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In this issue...

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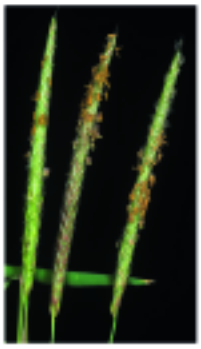
Aclonifen Effect

What is the Aclonifen Effect?

Aclonifen (contained in Proclus) is a new mode of action for grass-weed control in cereals. When aclonifen is applied in conjunction with flufenacet and diflufenican (contained in Liberator) you benefit from three different modes of action working on different parts of the plant cell. This powerful combination maximises control of grass-weeds, including difficult to manage rye-grass.



Black-grass

Rye-grass

Brome

How do Liberator and Proclus work together?

Liberator and Proclus are applied in tank mix at pre-emergence (ideally within 48 hours of drilling).

Aclonifen and diflufenican produce a stable film on the soil surface, where they are taken up by emerging leaves and stems of target weeds.

Flufenacet is more mobile and moves down the soil profile where it is mostly taken up by the roots of deeper-emerging weeds. In trials, Liberator and Proclus have shown to improve grass-weed control, with up to 10% increase in control of black-grass, and 37% increase in control of rye-grass, over straight Liberator.

"Aclonifen has been a real game-changer on my farm"

Ben Binder, 800ha arable grower in Kent

What is the advantage of three modes of action?

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Discover the Aclonifen Effect with Liberator and Proclus

For excellent control of black-grass, rye-grass and brome species with the confidence of a robust herbicide resistance management strategy.

Volume 24 Number 6
June 2022

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Editor's pick

One of best things about being an agricultural journalist is the inspiring people you meet. This month didn't disappoint when I sat down with the Cherry family to learn more about the journey that led to them to put on Groundswell (page 68). If you'd like to tell stories like this then don't miss the opportunity to be mentored by the *CPM* team as we Search for a Star (page 76).

With yellow rust the disease to be reckoned with this spring, Theory to Field looks at the work that's going on to find resistance that is more durable to help breeder's create varieties that feed the boom-bust cycle we're currently seeing (page 12). We also get views from the field on how cereal crops are faring (page 8).

June is the month to look at varieties old and new as cropping decisions for the autumn are contemplated. We profile Mayflower, the disease resistant wheat with good quality traits (page 18), and Typhoon, which stands out as offering something a little different to the rest (page 24).

We also feature the crop we all love to hate. Even as oilseed prices rise to very attractive levels, mitigating the risk associated with growing the crop is probably more important than ever. Variety selection has a part to play here (page 51) and we learn how a Scottish farmer is unlocking the secrets of building yield potential in the notoriously variable crop (page 34).

For those growing pulses, there's a fascinating look at a PGRO project investigating how insect pests can be managed without insecticides. It highlights how the nature-friendly farming measures employed on *CPM* columnist Martin Lines' farm are helping protect his bean crops (page 38).

Mike Abram made the most of an opportunity to sit down with Canadian cover crop pioneer Blake Vince when he was in the UK earlier this spring. You can read what he had to say on page 59.

If you're a Fastrac fan then you may be excited to read about how the new upgrades will benefit the operator, with a shiny new refit to the cab (page 85). We also report the highlights from LAMMA (page 92) which took place in Birmingham last month, having temporarily moved from its normal January date due to the COVID restrictions in place earlier this year.

For those looking at telehandlers, there's a definite trend towards more compact models among the new releases (page 80) and an electric machine makes its debut.

Our Opinion pieces are poignant this month, with Guy Smith paying tribute to Caroline Drummond, an incredible lady and force for nature whose work at LEAF inspired many to adopt change on their farms.

Andrew Wilson is back this month after tragically losing Malc, his right-hand man and friend. How he's found the time to write his column this month after clocking up 500 hours in just four weeks during potato planting, I'll never know, but it's testimony to the hard graft that goes into farming. Yet root crop growers are facing a tight squeeze as input costs rise and, unlike in combinable crops, there's little sign of increased produce prices. As an agronomist said to me this week — why are we grovelling around looking for aphids in a crop which needs to produce 10 tonnes to match the value of a tonne of barley? Food for thought…

I hope you enjoy reading the June issue of *CPM* as much as I've enjoyed putting it together.

In this issue

Opinion

Technical

Sustainable farming

Machinery

Roots

smith's soapbox

by Guy Smith

Caroline Drummond RIP

In my last piece I paid tribute to Henry Plumb who died in April. A crumb of comfort in the news of Henry's death was that we were lucky to have had him until the grand age of 96 in remarkably good health. I'm very keen not to turn this column into a regular obituary piece but this month I feel I must make mention of Caroline Drummond who passed away in May. In contrast to Henry, Caroline was taken from us much too young. Her death was one of those devastating bits of news that stopped me in my tracks.

I knew Caroline and worked with her on a number of projects for many years. I remember in particular the LEAF 'Speak Out' initiative from twenty years ago. It came on the back of the dark days of BSE and the Foot and Mouth pandemic, when British agriculture was at a PR low with the green lobby turning all its guns on farming and accusing it of every environmental vice imaginable.

'Speak Out' encouraged farmers to be more proactive when it came to positive communication with the non-farming public. It was about showcasing the good work farmers do when it comes to looking after the countryside and looking after livestock. I like to think 'Speak Out' helped the industry turn a corner rather than continue to watch like rabbits in headlights as its reputation headed for the shredder.

As an initiative 'Speak Out' was typically Caroline — relentlessly positive and always good fun. I'll miss Caroline dearly as will many others in the industry. The collective remorse is understandably palpable but while we didn't have her for nearly long enough, it's time to remember how she was such a force for good that we all benefitted from.

From GM 2002 to GE 2022

The question is whether gene editing is in the same place as GM was 20 years ago. The key difference is that with GE you move genes around in the plant, with GM you introduce genes from other species.

Our government seem convinced this puts GE in a different category to GM, thereby we have a policy acceptance it justifies a supportive regulatory environment to help it take root as a technology in the UK. Twenty years ago I couldn't see much wrong with GM, and that personal view is possibly vindicated by the proliferation of GM crops over billions of hectares around the world without any of the doomsday scenarios and scare stories being thrown around in the early 2000s proving in any way credible.

But crucially what GM never got was consumer confidence. While consumers are happy to wear the GM cotton or eat the meat from livestock fed imported GM protein, the rubicon few wanted to cross was actually directly eating the produce of GM crops. That fact stuck in the consumer claw. Twenty years on, we still don't grow GM crops in the UK, even if we do import them by the Panamax boatload to feed to British livestock or to purchase for our cotton underwear and luxury bed linen.

So even if the UK government is keen to allow GE technology to thrive on our farms, for me the jury is still out when it comes to the commercialisation of GE crops. The brutal reality is that as farmers, we can't just expect consumers to buy what we want to grow. It's more a case of having to grow what consumers want to buy, no matter how irrational or prejudiced those consumer preferences and buying habits might be.

Having said that, I suspect it's actually the retailers who hold the key that will unlock the GE genie from its laboratory bottle. If they are prepared to stick it on their shelves without too much red warning labelling then I suspect their customers will buy it, especially if it comes with some sort of taste or nutritional benefit. But that's a decision the grocers have yet to make. Until then it's watch that space.

Caroline created ripples that are turning into waves. The whole of UK agriculture owes an enormous debt of gratitude for that. Few create change in their lifetime.

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.

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> *"I'm seeing more disease where there are sprayer overlaps than misses, which makes me think that the yellow rust has taken advantage of a stressed crop."*

Cereal disease

Time will tell

Cereal crops started the spring looking 'full of promise', at the T1 timing there was 'all to play for' and as T2 fungicides are rounded off, it's a case of 'time will tell' as the dry weather continues. *CPM* reports.

By Lucy de la Pasture

The one thing about farming is that no season is ever the same. Earlier this year crop development seemed more the norm compared with last spring's slow start, but by the third week of May many wheat crops already had ears emerged and a few were even flowering.

"Crops are around two weeks ahead here, having moved through the growth stages quickly since T1s were applied. It's been an interesting season," says Andrew Wells, Arable Alliance agronomist and part time farm manager based in Nottinghamshire.

Although the showers trickling in from the West through the middle part of May have helped, Andrew says crops are on a knife-edge because it's been so dry. "February was the only month this year we've had above average rainfall, other than that it's been incredibly dry. If we have a hot week then it may tip the light land crops over the edge but, for now, showers are keeping crops hanging on."

The ongoing dry weather has also had an effect on spring planted crops. "Spring barley hasn't tillered as much as it would normally which means we'll be short on ear numbers, and number of ears equates to yield," he says.

Uncontrollable factors

But all isn't doom and gloom because grain prices are good, he adds. "I'm not keen on forward selling any of my own grain as I think the weather will still play games with us and influence the market. Europe is hot and dry too."

All in all, Andrew believes things have gone as well as they can in a season where lots of factors are uncontrollable. "Nutrient uptake has been lacking because of the dry weather, particularly in spring crops. Fungicide timings have been good, with no extended spray intervals so this harvest isn't going to be a disaster because there's a good margin there at current prices, even if the dry weather hits yields."

As far as septoria is concerned it's a case of so far so good, with disease confined to the lower leaves in most varieties. Instead it's yellow rust that's been causing the most concern.

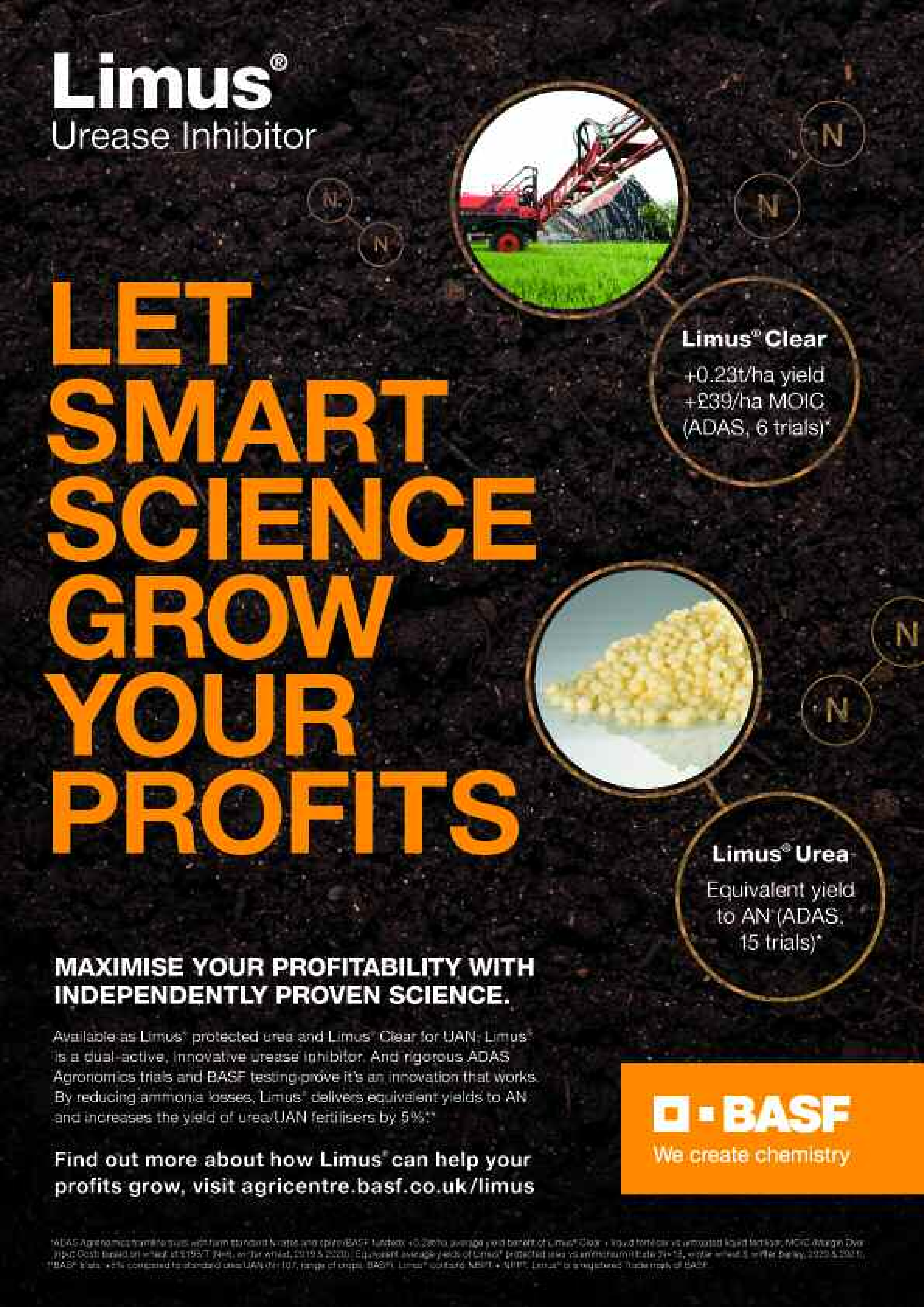
"KWS Zyatt is the worst variety in my area and I've had to apply a T1.5 spray in some places to keep on top of the yellow rust. In general, many crops are the more resistant varieties and even Gleam (rated 5 for yellow rust) seems to be doing okay."

Even though yellow rust has been reported on the highly rated variety KWS Extase (8), Andrew says he hasn't found any on the variety in his locality.

Further south in Hampshire, AICC member Nick Wall of Crop Management Partners, describes the spring as 'rapid'. "It's been dry but we've fared well with rain over the past couple of weeks with approx 38mm (1.5 inches) so far in May. Even though it's dry, we did have some decent rain in early March which has kept crop going. My colleagues in Kent are much drier," he says.

In his area, crops had reached leaf three fully emerged (T1 timing) in mid-April, which is about normal, and then growth sped up with ears emerging in all wheat crops during the third week of May, by which time early drilled Extase was just reaching anthesis. "It's two weeks earlier than usual," he says.

T2s went on mid-May and were hampered slightly by wind and showers. ▸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Crops have been racing through the growth stages during May, with early drilled KWS Extase reaching anthesis by the third week – at least two weeks ahead of the norm, says Nick Wall.

▸ "On average the gap between T1 and T2 was three weeks and where sprays did go on a little late, it was still within a week of rainfall so I'm confident we will have just enough 'kick back' control from the fungicide."

Nick has chosen to be a little more robust with his fungicide approach, with memories of last year still fresh in his mind when late rainfall caused a septoria resurgence that took a toll on some crops.

He notes leaves four and five as being quite dirty in some varieties, especially in early drilled wheat. "The impact of drilling date on disease is particularly visible this season. I have some KWS Firefly in the ground, that was seed carried over from the previous year, but it was late-drilled and it's still clean."

Overnight showers and damp mornings are likely to encourage septoria and Nick says that in early drilled crops it's beginning to move up the canopy.

Yellow rust is very evident in his area, particularly in Zyatt and Gleam, but also SY Insitor, but it's manageable, he says. "My colleagues in Kent have been chasing yellow rust all season and, on some varieties, they're having to protect each leaf as it emerges. Yellow rust has even been seen in spring barley."

Zyatt has been particularly badly affected and Nick says that yellow rust is making quality wheat production increasingly risky for growers. "Quality wheats are in demand but the resistance ratings for yellow rust in Group 1 varieties — Zyatt (4) and Skyfall (3) — is so poor that it's such a big risk now."

Nick has used a lot of Univoq (fenpicoxamid+ prothioconazole) at T2, which he says seems to have kept yellow rust in check.

Unfortunately Univoq is likely to be remembered this season for some of the problems experienced in spray lines. Andrew says he dodged the Univoq 'bullet' this spring more by circumstance than by design due to supply chain issues. "I've used a lot of Revystar (fluxaproxad+ mefentrifluconazole) at T2, so it'll be a good test of how good it is on yellow rust."

Fellow AICC member Tod Hunnisett has also gone mostly down the Revystar route at T2 because Univoq wasn't guaranteed to be available. "I don't like asking growers to buy up front because it compromises the agronomy if I have to recommend what's already in the spray shed," he says.

Yellow rust in KWS Zyatt has been Tod Hunnisett's biggest bugbear, though his colleagues in Kent are facing even bigger challenges with the disease.

Where Univoq was applied, it wasn't all without problem. "One grower has a 36m sprayer and had to replace all the nylon pistons and 'O' rings at £35 a pop. Every single one," he grimaces.

Rapid pace

Tod's patch extends across the south coast, from Broadstairs in Kent to Shaftesbury in Dorset, and extending north as far as Newbury in Berkshire. He also looks after crops on the Isle of Wight for good measure.

As in other parts of the country, he reports crops as being two weeks ahead of themselves and says most of his winter wheat is having a T2 spray as ears are emerging due to the rapid pace they're going through the later growth stages.

Again it's Zyatt that has the accolade as being the variety with the biggest issue this spring — yellow rust. "Interestingly, I'm seeing more disease where there are sprayer overlaps than misses which makes me think that the yellow rust has taken advantage of a stressed crop. The first fungicide went on with a PGR in horrible conditions earlier this spring so that may have been enough to let disease in," he believes.

Zyatt is a variety which reminds Tod of the variety Rialto, which he says always used to look terrible once the flag leaf was out. In Rialto's case it was due to pollen scorch but in Zyatt it's abiotic spotting that Tod is picking up on flag leaves.

With T2s done and dusted and some crops rapidly heading towards flowering, all three agronomists are turning their thoughts to a T3. Tod says he tends to go heavy early and then pull back on fungicide later if he can. His most likely tank mix will be Oraso Pro (prothioconazole+ tebuconazole) plus Comet (pyraclostrobin).

Andrew Wells says some crops are on a knife edge as it's been so dry this spring.

Nick has room for another SDHI in many programmes so he's considering whether to use Aviator XPro (bixafen+ prothioconazole) to extend septoria protection. That's something to weigh up with the mid-anthesis timing for fusarium/microdochium control, particularly as T2s haven't been on long, he says.

Both Nick and Andrew also look after farms with a regenerative approach and here both report crops as looking very clean.

"In a regen system we're very considered about variety choice and drilling date to reduce the risk from disease. I've picked up fungicide doses to be more in line with conventional farms at T2 this year. Last year the late disease pressure was too much," says Nick.

Andrew has a farm where silicon is being applied to boost the plants own disease protection mechanisms and he reports that at the moment it looks 'pretty okay'. "There's septoria in the bottom of crops and, at the moment, we're on top of yellow rust. But without fungicides, it's a bit like walking a tightrope with no bar and no safety net — it certainly makes you think differently," he says. ■

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Yellowhammer strikes gold

AHDB

from theory to field

> *"Combining genes that have a different biological function is going to be more durable than combining genes with the same function."*

This season, yellow rust is causing some head scratching in the field as it appears in unexpected places. This only serves to highlight the importance of a major research project looking for more durable yellow rust resistance, alongside continued pathogen population monitoring. *CPM* finds out more.

By Adam Clarke

Researchers have been quietly mining the wheat genome for novel yellow rust resistance and they have possibly struck gold, giving breeders a toolbox of markers that can give new wheat varieties durable defence against the disease.

There are three related rust diseases that affect wheat crops across the globe, including yellow rust, brown rust, and stem rust. All can have a devastating impact on yield given suitable conditions.

The former two are common in the UK, but there is just one — namely yellow rust — that's a problem every year, with the UK's temperate maritime climate being perfect for the pathogen's development.

Fungal diseases like yellow rust can be managed in two ways — by growing a resistant variety, or by treating with a rust-active fungicide where appropriate. Wheat breeders have predominantly been using major "R" genes to build plant resistance to the biotrophic disease, but this type of gene is relatively easy for the pathogen to overcome.

Lesley Boyd, research programme leader and yellow rust specialist at NIAB, says that this happens when a genetic mutation occurs in the yellow rust population, so the plant's resistance mechanism is no longer triggered when it attacks.

Resistance failures

These mutations happen in dramatic fashion, as growers have seen over several decades. New races are named after the varieties whose resistance genes failed, with names such as Brigadier, Robigus and, most recently, Warrior all on the unfortunate list.

In her 30 years working with wheat/yellow rust interactions, the Holy Grail has been finding genes that offer more durable resistance, preventing these dramatic cliff-edge failures.

"Durable resistance can be described as resistance that has remained effective for a long period of time in a variety that has been widely used across the wheat area," says Lesley.

There have been several research projects led by NIAB over the years that have aimed to meet grower demand for more durable resistance. One was WAGTAIL, which ran between 2011 and 2015.

Working with breeding partners in the UK, Denmark and Sweden, along with major plant breeding companies, it assembled some 500 different wheat lines popular across northern Europe with the hope of finding resistance to multiple diseases, including yellow rust.

Several genes were found that were contributing to yellow rust resistance and it was thought these genes could be durable, rather than the flash in the pan R-type genes easily bypassed by the pathogen.

This led to a spin off project dubbed Yellowhammer, which looked to confirm the promise of the yellow rust resistance genes discovered in WAGTAIL and add further genetic materials to the selection that plant breeders may be able to utilise.

Casting the net more widely was particularly important at this point due to the massive change in the genetic structure ▸

Lesley Boyd has spent much of her career on the quest to find durable disease resistance and project Yellowhammer may have uncovered how to get there.

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So far, project Yellowhammer has unearthed about 20 different genetic markers of interest.

▸ of the yellow rust population when the Warrior race arrived in Europe from Asia, explains Lesley.

"It prompted us to look again at the sources of resistance in UK and northern European wheat breeding material. The pathogen is always changing, and you need to keep a handle on what resistances are effective against the current population.

"For one individual breeding company, that's expensive and requires too much resource, but if they work as a community, assisted by research institutes like NIAB, it's a way of sharing the burden," says Lesley.

So, what work has been done within Yellowhammer? Initially, another 460 lines were screened in the field by the breeders in several countries. These included the UK, Denmark, Sweden, Germany and Northern France, providing diversity in location and pathogen population.

The same group of wheat lines have also been genotyped using the latest technology, so researchers understand the genetic makeup of each and have marked areas of interest for yellow rust resistance on their threads of DNA, she highlights.

Lesley says once you have the markers, you can then see if a particular wheat line containing a marker matches the phenotypic trait of yellow rust resistance in field and glasshouse tests.

Mining the genome

As the full wheat genome has been sequenced, the team at NIAB are utilising this resource, mining deeper into the genome to determine exactly which genes are responsible for the yellow rust resistance and how they work.

This is important because markers are not always precise in the first instance, she adds. The right gene may be a couple of places up or down the chain of DNA, so being as accurate as possible with markers can make the commercial breeding process more efficient.

"For example, the traditional R-type genes used for yellow rust are easily recognisable from patterns in their protein structure. However, this is the type of resistance wheat breeders want to avoid."

Instead, they are looking for what are known as biologically functional genes, for example peroxidases which are responsible for turning hydrogen peroxide into oxygen, and they too have recognisable protein structures that give their function away, explains Lesley.

This reactive oxygen is an antioxidant which in humans is known to fight diseases like cancer, and in plants it helps fight fungal pathogens. "If we have a marker of interest, we can look closer and if we find a potentially biologically functional gene two or three down the chain, we know it may contribute to a resistant phenotype.

"A more accurate marker for that functional gene can then be made, and double checked to see if it expresses itself in the phenotype," explains Lesley.

So far, the project has unearthed about 20 different markers of interest. It's also building a picture of what other biological functions those pieces of genetic material offer and how they are best combined to offer full resistance to yellow rust, she adds.

Lesley and the team at NIAB have recently harvested glasshouse material containing various combinations of genes from the top 20 yellow rust resistance hits identified in Yellowhammer.

These have been infected with yellow rust and the behaviour of the pathogen will be observed in the presence of the different gene combinations at microscopic level, recording how the pathogen grows and feeds within the leaf, and how many spores it produces.

"The hypothesis is that combining genes that have a different biological function and confer resistance in different ways is going to be more durable than combining genes with the same function. ▸

Research into practice

Given the season, where conditions for yellow rust have been ideal and changes in virulence may have occurred, Limagrain cereal pathologist Rachel Goddard is encouraged by the output of the Yellowhammer project.

She says one of the most interesting aspects of being involved in the project has been the screening of older varieties which were released onto the market 30 years ago.

Results have shown that some varieties which were susceptible to older yellow rust races are now resistant to current UK population of yellow rust and could provide some useful genetic material to stack into varieties within Limagrain's breeding programme.

She is also encouraged by the analysis of micro-phenotyping data and mapping of populations for novel sources of resistance, which is ongoing at NIAB, and this will help build more resilient varieties in the future.

"In the data, different genetic loci associated with resistance can change from year to year and location to location, which really underlines how dynamic the yellow rust population is. It shows the benefit of importance of the project's surveillance and monitoring of varieties over several sites and several seasons, as it can throw up some surprises," says Rachel.

Rachel says the micro-phenotyping is addressing a big question that pops up amongst growers and agronomists each year about seedling and adult plant resistance. Sometimes varieties can be susceptible to yellow rust in the autumn and early spring, before adult resistance kicks in. This can lead to a dilemma on whether to treat early or can catch people out when the focus is on septoria control.

It's hoped that markers and more information about the genes responsible for the two types of resistance, like when they become active, will allow breeders to potentially stack both in one variety, she adds.

"The combination of seedling and adult resistance together could potentially make plant resistance more durable. Also, if we know whether varieties have one or the other, we can pass that information on to the grower to help make more informed management decisions in the field," says Rachel.

Rachel Goddard says the micro-phenotyping is addressing a big question that pops up amongst growers and agronomists each year about seedling and adult plant resistance

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Outputs of UKCPVS enable plant breeders to produce varieties that are more resistant against representative isolates present in the UK says Charlotte Nellist

▸ "It's all about providing breeders with as much information as they need about what's present in the material and accurate markers to use now.

"In the future, the research community needs to continue to provide this information and knowledge as the pathogen population changes. That will be of huge value going forward and must stretch beyond the end of Yellowhammer," says Lesley.

Asked how durable the resistance of new generation varieties using the Yellowhammer genes will be, she couldn't provide a definitive answer, replying that there are many variables when genetics are exposed to the environment and pathogen population.

