don’t easily lend themselves to a no-till system, although direct drilling is sometimes a rotational option.

I also think cultivation timing has become just as important as the type of soil movement. The plough still has a strategic place here, but is no more or less of a tool in the box than the strip-till drill. Fundamentally, we want to give our crops the best establishment and chance to thrive, and being evangelical about a particular system would invariably set us up for compromise and disappointment.

Muck has always played an important part across our heavy and light land rotations, and I’m pleased to report that the resulting improved workability of soil, water retention, percolation and nutrient delivery is still bearing fruit. Our combinable yields thus far are better than anticipated, with winter barley a good 5% above our five-year average. Wheat has varied according to rotation slot, with that planted after potatoes doing much better than those fields after oats. Wheat preceded by beans

is still to cut, and at the time of writing, the pea vinerers have just finished harvesting our inaugural pea crop. I’m taking so far unripe crops as a positive – my farmer optimism is saying that they’re still putting on yield!

You’ll notice I’ve not majored on the state of our drought-stricken and stressed-out root crops this month? I figured you didn’t need reminding of what looks like a break-even season at best, any more than I wanted to write about it. Physiological age of our crops is going to be high given the day degrees accumulated recently, so it’s vital we look after what we have as best as we can. There doesn’t look like there’ll be surpluses this time next year, and every penny is going to count to stop the minus signs being too prominent in the accounts for 2026.

As for the beet and its prospects for the future, well, that’s a subject for another time. For now, I’ll bask in the joy of another year of rest for the dryer, a few decent cereal yields and a well-behaved combine... and try to ignore limp-leaved root crops and stropy irrigators! ●

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

Protecting beds for beet



“Once moisture has gone you simply can’t get it back, so less can be more when it comes to cultivations.”

STEPHEN ALDIS

Fast establishment and quick, early growth are critical to maximise sugar beet yields, however the process to produce a perfect seedbed should start in the autumn. *CPM* digs deep to assess best practice.

By Mike Saull

While the principles for securing a good sugar beet crop are well recognised, the many routes to get there can be increasingly varied. And while the aim is often to secure peak yields, the future performance of other crops shouldn’t be neglected through compromising soil health along the way.

Established beet growers will understand that if weather and soil conditions are favourable the crop should be drilled in early March; every week delayed past mid-April can cut yields by four adjusted t/ha. But, while growers may have the kit and capabilities to cover ground quickly and effectively, how should they go

about it without knocking the soil back and incurring unnecessary costs?

PATIENCE AND PLANNING

According to BBRO, regardless of establishment method, advice is to pay close attention to soil condition and adapt management to maximise performance. It’s a process that requires patience, planning and careful management tailored for every field, says Georgina Barratt, BBRO head of crop production.

“Soil conditioning should start in the autumn as soon as the previous crop has been harvested. Research confirms a range of benefits from using cover crops – particularly on lighter land – to improve soil structure, reduce erosion, and hold



Timing is key

Aim for complete destruction of cover crops at least six weeks before drilling, advises BBRO’s Georgina Barratt.



Strong foundations

Tillage should set a good foundation for the crop to avoid battling against a poor start, urges BBRO's Stephen Aldis.

nutrients overwinter," she continues.

"Surveys suggest around 60% of all beet producers now employ cover crops and that these are delivering soil health improvements as well as nutritional benefits to a crop that requires most of its nitrogen early."

However, this involves picking mixes that'll establish well – considering soil type and condition, and drill date and method. "Mixes comprising two or three species will often give the best balance of delivering a range of soil health benefits while not costing too much. Get them drilled in August or September; the earlier the better to utilise the warm growing period.

"Early destruction – typically in late winter or early spring – is crucial to prevent the cover crop from drawing vital moisture and nutrients out of the soil that could be of value to the beet seed once drilled.

"But be aware that they can also provide a green bridge for aphids and

virus yellows in the following beet crop, so aim for complete destruction at least six weeks before drilling. In this respect, don't worry about applying glyphosate in the cooler conditions at this time of year as it soon takes hold when conditions warm up, and be sure to keep to recommended rates," she explains.

Of all the different cover crop species options that are available, she believes clover is one of the most difficult to kill. Her advice is to consider using Kyleo (2-4-D+ glyphosate) and once this has been given time to work, using mechanical destruction if green matter is still apparent.