However, she's certain that the material will be more effective than the major R genes used before. "The more knowledge we have the better. Without genetic markers and a sequenced genome, we were blindly selecting based on phenotype and ended up with R genes that would last two or three years.

"Now, breeders will be constantly improving varieties and moving those genes around in different combinations to maintain resistance."

The genetic work and breeding efforts would not be possible without the disease monitoring work carried out by UK Cereal Pathogen Virulence Survey (UKCPVS), led by NIAB.

The ongoing project, funded by AHDB and the Animal and Plant Health Agency (APHA), aims to understand what's happening with pathogen populations in farmers' fields, including yellow and brown rust and wheat and barley powdery mildew.

It is the only extensive survey of its kind in the UK and identifies population changes using its seedling differential tests. These screen a sub-set of pathogen isolates on a range of seedlings with known resistances to each disease.

The risk associated with the change is then identified through screening of a sub-set of isolates in adult plant field trials and AHDB Recommended List or RL Candidate variety seedling trials.

The UKCPVS team are also part of the European project, RustWatch, which monitors yellow, brown and stem rust across Europe, alongside a network of 25 partners.

It aims to develop an early warning system for the three rust species to improve the farming industry's resilience the diseases. This will be achieved by linking rust surveys like UKCPVS with others across Europe.

Micro-phenotyping host resistance to dynamic rust populations and integrated pest management trials across Europe will quickly be able to offer practical advice to growers where necessary.

Charlotte Nellist, NIAB's pathology programme leader in charge of UKCPVS, says that the survey's vital monitoring work identified and supplied the isolates and spores for use in the Yellowhammer project.

"It ensures the most prevalent race at the time is used and the validity of the identified resistance (which will be incorporated into breeding programmes)," she explains.

The genotyping technology so important in Yellowhammer is also being utilised by UKCPVS to understand more about the yellow rust pathogen itself and has allowed plant pathologists to broadly group isolates into genetically similar groups.

"However, we know that within these groups, the isolates harbour different virulence profiles — essentially, they have a different set of genes that are able to overcome their respective resistance gene.

"Last year, we were able to genotype 48 different isolates of wheat yellow rust, allowing us to gather additional information to the supplied sample information," says Charlotte.

She adds that this supplements the seedling differential data and is all combined and used for selecting representative isolates for adult plant trials. This is important with such a complex population, helping to classify isolates and track any changes.

"Outputs of the survey also enable the breeders to produce more resistant varieties against representative isolates from the UK," says Charlotte.

She adds that in time, UKCPVS would like to add genotyping of wheat brown rust and septoria into the survey, given the right funding and research developments, adding the information breeders and growers can utilise.

"We value the time everyone takes to send in samples to the survey and would encourage this to continue.

"All samples are important and enable us to build up the best picture of what's happening to the pathogen populations across the UK. Details of how to get involved can be found on the NIAB website," says Charlotte. ■

UKCPVS would like to add genotyping of wheat brown rust and septoria into the survey, given the right funding.

Research roundup

From Theory to Field is part of AHDB's delivery of knowledge exchange on grower-funded research projects. *CPM* would like to thank AHDB for its support and in providing privileged access to staff and others involved in helping put these articles together.

For further info:

AHDB Project 1701165: A multi-locus strategy for durable rust resistance in wheat, in the face of a rapidly changing pathogen landscape (Yellowhammer) is being led by NIAB, with BBSRC as a scientific partner. Industry partners include RAGT Seeds, Limagrain UK, Saaten-Union (including Elsoms Wheat, DSV and LSPB), Lantmannen, SW Seed, Sejet Plant Breeding and Syngenta. The total value of the project is £657,519.

AHDB Project 21120034: UK cereal pathogen virulence survey (UKCPVS) is led by NIAB, in scientific partnership with APHA. The current phase of AHDB and Defra funding from April 2019 totals £800,914.

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BAYER

Wheat for a new world

> *"It's very different from the majority of other varieties on the RL."*

Insider's View

New genetics have brought Elsom's newest wheat variety, Mayflower, sailing onto AHDB's Recommended List. But what makes the variety unique and potentially worth trying? *CPM* heads on a voyage to discover more.

By Melanie Jenkins

For those unfamiliar with the historic ship, Mayflower, it was a square-rigged sailing vessel known for being one of the first colonial ships to transport pilgrims across the Atlantic to America, with its most renowned voyage completed in 1620. The aim of the trip was to take its passengers to a new life and new beginnings in the New World.

And in this respect, the New World is exactly where Elsoms wish to take growers with its latest wheat variety, Mayflower — so named as it was launched in 2020, the 400th anniversary of the fabled ship's crossing.

The journey Mayflower offers is one of high disease resistance, quality bread-making characteristics and the potential to utilise nitrogen more efficiently. Mayflower sits on the AHDB Recommended List as a Group 2 wheat variety, but according to Elsoms' Paul Taylor, it's a variety bred for bread.

French lineage

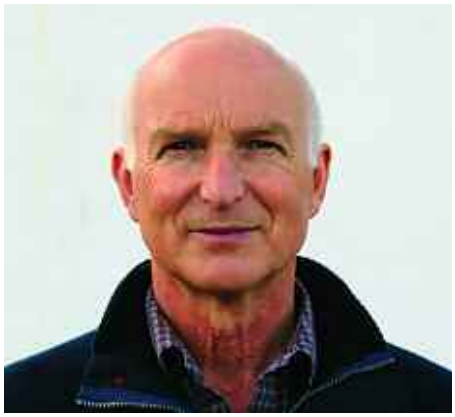
One aspect of Mayflower that Elsoms hope will catch growers' attention is its parentage. Hailing from French parents, the variety brings new genetic variation to the UK at a time when many varieties on the RL share parents and, in some lineages, their resistance to key diseases is deteriorating. "We're working on a narrow genetic base in the UK at the moment, so being based on French genetics is one of Mayflower's selling points, as hopefully its resistance is more durable to current disease pressures," says Paul.

Kent-based T Denne and Sons has also been part of the process, according to the firm's Andrew Bourne. "Our relationship with Elsoms means we do quite a bit of work helping develop new varieties and we recognise we need diversity in the range of varieties we're offering. There's too much reliance on Group 3 and 4 varieties, so it makes a lot of sense to have alternatives to consider."

Mayflower's parentage really caught Andrew Bourne's attention. "It's very different from the majority of other varieties on the RL, and by bringing in genetic diversity there's a lot better chance of Mayflower not succumbing to the major foliar diseases like septoria, yellow rust and brown rust. There's a significant number of mainstay varieties on the RL which are pretty incestuous, so Mayflower brings an opportunity to widen the genetic pool."

So how has Mayflower made its way to UK fields? Elsoms is the marketing agent of the French breeding company, Asur, which is co-owned by four Saaten Union members; Nordsaat, Ackermann, Petersen and Südwestsaat. "Elsoms' original remit was to produce high yielding feed varieties from soft wheats but now there's more of a market for Groups 1s and 2s," explains Paul. "Since our partners produce milling quality varieties, it helps us find Anglicised types that will work well here."

In the early part of Mayflower's testing it was put into a trials programme to see if it was a suitable variety for the UK and Asur



According to Paul Taylor, Mayflower's French parentage is one of its key selling points.

Mayflower has an earlier growth habit in spring because of its French genetics.

had sent samples of coded lines to be trialled as well. "It completely stood out for its disease resistance in both programmes last year," says Paul. "Everything else untreated was dead and all we could see left was Mayflower."

And it's Mayflower's disease resistance profile which could well garner a lot of interest. Scoring a 9 for yellow rust and an 8 for septoria, it has the strongest resistance package for these two diseases of all the quality wheats on the RL. "Mayflower has very strong early season disease resistance which is key to maintaining green leaf area," explains George Goodwin of Elsoms. "It scores a 6 for eyespot, partly due to carrying the *Pch1* gene, and its strong disease resistance continues in the mid to late season with its dual 6 scores for brown rust and fusarium."

To explore how it would react to fewer fungicide applications, Saaten Union placed Mayflower into trials, says the company's Andrew Creasy. "We trialled Mayflower, among other varieties, at our Suffolk site and as well as putting the RL standard treatment of three fungicide applications on — costing £220/ha — we dropped the T1 and T3 sprays and just sprayed at T2, costing £48/ha.

"From a margin point of view, one application did better than putting three on. Other varieties in the trial succumbed to yellow rust and septoria before we put the T2 spray on, but Mayflower held its own," he adds. "And though it does respond to fungicides, Mayflower allows growers a relatively open window for when sprays could go on."

Fungicide response

But Andrew Bourne strongly advises caution when it comes to reducing sprays in real-field situations. "A lot of people have fallen into this trap with highly resistant varieties in the past," he says. "They think they can get away with lower inputs and save a few pounds, but there's always a response to a robust fungicide programme," he believes.

"You're not only helping to protect the genetic resistance to disease, but also putting the plant into a physically better condition so it can put more energy into yield and quality rather than disease resistance. It's important to remember that trials are very different situations to on-farm growing conditions."

Due to its French heritage, Mayflower has an earlier growth habit in spring, but this has been an advantage in the past few years, says Andrew Creasy. "Interestingly, where we've been getting long, dry periods in the spring, it's advantageous to have something that gets up and away. Then when the disease resistance kicks in, even the untreated crops in our plots stayed green right to the end."

After seeing how Mayflower performed in trials in the UK against septoria and yellow rust, Elsoms grew milling specification ▸

People have driven past Tom Reynold's field of Mayflower and stopped to ask what variety it is.

▸ plots and screened these at 13% protein, at which point they sent samples to Campden BRI to get tested, explains Paul. "It was tested alongside UK Group 1 and Group 2 wheats and against German E wheat — which is set as being the standard for excellence — and Mayflower produced a ▸

Setting a course

Tom Reynolds is growing Mayflower for the first time as a seed crop on Pent Farm, near Hythe in East Kent. Running a mixed farming business, Tom has 200ha comprised of 30ha of permanent pasture for his 30 head suckler beef herd, 75ha of winter wheat, 31ha of grass seed and 28ha of winter beans, with the rest in HLS.

The farm is mostly heavy Gault clay, with a high silt content and high pH but some of the higher land is a clay with flint, while the downland is steep chalk.

Having grown KWS Extase last year, Tom wanted another variety with similar agronomics. Andrew Bourne suggested Mayflower and Tom now has 28ha of Mayflower with the rest of his wheat area consisting of Extase and KWS Zyatt.

Tom tries to stick to no-till but will do some light cultivations when needed. His Mayflower crop was direct drilled in early October after beans with a Horsch Sprinter fitted with JJ Metcalfe coulters and then rolled.

All his wheat crops had Crystal (flufenacet+ pendimethalin) and Hurricane (diflufenican) as pre-emergence sprays and then a dose of slug pellets. "We had a wet October and though we don't usually see slugs in our wheat when it follows beans, this year the slugs were considerable which was a struggle," says Tom. "Luckily, the weather dried up and the crops grew away from the slugs. You wouldn't know Mayflower suffered from slug damage as where it dropped leaves, it's certainly compensated."

Tom applied 100kgN/ha of 30N 10S liquid nitrogen and a further 120kgN/ha in late April. "We didn't split further as we had a dry spring," he explains.

At T0 Mayflower was so clean Tom just applied a PGR and trace element mix. Then at T1 the crop had Ascra Xpro (bixafen+ fluopyram+ prothioconazole) with manganese and then had Univoq (fenpicoxamid+ prothioconazole) at T2. "I think at T3 we'll get away with a tebuconazole or prothioconazole as it's had a robust programme so far."

Mayflower has been very clean in terms of disease. "People have driven past the field and then asked me what's in there because Mayflower's looked so good," he says. "Extase and Mayflower are on a par in terms of disease — very good and clean — but Zyatt has fallen to yellow rust, which is very interesting to see.

"Mayflower's yield potential looks very promising, so the hope is that its protein content does well as it'll be nice to see a variety with good agronomics do better in terms of N utilisation," adds Tom.

BEST PRACTICE GUIDE

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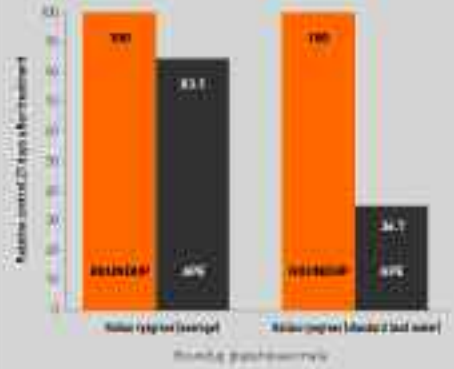

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Mayflower's disease resistance profile could well get it noticed, says George Goodwin.

▸ better baking loaf.

"So we're a bit gutted it got classified as a Group 2. We've got evidence that in a CBP breadmaking mix Mayflower is really suitable, but in some of the other processes it doesn't do as well, which is why it was categorised as a Group 2," he says.

The good news is that millers are becoming more flexible and pragmatic about how they use Group 2 varieties in grists, explains Andrew Bourne. "Millers can use varieties like Mayflower and KWS Extase to good effect, so this gives growers more options."

According to Andrew Creasy, Mayflower did equally well in terms of quality as Skyfall and Crusoe in Saaten Union's own trials. "It met the specifications of Group 1 with a Hagberg of 250, 13% protein and a specific weight of 76kg/hl — so from a quality point of view its equally as good."

In an effort to explore the sustainability of different varieties, Elsoms and Saaten Union undertook trials looking at the utilisation of nitrogen. "We looked at the effects of cutting back on N and we adjusted when we put it on during the growing season," explains Andrew Creasy.

Mayflower's (right) yellow rust resistance is apparent when compared with KWS Firefly (left).

"We've had one year of results so far which showed that putting 85kgN/ha in early to mid-March produced equally good results as putting the full 200kgN/ha on. We're now doing second year trials and will see more result after harvest."

Paul feels that Mayflower may have needed feeding before the other varieties. What Elsoms also noticed was that adjusting the application of N to varieties also changed the order of yield on the RL, meaning that Mayflower's yield surpassed competing varieties when less N was applied.

Early adoption

According to Andrew Bourne, the N-use efficiency trials are very topical because of the impact the cost of N is having on gross margins. "If we've a variety that consistently responds to lower rates of N, both in yield and grain quality, it's a variety we want to be looking at."

One thing Elsoms wasn't quite prepared for was how quickly Mayflower was placed onto the RL. "It went onto the list earlier than we anticipated, so we're still doing research and development work," says Paul. "But cometh the hour, cometh the variety.

"And Mayflower doesn't have the specific weight disadvantage that some of the other highly disease resistant varieties on the RL have. So it suits those perhaps wanting to sell it as a quality wheat," he adds.

One aspect of Mayflower which George advises growers to keep an eye on is its winter growth habit. "It has a low vernalisation requirement and will grow faster over winter than other conventional winter types. We'd advise sowing Mayflower from the first week of October onwards, with a latest safe sowing date of end of February. Although we know Mayflower is a strong tillering variety, we'd advise seed rate is increased by 10-15% for later drillings."

Andrew Creasy believes there's a spot in the market for Mayflower. "With all of the traits it has going for it, it's an option for those growing quality wheats who are after something different with better disease resistance than a lot of the current Group 1s.

"We know it makes a good loaf of bread from independent testing, so ultimately we hope it gets recognised as a quality wheat," he says.

Mayflower is likely suited to those with bigger cropping areas who may need more flexibility with their spray timings, according to Andrew Bourne. "It's less time critical to get sprays on as it's not as susceptible to diseases as other varieties, which is a great management tool.

Andrew Creasy notes Mayflower met the grain quality specifications of Group 1 in Saaten Union trials.

"The variety might not be on every grower's radar yet but it's one to watch for those thinking about disease pressures, the cost of N and market dynamics," he adds.

Elsoms still feels there's a lot more to discover about Mayflower and plenty of scope for it to find its place in the market, according to Paul. "It's a variety that has found a time and a place." ■

Mayflower at a glance

Yield (% treated controls)	
UK treated	97.4
UK untreated	89.6
East region treated	97.7
West region treated	97.3
North region treated	[96]
Grain Quality	
Protein content (%)	11.9
Hagberg Falling Number	293.7
Specific weight (kg/hl)	78.5
Agronomics	
Resistance to lodging without PGR	6.3
Straw height without PGR (cm)	89.3
Ripening (+/- Skyfall)	0
Disease resistance	
Mildew	7.8
Yellow rust	8.7
Brown rust	5.7
Septoria	8.4
Eyespot	[6]@
Fusarium ear blight	5.7

Source: AHDB Recommended List, winter barley 2022/23 – [] = limited data, @ = Believed to carry the Pch1 Rendezvous resistance gene to eyespot, but this has not been verified in Recommended List tests.

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SAATEN UNION

Breeding up a storm

> *In Typhoon, Limagrain has managed to marry good septoria resistance with OWBM resistance.*

Insider's View

Limagrain looks to whisk growers off their feet with its new wheat variety, Typhoon. Shaping up as good and dependable all-rounder with strong disease resistance and consistent yields, *CPM* inspects it closer to see how it'll perform.

By Melanie Jenkins

LG Typhoon is a new hard feed wheat sitting smack-bang in the middle of the Group 4 pack on AHDB's Recommended List. It looks to offer growers consistency, a desirable disease resistance package and good grain quality.

A cross between Garrus and the pathology cross LGW88, it was Typhoon's parentage which first piqued Agrii's interest in the variety, according to the firm's John Miles. "We identified it as a variety of interest because of its parentage and because it looked like there was something different about it. Typhoon's performing well and is up there with the likes of Graham in terms of yield."

Typhoon has emerged from Limagrain's breeding programme targeted at producing hard feed wheats. The programme is based around the design of ideotypes — models which combine morphological and physiological traits, says the company's Phil Tailby. "Ideotypes are the blueprints we have of wheats."

Genomic selection

Part of the drive behind this programme was the incursion of the Warrior race of yellow rust and as a result the firm has redefined the ideotype of all wheats so that only lines with combined multiple yellow rust resistant genes are selected. Septoria resistance has also been a large part of this programme.

"In real terms this means we can now genotype (record genetic make-up) material, so we can select the lines we want before seeing anything in the field and instead grow them in trays," explains Phil. "We start with hundreds of plants, rather than the thousands we would have had previously, and eliminate those without favourable genes.

"Because we genotype a lot of material, we can combine our records of 10 years of high-quality phenotyping (observable traits) and genotyping data to make genomic selections.

"Typhoon is one of the varieties which has come out of the markers used to genotype varieties and is a good indication of where things are going for Limagrain," says Phil.

The cross of Typhoon was first produced in 2013, he says. "For Typhoon, we looked at the projections of how it would behave and combined that with what we physically saw — this meant we had a better prediction of yield stability," he adds.

In all areas of the UK, Typhoon's yield averages 102%, according to Limagrain's Ron Granger. "Typhoon is similar to Gleam regarding its consistency of performance and it's up there with the big boys in a second wheat situation, yielding 104%."

Typhoon's second wheat performance has certainly caught John's attention. "Not many varieties lend themselves to a good second wheat position, but Typhoon looks to be a useful addition in terms of this." ▸

Phil Tailby spearheads Limagrain's genotype breeding programme which produced Typhoon.


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Typhoon has emerged from Limagrain's breeding programme targeted at producing hard feed wheats

▸ And in earlier drilling trials, before 25 September, Limagrain has seen it achieve 105% of the controls, explains Ron. "This is backed by AHDB early sown trials, which have yielded the same. Typhoon has favourable attributes for early drilling, like a prostrate habit and later spring development. The variety really does sit back and is still on the floor in early April.

"For those with blackgrass issues, you're probably not going to want to drill that early. But if you don't have blackgrass, there's opportunity to drill it early, especially in the North," he adds.

Agrii has had Typhoon in trials for the past year, but also had a small subset of trials the year before. "We've a couple of years of data on it now," explains John. "We like to understand where varieties fit as there are a lot out there for growers to consider. Sometimes yields is the component that's most important to them but if a good variety isn't the highest yielding of its Group on the RL, it can get passed over. There are some really interesting and useful varieties that aren't the top yielders, and Typhoon is one of them."

Disease resistance

Its untreated yield is also important as some growers are likely to be considering reducing their inputs at the moment, especially regarding fungicides, explains Ron. "Growers are looking at varieties with robust disease resistance as they're hoping to make cost savings — so disease resistance is very important."

Typhoon scores 9 against yellow rust on the RL and has a three-year mean of 7.2 against septoria, says Ron. "It also appears good against eyespot, with a 6 and it has Orange Wheat Blossom Midge resistance. Typhoon fits everywhere but it stood out for its disease resistance in the West last year."

According to John, the challenge from evolving disease pressures can be a large part of varietal selection. "With the loss of chlorothalonil and of rust actives, the importance of a robust disease profile — though always talked about — is now more important than ever before.

"In Typhoon, Limagrain has managed to marry good septoria resistance with OWBM resistance," he adds. "There are a number of varieties which now have strong septoria resistance but don't have OWBM — so this is an extra box Typhoon has ticked."

Another aspect of Typhoon which John is keen on is its seedling yellow rust resistance. "Typhoon is 'R' rated by AHDB in UKCPVS young-plant-stage resistance testing in 2021. This can be important as we don't know when a lot of seedling yellow rust resistance finishes and the adult resistance kicks in. Plus, there are only a limited number of varieties that have seedling yellow rust resistance — a lot of varieties are susceptible to it."

Agrii also likes Typhoon's grain quality. "You can take a variety out of trial and onto farm and there's always a disparity between the specific weight in trials and what's then achievable on farm, so you

Agrii first identified Typhoon as a variety of interest because of its parentage.

Getting noticed

Farm manager Freddy Calver had one of the first LG Typhoon multiplication crops in the ground last year. Freddy and farm owner, Paddy Walker, liked the variety so much that it's back in the ground this year.

Based at Brundle Barn Farms in Postwick, East Norfolk, Freddy works the 190ha where they grow sugar beet, potatoes, wheat, spring and winter barley, maize and red clover and run a herd of 130 beef cattle. The soil ranges from marshy peat land to very light sandy soils with clay areas as well.

"We grow red clover for silage, which we leave in as a two- or three-year ley and this year we're hoping to direct drill wheat into it," explains Freddy.

In the first year of growing Typhoon, the ground was ploughed ahead of the crop being drilled in early November. It had an application of liquid nitrogen ahead of separate granular applications about a month apart.

The crop was harvested at the end of August and yielded 10t/ha, above the farm average of 8-9t/ha.

Typhoon is in a second wheat position this year, but the farm has adjusted to a regenerative system. "Now we've gone down the zero till route the crop probably went in a bit late on 16 November using a John Deere 750A, but I think we got away with it," says Freddy. "With this new way of farming, we're trying to under sow all cereals with clover to help with the rising cost of fertiliser and fuel."

The biggest trouble on the farm is weed control, according to Freddy. "We're hoping the clover will help suppress weeds and reduce herbicide use. At the moment the spring barley and maize help with ryegrass and blackgrass, so we don't have any trouble with those."

This year's crop was sprayed with sulfonylurea herbicide — despite the farm trying to move away from it — to combat volunteers, and had three applications of fertiliser, the same as last year's Typhoon but the crop hasn't had any P or K because of the price, says Freddy. "But our P and K levels on the farm are probably pretty good because of the cattle muck we use."

So far this year's crop is looking good, according to Freddy. "It's very clean and doesn't seem to have much disease. From what I've read about it, it should perform well as a second wheat, so it'll be interesting come harvest. Obviously, we'll see how it performs with our new establishment practice, as I imagine it'll take a few years to get into it, but it'll certainly be one to watch.

"I think we really do have to look closely at the very disease resistant varieties like Typhoon to combat the spiralling cost of fungicides," he adds.

Typhoon scores highly on Agrii's Variety Stability Rating system.

want something which has a good score."

In terms of grain quality, Typhoon has a specific weight of 76.3kg/hl. "It's very comparable to Gleam," says Ron. "Typhoon has a lower Hagberg but this isn't an issue in feed wheat."

Straw stiffness is another massive element of variety choice, says John. "Certain areas of the country will drill later because of blackgrass and this can lessen the effects of weaker straw, but those opting for a more normal drilling window could find some varieties have less than ideal stem stiffness. So this is why we look for varieties with good standing ability and Typhoon is performing."

Typhoon is slightly later maturing at +2, but Ron feels this can be advantageous to growers. "It's important to spread out the range of variety maturity on farm because you never know when you'll be able to get started with harvest or when it'll end on farm. Spreading variety maturity is just another tool to help manage harvest in a changing climate."

According to John, Typhoon's slightly later maturity could be seen as a small deterrent to some growers. "This might limit uptake in certain areas where growers don't like later varieties but from how Typhoon's performing at the moment, there doesn't look to be any real negatives to it at all."

Typhoon also scores highly on Agrii's Variety Stability Rating system, says John. "It sits alongside varieties like Graham, KWS Dawsum and Fitzroy, which also score very highly on our system."

Important attributes

The VSR doesn't score on out-and-out yield but instead looks at traits such as grain quality, standing power, disease resistance, second wheat performance, sowing date, consistency, grassweed competitiveness and yield resilience under disease pressure. "We believe these attributes are important to growers and make up the sustainability of a variety on farm," he explains.

Overall, Typhoon has a range of desirable attributes for growers, according to Ron. "It has a consistency of yield potential over both seasons and regions, a high yield performance as a second wheat and in the early drilling slot. It has a strong, rounded disease resistance profile, taller but stiff straw and a good specific weight. With all of this, it offers growers good security and adaptability for on farm performance."

John agrees that there's a lot of positive aspects to Typhoon. "Though it's a few percentage points off the highest yielding varieties, when you consider the balance of attributes it has going for it, then it's hands down a winner. The market demands are changing due to pressures from the weather and farm finances and so growers are going to be looking for safer and more dependable varieties as a result. Typhoon looks to be a good all-rounder which is safe and won't expose growers to unnecessary risks which could financially burn them."

For those growers considering Typhoon as an option for the coming season, Limagrain says there's about 3000t of seed available. "There's enough to make up 3-5% of the certified seed market," says Phil.

So where next for Limagrain? One area the firm is paying close attention to is the regenerative farming movement. "We don't know what varieties on the RL are best suited to regenerative agriculture yet, but we are doing work looking into direct drilling, min-till, wide rows and seeding rates. The breeders and the trade have to do more to explore this," says Ron.

Limagrain is also using its ideotype breeding technique to predict future crosses, explains Phil. "We can simulate crosses and predict all of the traits we've measured before and use this to filter out varieties — meaning we'll only make crosses from those varieties with the most predicted potential.

"We're focused on discovering more disease resistance genes — whether from historical or ancestral material and maybe even from grass varieties." ■

Typhoon is slightly later maturing at +2, but Ron Granger feels this is advantageous to growers.

Typhoon has scored 9 against yellow rust on the RL and 7.2 against septoria over the past three years.

LG Typhoon at a glance

Yield (% treated controls)	
UK treated	101.8
UK untreated	89.2
East region treated	101.9
West region treated	101.7
North region treated	[102]
Grain Quality	
Specific weight (kg/hl)	76.3
Agronomics	
Resistance to lodging without PGR	7
Straw height without PGR (cm)	87.6
Ripening (+/- Skyfall)	+2
Disease resistance	
Mildew	6.6
Yellow rust	8.7
Brown rust	6.1
Septoria	7.2
Eyespot	[6]
Fusarium ear blight	5.7
Orange Wheat Blossom Midge	R

Source: AHDB Recommended List, winter barley 2022/23 – [] = limited data.

Flexing new muscles

> *“There’s no active ingredient out there that blackgrass won’t develop resistance to if it’s wrongly used.”*

Blackgrass control

Battling blackgrass is a yearly struggle for many growers, but FMC has a new herbicide that could soon be joining the fight. *CPM* took a trip to FMC’s French research facility to get a first-hand look at Isoflex in trials.

By Melanie Jenkins

The fight between weeds, legislation and chemistry is one that rages on each year, but amid this battle ground is a company that firmly believes in enhancing the growth of the agricultural sector. And this isn’t just a belief for FMC, it’s the firm’s core purpose, at the heart of everything it does.

Visiting FMC’s European Research and Development Centre (ERDC) in Nambsheim – situated in the Alsace region of France a mere stone’s throw from the German border – in mid-May, it was apparent that the company is driven towards providing new and effective chemistry for its customers.

Coming up to its 140th birthday, FMC has only actually been based at its ERDC site since 2017 when it acquired DuPont’s crop protection portfolio. The area is highly suited to a research site as the majority of European crops can be cultivated there, with an abundance of quality land and a supportive local community with a wealth of scientific expertise.

Product development

FMC’s regional headquarters are based in Geneva and it has sites across Europe, the Middle East, Africa and in the USA. Globally, it’s best known for its successes with insecticides — which make up 61% of its revenue — and herbicides in Europe, which account for around 40% of its European sales.

Fungicides have proven to be a trickier nut to crack, with fewer available products than it has in its insecticide and herbicide arsenals, but FMC is working to improve its portfolio and it’s moving into the realms of molecular biology.

A tour of the facility during our visit showed just some of the lengths to which the company has to go to get a product to market. Comprising 95ha of land for field trials, as well as 37 growth chambers, 23 laboratories and three greenhouses, the site hosts multiple research techniques — from isolating a product’s efficacy against specific insects and avoiding unintended casualties, to testing spray coverage using UV light and identifying the impact of rainfall on products.

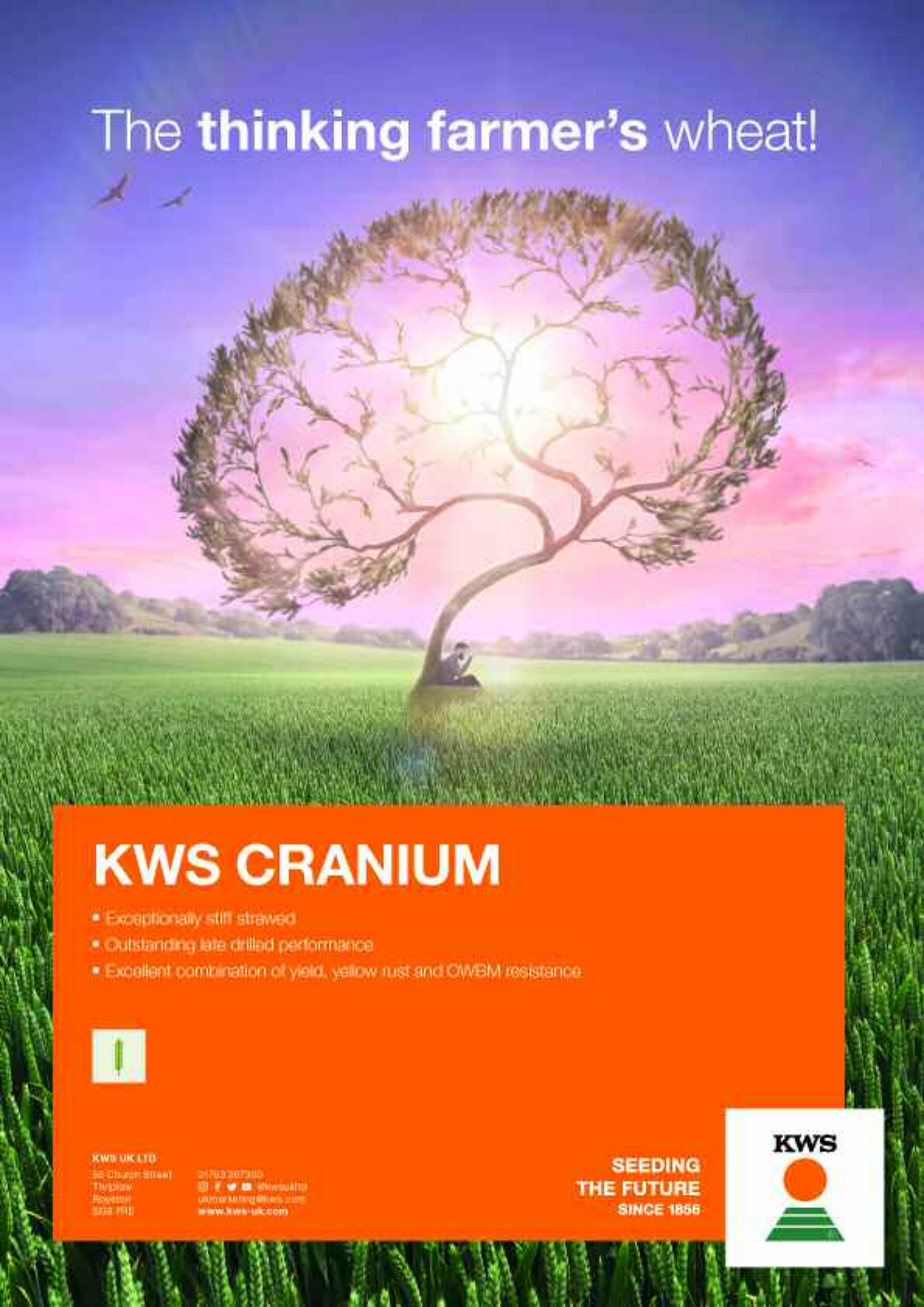
This all leads into the final stage of quality control. Thousands of hours of work go into research and development and millions of pounds in investment, and a product can get this far and still isn’t guaranteed to get authorised.

But with strained chemical efficacy and tightening regulations taking active ingredients off the market faster than new ones can be discovered, plus the need for weed control on farm more prevalent than it has ever been, FMC is aiming to produce the goods.

“It’s becoming more and more complicated for us to bring new active ingredients and formulations to market,” explains FMC vice president, Sebastian Pons. “This is the most difficult part of the process for us.”

But the firm is on the cusp of bringing not one, nor two, but three new modes of action to the market in the next few years. ▸

FMC has only been based at its ERDC site since 2017 when it acquired DuPont’s crop protection portfolio.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Getting new actives to the market is becoming increasingly complex and difficult, says Sebastian Pons.

▸ "It's been 30 years since the last new herbicidal mode of action for cereals was discovered and authorised within the company," says Sebastian. "We now have three new modes of action in the pipeline and two new biologicals coming in the next two-to-three years."

Beyond this, FMC has 11 new actives in development and 25 in the discovery pipeline. But the one closest to launch is a new herbicide that might finally help growers make some chemical headway against blackgrass, known as Isoflex active.

Isoflex is a new 2,4-dichloro form of isoxazolidinone found during the original discovery of clomazone. According to FMC, it has a unique mechanism of action that will be novel to many of the crops it's likely to be authorised for use on.

It provides both systemic and contact activity, with residual control and can be applied as a single dose pre-emergence and early post-emergence across a wide range of agronomic environments, says the company.

Isoflex potential

All going to plan, Isoflex should be available for use as a mix with a yet unnamed FMC product on a number of mainstay crops in the UK, including winter cereals, oilseed rape, maize, potatoes, sugar beet and other spring crops, pending registration.

When Isoflex has passed registration, growers will be pleased to hear it has shown to be as effective against key grassweeds and broadleaf weeds.

Based on FMC trials, Isoflex demonstrated good control over blackgrass and has good activity against Italian ryegrass, annual meadow grass, bromes, rats tail fescue, canary grass and cleavers, chickweed, speedwell, poppy, pansy, charlock, groundsel and shepherd's purse.

Isoflex's potential against blackgrass — should full approval be authorised — could have a significant impact for UK agriculture, as despite years of research and exploration into cultural control methods, it remains the single most economically important weed for farmers, according to Gareth Jones, UK technical lead at FMC. Based on research by ADAS and Rothamsted, FMC estimates that blackgrass causes losses of around £400M annually. "Resistance to old chemistry was identified as early as 1982 and then when stubble burning was banned, blackgrass became a really big issue."

FMC's ERDC site in France has 23 laboratories where different tests are carried out.

"So we're in a really exciting place," says Gareth. "It's hugely relevant to the UK and I've seen Isoflex in trials since at least 2016. It does depend on the trial, but I've seen comparable efficacy from Isoflex to other products on the market," he explains.

According to David Hennes of FMC, Isoflex and new BASF herbicide Luximo (cinmethylin) should be complementary to one another for use on blackgrass. "However, against ryegrass it should be better, but for sustainability growers will want other options. And though there are ▸ apply it when weeds have gone beyond this, the efficacy drops off."

FMC has also looked at Isoflex with and without adjuvants at the peri versus the pre-em. "Isoflex on its own, with an adjuvant at peri-em has taken out poppies and cleavers."

And further down the line, Gareth expects FMC to be able to provide percentages on Isoflex's efficacy against different weeds in different situations.

Isoflex in trials

A number of trials have been run at ERDC to look at the added value of Isoflex in the stack, with products such as Crystal (flufenacet+ pendimethalin), Liberator (flufenacet+ diflufenican), and other flufenacet mixtures. "We've looked at what benefit our product brings into that stack," explains Gareth.

The plots are split so that half is untreated (drilled at 300 seeds/m^2) and the other half shows the impact of Isoflex and other products. "This gives a visual direct comparison between the treated and untreated," he says.

"A trial of full rate pre-em applied Crystal at 4 l/ha, and 1 l/ha of flufenacet, showed some level of control, but not enough that growers would be happy with it. It was dry at application, which is a bit of a challenge for the residuals. And though it did give a reasonable level of control, it isn't enough for a commercial programme, so you'll want to put something else in."

A further trial looked at Crystal at 2 l/ha (again as a pre-em) — a rate FMC predicts could be the norm from a regulatory perspective in a few years' time. "There was significantly more blackgrass and more cleaver in this trial," says Gareth.

But in a third pre-em trial of Crystal — again at a rate of 2 l/ha — but with FMC's Isoflex product included, there was a visible benefit, he explains. "It's taken the poppies and the cleavers out. It's all about the additive effect and the different modes of action in the programme to get to the levels of control that we need to be seeing."

A final trail had the same products and rates as the third trial, but at the peri-emergence timing instead, says Gareth. "The trials of Isoflex I've seen over the years where it's been applied pre-em have shown a chunk of efficacy, and it tends to be pretty consistent. But if you then look at the peri-em timing — and you get the timing right relative to the weeds — you can see some great levels of efficacy. But if you

Peri-em applied Isoflex plus Crystal trial plot (left) compared with untreated (right).

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Source: AHDB Candidate List 2021/22

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A UV light is used to demonstrate spray pattern and coverage.

▸ concerns about crop injury from residual chemistry, this isn't an issue with Isoflex," he says.

But growers should be aware that Isoflex is not a one-stop answer to blackgrass. "It won't be for individual use against blackgrass in the UK," says Gareth. "It should be used in a stack with existing products at the rates currently approved. And growers should be able to mix and match as suits them in terms of herbicide stacks, plus the more actives in a stack, the less chance of developing resistance.

"The pressures from blackgrass are so severe, no single product will do the job, which is why we've a stacked and sequenced approach," says Gareth. "It'll be a case of growers working out the best approach on their farm to try to get 98% control of blackgrass — the percentage needed to prevent the seed bank increasing."

And though growers still have use of flufenacet, pendimethalin, diflufenican and prosulfocarb, among others, the need to alternate and stack chemistry is a tool vocalised by agronomists up and down the country. According to FMC, future herbicide programmes could instead be based upon Isoflex active, cinmethylin, picolinafen and aclonifen and more.

"The fact that cinmethylin and Isoflex have come along now means we'll still have, I believe, enough tools to be able to control blackgrass effectively," adds Gareth.

The other good news, according to David Hennes of FMC, is that baseline work with Isoflex has shown no indication of any resistance to the chemistry from either blackgrass or ryegrass. "But, knowing blackgrass, it's vital to use good stewardship," he warns. "There's no active ingredient out there that blackgrass won't develop resistance to if it's wrongly used."

From trials conducted by FMC on Isoflex since 2018, Maxime Benichom of FMC advises targeting emergence for maximum efficacy, but does stress that there's a level of flexibility in the application window. "Isoflex should be used as part of an integrated weed management approach and in combination with other chemistry."

Unnamed partner

But the questions growers might be asking themselves are, what is the unnamed formulation product Isoflex will be in partnership with and will it cause registration issues? Well, at the moment this is still very much under wraps, but FMC is highly confident that it's extremely unlikely there will be any issues with the unnamed second formulation partner that would prevent Isoflex being available to growers come 2024.

So how does Isoflex work? According to David, it blocks the formation of isoprenoids — the precursors to carotenoid biosynthesis — essentially preventing effective photoprotection from the sun's rays. The loss of the protective function of carotenoids then causes bleaching symptoms of green areas in susceptible weeds.

The proposed HRAC classification group for Isoflex is 13/ legacy F4, and David states that there's currently only one other molecule in this group.

And though FMC is expecting a lot of change in terms of chemical controls in the EU — and potentially the UK — over the next few years, it hopes Isoflex will bring an additional value to what could well be lost from the rostra of chemical activity.

Gareth Jones feels that Isoflex could be a hugely relevant herbicide for UK growers.

"We're expecting chemistry like pendimethalin and flufenacet to be restricted, in terms of the rates these can be applied at," says Gareth. "Though we're not sure about the extent of that restriction, the way we use those traditional, well-established products is going to change.

"So it's important to have products like Isoflex and Luximo to replace that chemistry in the stack, as the main blackgrass controlling element will have to come from somewhere, and we want to be part of that," he adds.

And Maxime is sure that Isoflex will get approval. "We don't have any concerns about the registration of the active. We expect UK registration of our formulation in the autumn of 2024, but this will likely be 2025/26 in the EU. And the World Health Organisation is aligned with the EU and so there are no major concerns there either."

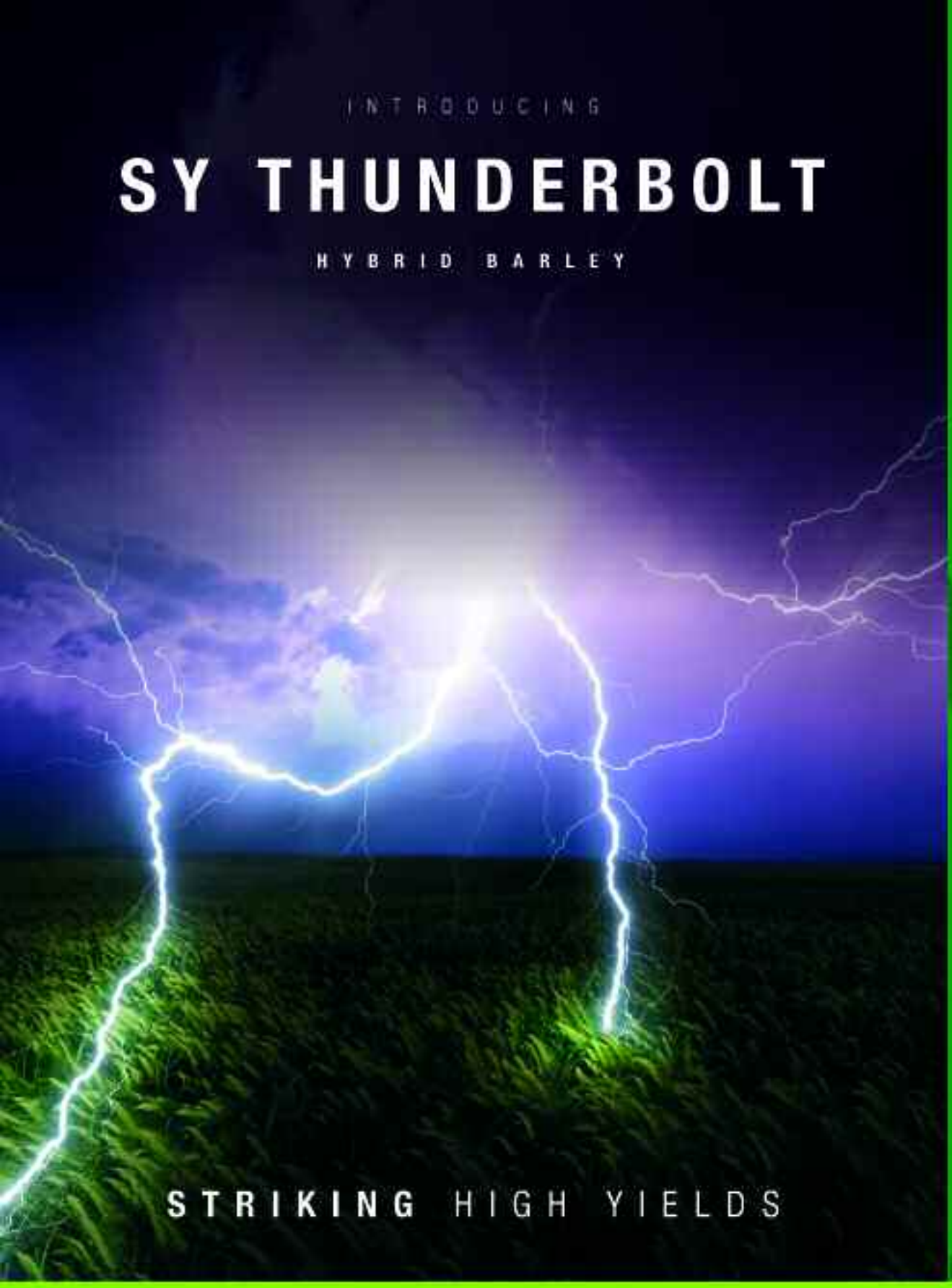
"We hope Isoflex will become part of good resistance management," adds Maxime. ■

FMC has 11 new actives in development and 25 in the discovery pipeline.

INTRODUCING

SY THUNDERBOLT

HYBRID BARLEY



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Source: AHDB Recommended List. The full database can be consulted at www.cereals.ahdb.org.uk

> *These aren't replicated trials, but they are real-world performance.*

Tools to feed the curious mind

Forward-thinking farmers

There's an extra layer of care that goes into managing the oilseed rape grown by McGregor Farms on the Scottish Borders. *CPM* visits and gathers updates on its 2022 on-farm trials to glean the secrets of building yield potential.

By Tom Allen-Stevens

David Fuller stoops to inspect one of the oilseed rape plants in his strip-trial assessment that sits neatly in its row, uniform with its neighbours. It's March, so pulling back the leaves reveals a stout crown now bristling with the new growth that will set the canopy over the coming months.

"At this time of the year, it's very difficult to tell the varieties apart, let alone how they will then go on to perform, although that new growth does look promising," he says. "We make regular assessments through the season, scoring the plots on vigour, earliness to flower and mature and then detailed yield assessments."

He takes his trowel and carefully eases up a plant to inspect its tap root, and it's a pleasing result — perfectly straight, reaching down over 30cm and with regular branching.

OSR trials

This is one of seven Dekalb varieties David has, growing side by side in 0.4ha plots in this field — a little bit of Scotland on an oxbow of the River Tweed just south of Coldstream. Its deep sandy clay loam soil is among some of the best farmed by McGregor Farms across its 3450ha, spread over 15 farms in the Tweed valley. Mostly undulating medium sandy clay loams, the land is surrounded by hills and varies from 70-190m above sea level.

And it's capable of pushing out a consistently high OSR yield — a five-year average of 4.84t/ha. Since 2019, David has entered an OSR crop into the ADAS Yield Enhancement Network (YEN) and in 2021 he won the silver award for his crop of DK Expansion which yielded 6.2t/ha — 57% of its 10.8t/ha potential. So how was that achieved?

"The YEN report is useful because it gives you a detailed breakdown of how the crop performed, benchmarked against the other entrants. Essentially, it's the number of seeds in the sample that gets you a YEN winner, which comes down to achieving the right canopy structure."

The strip trials, with the detailed assessments they come with (see panel on p35), help David develop the farm's variety portfolio. But this is just one piece of the jigsaw that builds into a crop that's carefully managed throughout the season to deliver its potential.

"We currently have 718ha of OSR and the area stays roughly the same year to year," he explains. "We grow all hybrids because we value the traits they come with. Pod-shatter resistance in particular is important for us — August is the wettest month, and wet-to-dry conditions can make the crop go brittle.

"Where a variety doesn't have the

There's a stout crown bristling with the new growth that will set the canopy over the coming months.

pod-shatter trait, we see a lot of losses and plenty of volunteers in the following stubble. Often at harvest we've had to break off OSR to get started on the wheat and need to know the seed will still be in the pods when we return to it.

"Although phoma is rarely a problem for us, the *Rlm7* gene for stem canker resistance means we don't have to worry about it, or spray to protect against the disease. Similarly, turnip yellows virus resistance (TuYV) is another one coming through on newer hybrids that delivers peace of mind. Clubroot is a problem with brassicas historically grown ▸

Packed with potential, but flowering date differs

By early May, some of the varieties in the McGregor Farms strip-trial assessments are reaching the end of flowering. "All of them are strong and robust with not much difference between them, and branched well to put out a good canopy. So we think we have plenty of potential across the plots," reports David.

"One thing I have noticed, though, is a big variation in flowering. DK Extremus was quick to flower, with DK Expansion not far behind. The newcomer, DK Exposé was the last to come into flower and notably later than the rest."

Early flowering is not a characteristic David particularly favours. "Last year we had a lot of late frosts which appeared to damage those early to flower. Having said that, this didn't show in yield results, so may just be perception."

David's been sharing the assessments of the plots with Bayer's Richard Williams. "We put current, commercial varieties along with one or two newcomers," he says. "This year the brand new one is DK Exposé, that also has TuYV resistance, along with DK Excited and DK Expectation. Then there's DK Exsteel, DK Exstar, DK Extremus and DK Expansion."

Selected growers across the UK have been working with strip-trial assessments of Dekalb varieties for nearly 20 years. There are 12 sites with David's currently the furthest north. There's one in Norfolk and in Suffolk, two in Hampshire, two in Wiltshire, a site in Herefordshire, Worcestershire, Staffordshire, and two in Shropshire.

"We provide enough seed for blocks of up to 1ha to be grown side-by-side. We recommend up to 50 seeds/m^2 looking for a final plant stand of 25-35/m^2, but leave the actual drilling date up to the grower — it's good to have a spread. The management of the crop is also up to the grower, to ensure they are grown as close as can be to standard farm practice, although all of the UK growers involved pay particular attention to detail with their OSR," notes Richard.

The plots are then closely monitored throughout the season and given scores under a visual-assessment protocol that's repeated on similar sites across Europe to ensure data has real comparable credibility, he points out. Plant counts, vigour, uniformity, disease presence and development before winter are assessed in autumn. In early spring, regrowth and stem elongation after winter are scored, then earliness of flowering, lodging and maturity. Before harvest there's another lodging assessment, along with checking for stem-based diseases, then final yield, oil content and moisture are assessed.

"We've found Exsteel the most vigorous in autumn, making it ideal for later plantings. Exposé and Exstar are slightly slower with Exposé having a squatter growth habit, so more flexible with their establishment window. Both Extremus and Exstar tend to be early to flower while Exposé and Expansion are later," summarises Richard.

"Exposé does look promising, relatively short and very stiff with good disease resistance, including TuYV. It flowers for longer, and that's where we think it puts on the yield," he says.

The strip trials go hand-in-hand with small-plot work carried out on all Dekalb varieties, continues Richard. "We work closely with strip-trial growers so get a really rounded picture on how the varieties perform, and I think that helps all growers get the best from the Dekalb lines — it's when a grower sees a variety perform in front of them they get the proof they require to grow it well.

"We're now introducing variable-rate N work into the trials and looking at biostimulants, making good use of Bayer's FieldView to assess results. For next year, we have more candidates with TuYV resistance and two promising lines with clubroot resistance. Look out also for some really interesting Clearfield and HOLL varieties coming through," notes Richard.

It's when a grower sees a variety perform in front of them that Richard Williams believes they get the proof they require to grow it well.

The strip trials equip David with the tools he can use to feed his curiosity on how to manipulate the crop to get the best out of it. "While the AHDB Recommended List provides useful data, it has its limitations," he says. "These aren't replicated trials, but they are real-world performance. And with rapeseed prices in excess of £800/t, it's worth putting time and effort into every extra seed you can tease out of the crop."