"I've seen people pull clover out and leave it on the surface only for it to drop roots and sprout again," she highlights. "The same herbicide choice should be used on big and bulky cover crops."

MAINTAIN RATES

Trial results suggest a residual nutritional benefit from a cover crop,

Getting more from every kilo of nitrogen

Although understanding soil health is the first step, making the most of that knowledge ultimately comes down to nutrient management

While there's a tendency to think of nutrient benefits on a per-nutrient basis, achieving the greatest return relies on understanding how they work together. According to Toby Ward, nutrition agronomist at Origin Soil Nutrition, nitrogen and potassium provide a good example of why nutrient interactions shouldn't be overlooked.

"Nitrogen remains the main driver for yield, but its availability to the crop relies on adequate quantities of other nutrients," he explains. "There's a direct cellular relationship between nitrogen and potassium that has to be maintained."

Where soil potassium levels are inadequate, the crop's ability to take up and utilise nitrogen is compromised, meaning a proportion of applied nitrogen is effectively wasted.

"Good long-term soil potassium levels allow new applications of nitrogen to move throughout the rooting zone," says Toby. "If potassium is deficient, the crop simply can't make the most

of the nitrogen that's been applied."

Following another dry growing season, many growers are expected to bale straw, increasing the amount of potassium removed from fields. Toby says that makes post-harvest soil testing particularly important, rather than assuming nutrient reserves remain adequate.

"Testing soils after harvest will highlight any deficiencies," he says. "Where potassium levels are insufficient, growers could consider reducing nitrogen applications slightly to create headroom for potassium, which is currently less exposed to market volatility while delivering wider agronomic benefits."

The interaction extends beyond nutrient uptake alone. Potassium plays a central role in regulating photosynthesis, water movement and the transport of sugars through the plant, while nitrogen drives cell division and expansion, increasing the crop's demand for water.

"The crop's response to potassium



Good long-term soil potassium levels allow new applications of nitrogen to move throughout the rooting zone, says Origin Soil Nutrition's Toby Ward.

isn't always as obvious as it is with nitrogen," adds Toby. "But maintaining adequate soil potassium improves drought resilience because it allows the crop to use water more efficiently and withstand periods of stress for longer."

The point is reinforced by the Potash Development Association, which reports that the shoots of a well-fertilised cereal crop can contain between 10-15t/ha more water than a crop where nitrogen is limiting, highlighting the importance of maintaining potassium levels alongside nitrogen to maximise both nutrient use efficiency and crop resilience.

but this varies greatly. As a result, Georgina recommends maintaining normal sugar beet nitrogen rates for the first N application after the cover crop. “Early nitrogen is important to boost canopy production and the first application – typically just ahead of the final cultivation – should apply the largest amount of the nutrient without compromise,” she maintains.

“Soil analyses – from samples taken before the first nitrogen was applied – can give an indication of residual nitrogen allowing growers to potentially adjust rates, but often these arrive too late to influence decisions particularly for the first application.”

BBRO’s Stephen Aldis adds that while sugar beet gives an ideal opportunity to carry out remedial cultivations ahead of drilling, only do so when required, and then only carry out what’s necessary. He says it’s also important to check with a spade to ensure the desired results are being achieved, and adjust loosening operations if not.

“Subsoiling or cultivating prior to the cover crop can take out any pans or general compaction with the bonus that the following cover crop roots will help to stabilise the soil. This way you can boost good drainage and structure for a crop that can root deeply and vigorously.”

He stresses that understanding how to destroy cover crops and manage residues is an important step before going down this road, and there’s no doubt that the process is easier on lighter soils allowing for more varied, multiple tillage approaches in the spring.

SELECTING THE DEPTH

Furthermore, ploughing is a common primary cultivation method on light land to bury residues, but it’s important to ensure this doesn’t compromise the seedbed, he says. “Adjust plough depth to suit the situation and go as shallow as possible to achieve the desired result. There’s no point in compromising soil that’s in a good stable condition at greater depths or moving soil unnecessarily,” comments Stephen.

“Spring ploughing isn’t an option for everyone though, given the risk of smearing and compaction on heavier soils which can then dry out quickly leaving growers struggling to work a seedbed that retains enough moisture to drill into.