	DK Expectation	DK Extremus	DK Exsteel	DK Expansion	DK Excited	DK Exstar	DK Exposé
Product characteristics							**NEW**
Oil content (%)	45.2	45.4	45.5	44.5	45.6	45.3	45
Earliness at regrowth	Mid	Mid-early	Mid-late	Mid-late	Mid	Mid	Mid
Earliness of flowering	8	7	6	5	7	6	5
Earliness of maturity	6	6	5	6	6	6	5
Plant height	5	5	6	5	4	6	4
Lodging resistance	[8]	8	8	9	8	9	9
Stem stiffness	7	8	8	8	7	8	8
Phoma resistance	7	8	8	7	8	8	8
Light leaf spot resistance	7	7	7	6	6	8	6
Pod-shatter resistance	Y	Y	Y	Y	Y	Y	Y
TuYV resistance	Y				Y		Y
Coldstream strip-trial results 2021/22 season							
Vigour (Nov 21)	8	8	8	7	6	6	7
Uniformity	7	7	7	7	6	7	7
Development before winter	7	7	6	7	6	5	6
Early flowering (April 22)	6	7	4	3	5	6	1

Source: Dekalb earliness at regrowth data; DK Expectation – AHDB Recommended List Winter oilseed rape 2022/23; DK Extremus – AHDB 2021; DK Exsteel – AHDB RL 2021/22; DK Expansion – AHDB RL 2022/23 Control Variety; DK Excited – Dekalb private trials data 2021; DK Exstar – AHBD RL 2017/18; DK Exposé – NL1 2020 and NL2 2021; Coldstream results – Dekalb private trials data, comparative for site only; Scores (1-9) high figures indicate the variety shows the character to a high degree; [ ] = limited data.

An even plant stand is important, as is good autumn vigour, but strong spring regrowth is not quite so critical.

▸ quite extensively for livestock feed in the area, and we look to grow varieties that have resistance on land we know to be infected."

Currently in the ground, aside from the strip-trial assessments, are Aurelia, DK Expansion, DK Exsteel, DK Exstar, DK Explicit and Crocodile for clubroot. "We generally grow two or three varieties on a look-see basis to develop the portfolio, and this is where the strip trials really help to put characteristics side by side for comparison and identify lines we'll find useful."

Growth characteristics in particular are aspects David keeps a close eye on. "A lot of the yield comes from establishment, so an even plant stand is important. Three quarters of our crop is grown after winter wheat, so first and foremost, I look for good autumn vigour. Strong spring regrowth is not quite so critical for us as we don't want the crop to develop too soon and get damaged by late frosts."

Coming into the spring is where flowering and maturity characteristics of the variety come into play. David looks for a variety with a steady spring growth and one that won't come into flower too early. He takes comfort in a long flowering period, however, and is happy for the crop to mature late, so long as that doesn't push harvest into an unnervingly late window.

With the genetics set, the rest is down to management. Two 7m Simba SL 700s break the ground and establish the crop in a one-pass system. The legs are generally set to 250mm depth, with starter fertiliser dribbled behind, and the second set of discs in line with the legs. Following these is a Double-D ring press that the seed is put in behind, at a row spacing of 450mm, again, in line with the legs. A light harrow covers the seed and an Aqueel roller finishes off the job.

"The Aqueel runs clean in wet conditions and holds critical seedbed moisture in dry conditions. But if it's particularly dry, a set of Cambridge rolls are used as well." Cabbage stem flea beetle hasn't been a problem for crops in the area, he reports.

Good establishment

"We aim to drill all 700ha in a week, starting after 20 August and finishing by 1 September — that's our critical window," says David. "Good establishment is crucial, and we look for the right soil conditions and the right plant population with even spacing and germination. We want 25 plants/m^2 coming into the spring, so a rate of 35-40 seeds/m^2 is generally sown."

The starter fertiliser puts 19kgN/ha with 27kg/ha of P near the seed. "We're often short of magnesium and apply this is in the autumn with boron. Around stem extension, the crop also gets manganese, molybdenum, extra Mg and Bo," he adds.

"We still find a pre-emergence herbicide the more reliable form of broadleaf-weed control, so apply quinmerac and metazachlor. Grassweeds haven't been an issue in OSR until recently, but we're now finding brome and rat's tail fescue increasingly difficult to control, so apply propyzamide late in the season. We'll also apply prothioconazole for light leaf spot as late as we can travel."

David relies on an N-Sensor on its Absolute setting to tailor nitrogen rate to the crop growth in spring. This results in around 200kgN/ha applied in two splits as liquid 30%N with 9.5% SO_3. The first goes on towards the end of February with a slightly larger dose a month later.

"LLS is the main disease concern in spring. An application of tebuconazole with azoxystrobin is applied at yellow-bud stage in mid-March, which also helps to shape the canopy. We'll follow up three weeks later with a boscalid-based application that also takes care of sclerotinia," he says.

"We have trialled Aviator (bixafen+ prothioconazole), using Bayer's FieldView to record it and assess the results, and that worked well, so it's an application we may look to use more of in future," he notes.

Just as an even establishment and early season management are critical to success for OSR, David believes how the crop is treated towards the end of the season has an important role in the final result. "Attention paid to getting the canopy right makes a huge difference, and we do consider greening.

"While fungicide applications are mainly for disease control, they also have an effect on branching. Then we want to make the most of the sunlight during June and July, so try to keep the canopy going for as long as possible, holding off the glyphosate desiccation until as late as we dare. Pod-shatter resistance again provides a little reassurance here.

"We find that when you set up a crop with the genetics that fit the system you're looking to follow, then monitor it closely and give it the attention it deserves, that's when a good average OSR crop becomes a YEN medal winner," concludes David. ■

The newcomer is DK Exposé, which comes into flower later, but flowers for longer.

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- TuYV protection with good tolerance to Verticillium wilt.
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- Low biomass variety for early maturity and easy harvest.

Source: AHDB Recommended List 2022/23.

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Finding favour for faba beans

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Pulse Progress

A new study, led by PGRO, has observed the combined effects of perimeter trap crops and semiochemical attractants to manage pests in faba beans, in a bid to help growers reduce their reliance on insecticides. *CPM* delves into the detail.

By Charlotte Cunningham

Moving away from reliance on inputs is a topic hot in the headlines at present — not only encompassing fertiliser, but also crop protection chemistry — as the industry seeks to farm more with the environment in mind.

That said, taking a more holistic approach to crop production has been the direction of travel for quite some time for many growers, with integrated pest management (IPM) becoming an integral part of decision making on farm.

A new research project led by the Processors and Growers Research Organisation — funded by the Ekhaga Foundation — has sought to explore this further, in a bid to develop an IPM solution in faba beans which could help growers move from high insecticidal inputs towards cultural and organic production techniques.

While faba beans are an important part of UK rotations, they can be plagued by the presence of both the pea and bean weevil and the bruchid beetle.

Insect pests

In terms of how they impact a crop, infestations of weevils are attributed to yield reductions, while bruchid beetles cause damage to the grains in which the larvae feed upon, explains Dr Becky Howard, research and development manager at PGRO, who headed up the research project. “The challenge with both of these pests is that they’ve become more difficult for growers to manage,” she explains. “This is due to a combination of restrictions on chemistry usage and resistance issues within the insecticides that are available.

“Ultimately, we’re looking solely at pyrethroids for the control of both pests, and it’s fair to say that they’re not as effective as they could be.”

Becky adds that in organic production systems, the challenge is even greater, with very few effective management techniques at present.

This combination of factors framed the recent study which looked at alternative IPM practices to manage the pests — namely, trap cropping and using semiochemical attractants. “The purpose of the study was to see if it was possible to pull pests into the trap crop and to keep them there as long as possible — ultimately, to keep them away from the main crop. There’s also a lot of literature to suggest efficacy for trap crops — like lucerne — to host beneficial insects too, so this is something we also wanted to explore.”

Becky says it was important to test both techniques under commercial-scale field conditions, and so three sites, operating different farming regimes and approaches to pest management, were selected.

For the purpose of the study, the farms were given reference names — PAP, MID and HH (see table ‘Farm details’). Two of the sites had trap crops containing lucerne or vetch, and the other had an early sown spring faba bean trap crop.

At site PAP, spring field beans were sown in April 2021 as the main crop and there was an area used as a control region which didn’t contain a trap crop. The trap crop was a long-term legume-rich margin that included vetch.

At site MID, lucerne was established in two of the trap crops in July 2020, and a third trap crop consisted of a grass and ▸

A new study carried out by PGRO has looked into IPM strategies to manage pests in faba beans.


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The purpose of the study was to see if it was possible to pull pests into the trap crop and to keep them there as long as possible, explains Becky Howard.

▸ flower mixture. Winter beans were sown in October 2020 as the main crop and there was no control area for comparison.

At site HH, there were two fields containing trap crops — one was used with additional pheromone and plant volatile insect lures, and one without. The trap crop in both fields was spring field beans sown in early January, and the main crop was spring field beans sown in April 2021.

No insecticides were applied to any of the field bean sites during the trial — though there was historic usage on some farms — and at each location 40 pheromone and 40 plant volatile bait stations were located within the trap crop, explains Becky.

Both types of lures used modified boll-weevil traps which allowed the pest to enter via the base and crawl into the trap. "In terms of positioning, they were arranged in two rows — one closer to the main crop and one further away," she adds.

Observation-wise, assessments were carried out in a number of ways, across various growth stages.

With pea and bean weevil most likely to cause damage to the plant itself, pest damage and activity was assessed by looking for foliar damage, explains Becky. "Distinct adult weevil feeding notches were recorded on the top leaf pair on 25 plants at each sampling point in the main crop on at least two occasions following emergence of the crop."

And with the bruchid beetle often causing damage to seed, this was the focus of these assessments, she adds. "Seeds were cut open and examined for the presence of larvae or adult beetles."

Damage differences

"There are visible differences between damage caused by adult bruchid beetles and larvae," points out Becky. "Adult beetle damage tends to be seen as a circular exit hole on the seed surface, whereas larvae tends to leave brown marks under the seed coat."

The bait station traps were checked every two weeks and the number of beetles/weevils recorded, before being emptied ahead of the next observation date.

Other assessment methods included emergence traps to monitor weevil emergence from soil, as well as pitfall traps in both the main and trap crops. Observations on biodiversity at the sites were also made using sweep netting.

At BBCH growth stage 97, 10 plants were collected from each of the 20 assessment/sampling points within the main crop at each site to use as harvest samples. At site HH five additional samples were taken from each of the trap crops, explains Becky. "Pods were removed from the plants and seeds removed from pods. These were weighed, and moisture content was measured. Yield was calculated as t/ha for each sampling point, considering the plant density counts carried out at early crop growth stages."

With so much data gathered during the observations, finding a way to express pest damage and the impact on yield was a complex task, notes Becky.

Bruchid beetles cause damage to the grains in which the larvae feed upon.

Mean pest damage has been used to best represent this, and the study report detailed that there were some significant associations between yield and the mean number of weevil notches per plant at sites HH and MID (see 'Pest damage summary').

There was also a significant association between the mean percentage of bruchid damage and yield at MID that also affects yield, although this may not be a direct association but related to another factor — such as plant density or vigour, notes Becky. "There were no significant associations between pest damage and yield at PAP. Overall pest damage was lower at PAP than at MID or HH.

"In summary, from what we've seen so far we can say that the early sown spring faba bean trap crop appeared to have the clearest effect on pest levels in the main crop, and trap crops containing lucerne may have influenced the level of pea and bean weevil damage in winter sown beans at one of the sites."

Rather interestingly, the sweep netting results showed that the PAP site also had a far greater percentage of beneficials (57%) — and subsequently, less pests —

Infestations of pea and bean weevils are attributed to yield reductions.

Farm details

Site reference	Cultivation System	Whole farm spray regime	Crop	Trap crop details	Crop sown
PAP	Crops drilled directly into stubble	No insecticides	Spring Beans	Long term legume rich field margin	10 April 2021
MID	Plough-based	Insecticides only if required	Winter Beans	Mixture of lucerne and wild bird mixture	14 October 2020
HH	Plough-based	Standard insecticide programme	Spring Beans	Spring Beans sown in January	5 April 2021

Footnote: Farm details for the trap cropping sites in 2020-2021. Source: PGRO

Pest damage summary

Site	Mean % bruchid damage	Mean number of pea and bean weevil notches per plant
PAP	11.72	6.23
MID	13.47	20.47
HH9 (no lures)	21.66	8.94
HH10 (lures)	23.29	23.03

Footnote: Mean % damage to seed caused by bruchid beetles (by number of seeds) and mean number of pea and bean weevil notches per plant recorded at each site in 2021.
Source: PGRO

compared with the other trial sites. "This could possibly be due to the long-term regenerative approach taken on the farm," concludes Becky.

The 'PAP' site is a 165ha farm in Cambridgeshire, farmed by Martin Lines, UK chair of the Nature Friendly Farming Network and *CPM* columnist. "Over the past few years, we've been focused on changing the system and transitioning towards a regen style system, which has much less reliance on inputs."

In a bid to work with nature — rather than against it — Martin says he's been able to remove insecticides from the system completely by recognising the benefit of creating good quality habitats for beneficial insects to promote the biological control of yield-robbing pests. "I quickly realised that the less we did — by means of insecticides — the more beneficials we had."

When approached by the researchers, Martin says he thought this would be a good opportunity to put some science behind what he was seeing anecdotally. "The bruchid beetle has always been present here and we already had in situ a number of margins containing lucerne grown next to spring beans, so the site seemed a good fit."

As highlighted in the study, Martin's farm showed to have both the lowest level of pest damage and the highest level of beneficiaries. So what has this approach meant practically on farm? "By not using insecticides we've increased our beneficials and experienced less pest damage. This has reduced our costs, while increasing our output, and I know I'm going to get paid in the future for delivering habitats for wildlife. It's just an all-round better economic model for my farm."

Adult beetle damage tends to be indicated by a circular exit hole on the seed surface.

Habitat creation

Creating good quality habitats for beneficials is vital to make this work on farm, adds Martin. "They need habitat all year round, so it's critical not to cut/remove everything and leave them with nothing over winter.

"I think it's also important to have a diversity of plants in those areas, and for us, lucerne is working well."

Martin says his next step is to try and gain a deeper understanding of what species are particularly useful for hosting beneficials.

He also adds that recognising beneficials will struggle to travel across big open fields, as found in the East, is important and so provision has to be made in terms of how fields and margins are structured in order to help them out.

"Nature has always delivered a balance in the past and given the current constraints on food production and climate change, I believe we need to find a new balance for the future.

"Our farm is a commercially run farm, and it has to make a profit, but nature gives us free gifts in predation and productivity. Essentially, the less cheques I have to write for products, the better I'm going to be as a business. It's all about future-proofing what we're doing."

Though the first year of trials has provided some good direction for further research, Becky says it's too soon to be thinking about any headline conclusions. "The preliminary results have provided us with a huge amount of data and getting to the bottom of that is complex. Therefore, at this point we've concluded that we need the full three years of data to make any strong conclusions regarding the efficacy of trap cropping and semiochemical attractants.

Using beneficial insects is good for the environment and bottom line, believes Martin Lines.

"However, something that has been very clear is that where beans are sown early, there's a big difference in pest damage levels – specifically, early sown beans have shown greater damage in the trap cropping area. What we're now trying to determine is whether or not the main crop is experiencing more or less damage as a result."

Following end of the 2021 trials, the study is being repeated this year and in 2023, with a greater number of trials set to be carried out at HH to further explore the potential of the early sown spring bean trap crop, explains Becky. "As well as this, a number of demonstration trial plots have been set up at the Cereals site in Cambridgeshire. The aim of this is to provide a site which facilitates discussion and knowledge exchange with other growers, and a comprehensive plot trial will be established later this year — and next year — with the results presented during the 2023 season." ■

Distinct feeding notches on leaves show the presence of adult weevils.

Sensible nitrogen management

Soaring nitrogen prices and Clean Air legislation are putting the spotlight on urea. *CPM* takes a look at how to manage both.

By Mike Abram

It's amazing how a year can change what a 'sensible' price for fertiliser feels like. This time last year paying around £300/t for 34.5% ammonium nitrate only felt sensible in hindsight, yet Berkshire grower Dan Willis is already describing his recent purchase of Limus-treated blended urea — which also contains 3% K, 1.5% Mg, 4.5% Ca and 12% S — at £646/t as a sensible price, albeit with a slightly ironic laugh and with his head in his hands.

Selling some wheat forward for January 2023 at £340/t helps cover the cost of the purchase. “I can make enough forward sales to start budgeting those types of figures in the gross margin. I've got my base fertiliser secured, and if the wheat price does crash, I can choose whether to spread it.”

Economically, he says, it makes sense currently, particularly as it doesn't compromise product quality for value. “Treated urea and Polysulphate are both products I like and use, so having both blended together at sensible money feels like a bonus.”

He grows just under 200ha of winter wheat at Rookery Farms, Curridge, just north of Newbury, on the 700ha farm, which also includes a significant proportion of spring crops.

On light sandy soils over chalk, he finds quality easier to obtain than higher yields, so about 80% of the winter wheat is KWS Zyatt, with the remainder KWS Extase. Both achieve milling quality premiums.

Managing blackgrass

Establishment is with a Sumo DTS strip till drill, with very little cultivation carried out across the farm to maintain moisture. Managing the trash in stubbles pre-drilling is the key to success, he says. “It's allowed us to be more timely with drilling.”

Wheat is drilled later than historically on the farm now as blackgrass has crept in over the past 10 years — probably imported either in organic manures or compost, or brought onto the farm via machinery as Dan also supplies harvest contracting services.

“It wasn't uncommon for us to be finished drilling by the second week of September, but now we don't start until early to mid-October.”

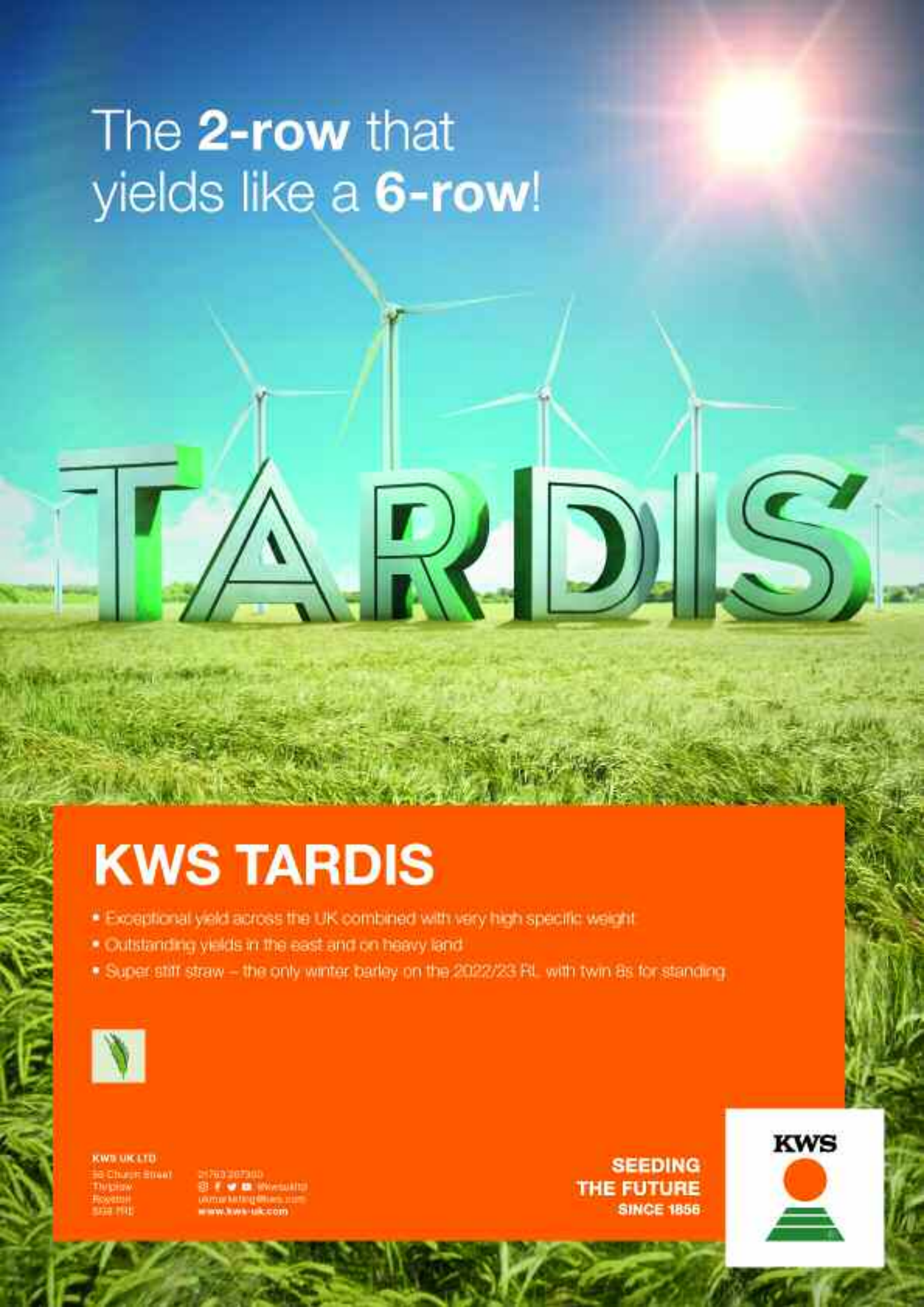
While later drilling, along with spring cropping, has helped with blackgrass control, it has brought a downside in being the wrong side of a dry spring, with the farm relying on rain in April and May to maintain yields, he says. “Earlier drilled crops seem to weather a dry spring much more easily.”

That's despite an improvement in soil resilience through 20 years of rotationally applying organic manures and compost across the farm. Rain in mid-May has helped ease some of the concerns over this year's crops, although the farm has only recorded 132mm of rain from January to mid-May — less than in 2020, which will impact yields, he suspects.

Nutrition is a key focus in any season, with Dan firmly believing in its role for healthy plants. This season has seen a change of approach with a partial switch to liquid fertiliser, facilitated by a new 30m John Deere 4140R self-propelled sprayer.

“Our biggest driver was wanting to be a bit more timely and to improve accuracy,” says Dan. “We'd seen our headland yields drop away over the years as we'd gone to wider tramlines. There was nothing ▸

Dan Willis is already describing his recent purchase of Limus-treated blended urea at £646/t as a sensible price, albeit with a slightly ironic laugh and with his head in his hands.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▸ particularly wrong with the machine applying the fertiliser, but it was getting that edge-to-edge accuracy we were after with the liquid."

Around 60-70% of his nitrogen requirements, both solid and liquid, were procured from Bartholomews early enough to be at last summer's "sensible prices", with more liquid ordered for the New Year. All the solid fertiliser is Limus-treated urea, which reduces volatilisation from urea fertilisers.

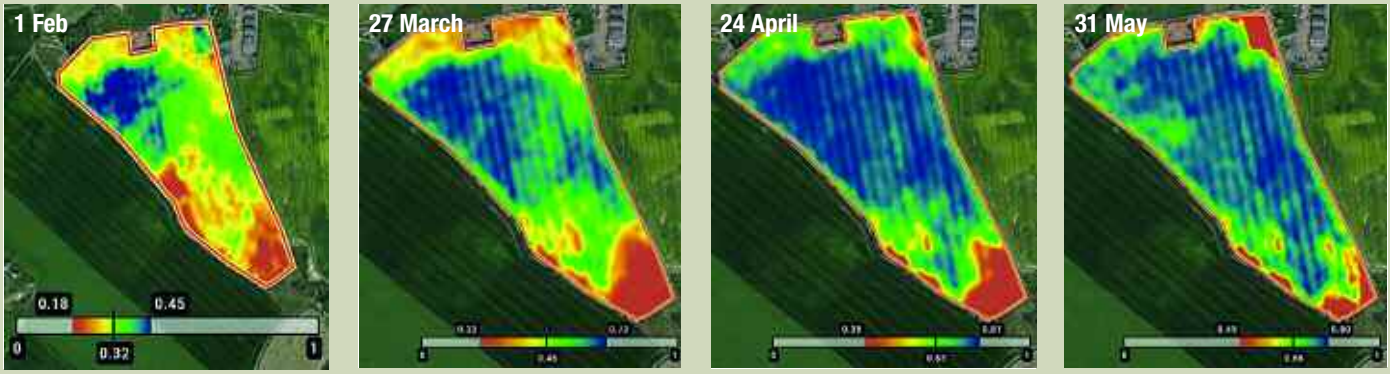
"We've used untreated urea over the years, but we've always been cautious and waited for rain or temperatures to drop before applying it, and we weren't always getting it on when we wanted to."

In contrast, using Limus-treated urea has given him the flexibility to apply it at any time during the season, he says, including last splits on winter wheat in May this season, leaving some liquid in the tank to top up the proteins if needed later in the season. "Most people will use urea early, but with this product you can confidently go late."

He takes a little and often approach to his nitrogen programme in wheat, with application timings calculated by working back in three-week intervals from a fully emerged flag leaf in mid-May, with a first application of around 30-40kg/ha in mid-February. "We aim to apply around 165-175kgN/ha by the third week of April."

More frequent applications allow him to adjust rates to the prevailing weather. For example, in the dry spring of 2020 he stopped applying fertiliser in mid-April after two months without any rain, allowing carryover to the following season. "It wouldn't have mattered if we had doubled ▸

Real Results trials convince



NDVI images of the winter wheat trial site were taken throughout the season as part of the Real Results monitoring.

Two years of Real Results trials at Rookery Farms have confirmed the benefits Dan was already seeing from using Limus-protected urea across the farm.

In 2020, alternative tramlines were treated with either Limus-treated urea or ammonium nitrate in winter wheat (see table) in his little and often approach.

The average measured yield of the ammonium nitrate tramlines in the winter barley trials was 7.06t/ha, with Limus-treated urea increasing yield by 0.13t/ha.

A similar trial in 2020 in winter wheat saw yields of 6.77t/ha for the ammonium nitrate and a 0.28t/ha increase with Limus-protected urea.

These are similar results to other trials, says Jared Bonner, BASF business development manager for Limus. "Limus-treated urea is equivalent to ammonium nitrate, and there's usually an increase over untreated urea of around 5%."

That's important for Dan. "There was a premium of around £20/t for protected urea over untreated. We've come away from untreated urea because it's less efficient, particularly late in the season.

"Now what we're doing is efficient, and if we're not seeing a difference to AN, it gives flexibility over what source of N to buy. I can look at p/kg and not be worried about efficiency. It's certainly been good for us," he says.

"There are no issues with spreadability and no fear you won't achieve the result. It's a good product," concludes Dan.

Rookery Farms, 2020 WB Real Results trial – Mushroom Field

Date	Nitrate (kgN/ha)	Ammonium nitrate yield (t/ha)	Limus protected urea (t/ha)
5 feb	69	7.06	7.19
7 Mar	46		
30 Mar	69		
19 Apr	46		
Total	230		

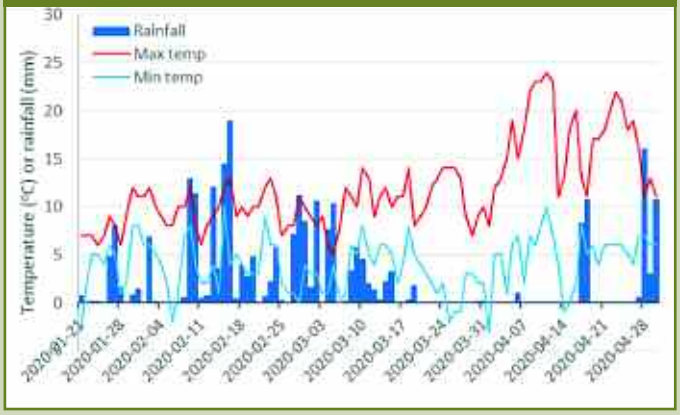
Source: ADAS Agronomics, 2020

Rookery Farms – 2020 WW Real Results trial – Long Field

Date	Nitrate (kgN/ha)	Ammonium nitrate yield (t/ha)	Limus protected urea (t/ha)
5 feb	69	6.77	7.05
7 Mar	46		
1 Apr	46		
Total	161		

Source: ADAS Agronomics, 2020

Weather conditions in Long Field (2020)



Rainfall and temperature conditions during the period of Limus-treated urea application.

Source: ADAS Agronomics, 2020

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This season has seen a change of approach with a partial switch to liquid fertiliser, facilitated by a new 30m John Deere 4140R self-propelled sprayer.

▸ our dose from thereon in that year."

He has found a total dose of 220kgN/ha in four or five applications optimum, with the potential of an extra 20kgN/ha to top up protein levels if needed.

"Any more than 220kgN/ha base fertiliser feels like we're wasting it — we've tried 280-300kgN/ha and it isn't giving us any more yield. It's tough to get more than 10t/ha on this land, so we have to be cautious in what we spend — that's our margin."

Last season he used Hill Court Farm Research's root analysis just after flowering, which predicts grain protein levels in wheat. That influenced his decision about topping up for proteins saving around 20t of Nufol, with only 50% of his wheat treated. "I put a lot of trust in it, but our proteins were 12.8-13.2% with an average yield of 9.1 t/ha."

He's also making use of other analyses — N-min tests were taken for the first time this autumn. "It was quite an eye-opener. We've got one field where we've gauged our nitrogen use totally on the result and we're going to end up about 140kgN/ha."

Tissue analysis has been used for longer, with more focus being put on trace elements applications partly to help utilise nitrogen more efficiently. "It gives us a good guide before the main timings — we routinely tissue test around GS23-24, GS30-31 and GS39, so we can top up what's missing."

Manganese is always required on his light land, with typically five or six applications required during the season. "Thankfully it's not an expensive problem to solve."

Sulphur is the other main focus, with the aim of having a 3:1 ratio of nitrogen to sulphur. That's been achieved through switching to a combination of 24% or 26% N, with 7% or 8% S, liquid fertiliser, and applying 120 kg/ha of slow release Polysulphate in the autumn and 125kg/ha again in February for a total of 70-80 kg/ha of sulphur.

"Sulphur is something we've upped more and more, but now we're getting best use of our nitrogen — we're seeing the result in the crop and in the tissue analysis," he concludes. ■

The Real Results Circle

BASF's Real Results Circle farmer-led trials are now in their sixth year. The initiative is focused on working with 50 farmers to conduct field-scale trials on their own farms using their own kit and management systems. The trials are all assessed using ADAS' Agronomics tool which delivers statistical confidence to tramline, or field-wide treatment comparisons — an important part of Real Results.

In this series we follow the journey, thinking and results from farmers involved in the programme. The features also look at some other related topics, such as environmental stewardship and return on investment.

We want farmers to share their knowledge and conduct on-farm trials. By coming together to face challenges as one, we can find out what really works and shape the future of UK agriculture.

To keep in touchwith the progress of these growers and the trials, go to *https://www.agricentre.basf.co.uk/en/Real-Results-Circle/* or scan the QR code.

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What's the issue with unprotected urea?

Ammonia emissions are responsible for effects like smog, eutrophication, and damage to sensitive habitats, which is why there's a statutory obligation to reduce ammonia emissions by 16% by 2030 in the UK, as part of the government's Clean Air Strategy.

Around 87% of ammonia emissions in the UK are said to come from agriculture, with solid urea fertilisers responsible for 8%.

Unprotected urea can release ammonia into the atmosphere, particularly when applied in dry conditions through the activity of urease enzymes, explains Jared.

While this reaction is necessary to convert urea into plant available ammonium, if it happens on the soil surface, it causes a localised rise in the pH of the soil around the granule. This spike will lead to ammonia volatilisation unless the fertiliser is washed into the soil by rainfall, buffering the pH spike.

Limus, which contains two urease inhibitors, NBPT and NPPT, minimises this volatilisation by temporarily delaying the conversion, effectively blocking the urease enzymes on the soil surface, and buying time for it to be washed into the soil, says Jared.

"As soon as you get moisture the urea granule effectively melts into the soil, where billions of these ubiquitous urease enzymes swamp the Limus inhibitors, converting urea into ammonium."

While the effectiveness of Limus varies with environmental factors, such as soil type and length of dry spell, BASF trials have shown reductions in ammonia emissions — on average by 70%.

The product is available for both solid and liquid urea, says Jared. Pre-treated solid urea is available through Bartholomews, Thomas Bell and COFCO, while the option for liquid UAN, Limus Clear, is sold through Frontier as an additive which the farmer can decide whether to use based on environmental conditions at the point of application.

Limus-protected urea contains two urease inhibitors, NBPT and NPPT, which minimise volatilisation by temporarily blocking the urease enzymes on the soil surface, and buying time for it to be washed into the soil.

From next season there will be restrictions on the use of urea-containing fertilisers. Unprotected urea can only be applied between 15 January and 31 March, with only treated/inhibited urea used outside that period, unless an agronomic justification is provided by a FACTS qualified agronomist, explains Jared. "That's likely to drive an increase in the use of all inhibitors."

> *"A one-size-fits-all approach is invariably wrong."*

Managing risk survey

Risk or reward?

With growers looking to ensure the long-term security of their farm businesses, managing and mitigating risk where possible is crucial. *CPM* explores the key priorities.

By Charlotte Cunningham

UK agriculture and crop production is going through one of the most turbulent episodes in recent history, following Brexit, changes to the support structure, volatile global markets, and energy supplies — and now, a war on the fringe of Europe is putting global food supplies into further jeopardy.

These pressures are coming to bear on practical farm management in many ways and are likely to have an influence on both short and long-term future decision-making on farm, causing growers to mitigate risk where they can. But just how far reaching are those changes likely to be?

Some of the challenges and opportunities were explored in a recent *CPM*/Hutchinsons survey, which examined what changes growers may seek to make around rotations, nutrition, environmental management, and technology.

With cropping at the heart of arable production, most future decision-making will be based around what is put in the ground, says David Howard, head of integrated crop management at Hutchinsons.

And with current crop prices looking attractive, many are likely hoping to capitalise where possible, however, 43% of growers said they won't be making any changes to their rotations to reflect the current markets.

In contrast, with input costs also at record highs, 35% of growers noted that they'll be looking to include more pulses to minimise nitrogen costs. Also with an eye on keeping costs down, 27% said they'll be including more spring cereals in the future.

Strategic approach

"As a general rule, I think growers have been focusing a lot on evening up their rotations and taking a strategic approach to cropping over the past few years, so it's no surprise that few are making changes," believes David. "Close rotations have largely gone out the window due to other challenges — like weeds and pests — and instead, rotations now tend to be much more diverse."

However, Matt Ward, head of services at Farmacy, says the results reflect just how much uncertainty is being felt at present. "There are nearly as many people saying they'll plant more wheat (16%) as there are saying they'll plant less (14%). I think this is reflective of the uncertain times many growers are facing."

While incorporating more legumes may help offset some reliance on synthetic nitrogen sources, the benefits go beyond this, adds David. "Legumes are brilliant options for improving the nutritional status of the soil in general."

Suffolk farmer Tom Jewers believes it's churlish to make dramatic changes based solely on the current outlook. "Arable farming is a gamble at the best of times. Most people have a set rotation for a reason. While high prices are great, the cause of them isn't. For long-term sustainability I don't think it's wise just to jump at higher prices."

However, if rotations aren't fit for purpose, shying away from looking at other options may also be counterintuitive, warns Matt. "Carrying on regardless might not be the right thing to do for future viability."

Oilseed rape prices are looking particularly buoyant, and with many growers reporting a better season — will these two factors be enough to encourage farmers to take a chance on the break crop once again? Almost half (48%) of growers said they'll keep their area the same next season, while 13% plan to grow it for the first time in several years next season and a further 15% say they'll increase their area to maximise the opportunity to cash in on high prices. However, 22% say it's still too risky to grow the crop.

"With the current global challenges, ▸

Rotations now tend to be much more diverse, says David Howard.

Tom Jewers says he's not confident in what he's seen of the new ELMs schemes so far.

▸ I think it's likely that OSR prices will remain high for some time," says David. "However, the risk that comes with growing the crop hasn't disappeared and it's important to remember that a lot of people stopped growing it due to the severity of cabbage stem flea beetle pressures a few years ago."

Tom is among those growers who are cautious. "It's in our rotation and we've found that the only way we can get it to work is by sowing it early, straight after winter barley.

"But we had a nightmare this year," he laughs. "I thought we had the job sussed, but this year we've struggled with winter stem weevil which, I have to say, I'd never heard of."

Tom explains that the pest is similar to CSFB, with the main point of difference being that the larvae don't have legs. It is, however, just as destructive and this highlights just how much risk there still is with growing the crop, he adds.

However, there are a number of steps growers can take to mitigate the risk, adds Matt. "Avoiding small fields and headlands is a good tip. There's such value in the crop that you can avoid the headland and still make more money than not growing it at all."

Based on the fluctuations in input costs — as well as the growing pressure to farm more with the environment in mind — many growers say that they'll be changing crop nutrition and/or nitrogen management in the future.

Alternative sources

The use of more organic manures and digestate looks set to increase in popularity, with 40% of growers noting this as one of the key changes they're likely to make, while 38% say they're planning on utilising precision nutrition to target inputs. A further 32% are considering the use of more foliar N products.

Tom says he's likely to adopt a range of techniques, though lack of a decent local source of organic manure means this may not be an option for him.

Matt says Tom's predicament is likely to be the case for many growers. "I think a lot of people are understandably looking to organic manures but I think we have to be realistic about where good supplies can be obtained from.

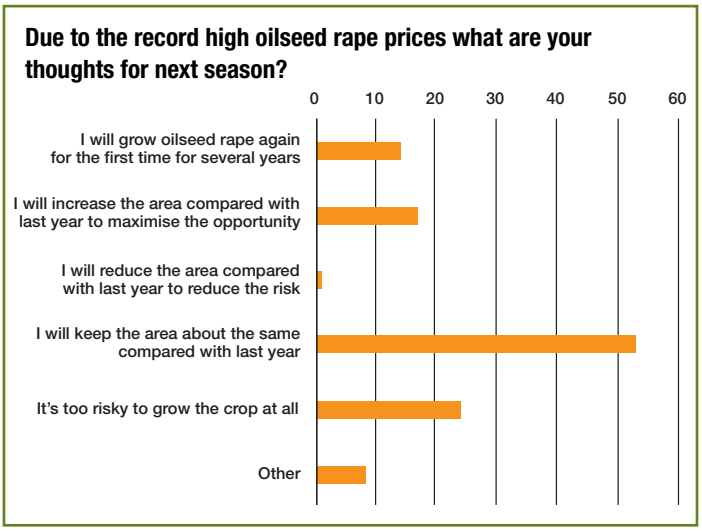
"That said, I'm certainly having more conversations around how to use manure more efficiently — all of a sudden it's become a valuable resource, not just muck."

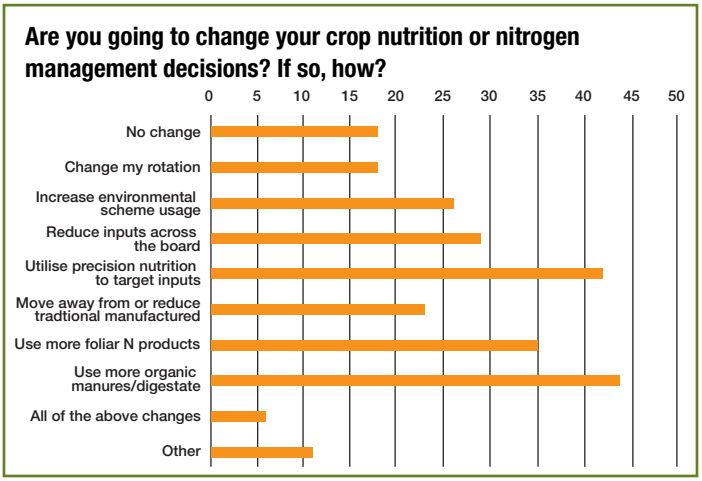
Through his involvement in the Hutchinsons Helix project and some positive trial results, Tom is also keen to get more from foliar N.

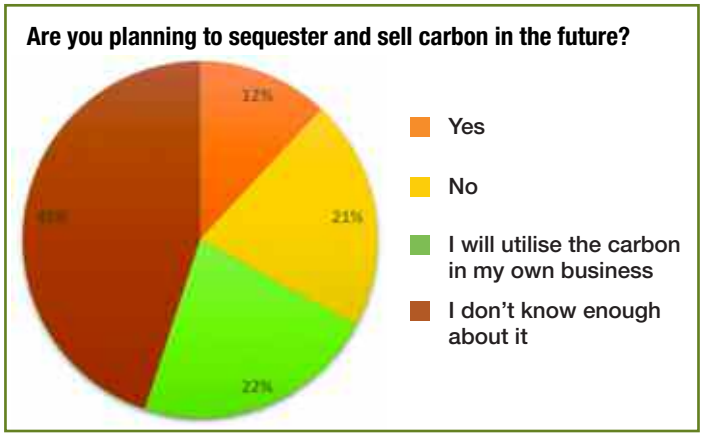
On farm trials observed the effect on yield when applying 160kgN/ha plus two doses of foliar nitrogen, compared with a more robust N programme. No statistical differences were found. "We're looking at this again within the Helix project this year, dropping N rates to 130kgN/ha and I'm also doing my own trials using N rates of 80kg/ha.

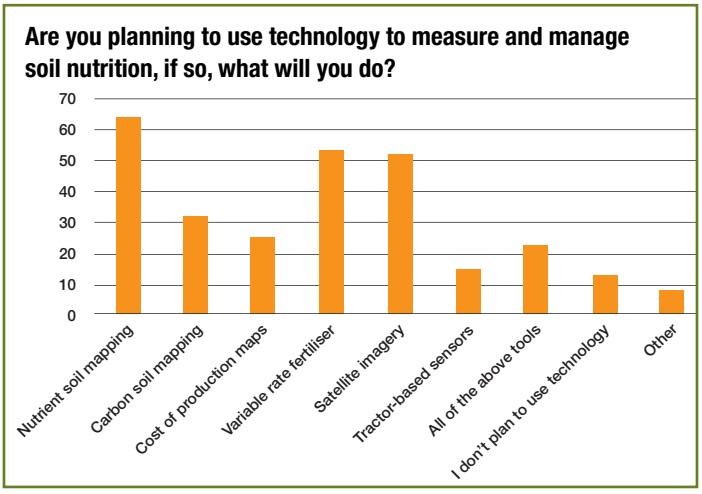
"In the East, we tend to get a dry period in the spring, so I believe foliar applications have a place to get N on the crop in the absence of rainfall. The downside is that foliar products are particularly expensive, so there's a balance to be found."

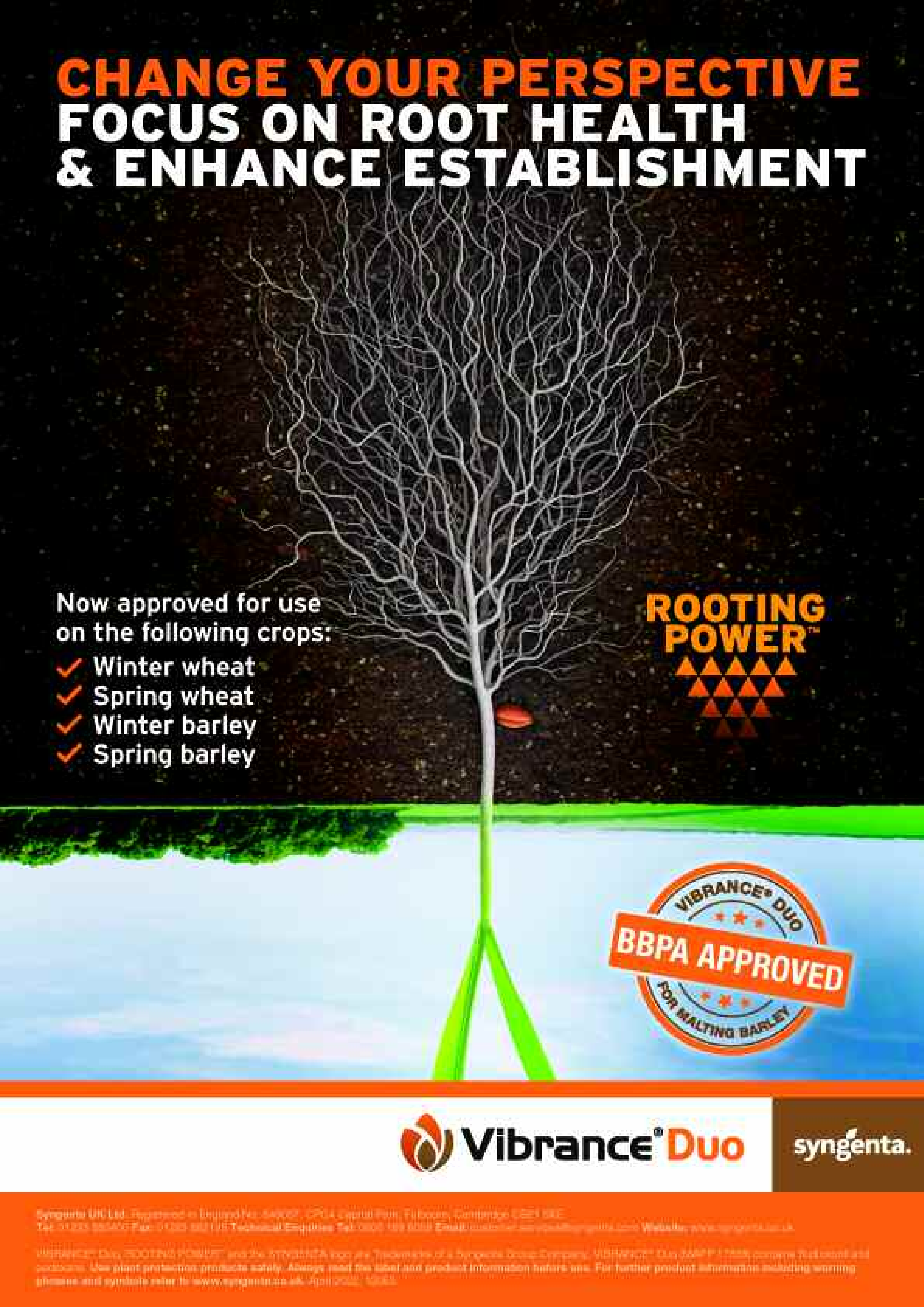
Though more detail is still to be revealed, it's been made clear that a more holistic approach ▸











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Manure is now being seen as a valuable resource, rather than just muck, says Matt Ward.

▸ to crop nutrition is likely to be incentivised under the ELMs. Of course, stewardship is nothing new, with 42% of growers noting that they're already in a stewardship scheme and will look at ELMs when eligible. In contrast, 15% say they don't know enough.

While Tom is in a number of stewardship options at present and believes they're an important part of farming, he's not convinced about what has been revealed so far about ELMs. "I've seen and read a lot and I don't like what I've seen. I've also had many conversations with both my local MP and Janet Hughes (Defra) and I've concluded that the SFI is completely underfunded. One of our stewardship schemes ends next year and given the option, I'd rather re-enter that."

Matt reckons that while protecting the environment is an important duty growers must undertake, there has to be a business case for doing so too.

Alongside rewarding public good, reaching net zero is also a priority for both government and agriculture, with the NFU setting ambitions to reach the goal by 2040. Many growers have made great progress already in reducing emissions with plans to reduce them further. In terms of how they aim to do this, 43% of growers say they will be planting more cover crops, while 39% plan to change establishment methods, 38% say they'll do so mainly by reducing fuel and 31% say reducing fertiliser will be their main approach. Just 11% of participants revealed they have no plans to reduce their carbon footprint.

Hutchinsons' new TerraMap carbon module is one of the tools available to help growers better understand the carbon impact of their operations on a realistic farm scale. It's claimed to be the first carbon mapping service to provide a highly accurate baseline measurement of both organic and active carbon in the soil.

But how does it work? Within the Omnia Carbon management tool, it's possible to create different rotation scenarios from types of cropping and variety, to stewardship and management practices and see first-hand the projected CO_2 impact and financial performance, explains David.

Matt says that aside from the environmental benefits, a lower carbon footprint is just good for business. "Lowering emissions from agriculture revolves largely around being more efficient with resources and inputs — so that's got to be good for the bottom line too."

Not only does agriculture have the opportunity to reduce its emissions, but also to sequester and potentially sell carbon stocks in the future. However, there's still much scepticism surrounding this, with 45% of growers saying they just don't know enough about it.

"We're of the opinion that there's not enough information on what carbon trading schemes will look like and how they'll be judged in the future," believes David.

Tom adds that he personally won't be looking to sell any carbon stocks until clear criteria is set out by someone official. "It'd be lovely not to have any government interference, but it does require some kind of regulation, in my opinion."

Sustainability is another phrase talked about regularly, and for many businesses this means increasing farm productivity to ensure longevity and future business viability. But what's the best way to do this?

Half of growers say they hope to achieve this by removing poor performing areas from the cropping regime, while 42% say they'll be looking into regenerative methods. Reducing fuel and artificial fertiliser usage and incorporating soil improvement methods were also noticed as key priorities.

Considering options

While taking poorer areas out of production is a popular choice, Matt warns that this kind of decision making shouldn't be binary. "I don't think it should be a case of deciding whether to crop or not, but more about considering whether or not you should plant a certain crop in a certain year. Some crops are much more resilient than others, so it's important to consider all options."

With regards to soil nutrition, 58% of growers say they're planning on using more soil nutrient mapping to measure and manage nutrition, while variable rate fertiliser looks to be an attractive option for 48%. Almost half (46%) say they're also interested in the potential of using satellite imagery.

Yield mapping can also be useful, points out David, with 40% of growers noting that they're already using it to highlight high and low performing areas and 37% to identify anomalies in a field. "One of the big perceived barriers with yield mapping is that combines are expensive and there are many growers running older machines which don't have them onboard," he explains. "However, it's not impossible to have retrofitted yield mapping technology installed.

"While there may be a cost, I think it's really important to remember that if we can't measure something, how can we manage it? As growers start to replace older kit, I think yield mapping will become standard."

Tom believes that having access to such a wealth of data nowadays is incredibly beneficial for those looking to be more precise and increase the productivity — and profitability — of their business, but it's important to ensure the value of that data is being realised. "To get the most from data, you have to be strategically using it rather than just looking at maps. Our ambition is to be much cleverer with how we use our farm data and based on what we've learnt through the Helix project, I believe we can achieve the same yields with less inputs without really having to try. It's all about just being smarter with what we do and where we put inputs."

Matt echoes these sentiments and concludes: "Because we're investing so much more in crops now, a one-size-fits-all approach is invariably wrong. By pooling all of the resources available, there's a huge opportunity to protect the environment, ensure long-term business viability and boost that all important bottom line." ■

Winner announcement

Congratulations to our winner Ted Holmes from Warwickshire who responded to the *CPM*/Hutchinsons survey on managing risk and has won the fabulous bumper prize of full access to Omnia Precision for a year (including extensive support from an Omnia specialist), as well as 50ha of TerraMap Carbon soil scanning and an iPad Air and Apple Pencil.

Ted responded to the survey and completed the tie-breaker question, which asked respondents to detail the way they believe most effective to manage business risk going forward.

To take part in the next survey, make sure we have the correct details for you by emailing *angus@cpm-magazine.co.uk*

> *Flexibility within a variety is key.*

A breakthrough for the break crop?

Better buying, better selling

As British grown oilseed rape starts to signal towards a slight recovery, how can growers get the best from the crop? *CPM* finds out more…

By Charlotte Cunningham

Looking cautiously around the countryside, oilseed rape crops are largely looking well, with carpets of evenly established yellow flowers a sight for sore eyes after a challenging few years.

Though the mighty mouth of the cabbage stem flea beetle proved an opponent too great for many growers, with more knowledge about how to grow OSR to avoid the worst of beetle pressures, and high crop values going forward, it could be enough to attract growers once again reckons Duncan Durno, arable technical manager at Openfield.

"Despite the challenges, OSR is still an incredibly important break crop," he says. "There's a lot of crops looking very good and I think growers are starting to get more confident with getting OSR up and away to mitigate the risk of flea beetle damage. This is also supported by some very strong prices at the moment — adding to the attraction."