“Where growers do want to invert heavier soils, most will typically plough and possibly press early,



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Secondary cultivations should ideally achieve the desired seedbed from just one pass.

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- and let the weather do some of the work over the winter.”

He notes that UK winters aren't always cold enough to produce a decent frost tilth. “Tillage should set a good foundation for the crop and you don't want to battle against a poor start. In this respect, get the drill operator to sit with your harvest operator in the autumn to find out exactly how they'd like the crop laid out for ease of lifting.

“While growers and operators are always conscious of achieving a good seedbed with regard to aggregate size and soil moisture retention, it's also important to achieve a level finish to aid the harvesting process.

“Although the size of harvesters and their 3m lifting unit may appear to provide a very stable platform, a level field is still required to ensure maximum recovery of beet for the factory and efficient running of the harvester. Recognising these aims creates a focus at cultivation time, and more precise drilling is important to ease the harvest process.”

MOISTURE PRESERVATION

According to Stephen, the key to spring establishment is moisture conservation, meaning only doing what's necessary, as late as possible, and just ahead of the drill. “Conserving seedbed moisture is becoming a constant battle in increasingly dry springs,” he adds.

“The problem is that once moisture has gone, you simply can't get it back, so less can be more when it comes to cultivations. 2026 has proven once again that we can't rely on rain in March and April for the moisture we require to germinate seed drilled into dry seedbeds.”

As such, Stephen's view is that growers should be more strategic in the way seedbeds are created. Secondary cultivations in the spring should ideally achieve the desired seedbed from just one pass, helping to retain moisture and limiting compaction from additional wheelings, he says.

“Combination harrows are always popular on farm, and the key is to tailor the type to the situation. If you always require two operations with what you have in the shed, maybe it's time to look at an alternative that can provide the seedbed in one pass?

“Discs are useful, particularly when



Setting up for the future

According to BBRO's Stephen Aldis, more precise drilling is important to ease the harvest process.

copied with cover crops or high levels of crop residues from the previous crop, but take care not to smear soils in wetter conditions and ensure they move the whole width of the soil profile while leaving a level finish for harvesting.”

He adds that power harrows may be required when conditions aren't optimum, most notably in a challenging spring. “While they're often seen as a cultivation of last resort, one pass with a power harrow may be better than four with another cultivator.

“An increasing number of growers are now using strip or minimum tillage to establish their beet crops, but they have to be aware that these

systems can require a lot of learning and adaption on farm, so starting with a small area would be a wise choice.”

Equally, it's important to consider the whole approach

from start to finish as changes in machinery and practices may be required to effectively implement any change in system. The most obvious of these could be a replacement drill, with much more choice now available on the market, he says.

“Many of the drills now being used for beet were originally designed for the maize crop and feature a larger number of potential adjustments. While this can be very beneficial in reduced tillage systems, it does open the door for error.

“For example, larger drills can place seed deeper than is required for the

beet crop and excessive ‘down force’ can result in sidewall compaction, with the force transferred through the side depth wheels rather than the discs or coulters, potentially creating a zone of compaction around the seed. That's exactly where we don't want it,” he warns.

There's no doubt that moisture conservation has been a recurring theme during the past six years, adds Stephen. “How you deal with it has to be tailored accordingly, particularly with regard to drilling depth; have a plan and look at each operation on an individual field level based on thorough soil assessment.

“Ideally, drill depth should be around 2.5-3cm, but if moisture isn't available, then consider going that little bit deeper up to 5cm depth.

“The ultimate aim is to establish a uniform population of 100,000 established plants/ha across every single part of the field, and to get these to meet in the rows as quickly as possible – parochially by the time of whatever county show is on your doorstep.

“Once the crop is established, do your own plant counts from different areas to check which approach has given the best populations. Counts carried out in rows, in the wheelings and on the headlands, are just as important as those in the better structured areas. These will confirm whether what you've done has worked effectively, and help to identify potential areas for improvement for the future beet crop,” concludes Stephen. ●

“I've seen people pull clover out and leave it on the surface only for it to drop roots and sprout again.”



Using technology to get smart with water

“Having data that shows you where roots are active is incredibly valuable in maximising profitability from the amount of water available.”