A successful crop starts long before a drill is pulled out of the shed, and comes largely down to choosing the right variety, believes Duncan. "In light of what we've seen and learnt about the habits of the CSFB, flexible drilling windows seem to be one of the best tactics for avoiding the worst of it."

Agronomic qualities

"Flexibility within a variety is key because the 'ideal' window will vary from farm to farm. For example, in the South there seems to be a trend towards drilling later, whereas those in the North tend to benefit more from earlier drilling. The conditions have to be the driver for sowing a crop — not the variety."

But flexibility and the ability to get up and away also has to translate into good yields, adds Duncan, and so it's important to select varieties which are stacked with good agronomics too. "This is an opportunity to think about what kind of drilling window you tend to sway towards and what other qualities you might need to support that. For example, good stem strength and TuYV resistance might be a must-have for early drilling. Traits pod shatter resistance also help to add reliability and inherent strength to a variety."

Duncan says there are four key varieties in the Openfield portfolio which offer both flexibility and a strong performance: Ambassador, DSV Duplo, DK Excited and Tennyson.

A hybrid from the Limagrain stable, Ambassador is one of the highest yielding and most consistent OSR varieties on the 2022/23 AHDB Recommended List with a gross output of 106%. Proven on farm over the past three seasons, Ambassador is now the most widely grown variety across Europe, notes Duncan. "Flexibility in drilling date is provided, with the variety being well suited to both the early and late window, with notable autumn and spring vigour."

Agronomically, it's a good choice too as Ambassador is fully loaded with traits, including TuYV and phoma resistance, as well as Limagrain's N-Flex trait, explains Liam Wilkinson, arable crops development officer at Limagrain. "This trait-packed variety offers maximum security to growers ▸

The combination of more knowledge on how to avoid the worst of CSFB, plus strong forward prices for OSR, could make growing the crop attractive again, says Duncan Durno.

Limagrain's new N-Flex trait, found in the variety Ambassador, can aid nitrogen use efficiency.

▶ with the inclusion of TuYV resistance, as well as a solid disease resistance package. It also contains the valuable trait of pod shatter resistance, which offers final yield security. With current commodity prices, I believe this is a must-have inclusion when looking at variety choice for this coming autumn."

Data recently received from independent market researchers, Kynetec, has also shown that in terms of area Ambassador is the biggest variety in Europe for this year's harvest, he adds.

Primed for success

Priming seed to encourage germination is common practice in high value crops, and in a bid to incorporate the same strategy for success into OSR, Openfield has been carrying out trials on primed OSR seed for the past two seasons. "The technology is proven in many high value crops where crop uniformity is critical, and we wanted to see if this evenness of germination and establishment could be used to our advantage in the fight against CSFB," explains Duncan.

This season, Openfield is running primed and non-primed seed comparisons in farm scale strip trials using Elgar seed, from Elsoms.

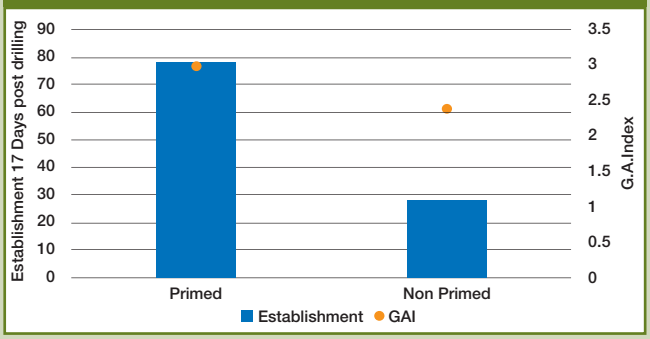
So how have they fared so far. "Large scale plots were drilled side-by-side using primed and non-primed seed from the same seed lot to allow accurate comparisons and assessments to be made," he explains. "Plant counts at 17 days post drilling showed 78% establishment in the primed plot and only 28% in the non-primed — an impressive start," notes Duncan.

Pre-winter growth area index (GAI) assessments were done on 20 November, before any winter defoliation had taken place. Results were again very positive, with the non-primed plot showing a GAI of 2.4 and the primed plot showing a GAI of 2.99, explains Duncan.

"Even more impressive is the evenness of crop canopy across the whole of the primed plot with all plants of an equal size and at the same growth stage."

Crops were assessed for spring regrowth and early flowering with both these timings showing a more even crop development in the primed plot he concludes. "With this level of crop uniformity, it will help growers to optimise input efficiency with improved timing of nutrient and crop protection applications."

Trial results on primed vs non primed Elgar oilseed rape seed



Source: Openfield

Duplo is also one of DSV's 'triple-layer' varieties.

Also boasting good autumn vigour is DSV Duplo. "With many people drilling later to hopefully miss the worst of CSFB pressures, Duplo is an ideal choice," explains Duncan. "In fact, with earlier flower development, it's probably not one you'd want to put in the earlier slot."

Duplo is also one of DSV's 'triple-layer' varieties, explains the firm's Sarah Hawthorne. "DSV Duplo was initially fast-tracked into the UK market because of its exceptionally strong establishment but it's proven to be a strong and resilient variety throughout the growing season.

"As well as TuYV and pod shatter resistance, the variety also has *Rlm7* plus multigene resistance to phoma stem canker and the DSV N-efficiency trait allied to a deep rooting system to help ensure robust growth in virtually all conditions — including droughts."

Though it doesn't form part of the RL, Dekalb's DK Excited is a strong option worth considering, points out Duncan. "In Bayer's own trials, it's come out on top for yield, and also boasts a whole host of other important traits like rapid establishment, early growth habit and vigour — as well as TuYV resistance."

Breeder, Matthew Clarke, says that DK Excited is the "next step up" in Dekalb's OSR breeding programme. "Looking at both our breeding trials and commercial data, DK Excited has been proven to give consistently high performance across a wide range of European environments in addition to those in the UK. This level of yield consistency, added to the Dekalb yield protecting traits of pod shatter and disease resistance, translates into a very robust hybrid for all UK growers."

And finally, Openfield is championing Tennyson, a newly recommended variety from Elsoms. "With a wide drilling window, Tennyson is a great choice for growers looking to build flexibility into their drilling programme," says Duncan.

Recommended for growers in the East and West regions, Tennyson also boasts a top agronomic merit score on the AHDB variety selector tool, adds Jack Holgate, crop manager at Elsoms.

During the 2022/23 launch, ▸

Tennyson will be sold as primed seed this season.

Better buying, better selling

Lack of production from the CF Fertilisers Ince plant is causing havoc for sulphur supplies, explains Lucy Hassall.

▸ the RL team noted Tennyson as a variety with a high gross output (104%), high resistance to lodging and very high resistance to stem canker (9) — pointing out that this resistance is based on different genetics to most varieties on the RL. It also boasts a score of 7 for light leaf spot and benefits from TuYV resistance too.

From this year, the variety will be sold as primed seed, and Jack adds that this is beneficial for establishing a uniform crop of OSR. This is something Openfield is particularly interested in, and the firm has been carrying out its own trials to look at the benefit of priming technology (see box 'Primed for success').

Once established, managing the crop with the correct nutrition is also vital for getting the best from OSR, notes Duncan. "One of the most important considerations for rape is sulphur — it's a very sulphur-hungry crop and nitrogen use efficiency is largely governed by sulphur ratios."

But with input availability across the board thrown into jeopardy of late, the outlook for sulphur supplies is equally precarious, explains Openfield's fertiliser manager Lucy Hassall. "There's definitely been a lot of concern leading up to the new season reset with regards to availability. Ultimately, CF Fertiliser not running the factory at Ince is a big issue. A lot of UK farm supplies have traditionally come from this plant, namely DoubleTop, SingleTop and Sulphur Gold."

In a situation where supply is limited, the best course of action would be to consider switching to a Yara 26/35 grade, which still has high levels of sulphur, explains Lucy. However, this too is in short supply. "Each supplier has only been allocated a small amount, and ultimately, as soon as it's come in, it's gone back out again. Origin is another potential source, but again it's the same story and we just can't get hold of any."

With high sulphur products in short supply, but high demand, Lucy says there's been a shift towards growers looking for lower grades (27/12) with a mind to go with a little and often approach to application.

DK Excited has been proven to give consistently high performance across a wide range of European and UK environments.

"But even these sources have come back with low offers. It's a real concern."

The only readily available option at present is urea sulphur, she explains. "In particular, we've turned our attention to polysulphate sources."

Mined in Yorkshire

Polysulphate is made up of sulphur, potassium, magnesium and calcium, and the world's only polyhalite mine is operated by ICL in North Yorkshire. The firm's Scott Garnett explains why polysulphate could be an important part of crop nutrition plans going forward — and in particular, this season. "It's a natural mineral that we mine here at Boulby, North Yorkshire. Because it's a rock, there's no manufacturing involved — we simply mine it underground and cut it to size. It's also got the lowest carbon footprint of any other mineral fertiliser out there."

Compared with traditional sulphur sources — which are known for leaching — polysulphate also offers a more sustained supply of sulphur to crops, he adds. "The nutrients held within the rock crystals are released over a prolonged period. This can be up to 50-60 days, compared with just a few weeks from other sources. This means that the sulphur is readily available to the plant for longer, which when growing a tricky crop like OSR is highly beneficial."

Polysulphate is made up of sulphur, potassium, magnesium and calcium, explains Scott Garnett.

Polysulphate doesn't, however, contain nitrogen, so Lucy advises going with a nitram/polysulphate programme.

Though interest has been growing year-on-year, Scott says the current challenges have actually shone a light on how beneficial other resources, like polysulphate, can be. "What's more, it's a very sustainable resource, which is particularly important at a time where growers are struggling to reserve the supplies they require." ■

Better buying, better selling

To remain at the forefront of arable farming and to maximise the value from every hectare of crop grown requires a keen understanding of the grain market, the seed to supply it, and the fertiliser to feed the crop.

Through this series of articles, *CPM* is working with Openfield to provide a market insight and help farmers to focus on these major business decisions to ensure better buying of inputs, and better selling of the produce.

Openfield is Britain's only national farming grain-marketing and arable inputs co-operative, and is owned by over 4000 arable farmers. Openfield's team works with a total of 6000 farmers to supply some of the biggest and best-known names in the British food and drink manufacturing industry.

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CLIMATE CHANGE CHAMPIONS

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The evidence of true prosperity

Climate Change Champions

Managing the estate’s assets to maximise profitability has always been the core aim for Charlton Park in Wiltshire. *CPM* visits to find out how the same measured approach is now being applied to its natural capital.

By Tom Allen-Stevens

Standing on the edge of the near-empty digestate lagoon at the new AD plant, you get a good view of the operation. Over the far side, a Manitou telehandler is beetling back and forth, feeding maize silage into the 40t hoppers.

“It’s currently fed about 60t per day, but that will increase as the plant builds to full capacity,” explains Robin Aird, estate manager at Charlton Park, near Malmsbury, Wiltshire. A small portion of the estate’s 1667ha has been given over to a gas-to-grid plant that was commissioned in April, fed by a significant area of its crops. This is set to put 500m^3/hr of renewable, home-produced biomethane into the network, reducing the UK’s reliance on gas from abroad and energy from fossil fuels by around 2MW.

In the foreground are three tall siloes with a network of steel tubes that glint in the sunlight. These thrust out in front, ready to receive a share of the 25,000t/yr of food waste that makes up around 50% of the digester’s diet. Then in the middle, there’s a block-wall structure, with what looks like a cage and a box on top, dropping fragments of a fibrous substance into a heap below.

Switch to digestate

Robin wanders over, picks up a handful and runs it through his fingers. “This for me is what it’s all about. We’ll receive a total of around 45,000t/yr of digestate in both solid and liquid form to help us reduce reliance on synthetic fertiliser and build life into our soils.

“But it has to pay dividends. If you’re haemorrhaging cash, it doesn’t matter what environmental achievements you’ve made — they’ll be undone. Our approach has always been to keep the land in good heart, but we’ll sweat the estate’s assets, and ensure first and foremost that it’s a profitable business. That goes as much for its natural capital as it does for the crops we grow.”

Since he arrived in 2003 at Charlton Park, an estate that’s been in the same family since the late 16C, Robin’s carefully evolved its farming system on soil types that vary from gravel to brash to loam to clay. Sometimes these all appear in the same field, and the resulting yield rarely scrapes above the national average. However, benchmarking puts the farm’s financial performance in the nation’s top 25%, and his aim is to achieve this across its natural capital assets, too — not just carbon, but biodiversity and water quality.

“Whenever a new scheme or opportunity in farming comes along, we take a good look at it and work out what works within our system without affecting the bottom line. There has to be a clear benefit for both profitability and the estate’s biodiversity,” he states.

It’s this measured approach that led the farm to exit Entry Level Stewardship just over five years ago, to focus on improving arable ▸

Three tall siloes store a share of the 25,000t/yr of food waste that makes up around 50% of the digester’s diet.

The digestate makes a big difference in helping the estate reduce reliance on synthetic fertiliser.

▸ profitability. Now it's back in, with a Countryside Stewardship (CS) agreement that started last year.

It's no accident that the AD plant has come on stream at the same time. This is a joint venture, with the estate's main involvement being a land rental for the site plus the contract to grow its crops and take the digestate. Robin's carefully adapted the cropping to take advantage of this new direction, feathering in a CS agreement that achieves the productivity aims, while attracting an additional payment.

Leaving the AD plant behind, he stops off in a field of spring wheat to explain the new rotation. "We have four roughly equal blocks of 240ha with winter wheat grown across one, then we've introduced hybrid rye for the digester over another. A low input spring cereal is grown on the third, after stubble turnips and the new crop for us is maize. In front of this there's a cover crop of oats, vetch, crimson clover and phacelia," he says.

"Previously I wasn't a fan of cover crops, but if we're being

What makes Robin Aird a Climate Change Champion?

Innovative ideas

If there's a confidence about the way Robin presents Charlton Park and its farming prospects, it's because this is based on a solid grasp of the underlying figures. Applying the same approach to its natural assets sets the estate up for a bright future.

Cultivation care

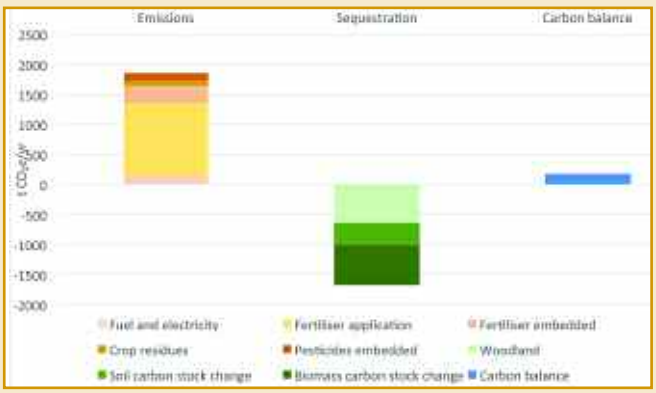
A gradual, sustained reduction in cultivation is already bringing benefits in terms of reduced costs and improved soil organic matter. Maize presents a challenge, but the business now has the measurement tools to bring optimum results.

Productivity push

The move to digestate away from synthetic fertiliser makes a massive difference for the farm's sustainable productivity. Robin has pushed this further by exploring every opportunity to maximise returns through both crop management and stewardship.

Bio-based boldness

The wider, societal benefit of the AD unit arguably sits outside the business. But Robin has carefully ensured maximum opportunities for the estate and the WOMAD festival presents an ideal and direct route to market to capitalise on its natural assets.



Source: Charlton Park, 2022, calculated using Sandy by Trinity Agtech. Figures shown are indicative and exclude pasture.

paid to grow them, we can ensure they work. I don't like to see land go bare, so the crop in front of the maize works well, with the green cover sprayed off about two weeks prior to planting. Sheep are brought in to graze the stubble turnips, and you have to take care they don't puddle the ground."

It's early days but, judging from the vibrant crop of low-input spring wheat he stoops to inspect, it's a system that's working. He takes a spade to the soil to reveal a throng of roots and other life below that appears to be delivering the above-ground goodness.

"We think we're delivering benefits, and on paper it all seems to work financially. But 'think' is a big word with a lot riding on it. We need to know for sure that this system is taking us to where we plan the estate to be — that its natural capital assets are performing at the same level as the profit and loss account and balance sheet are telling us," he says.

Scientific analysis

This is why Robin has chosen to bring the estate on board with Sandy, the software from Trinity AgTech he's using to capture all of the management information (see panel on p58). This is brought in from the farm's Gatekeeper records and other sources and then analysed by powerful algorithms. Trinity claims the methodology behind this is backed by a 37-strong scientific board of leading experts in natural capital who have gathered together the peer-reviewed evidence.

Combining this in Sandy with the farm's management data gives Robin a set of metrics on the estate's carbon emissions, sequestration, biodiversity and water quality, and how these will develop over time. "What I'm hoping is that with Sandy I can quantify changes or practices — it's not just guesswork but actual figures," he says.

Fertiliser is the big one — Robin calculates the digestate

A throng of roots and other life in the soil appears to be delivering the above-ground goodness.

brings down synthetic nitrogen applications from 210kgN/ha for a typical wheat crop to just 100kgN/ha. But this is on the back of reductions already achieved. "We haven't applied any compound fertiliser for 19 years, and have maintained indices through spreading around 4-5000t/yr of farmyard manure, chicken litter and biosolids. This has also raised soil organic matter from around 1% when we started monitoring it to around 2-3% now, and allowed us to sell straw off the farm.

"What we want to know now is how the new cropping will affect indices — rye is hungry for both P and K, while maize also takes a lot of K, although the idea is that we replenish this through the digestate."

By now, Robin has arrived at the block of maize just emerging through soils that are drier than he'd like. "We're still learning with this crop — for example, this year we made an extra cultivation because the seedbed just didn't look right," he admits.

Ploughing ceased when Robin arrived on the farm, with a 4.7m Grégoire Besson Discordon the main cultivation tool. The number of passes and depth have gradually reduced over the years, guided by plenty of monitoring and spadework, with a 6m Väderstad Carrier now playing a more prominent role.

"Diesel use has reduced by 23% between 2015 and 2020, showing the cultivation policy works, but the addition of maize into the rotation has knocked this up again by 10%. Going forward we want to have a plan that ▸

The non-cropped areas are given the same approach of delivering sustainable performance as the cash crops.

Climate Change Champions

UK Farming has set itself the challenging target of Net Zero emissions by 2040. Although led by the NFU, it will take the entire industry, working together in a partnership approach to meet this ambitious goal.

But there are individual growers, thought leaders who have already started on this journey. They have the ideas, the progressive outlook and the determination to shape positive change. *CPM* has teamed up with leading agricultural suppliers who have a credible Net Zero aspiration to identify these individuals and bring them into the top-level discussion about how farming can position itself as the solution to climate change.

cpm-magazine.co.uk/climatechangechampions/

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▸ brings it down again but measures the results more accurately in terms of carbon emissions," notes Robin.

On the way back to the estate office, you're treated to some of the estate's most stunning natural capital assets — there's 180ha of permanent pasture along with 60ha of temporary grass and 100ha of woodland. Together with field margins and corners, ponds, streams and wildlife corridors, the estate has a total of 168ha in non-woodland stewardship, with the parkland and the Grade one listed mansion itself a fitting jewel in the crown.

So is financial performance ever compromised for the looks and heritage of the historic estate? "Absolutely not," comes Robin's quick reply. "We have 122ha of non-productive areas outside stewardship, but take the same approach with all our non-cropped areas of delivering sustainable performance as we do with the cash crops."

Silage from the temporary grass and pasture forms an essential constituent of the diet for the AD unit. Again, management of these areas has been carefully feathered into the CS scheme to make the most of the grassland options and payments available. But rural stewardship isn't the only way this Wiltshire estate works its natural assets.

The centrepiece here is the WOMAD Festival (World of Music, Arts and Dance), a regular feature at Charlton Park, that will take place this summer after a two-year COVID-enforced break. Started by Genesis singer Peter Gabriel, WOMAD has held the record as the biggest international music festival and is celebrating its 40th year in 2022. Some of the most highly regarded musical and performance acts from across the world are coming to Charlton Park for four days at the end of July and are expected to bring around 35,000 people onto the estate.

And Robin's looking beyond the headline acts to what he believes may become another important new income stream for the estate. "Sustainability sells," he points out. "Every festival goer and the festival itself will have a carbon footprint to offset. What we can sell here are the biodiversity co-benefits too.

"We're already looking at offering electric-scooter tours, dog-walking areas and rough-runner races. Against a credible, sustainable scientifically evidenced background, we can offer festival goers a four-day experience that also contributes tangibly to a lasting rural legacy." ■

Evidence puts the estate in a strong carbon position

Joining the tour of Charlton Park is Sian Rowlands who's been helping Robin understand the position of the farm's natural capital, including its carbon emissions.

"Initial results from the estate's arable and woodland enterprises indicate net emissions of 174t CO_2e. That includes total emissions of 1846t and sequestration of 1672t, of which 631t is attributable to the woodland. The figures for pasture are currently being incorporated, which will likely contribute to sequestration."

Robin was keen to understand the impact of the AD plant. Sian explains that current fertiliser usage accounts for around 1500t of emissions. "That should reduce with the switch to digestate, which would make a difference to the net arable balance, before you take any soil improvement into account," she adds.

Sandy has an optimisation feature that allows you to run scenarios to reduce emissions, showing financial, yield, and carbon implications. The software enables users to set target budgets and yields, and Sandy will recommend carbon reduction strategies that fall within these targets. This could include changing tillage, agroforestry, or nitrogen applications.

Robin feels that maize cultivations would be the one to look at here. "Maize is a much-maligned crop, and while we're following best practice, the figures suggest to me there's scope to bring down emissions. One aspect that seems to make a difference is the addition of a cover crop in front of it, especially a leguminous mix," he says.

The figures produced so far indicate the switch to digestate away from synthetic fertiliser may have tipped Charlton Park the right side of net zero. The Trinity team believes this would put the estate in a strong position to benefit from the emerging natural capital markets, including carbon, biodiversity, and water quality. "Robin's worked hard to implement more sustainable farming practices and has set a journey towards net zero. We reckon that's a great way to prepare to access the new income streams if he chooses to do so, which is why Trinity AgTech is pleased to support his nomination as Climate Change Champion 2022," concludes Sian.

Charlton Park is in a strong position to benefit both from the emerging carbon market and add value to this through selling biodiversity co-benefits, says Sian Rowlands.

> *Agriculture is in the crosshairs of society, so it's important we have people who are willing to stand up, articulate our position and speak positively.*

Conversations with Blake Vince

Roots not iron

***CPM* meets the creator of the #rootsnotiron hashtag, Canadian cover crop pioneer Blake Vince to talk cover crops, water, nitrogen prices and the role of livestock on his farm.**

By Mike Abram

There's no question that a Nuffield Farming Scholarship brings the participant, and agriculture more widely, some breakthrough moments. For Canadian farmer Blake Vince that happened at a field day in Ohio.

Blake was visiting to look at machinery but came away with a more striking memory after an encounter with Dave Brandt, "the granddaddy of cover crops", as Blake describes him, in a soil pit.

"He called me over and said: 'I can do more with roots than you can with that machine," recalls Blake.

Summer cover crops planted in June on David's farm were over the hood of a tractor in August highlighted his point, and Blake came away convinced this was something he needed to implement on his 486ha farm bordering the Great Lakes in southwest Ontario.

Finding solutions

Two other factors were also important at the start of his cover crop experimentation. Firstly, economics. Margins were being eroded and he saw the use of cover crops as an opportunity to further reduce fuel use by fully switching to no-till from a hybrid system, that also included some strip-tillage.

"My thoughts were if I can get this system perfected and use roots to open the profile of our Brookston clay soil, and fix nitrogen biologically rather than purchase it, I could save some costs.

"But what really compelled me was a photo of Lake Erie showing problems with blue-green algae blooms created by agricultural run-off. I knew agriculture was part of the problem and I wanted to be seen as part of the solution, not the problem."

A Nuffield Scholarship followed in 2013, along with the phrase "roots not iron" — which he created and helped popularise as a social media hashtag #rootsnotiron. Nearly 10 years later, as current chair of Nuffield Canada, he's widely regarded as a pioneer in incorporating cover crops into arable rotations.

"Nuffield allowed me to travel the world, see this methodology in practice and to develop a network of mentors. Together we've learnt from each other's successes and failures, and by disseminating that information freely, as Nuffield asks, I've found myself considered a pioneer."

His initial foray into cover crops was blending and drilling easily accessible seed on the farm — radish, soya bean, peas, oats and canola. "I learnt along the way to set the opening based on the average seed size in the blend." ▸

Blake Vince sees the future in walking the profit off the farm – as animals or customers buying produce direct.

▸ No-till corn followed the cover crop, and there was no discernible difference in yield where he used the cover crop compared with no-tilled, or strip-tilled, corn without the cover.

That encouraged him to immediately start trialling 14-way cover crops blends, including six legumes, various cereals, plus sunflowers, radishes and phacelia. This was compared with a four-species blend, a two species cover of oats and radish, and volunteer wheat, he says.

"Where we had more diversity, we had consistently more corn yield. Walking the field that summer, you could literally feel the nuances of differences in the soil as you walked across the plots," he says.

"It felt a lot more resilient, more forgiving and alive. It was like

Water worth more than carbon

While on paper Blake should be in an excellent position to benefit from the rush to reward farmers for storing carbon in their soils, he says the schemes in North America are more interested in what he calls 'freshly minted carbon'.

"These are people changing their practices now that have the potential to significantly increase their carbon. That lends itself to farms with soils that have been significantly eroded.

"With farmers further down the path of change, the changes you will see will be less significant as the soil is finding its equilibrium."

It frustrates him that society is happy to incentivise change but reluctant to reward those that have already done the heavy lifting. "The whole thing is a bit farcical, with the lack of regulation. I have no interest in signing into any scheme presently, as I don't like being tied into a contract that governs what I can do on farm."

He suggests water might be a better target for incentives. Increased water vapour in the atmosphere is a consequence of human-produced global warming, and effectively supercharges the warming caused by other greenhouse gases.