PETER WHITE

Technology will play a key role in helping Elveden Farms to use water and fertiliser sustainably in the future, as CPM finds on a tour organised by AgriTechE.

By Mike Abram

A £4.5M investment in a new reservoir is just part of Elveden Farms’ approach to keeping its root crop production sustainable as the pressure on agricultural water and nutrient use continues to increase.

The government’s *National Framework for Water Resources 2025* makes it clear that agriculture will be expected to improve efficiency, develop more resilient local supplies and, in some catchments, prepare for the possibility of reduced abstraction where current use is judged unsustainable.

Nutrients use is heading in the same direction. The Environment Agency’s latest assessment of agriculture’s impact on water emphasises the need

for tighter nutrient management, better soil stewardship and more targeted use of technology to reduce losses while maintaining productive farming systems.

LESS WATER

Those policy drivers haven’t been lost on Elveden Farms’ senior farm manager Nick Scantlebury. “We know the Environment Agency is wanting to take water away from agriculture, and we feel they’ll be reducing our groundwater sources. Reductions could be anywhere from 5-20% by 2030,” he suggests. “So we have to do the same job, or probably a better job, with less water in future.”

That’s likely to see further shifts



Long-term strategy

Elveden Farms has worked to improve its water management for the best part of 30 years, notes senior farm manager, Nick Scantlebury.

► towards switching poorer performing land into environmental stewardship schemes or other sources of income, while getting the same tonnage of produce from a smaller area, using fewer inputs in terms of water, fertiliser and sprays, he adds.

However, it's certainly not a new goal – Elveden has worked to improve its water management for the best part of 30 years, notes Nick, but the developments in collecting, analysing and using data for decision making is opening new opportunities for further improvements.

The farm currently uses around 42 litres of water to produce 1kg of potatoes across its 550ha of production, with each hectare typically receiving around 250mm of irrigation in a season depending on rainfall.

Quality, then yield, are the key drivers for irrigation use, highlights Nick. On the packing side, both salad and main crop potatoes are irrigated for scab control to achieve a clean skin finish, while on the processing side irrigation is used, but slightly less intensively, to

ensure the product McCain receives is consistent in shape and size.

While checking with a fork remains crucial, Nick uses at least one probe per veg crop field installed by Soil Moisture Sense, together with a secondary check on designated fields using the irrigation scheduling decision support model developed by Mark Stalham Potato Consultancy, to drive decision making.

UNDISTURBED

Soil Moisture Sense's probes have six sensors spaced at 10cm intervals on a 60cm moisture probe, starting at a 5cm depth.

Unlike many other probes, installation doesn't disturb soil, with a hole drilled with a tapered auger for the similarly tapered probe to

be pushed into, explains Tim Blyth, director of Soil Moisture Sense.

"We're then reading exactly the same soil structure as the rest of the field," he comments. "So we can be confident that when water is coming in from the top, it'll be behaving the same as elsewhere in the field."

Connected to a solar-powered

data transmission unit, alongside a rain gauge, data is sent to the cloud and relayed to growers via the firm's IrriMAX Live app in a range of near real-time graphs.

The sensors assist growers in understanding water use in several ways, including helping to measure how much water the crop is using each day, explains Tim. "There's a staircase effect in the data that's day and nighttime water use by the plant. The flatter spot is during the night when there's minimal water use, and then a drop during the day when the crop is photosynthesising.

"This allows growers to quantify daily water use and gauge how many days remain before irrigation is required."

With sensors at multiple depths, the data also shows where roots are actively taking up water. By summing those layers together, growers can track total available water in the main rooting zone and aim to irrigate only to the depth where roots are extracting water, refilling the moisture deficit without over-watering deeper layers.

"If you're pushing water deeper, which you can see by spikes in the data, you might be wasting water and possibly washing nutrients through the profile," says Tim.

"Is it better to irrigate with less water but more often, or bigger volumes, less often?"

Does drip irrigation fit at Elveden?

Drip irrigation could be a tactical solution for awkward field sections that are difficult to irrigate with traditional kit

According to Andrew Howseman of Drip UK, benefits include typical 30-40% water savings plus improved fuel economy – consuming 5-6 litres of diesel per hour to irrigate 40ha.