"If we can improve water holding capacity and increase infiltration rates, that can effectively reduce erosion, run-off, and drought. In areas that are rain-fed, that will improve productivity, helping the local economy."

Tying incentives to water would be more visual and easier for the general public to understand than carbon. "We drink it every day, wash in it, etc. It's an essential ingredient to life. We know the problems with water — it's agricultural runoff, human effluent and commercial pollution.

"We can address these problems by making wholesale changes. That's where protecting water resources would be an easier sell and allow people to get behind agricultural initiatives that tie farmers back to water quality."

Blake believes protecting water resources would be an easier sell than carbon and allow people to get behind agricultural initiatives that tie farmers back to water quality.

Cereal rye in grain maize stover, flown on with an airplane in September pre-maize harvest 2020. Photo taken spring of 2021.

walking on a hardwood floor and then walking onto a carpeted floor. Having these living roots is a huge asset to open up and increase water infiltration and water holding capacity."

Cover crops are now used extensively through his rotation. After corn, cereal rye is broadcast into the standing corn stocks in October or November — a single species is used as typically not much else will grow and survive the winter.

Soya beans are direct drilled into the rye 'on the green', which keeps weed populations in check — important as Roundup Ready (glyphosate) resistant weeds are an issue in the region.

In year two, after soya beans are harvested cereal rye is direct drilled into the stubble. "We direct drill into soya bean as the stubble doesn't provide enough shelter to protect that young seedling, unlike corn."

After a second season of soya beans, winter wheat is no-tilled post-harvest. "The wheat is typically harvested in July and, following that, I plant the big diverse blends, usually of 18 species."

Around 5-6 species survive through winter — cereal rye, crimson clover, hairy vetch, peas, purple-topped turnip, and possibly a trace of linseed. "I then usually direct drill corn into a big green living cover in the spring."

But the past summer he started working with a grazier with a small suckler herd to graze some of these covers to cycle nutrients and he's already excited about the extra environmental benefits. "I didn't anticipate the return of some birds of prey, some other songbirds typically found in grassland habitats, and even some amphibians in such short order."

Livestock benefits

It's the first-time livestock have been on the farm since around the time the farm converted to no-till in 1983. At that time rising inflation and lower commodity prices, including beef, prompted his father and uncles to prioritise arable farming and close a small beef feedlot, while a dairy herd was sold in 1974.

"The biggest advantage of having a grazing ruminant is you get the beneficial microbiology that comes in the faeces, urine, mucus, and saliva back into the soil and that helps complete the relationships.

"I think we've done a huge disservice by removing animals from the land. Manures and animal interaction with the soil is critical. With fertiliser prices having risen, I think animal husbandry and access to manures, providing you can feed those animals profitably, will be a huge asset to the bottom line."

Like many in North America, Blake didn't have any fertiliser secured heading into spring planting — that's going to mean ▸

The biggest advantage of having a grazing ruminant is putting the beneficial microbiology that comes in the faeces, urine, mucus, and saliva back into the soil.

▸ a significantly different fertiliser strategy this season.

Prior to the Ukraine war, he could see the NOLA (New Orleans, Louisana) price softening and was holding off buying but, coupled with selling winter wheat forward on prices that have now increased dramatically, he's on the wrong side of both markets. "It's a bitter pill to swallow."

Any bought-in fertiliser will be used very judiciously, he says, but he's also hoping that non-grazed mixed species cover crops grown before corn will help provide nitrogen to the crop. "The concept of plants helping each other intrigues me, and while I can't expect to have the same physical yield, it's better to make a margin than no margin."

He's also conscious of the increase in risk this spring, which could well be a forerunner of what farmers in the UK could face this autumn. "Farmers are on the hook for a larger sum going into spring planting. If our line of credit is maxed out to buy fertiliser, seed, herbicide and fungicide and we don't come up with the yield we're expecting because of drought or a hailstorm, what happens if you're short of crop? We're exposed and that's concerning.

"We're handling a lot more money, which would be one thing if we could stand to profit more but that isn't the case, necessarily."

Non-GM varieties

Blake grows non-GM corn and soya beans. "I'm not interested in the latest traits as I have a focus on soil health and a good rotation. I'm not growing corn after corn, or just alternating corn and soya beans, so I don't need insect protection or herbicide resistant technology."

Premiums for non-GMO corn are typically harder to find than for soya beans, and earlier in spring both failed to increase in line with increasing commodity prices, further adding to risk, particularly for corn where non-GMO yields are typically 5-7% lower.

"One of the motivational factors to grow non-GMO was that farmers are producers of food, and yet when I was growing GM crops, corn was for ethanol, soya beans for biodiesel and plastic.

"With non-GMO at least I'm back to producing food. The soya beans go to make tofu and miso, while the corn is being used for non-GMO Canadian Club whiskey."

His soft red milling wheat is milled for flour to use in doughnuts and cookies. But the future, he hopes, is to "walk" the profit off the farm. "By walking it either has to have hooves or be people coming to the farm to buy direct. That helps you capture more value.

"When I look at the millions of people who live within an hour away from my home, notwithstanding the border and the current high fuel prices perhaps discouraging people from travelling, I see a good opportunity to find products to direct market.

"That's why I keep coming back to beef. I think there's a vast segment of consumers that will demand animal-based protein. If beef is raised in a system they can appreciate and respect, the story will be an easy sell. That was evident the minute I put cattle back on the landscape with the comments I got from people, including wanting to buy the beef.

"It made me realise people do pay attention. The same with the cover crops — the questions I receive come from people from non-farming backgrounds.

"Agriculture is in the crosshairs of society, so it's important we have people who are willing to stand up, articulate our position and speak positively. I think our cover crops, soil health and water initiatives are a positive story that's easy to be excited about," he says. ■

Slow pace of change in Canada

In Canada, Blake is very much the exception in his farming methods. "Farmers like me are spread few and far between. We are fought every step of the way by 'big' agriculture retailers as we're seen as disrupters to the current model."

Another challenge is that soils, at least in Ontario, are relatively "young" and haven't been farmed for that long. That means they still have intrinsic value and lend themselves to tillage, he says.

"We also have a lot of European immigrants who are used to using tillage but by using that exhaustive approach things will never get better," he claims. "They burn off more carbon and use more fuel."

It's driven by plenty of available rain, meaning preservation of water in soil is less important than in more arid areas. "We're lucky to get the rain to perpetuate their preferred methodology. But you can no longer say the farmer is ignorant — he knows the negative consequences of his actions.

"The bigger risk is indifference — how do you help the farmer who is indifferent. He's not going to listen to others, but we all share the same air and water.

"After doing my Nuffield, the people I really wanted to influence were those close to home, and that's been difficult. I've been told I'm moving too fast, but we started no-till in 1983, how much slower do you want to move?"

On his farm, he can now find up to 45 earthworms/sq ft of soil — equivalent to nearly 5 million/ha. "The depth earthworm middens, or channels, go down is far greater than any tillage tool you could buy today, and would require in excess of 500hp tractor to pull that tillage tool anyway."

He's also seeing significantly improved water infiltration rates following big rain events, combined with crops being more resilient to drought. Soil organic matters have increased from 3.5-4% to 4.8-6.5%. "It's not uncommon for neighbour's organic matters to be nearer 2%.

The depth earthworm middens, or channels, go down is far greater than any tillage tool you could buy today.

"Visually I'm seeing more mushroom fruiting bodies, so I can see our soils are changing from being bacterial dominant, which is inevitable when using chemical-based products, to being fungal dominant — which is what you find in a forest."

> *“We aim for a circular system in which the arable complements the livestock and the animals complement the arable.”*

A circular approach tells its own story

Green Horizons

Livestock underpin some of the most sustainable arable systems in the country. *CPM* travels to the furthest reaches of Scotland and Wales to find out how two very contrasting systems fit in.

By Tom Allen-Stevens and Rob Jones

Farmed animals present something of a sustainability conundrum: on the one hand, slurry and manure applications can cause pollution while the methane is a damaging contributor to greenhouse gas emissions. But organic applications to the land reduce dependence on synthetic fertiliser use, and managed well, livestock can enrich soil biodiversity and lift an entire cropping rotation.

On the banks of the River Spey in Moray, east of Inverness, Bill Smith seems to enjoy the scampering and scurrying of his young piglets. They’re clearly curious about the visitors to their barn and have left the bales they were playing on in favour of a version of grandmother’s footsteps.

The piglets form a bed-and-breakfast enterprise on the 161ha Byres Farm Crown tenancy Bill runs as part of a 485ha family farming business. But it’s what they leave behind that interests him more.

Manure, mulch, crop

“Pig muck is supposed to be high in nitrogen, but these piglets arrive at seven weeks old from outdoor herds and stay on farm for seven weeks before moving to a finishing farm at 75kg liveweight, leaving manure with a very high straw content,” he notes.

“But I like that — we’re growing low N malting barley, and what I’m looking to do is feed the ground that feeds the mulch crop that gives the barley its goodness.”

Bill runs the arable side of the business, alongside his father John and brother Alan, who looks after its main livestock enterprises. These comprise 180 suckler cows, moving away from continental breeds towards Aberdeen Angus crossed with Lincoln Reds and Stabilisers. There are also 450 Lleyn/Logie hybrid ewes.

Half of the farm’s 320ha of Laureate spring barley are destined for Boort Malt and Crisp Maltings, who supply the Glenlivet and Aberlour distilleries respectively. The crop is rotated with temporary grass, but the main break is the cover crop that precedes it.

“The most important crop is the mulch — it’ll spend up to seven months in the ground while the barley grows for just five,” continues Bill. “So we aim for a circular system in which the arable complements the livestock and the animals complement the arable. All the straw is baled and turned into muck, and every block of land has its own source of manure. That for us is where the arable cycle starts.”

Bill’s joined by his Agrii agronomist Andrew Simpson. With drilling of the spring crop just about to start, it’s a chance to take a look at the predominantly sandy loam soils and discuss progress of the arable side of the business. “Spring barley ▸

The piglets at Byres Farm leave behind manure that provides the right balance to feed the ground that feeds the mulch crop that gives the barley its goodness.

Manure is usually applied before establishing the cover crop at Byres Farm, but sometimes it's applied just before ploughing.

► is a very important crop for this part of Scotland and can be the only arable crop some soils will see," notes Andrew.

"This is light land with some blow-away sands. If all you grow is spring barley after spring barley, the performance will dip and the soil will degrade. It can spend much of the year with no roots growing through it, so it's important to keep organic matter levels up, that it retains its structure and that there's plenty of life in the soil throughout the year."

Bill's settled on a mix of white mustard and fodder radish, drilled at 8kg/ha, although this may be raised to 10kg/ha. "We first started growing cover crops 10 years ago. I wanted a demo of a Väderstad Spirit drill in the autumn, so at the suggestion of our Agrii agronomist, we did a mustard trial."

He finds white mustard provides plenty of fast-growing green cover, while the fodder radish puts down a good root to help with soil structure. "Generally, we sow a greater share of the mix with mustard, but on heavier land, we may flip it round and drill more radish. We have tried phacelia, but that doesn't provide the ground cover we're looking for after spring barley. The other advantage of mustard is that it dies in the frost," he explains.

The cover crops are generally left ungrazed as it's the biomass Bill looks to benefit from. However, tired grass leys may be put into kale in early summer ahead of the spring barley, and stubble turnips are also grown. "We find it's the green matter that brings us the bugs, the worms and soil biota," he adds.

The cover crop is incorporated from the start of December with the farm's 7f plough and press, with no glyphosate used. Bill believes this still presents the best way to prepare the land, although like many in the area is looking at what reduced cultivations and

(From L to R) Phil Davies, Dai Llewellwyn and James Davies check on Ludchurch Farms' first cut silage.

direct drilling may offer.

"When it's right for our soils to go to direct drilling, we'll do so, but they're not there yet. Also yield is key — we're achieving 6-7t/ha of spring barley plus the straw and don't want to compromise that output," he says.

"However, we are noticing a difference in the soils — the heavier ones used to glisten when you turned them over, but now they plough more easily and leave a more friable surface. They hold their structure better and yields are creeping up."

Bills feels the job of feeding the crop is more than half done before the barley seed goes in. "The trick is to treat the mulch crop as a proper crop, aiming for good establishment and to feed it. We'll usually put the muck on before the mulch, but sometimes apply just before ploughing," he notes.

"It's difficult to know which is bringing the most benefit and I think they complement each other. What's more, we're always learning and introduce new ideas that can help the system — our circular economy is rather like a whirlpool that brings in things and develops aspects I didn't anticipate."

One of these may be the farm experiences and events business the family has created that welcomes the public of all ages, especially children. Run by Bill's wife, Helen, Byres Farm has a weekly Fun Farm activity group for pre-school children to learn about what's happening on the farm, take part in related craft-making and see and feed animals in the animal paddocks.

Experiences for older visitors include tractor driving and a malting barley whisky tour, in which Bill guides a group through the fields, and explains what he does to grow a "magical" crop.

"We've established a network of farm margins and also offer a pollen and nectar tour and a farm sculpture walk, where we've teamed up with local artists. It's a good way to grow the business without growing the acres. But it also gives us the opportunity to tell the soil story — how the goodness they taste in a bottle of Glenlivet starts with the care we give to the soils.

"And it gives us all a real sense of perspective — as a family, we've always aimed to farm in an environmentally friendly way, that keeps the long-term interests of the land at its heart. We're not doing what we do to tick a box, but because we genuinely feel we're farming in the right way, and I think our visitors appreciate that," concludes Bill.

Slurry feeds the soil

Masses of mycorrhizae and an upsurge in mole populations are 'living' proof of the success of the increasingly regenerative integration of cropping with Ludchurch Farms' substantial dairy herd, near Narberth on the south western tip of Wales, over the past four years.

This stems from the determined effort Phil Davies, his wife Louisa and son, James have been making with Agrii agronomist Dai Llewellyn to put the most sustainable crop production science into the 600ha of 'arable' land on the Green Horizons' network farm.

"It's amazing how much things have improved in such a short time," stresses Phil, pointing to a veritable mat of mycorrhizae in the stubble of this year's first silage cut and a wonderfully rich, well-structured, root-filled soil beneath it.

Weighbridge records show a dry-matter yield of around 20t/ha of silage from new leys from slurry and nitrogen inputs that RB209 suggests would be suitable for target yields of 12-15t/ha. Wheat for crimping achieves 14t/ha at 35% moisture.

"As well as what we see and measure ourselves, our slurry contractors tell us how much better the ground is travelling. And our mole man simply can't believe the extra pressure we're putting him under! Our focus on mixed cropping with year-round roots in the ground and the most effective organic manuring is really paying dividends."

With 140-150cm of annual rainfall on silty clay loam soils, everything Ludchurch Farms grow supports their high output

A mat of mycorrhizae in the stubble of this year's first silage cut overlays a rich, well-structured, root-filled soil at Ludchurch Farms.

1250-cow Holstein herd which, in turn, supports their cropping with large volumes of muck. While grass silage remains an essential part of the rotation, its area has been reduced markedly from 300ha to 200ha currently in favour of cereals.

Winter and spring wheat and winter barley are crimped and clamped with a preservative, which allows harvest to be pulled back by 2-3 weeks away from the farm's wettest month — August. There's extra work to dry the cereal straw before baling, but it saves Phil more than £150,000/year in bought-in straw, he says. "With rolled wheat trading at well over £300/t, if you can get it, and haulage charges of £20-£25/t from England, our approach certainly stacks-up at the moment."

But maize has no place in the business. "We tried it once, but we simply can't afford to undo all our soil improvement ▸

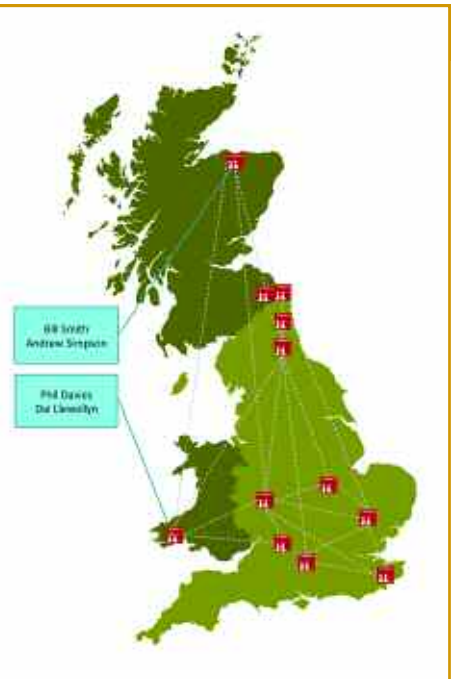
Green Horizons

The farmer network is part of Agrii's ambitious Green Horizons plan of practical action to improve the sustainability of UK food and farming.

Focussed on increasing farm productivity and viability, providing integrated whole farm solutions, improving soil resilience, enhancing the environment, and extending stakeholder engagement, this initiative brings together the best scientific intelligence and farm experience to inform future improvement action.

Network growers are working alongside Agrii's extensive variety, soil resilience, IPM and other trial work, and collaborative projects with a range of partners to share ideas, test approaches and showcase progress.

Up-to-date information and a series of specialist insight reports is available from *www.agrii.co.uk/greenhorizons*



Where some of Ludchurch Farms' ground doesn't get sufficient low disturbance lifting ahead of direct drilling, crops invariably struggle.

▸ efforts by growing it. It disrupts roots in the ground and provides no opportunities for manuring the growing crop."

Having started to move away from a traditional plough and power-harrow drill regime 6-7 years ago, the Davies family's reduced tillage journey really began in earnest in 2018 when they brought in Dai Llewellyn with the challenge of raising their cropping game.

Balance of cropping

"Our key objective was to apply the best, most sustainable arable approach to grass production," explains Dai. "We were also keen to make much better use of the dairy slurry. At the same time, we wanted the best balance of cropping to support the herd. And one which had the greatest flexibility to adapt to milk price and input cost changes."

A 6m Horsch Avatar SD drill has become central to the cropping. This allows the cereals to be drilled direct into grass or cereal stubbles and cover crops wherever possible, but it's equally at home in soils lightly cultivated with the Horsch Joker or lifted with the more recently acquired He-Va Stealth.

This flexibility is important with a relatively high silt content, making the ground susceptible to shallow panning; especially so with the intensity of trafficking involved in a multi-cut silage system, not to mention regular umbilical slurry applications.

"We've learnt how important it is to get poor soils into the right condition for direct drilling in the first place and to keep them there with strategic low disturbance metal at depth whenever necessary," points out Dai.

The grass cutting height has been raised to 100mm, rather than a more traditional 50mm. This sacrifices a little first cut yield — although mainly of stem. However, it reduces stress on the crop to massively improve recovery and subsequent yields, as well as its contribution to the soil, he says. Replicated on-farm trials of the bio-stimulant, PhysioCrop, and growth enhancer, Smartgrass, have proven their effectiveness in boosting fresh-matter yields.

One fundamental change in the management has been to make better use of dairy slurry across all cropping. "In the past it was more a matter of finding a place to put it. Now, every part of our ground can be served with our separated slurry storage and umbilical application system," says Phil. Tankers are confined to one small area of each field headland to minimise pressure on the soil, he adds.

"Analysing the slurry allows us to apply around 35kg/ha available organic nitrogen plus liquid N+S for each silage cut. We apply a similar amount of slurry N to the winter cereals in two spring splits and spread the separated solids on our spring crops."

The urease and nitrification inhibitor LiquiSafe is routinely added to all the liquid fertiliser following farm trials, which showed it consistently gave the same crop performance from 15% less nitrogen.

While the system is working well, Phil notes that one potential cloud on the horizon is the move by the Welsh Parliament to make the whole country an NVZ. "Our umbilical regime for applying carefully controlled and targeted amounts of separated slurry to growing crops carries the least possible risk of nitrate pollution. Yet the NVZ limits on organic manuring will force us to cut back hugely on this resource, which is so valuable for our soil condition and productivity and means we'll need to buy-in a whole lot more fertiliser. And what will we then do with the muck? It's crazy," he says. ■

All looks well for Groundswell

As the hunger for knowledge about a more sustainable way to farm grows, this year's Groundswell (22-23 June 2022) looks set to be bigger and better than ever. *CPM* previews the event.

By Charlotte Cunningham

When the first Groundswell event took place in 2016, there are few who could have predicted just how influential and special the gathering would become.

Now, seven years later, regenerative agriculture is everywhere, with farmers across the country turning back the clock and reverting to some of the more traditional methods of farming in a bid to create sustainable, profitable businesses which farm with the environment and wider biodiversity in mind. And Groundswell has firmly cemented itself as the flagship event for knowledge exchange, idea sharing and pure passion for simply wanting to farm better.

This year's event is set to be bigger and better than ever, with crop plots, working demonstrations, over 175 exhibitors and a brimming seminar schedule ensuring there really is something on offer for everyone.

While the term 'regen' may mean different things and take different forms to many people, organiser, Alex Cherry, says regenerative agriculture is simply the production of food or fibre which, at the same time, improves the environment.

At the core of the event is the 'five principles of regenerative agriculture' of which much of the exhibits and seminars focus on.

These are:

1. Don't disturb the soil
2. Keep the soil surface covered
3. Keep living roots in the soil
4. Grow a diverse range of crops
5. Bring grazing animals back to the land

As such, growers will be able to seek the latest advice on cropping for a regenerative arable system, learn more about the impact of cultivations and using holistic techniques to promote soil health, and even get up close and personal to livestock to better understand how these four-legged machines could be the answer to promoting long-term sustainability in arable production.

Therefore, the event is aimed at anyone who simply wants to make better informed decisions, says Alex. "Groundswell is a welcoming, open-minded and innovation-led event. For anyone hoping to be inspired, it's a chance to take a fresh look at farming and get excited about the future of the industry." ■

Groundswell 2022

Where: Lannock Manor Farm,Hertfordshire, SG4 7EE

When: 22-23 June 2022

Important information: Tickets can be bought online. Camping (glamping and self-camping) options available on site too.

The event will consider how livestock could play a bigger role in arable production.

> *The intention is in its name – we're surfing on the swell created by other people.*

A festival of ideas

Groundswell is agriculture's event with a difference. *CPM* visits the Cherry family at Weston Park Farms in Hertfordshire to discover the back story to what's fast becoming the UK's most talked about event – put on by farmers, for farmers.

By Lucy de la Pasture

The third week of June is eagerly anticipated by thousands of people. Programmes are poured over to prioritise the 'can't miss' sessions and note when to be at which stage. With a buzz of excitement, tents are thrown into cars along with footwear for all eventualities. It's a chance to cut loose from the day-to-day responsibilities and meet up with friends old and new.

While a great many will be heading to Glastonbury, a growing number will be heading to farming's fastest growing event, Groundswell. One is a festival of music, the other is a festival of ideas.

As well as shared dates, Glastonbury and Groundswell have a lot more in common. One of those is that they're both hosted by a farming family with a passion for the genres they provide.

So how did it all start for the Cherry family?

Brothers John and Paul Cherry took the reins at Weston Park Farms some 35 years ago and their journey really has been a road to Damascus.

Farming was boring

"When we took over the farm, the outgoing tenant had been averaging around 6.2t/ha (2.5t/acre) for his winter wheat. We were pretty sure we'd do better and join those pushing the boundaries at that time, producing 10t/ha. But we've never averaged that here," explains John.

The farm is a chalky boulder clay and where the chalk comes to the surface, it's easy soil. But in the main, the clay is anything but easy and has a tendency to slump and become tight, adds Paul.

"The farm now averages wheat yields of 8.5t/ha, with the odd field occasionally producing 10-12t/ha. The soil really isn't good enough to produce more."

Until relatively recently, the farming system has been very conventional with tillage at its backbone. The farm started on a plough-based system and quickly moved to max-till, discing and pressing, but it became obvious that the heavy clay land was getting more difficult to work.

The Cherry brothers describe farming as pretty boring at the time, rolling out the same system year-on-year and become more and more divorced from the growing crop and the soil.

"Our agronomist made the recommendations, often passing them directly to our sprayer operator. We weren't really that involved. I was getting sick of farming and doing the same old, same old...," says John.

So what changed? It was more a case of reconnecting with their values after realising how far they'd strayed from them. John explains: "I was always interested in soil health. When I

With an increasing thirst for information and lots of unanswered questions, Paul (right) and John Cherry were inspired to host the first Groundswell event in 2016.

was at university I was reading 'The Living Soil' by Lady Eve Balfour but there was very little mention of soil health in lectures, it was a much more industrial approach to the soil. So I was aware, but I didn't have the 'know how'.

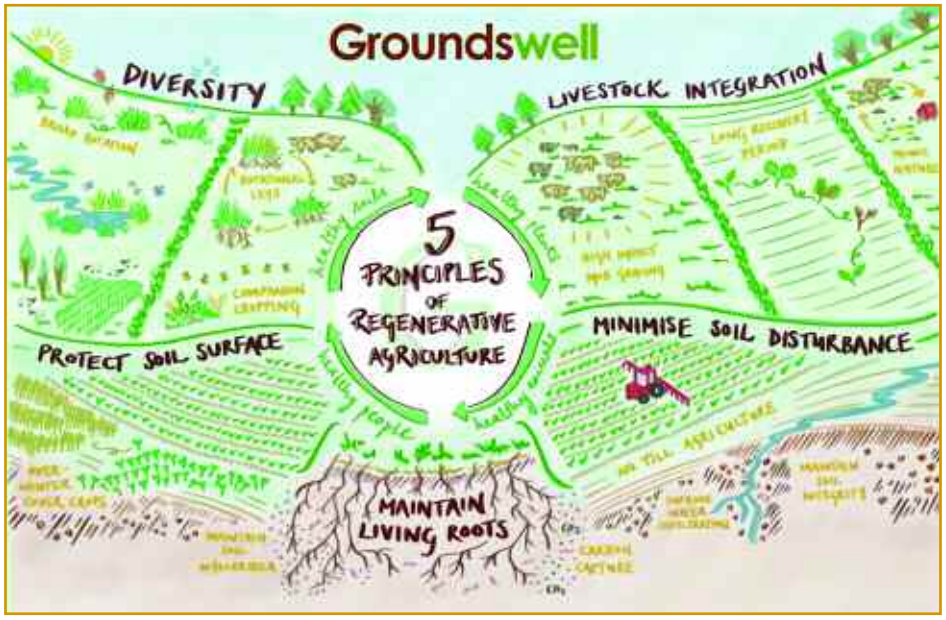
Eureka moments

"My eureka moment was when I found farmers who were putting their soil first. I visited Tony Reynolds' farm in Lincolnshire and there were skylarks just everywhere. It was because of the way he was farming."