"Potatoes on marginal land really respond to drip," he says. "My experience is that drip evens up the water through the soil profile better, so the drier areas get more water and produce a better yield. I believe you can lift a 30-35t/ha crop to 42-45t/ha, which is where you get a better overall yield and a better result."

Elveden is trialling drip irrigation technology on a relatively small area of sloping field that farm manager Nick Scantlebury wasn't sure whether to plant because of difficulty irrigating.

"I said let's irrigate in a different way. Drip will stop us flooding the area at the bottom of the hill when irrigating, and for other operations we're only wetting when we need to," explains Nick.

Drip also lowers risk from fungal diseases by keeping the canopy dry, he notes, while fertiliser could be potentially applied through the system too.

Of course, infrastructure costs are a consideration with the technology, but Andrew suggests the economic sweet spot is for around 32ha.



Key benefits

In Andrew Howseman's experience, drip irrigation evens up the water through the soil profile, so the drier areas get more water and produce a better yield.

Maximising rooting depth through effective cultivations is critical to making best use of water, adds Soil Moisture Sense director, Peter White. "If poor cultivations restrict maximum rooting depth, plants could be missing out on an extra 40-50mm of water, which will make an enormous difference to yield," he comments.

"Having data that shows you where roots are active is incredibly valuable in maximising profitability from the amount of water available."

VALUABLE INSIGHTS

Other information the probes provide includes how much water was actually applied and whether it entered the soil profile, giving an early warning when water isn't penetrating the soil as expected, as can happen in hydrophobic or very dry sands.

But while the probes are an integral part of how Elveden currently manages irrigation on the farm, Nick is testing whether more data can help to make smarter decisions and help save water through a Defra-funded ADOPT project.

Currently in most fields, a single probe is sited in the first irrigation run, explains Nick says. If it rains while the field is being irrigated, that probe will say the field is saturated, while in another part of the field there won't be any accurate data for where irrigation was stopped prior to application after the rain.

"We're not necessarily turning the irrigator back on very accurately," he says. "But if we had probes in every run, you might be able to make better decisions."

At a cost of around £1200-1400 to buy the probe, plus £200/yr/probe subscription fee, that probably won't be feasible commercially, but Nick is keen to see what benefits there are from splitting fields into smaller management zones in the ADOPT trial, and whether variable irrigation across the field is practical and worthwhile.

To test that, the two-year project splits a potato field into eight runs or zones, with 14 soil moisture probes sited at strategic points. With at least one probe in each run, Nick is using a combination of the data from the probes and information from Mark Stalham's irrigation scheduling model to determine when and how much to irrigate.

"If run one needs 20mm and

run four needs 25mm, we can do that, rather than just use data from a single probe," says Nick. "We're trying to manage the crop evenly to get a more consistent product."

In addition, Nick is experimenting with when to apply, with the northern half of the field receiving irrigation during the day, and the southern half at night.

A similar trial is also running in onions on the farm, he adds. "We don't have quite as good a handle on the soil moisture deficit trigger point for when to irrigate in onions as in potatoes, so we're looking at irrigating one run when it reaches 15mm deficit, another with 20mm, and third with 25mm deficit."



Moisture sensors

The Soil Moisture Sense technology assists growers in understanding water use in several ways, including helping to measure how much the crop is using each day, explains the firm's Tim Blyth.



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- “Is it better to irrigate with less water but more often, or bigger volumes, less often? And will that limit stress in the onion crop?” he questions. Success will then be measured through yield and quality, with each area harvested separately.

But it's not just water where Elveden is using technology to help improve efficiency – it's also experimenting with sensors that track nitrates and help with decision making about when crops require applications, highlights Nick.

JUSTIFICATION

In onions, there's often a period mid-season where visually crops look hungry, and experience suggests applying more nitrogen, notes Nick. “But with more variable seasons, I thought we required more data to back up applying nitrogen and how much.”

That led him to getting in touch with Paul-Tech, which has built a soil nitrate station that's placed in a representative part of a field. Using two or three probes, it measures plant-available nitrate at typical depths of 8cm, 20-25cm and 40-50cm, according to the firm's Rob Vanhoucke.

The system overlays weather modelling and satellite imagery with soil data to calculate how the crop is using nitrogen. “It helps you to understand at each layer where the probes are, what's happening with applied nitrogen. When is it being released? When is the plant using it? Is it leaching through the profile?”

Having tested this in various crops, Nick says the sensors are able to detect nitrogen applications, as long as there's moisture. As with crop nitrogen uptake, applied fertiliser requires soil moisture to dissolve and become available to plants, so changes in nitrate levels are slower to appear in very dry conditions.

“If the soil is really dry, it's challenging for it to pick up nitrogen applications, but in moist situations, it reacts very quickly,” he adds.

That simple finding has focused Nick into trying to apply nitrogen ahead of irrigation to help make it available as quickly as possible. “It's about planning our operations to make that happen, because if it's dry and the irrigator isn't coming for seven days after we spin fertiliser on, we've lost seven days.”

The sensors are also helping Nick to compare a little and often



Nitrate station

Paul-Tech has built a soil nitrate station that's placed in a representative part of a field.

approach to nitrogen applications in onions compared with the standard regime. “Onions are lazy rooters and want everything given to them as close to the surface as possible.”

Standard practice is to apply 120kgN/ha in four doses through the season, but a trial last year suggested a more extreme little and often approach could potentially save nitrogen at the end of the season.

That's led to a trial this year where standard practice will be compared with 90 or 120kgN/ha split into eight applications to

investigate more closely whether that finding can be repeated.

“I'm not sure my fertiliser spreader driver will like me if I double the number of applications across 550ha, but we have to test the theory with nitrogen at £500/t. Obviously fuel costs have to be taken into account, but if we can save money on nitrogen it will add up pretty quickly,” he concludes.

Information for this article was gathered at AgriTechE's Soils and Water Management day held at Elveden Farms. ●

LASTWORD



WITH JANINE ADAMSON

Stop the bots

gadgets, these things inevitably become abused. I feel AI is at risk of being in that category. It'll be over-used to the point of becoming fatigued, when really, its core purpose could be very useful to society.

Why is it in our human nature to do this? Why can't we be more measured and pragmatic, rather than pile in with herd mentality? I'm not sure I can answer that one.

At times, I've been guilty of being swept along with a fad or trend, not that I believe AI is a flash-in-the-pan necessarily. Does anyone remember Beanie Babies? The little cuddly soft toys that society was conned into believing would become our future fortunes? Guilty – I have a box full of those in storage gathering dust. Still, very cute mind, and if anyone has a Brownie the bear lying around, you know my email...

Equally, I have some questionable tattoos from earlier seasons in my life; I've binged a viral Netflix series like the next person; yes I've tried Dubai-style pistachio

chocolate (what was the point of that?). However, no, I will not use ChatGPT to generate 'creativity' on my personal behalf.

I'm so proud to say that our cover image this month was taken by an actual person, featuring a real person, real soil and real sky. The only time I've used AI on a cover of *CPM* was to 'cajole' two worms to form a heart shape back in August 2024. I'll hold my hands up on that one, but the text and everything else was human, and the inside certainly was.

Now, there are instances where I appear to be unwittingly using AI, oh noes! That's because if we're honest with ourselves, even spell-check in software such as Word is AI-driven. So too is the transcription for the voicemail on my mobile phone... it's literally everywhere. My beef is where it's impinging on personality, whether that's for an individual, brand or other.

There's a popular song by Groove Armada that seems appropriate to quote: 'If

everybody looked the same, we'd get tired of looking at each other...' – yep, give Andy Cato another 50p. Anyway, isn't that the joy of being human? We all bring our own level of sparkle to the farm party. Last time I checked, I don't think bots can quite do dry sarcasm like us real folks.

So let's keep the uniqueness going strong, the dodgy MS Paint-style graphics, the cut-and-shut Photoshopping. If nothing else, it'll make this cynical girl smile. ●

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.

“It seems AI-generated posters and social media content continue to plague me. Every corner I turn, 'our bro' ChatGPT is there. Even my beloved Pilates teacher is using it; love you, India. In fact, seeing such content turns me off – I'll make it my mission to NOT go to the event or pay any attention to the messages being conveyed. So if it wasn't for already enduring India's excellent pain for gain sessions and sunshine personality, I'd be skipping by.

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