John then went to the US for the No-till on the Plains conference and met lots of no-till farmers from Kansas while he was out there. "I saw the rainfall simulator on a prairie soil which compared grass with cultivated soil and where there were living roots, the water came out clear.

"It backed up what we were seeing at home and clarified that cultivated soil holds less water than soil that's been left alone, and that water doesn't run through fluffy soils created by machines."

At around the same time, Paul witnessed a rainfall event in a valley on the farm, where the Cherry's field runs down to border a neighbour's field the other side of the valley. "Our field was in stubble and the neighbouring field had been ploughed. After the rain, his field was covered in gulleys where the water had run down the hill, taking the topsoil with it. Our stubble field had no soil movement at all. It made me realise that we couldn't go on treating the soil like dirt and that we could be working with nature better. It doesn't have to be a battlefield."



The five principles of regenerative agriculture takes pride of place on the wall in the Cherry's farm office.

So in 2010 the decision was made to go no-till with the purchase of a second-hand John Deere 750A and it went on to drill the whole acreage at Weston Park Farms that year. That drill did another year and then the farm bought a new one.

The aim now is to produce what the land wants to produce rather than strain the system in the endless pursuit for more. "We want to make the soil better every day," says John.

"The wheels came off in various places because we'd changed the system and were ▸

If you're interested in direct drills then they'll all be on show at Groundwell, though it remains primarily a festival of ideas.

▸ learning how to make a regenerative approach work. Yes, there were a lot of challenges, but yields didn't really suffer."

Taking centre stage on the farm office wall behind where John is sitting is the infographic showing the five principles of regenerative agriculture. One of those is maintaining living roots and John is positive that it's these that make such a difference to his more difficult clay soils.

While no year is ever the same in farming, it holds even more true in a regenerative system. "We don't have a standard rotation, it has to much more flexible," says Paul.

Instead the cropping decisions are driven by factors such as the weed burden in fields, he says. "In practice, there tend to be less weeds in a no-till system as the weeds seeds remain on the surface. You can keep fields clean if you're clever, which we haven't always been," he admits.

Flexibility gives options

But the flexible system gives the farm options. "If we find ourselves with a carpet of blackgrass then we clean it up over the winter and plant a spring crop. Another option we have is to take the crop off as silage for our suckler cows if we want to prevent seed return."

The farm has always had a few animals around, adds John. "But we started the suckler herd in the 1990s and it's one of the best things we did. If we run into real problems with blackgrass then we'll take it out of arable production and put it into a four-year herbal ley for the cows, which gives the ground a proper clean up and super-charges the soil at the same time."

The second major factor that helps determine the cropping is the soil itself and, in particular,

It was the transformation of his father and uncle that rekindled Alex Cherry's enthusiasm for farming and brought him back from a career in the city to run the Groundswell event.

feeding the biology, explains Paul. "The one thing we've learnt is that we can't follow a straw crop with a straw crop, the biology needs diversity so break crops play an important part on the farm."

This year the Cherrys have a winter wheat and winter bean mixture in the ground which Paul says is looking really well having had very little nitrogen and no fungicides. "It's a proper

companion crop and the plan is to harvest the field and then separate out the beans."

Paul's son, Alex, notes that the root nodules on the bean roots are bright red inside, indicating the presence of leghaemoglobin which means they're busy fixing N.

As on many other farms, the very dry start to the year is beginning to affect crops on the farm, says John. "We drill quite late as the conventional wisdom is that a regen crop wants to be a fortnight behind coming into the spring. We also didn't terminate our cover crops early enough this year so there was some competition from them. It goes to show that every day is a school day."

Even though regenerative systems aim to reduce inputs, nitrogen use on the farm this year is actually lower than was intended. "We were going to put some urea on but the ground's so dry, there didn't seem to be much point so it's still in the shed. Tissue tests are showing that crops are okay for nitrogen and crops do look well."

Last year the Cherrys tried a no fungicide approach on some winter wheat and it wasn't a great success, says Paul. "The change in weather meant we had to put on a fungicide at T3, but it really went on too late."

Nonetheless, reducing inputs remains an aim and nitrogen fertiliser use, in particular, is problematic, believes John. "It's expensive and at high rates it messes up the soil for a couple of reasons — because it's a salt, and because it alters the C:N ratio in the soil which encourages soil biology to eat up the humus. In a no-till system using higher rates of N has the effect of encouraging the soil to compact."

For Alex, a career in farming hadn't been on the cards and, instead, he was working in London as a chartered surveyor. "I wasn't inspired to be a farmer until the farm changed to no-till. I saw John and Paul evolve very quickly as farmers when they started getting into soil health. Everything changed, attitudes changed, and our conversations became more excited because we could see a positive future. Before the farm was on a treadmill and it really wasn't clear where we were going.

"In the second and third years of no-till, the farm started to produce its best ever margins and that really sealed the deal. Farming was becoming fun and exciting, and we were saving on time and inputs while benefitting the environment," says Alex.

Rekindling the flame of enthusiasm by farming in this way led the Cherrys to attend BASE and other soil health events. "These were full of energy and exciting compared with other farming events. It was more interesting than the farming I grew up with," he says.

Sharing ideas

With an increasing thirst for information and lots of unanswered questions, the Cherrys were inspired to host the first Groundswell event in 2016, run by Alex who left the city to return home to take the reins as event director. It made sense to bring together all the experts in soil health and regenerative approaches. "The intention is in its name — we're surfing on the swell created by other people," explains John.

Traditionally farming events have been mostly about industry extracting money from farmers, adds Paul. "We're not providing a space to sell machinery at Groundswell, it's all about selling ideas. It brings together like-minded people, whether you're an academic, a farmer, or a student. There's huge value in sharing experiences when facing the challenges of moving to a regen system."

John adds: "We are very lucky to have Alex, as he has a festival mind from his experience organising music festivals. I think the reason why Groundswell works so well is because people love coming to it — it's a mixture of entertainment and information."

The lovely thing about the regen world is that a lot of people are experimenting, he adds. Groundswell provides a platform for the discussion of those ideas and the event has had more than 150 session applications with different speakers in 2022.

With nearly all the sessions recorded, the event is truly open source, remaining true to its ethos of sharing information for the benefit of all.

"We had 450 attendees at the first event and one of the speakers was Jill Clapperton. She advised us not to run Groundswell every year as we'd find it hard to get speakers. Seven years on and we have an incredible interest from people wanting to share their experiences at Groundswell."

Jill is returning in 2022, when around 5,500 people are expected to visit the event, and she'll be sharing more about the link between a healthy soil and producing healthy, nutrient-dense food. This connection between farming and food is something that will feature at this year's event with its 'Food for Thought' theme, says Alex.

"We're engaging much more with hospitality and chefs. The regen story is so good that there's a lot of interest from foody retailers and the Groundswell Real Bread Bakery will be open each day providing bread made from heritage grains. The SSAW Collective are also hosting a three-course long table banquet on both evenings of the event."

Fibre production is another area where there are opportunities for regen growers and that will also form part of the conversation, and it is conversation that is really what Groundswell is all about, says Paul.

There are seven stages this year with a programme that's sure to promote discussion, adds Alex. "Regen farmers should be rewarded for what they're doing, either privately or through public money. So we're bringing together people from all corners — companies measuring carbon, trading carbon, the soil and carbon — into a 'boxing ring' to discuss their ideas and help people understand carbon better."

If you can't make it to Groundswell then Alex says all bar the Speaker's Corner sessions will be recorded and available on YouTube, making the event truly open source and remaining true to its ethos of sharing information for the benefit of all. ■

As Lannock Manor farm transforms into an event venue, life remains unchanged for the Cherry's herd of beef shorthorns.

Talking sustainability

> *“This year’s programme is bigger and better than ever.”*

With a jam-packed schedule planned over the two days, *CPM* takes a look at some key themes of the seminar programme at this year’s Groundswell event.

By Charlotte Cunningham

Not often at events do questions from the audience spark such thought-provoking discussions that the idea sharing continues long after the chairman wraps up a seminar session. But Groundswell is very much the exception.

And bringing together the very best brains of regenerative farming, the scope of this year’s seminar programme is somehow bigger and better than ever before. It covers a range of topics from carbon farming, soil health, the importance of linking arable and livestock production, the role of policy in the future of regenerative farming, and how farmers can better communicate with consumers.

The format is a mixture of seminars, demonstrations, panel sessions and workshops, taking place across a whopping eight stages: the Agricology Discussion tent; the Barenbrug Grass tent; Big Top; the Breakout tent; the Kellogg’s Origins Soil tent; the NIAB seminar tent; Speaker’s Corner and the Yeo Valley Old Dairy tent.

Host farmer John Cherry will be among those stepping into the spotlight as he takes part in a panel discussion about what regenerative really means — beyond farming practices — and explores how farmers, producers, brands and businesses can adopt a truly regenerative mindset and approach to healing people and the land. John will be joined by Abby Rose, farmer, physicist, and soil health advocate, as well as Dee Woods — an award-winning cook, broadcaster and researcher with over 25 years experience.

Visitors will also get the chance to quiz George Eustice once again this year, with the Secretary of State making two appearances in the seminar schedule. On day two (23 June) he’ll be joined by other leading industry figures, including Rosie Boycott and Minette Batters, for a panel session in the Big Top at 10:45am.

The environment secretary will also be in the spotlight later in the day in the Agricology Discussion Tent to tackle the all-important question: what can policy makers do to support regenerative farming? He’ll be joined by Henry Dimbleby and MPs Ruth Edwards and Oliver Heald, as well as beef farmer, Ian Davis.

With industry-wide collaboration often highlighted as fundamental for driving change, visitors will also be treated to an insight into regen from a global perspective through Dwayne Beck, in the Kellogg’s Origins Soil tent. He will be asking the question: are we doing the ‘right things’ or only doing the wrong things better?

Dwayne is a professor in plant science and well-known in the regen world. He’s also currently the research manager at Dakota Lakes Research Farm in Pierre, South Dakota.

His emphasis is on developing no-till systems for irrigated and dryland areas in central South Dakota, and says his primary achievements deal with development of programmess that have allowed producers to profitably adopt no-till techniques in a large portion of central South Dakota. The identification of the extremely important role played by crop rotation in minimising weed, disease, and insect problems while increasing potential profitability was the key contribution of this project.

The Dakota Lakes Research Farm consists of 324ha of land, of which about 101ha isirrigated, and the entire operation is managed using no-till techniques.

For those looking for a more interactive discussion, a must-see is the rainfall simulator in the Big Top, led by Dr Jill Clapperton of Rhizoterra, which will showcase the dramatic effect of 5cm of rainfall on soils under different management regimes: no-till and cultivated, with and without cover and under permanent pasture.

And for the younger generation, or those looking for a way into the industry, the NIAB Seminar Tent will be hosting a session on removing barriers for young people in farming. Hosted by David Fursdon, farmer and consultant, this session will delve deeper into the work of the Prince’s Countryside Fund in supporting succession, progression and new entrants into farming. Visitors will hear from Liz King, project officer, about the opportunities for young people, as well as two young farmers — Liz Tree and Chris Woodhead — who will share their experiences.

Groundswell afterhours

For those looking to continue the conversations into the wee hours, this year’s event will see the return of the famous Earthworm Arms bar, plus an array of independent food and drink traders serving the night before and during the event, with live music playing into the evening on the 22 June. On site camping is available via advanced booking.

The SSAW Collective are also hosting a three-course long table banquet on both the 21 and 22 June and tickets can be reserved online. ■

Visitors will have the opportunity to put their questions to George Eustice as he takes part in a panel session on day two of the event.

The line-up

To help visitors plan their time at Groundswell, *CPM* has picked-out some of the most inspiring seminars and talks from across the two days. The full seminar programme can be found online.

	When?	Where?	What?	Speakers?
The symbiotic benefits from the co-operation between research and practice	22 June 10:00-11:00	Kellogg's Origins Soil Tent	A discussion session on how Grand Farm was developed into a research and demonstration farm and the regenerative methods which are applied on the organic arable field farm based near Vienna in Austria. Covering using organic, reduced tillage and no-till, crop rotation, perennial crops, cover crops, flower strips, agroforestry, zero pesticide, compost, vermicompost, compost tea, seed inoculation, transfer mulch.	• Alfred Grand, Grand Farm
Carbon question time	22 June 16:00 – 17:00	Big Top	Opinions from four industry experts on how farm businesses go about 'de-carbonising' UK agriculture.	• Liz Bowles, Farm Carbon Toolkit • Professor John Gilliland, Queens University • Janet Hughes, Defra • Dr Jude Capper, Harper Adams and independent consultant • Alex Robinson, Natural Captial • Johann Tasker, Farmers Weekly
Regenerate your mind	23 June 11:00-12:00	Kellogg's Origins Soil Tent	A session hosted by farm advisor Ben Taylor-Davies looking at the social aspects of regenerative agriculture and delve into why it was fundamental in helping him overcome his mental health issues and opened his mind to a world of people, places and partnerships.	• Ben Taylor-Davies, independent advisor
Do potatoes have a place in a regen system?	23 June 13:00-14:00	Speaker's Corner	Drawing on a range of real-world examples this session will explore how no-till potatoes have a place in a regenerative farming system and also poses the question: 'What should be the most sustainable carbohydrate source in our diet today?'	• Richard Harding, agronomist
The threat of weeds for regenerative agriculture	23 June 16:30 – 17:30	NIAB Seminar Tent	The key components of regen ag are predicted to select for a different selection of weed species to those that we are currently dealing with – particularly those associated with less soil disturbance and/or perennial components. This session will discuss these possibilities, using case-studies from the UK and France.	• Will Smith, NIAB • John Cussans, NIAB

> *"The core values are knowledge transfer and industry-wide collaboration."*

Crops and kit

Aligning variety choice and establishment methods is fundamental for regenerative success. *CPM* looks at the crops and kit offerings at this year's Groundswell.

By Charlotte Cunningham

When it comes to traditional variety selection, one might sit down with the AHDB Recommended List to highlight those of interest and then head to regional sites to see if its paper claims match up with in-field performance.

The priority characteristics may vary from farm-to-farm, but more often than not, it's yield that's king — closely followed by the desire to plant something that offers a 'good all-round' package. But are these priorities the same when selecting a variety for a regen system?

In a recent survey carried out by *CPM* (May 2022), growers noted the feeling of a lack of information — stating that they'd like to see more on how varieties perform under low or no nitrogen settings, or different tillage systems, to name a few.

To address some of these thoughts, NIAB's Dr Phil Howell will be discussing the challenges of breeding the best varieties for regenerative agriculture in the NIAB Seminar Tent on day one (22 June) of this year's Groundswell.

Ahead of the event, Phil gave *CPM* a flavour of what he'll be discussing during his seminar, and an insight into some of the challenges facing breeders and how these may be addressed as the interest grows for regen-suitable varieties.

"It's often mentioned that for many crops, yields seem to be reaching a plateau. However, we know that in trials, yields are continuing to increase as new varieties are released, which leaves a gap between what's happening in trials and what's happening on farm.

"This raises the question of whether our trials and testing system is still the best and fairest way of identifying the best varieties for growers and their customers."

Failing system

Breeders are in a difficult situation, reckons Phil. "They want to produce varieties that do well on farm as these will capture market share over a relatively long period. But before they can market these varieties, they have to pass through National List testing, which follows a well-established and rigorous protocol set by APHA.

"However, being added to the National List is rarely enough to guarantee sufficient market share to cover the costs of running a breeding programme, and performing well on the RL — or for more minor crops, a Descriptive List — is the gateway to market success. So, varieties must first clear the hurdles required of the NL/RL testing system before they have a chance to assert themselves on farm."

Phil adds that this means breeders are left trying to address two overlapping, but different problems: what will do well in the testing system, and what will do well on farm.

"When we move to regenerative farming systems, including organic farming as an extreme example, there's a bigger discrepancy between the status quo of the testing system and practice on farm. How can breeders possibly produce the best varieties for organic farming through the current testing system?

"Breeding is most effective when selection in early generations most closely matches the situation a finished variety will be in."

What's more, breeding is expensive, he adds. "A typical large wheat breeding programme has annual operational costs which run into the millions, so breeders will try and recoup those costs by chasing the largest royalty market, which is still conventional agriculture."

Phil notes that breeders will screen for varieties better suited to less intensive farming systems, often, but only by testing the few varieties that have emerged at the end of the "selection funnel" rather than earlier in the process, when there is still more useful variation to select from. "So variety improvement for these situations is probably slower than it could be.

"In the Groundswell session I hope to talk in general terms about this problem and include some views from breeding companies and AHDB about steps that have been taken to make new varieties more sustainable.

"My NIAB colleague, Dr Stephanie Swarbreck, will also be on hand to discuss some of the work she has been doing to improve N-use efficiency and soil-root interactions. We will also be joined by Dr Ambrogio Costanzo from Organic Research Centre, who will discuss the approaches the organic sector is taking."

As well as gleaning the latest cropping advice from the experts in the seminar tents, the Groundswell Agronomy team will also be on hand at the event to provide advice to growers who are keen to explore, or perhaps already on, a journey towards implementing a more

This year's Groundswell will once again feature a direct drill demonstration zone.

regenerative system.

The Groundswell Agronomy team is made up of agronomists and consultants with a shared passion for the regenerative production of food, fibre and renewable energy.

"The biggest challenge to adopting regenerative agriculture really is working out how to do it — coming from an industrial farming background, like most of us are, and then trying to completely change the system," says host farmer, John Cherry.

"One of the reasons we set up Groundswell Agronomy was so that people could find agronomists who were talking the same language."

On the team is Richard Harding, who says that the service can provide all sectors of agriculture with the solutions they require to maintain and improve farm business profitability in the face of a gradual reduction in BPS, growing environmental concerns over conventional food production, and a need to move beyond sustainable to a truly regenerative agricultural system. "Groundswell Agronomy is a service available to anyone interested in investigating anything from a full system rethink to just one specific technique, and can be tailored to provide as much or as little on-going support as required. The core value of the service is knowledge transfer and industry-wide collaboration."

And for those who want to see crops in the ground, KWS will be presenting a number of varieties, alongside cover crop plots from Kings Crops. Barenbrug also have a number of grass and herbal ley plots.

What's more, there will be a chance to see the results from a biostimulant trial which has taken place on site. This tramline trial will see products from Amino A, Unium, Nutricor, Aiva Fertiliser, Timac Agro and Interagro go head-to-head in a bid to let growers see for themselves if the proof really is in the pudding when it comes to using biostimulants.

And it's not just about what you put in the ground, but also how you do it…

While moving to a less invasive approach to soil movement is part of the foundations of the regenerative movement, the financial investment in machinery is often noted as a barrier to growers hoping to embark on the transition.

Therefore, ensuring any investment aligns with farm priorities is key, and to help growers do just that, this year's Groundswell will once again feature a direct drill demonstration zone to allow growers to compare the performance of some of the leading direct drills in real life conditions — as well as a range of static kit on display. ■

Manufacturers taking part in the demonstration zone include:

- Amazone
- Claydon
- Primewest
- Dale Drills
- Horizon Agriculture
- Horsch
- John Deere
- Kverneland
- Novag
- Ryetec
- Samagri
- Simtech T-Sem
- Sumo
- Opico
- Weaving machinery

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over the gate

by Claire Eckley

Sharing knowledge helps us grow

Spring and summer bring warm evenings and hopefully a few farm walks. Whether it's with your NFU branch, gate crashing the kids' YFC meetings, a local farming group, or a trot out to see some crop trials, this is a great time of year for getting out, meeting up with friends and enjoying a look around someone else's farm. Perhaps more importantly, it's a great time to get out and meet new people in the industry.

In our area we have a relatively new Farmer Cluster. By working together, farmers can work more cohesively to deliver benefits for soil, water and wildlife at a landscape level. Across the Weald of Kent, individual holdings have largely specialised into arable, top fruit, pasture or perhaps vines. As farmers in different sectors we don't often get together, even though we are farmer neighbours. In fact, quite a lot of us didn't know each other at all before our cluster started.

Our cluster is concentrated around the village of Marden. It started two years ago, just before lockdown. Now there are 18 of us getting together to look at examples of how to deliver habitat for local wildlife, with some support from Kent Wildlife Trust and others. Various parts of ELMs are being discussed, and blended finance is a hot topic — where some other agency may offer some funding on top of ELMs. Clusters are often strung along a river and ours is in the vicinity of the Teise, where it splits into the Lesser and Greater. Both eventually flow into the Medway at that notoriously flood prone area, Yalding.

Some clusters are much further ahead than ours, so they may be formally constituted, applying for grants, or measuring carbon already. Some are much bigger than ours too. If there's a cluster in your area, I recommend joining. If there isn't, I recommend starting one!

It can be easy to stay close to home, or just meet up with farmers in the same sector, but by going somewhere new, we hear new ideas and points of view. An open and curious mindset may well be crucial in getting businesses through the next few years. Our cluster visited Elmley National Nature Reserve recently, a remarkable landscape in the wet bits on the Isle of Sheppey just off the North Kent coast. Philip Merricks has farmed the land for decades, growing arable crops initially, but now cattle at a low stocking rate roam the marshes with a great deal of wildlife. It was interesting to hear how the business had changed, but he was also interested in our cluster.

Recently, I visited the UK's largest agroforestry farm, Whitehall Farm, near Peterborough. Stephen and Lynn Briggs are new entrants, and installed 52ha of agroforestry in 2007 when they took on the tenancy. Avenues of heritage and modern apple trees are surrounded by oats. We heard about soil erosion on this very flat landscape and how the trees were slowing wind speed to protect the soil, and even providing extra spray days. Biodiversity has increased ten-fold, and pollinators are up 200%. The Briggs' are also selling direct to the public, with a farm shop selling the apples and oats produced on the farm.

We're arable farmers, and therefore clueless when it comes to growing trees! But thanks to our cluster, we know plenty of top fruit growers in our area who might help us get the best out of an agroforestry system should we decide to pursue it. Some aspects of our regenerative system have caused raised eyebrows amongst our arable neighbours, so this could be a chance for our top fruit neighbours to also wonder what's going on!

A trip to a show you've never been to is always a great day out. Groundswell is firmly on our calendar, along with the Oxford Real Farming Conference. Whereas we describe ourselves as regenerative farmers, we keep on learning from other management systems — be they conventional, biodynamic, organic, and even "rewilded". YouTube, Twitter and various podcasts are mines of information, and sometimes you get to meet these people who may share their mistakes, or just share the successes.

Time away from the farm is never a bad thing for our mental health, so go somewhere new, you never know who you might meet and what you might learn.

Claire Eckley is a partner in her husband Guy's family farm, operating across 500ha of regenerative arable land in the Weald of Kent. As well as selling commodity crops, the Eckleys process on-farm to add value and market oil and flour under their Pure Kent brand.

@PureKent

Could agroforestry be the next addition to the Eckley's regenerative farming system?

naturenatters

by Martin Lines

The merits of a bird's eye view

June is here, and it's time to look around the farm to see how successful our blackgrass control has been. There's always hope that blackgrass won't show its head above the crop and, fortunately, most fields are fine — with one or two with areas to keep an eye on.

Blackgrass has been an expensive problem to tackle. It's meant changing our rotation, drilling dates and crops over the past few years, with most of our efforts successfully addressing our concerns. It's also thrown up a few other issues, like wild oats reappearing in some of our fields as we've cut back the need for spring herbicides.

Travelling around the country last month, you can see the difference in fields that once had a brown haze now looking very clean. There were a number of areas with a persistent problem, and some farmers are taking the ultimate action of spraying off the crop or silaging it to prevent seed return. With crop prices exceptionally high, now is an excellent time to have a go at doing things differently.

Suppose you have areas with a real problem, now could be a beneficial time to take those areas out of production or crop the field differently for a year or two. When the wheat price was low, we tried to make every hectare contribute productively. With better returns, we can take bolder action, focus on the troublesome areas and tackle longstanding issues. This might mean a reduced income now, but with your fields earning a better return, it can be covered long-term with reduced costs and fewer weed burdens.

I recently took a flight to Northern Ireland — my first since the beginning of COVID19 — and flying out of Stansted, I looked down to see many fields looking well, some struggling with the dry weather or from a poor establishment in winter. The diversity of practice was abundant from my view in the sky, and it was a patchwork of differing approaches to farming with nature. I could see the number of fields currently in or about to be in countryside stewardship. I could see all the field margins, awkward corners and straightening up of fields. And I could identify farmers who have taken up the skylark plot options in their winter cereals.

As farmers, we have to communicate to the public the changes happening in the countryside and the actions many of us are taking to improve biodiversity. If we're looking for long-term support to manage the landscape and our natural capital, we must get the public and governments on side to continue funding these things in the future.

Another thing visible at take-off was the sheer number of fertiliser spreaders used in windy conditions or not calibrated to the products they were spreading. An uneven application rate was evident not just on one or two farms but across many fields.

Given the current extortionate cost of nitrogen, investing time in calibrating your machine surely must pay off. To be visible, it must be significant under or over application. I know several farmers who use a drone to fly over the crops to assess crop condition, and while this may not help for this year, at least you can improve things for 2023. Public satellite imagery of the farm can also be helpful, but it's not usually available quickly. I'm increasingly using satellite imagery to assess crop nutrition and biomass, and I would highly recommend this as a valuable way of monitoring fields and inputs. Much like approaching management changes, it helps now and again to see things from a different angle, and nothing is quite so reorientating as a view from above.

Our attention is turning towards harvest and what could be an early one. Many crops look to be a week to 10 days early, and preparations may need to speed up to have everything ready in time. Hopefully, by attending upcoming events and field trials, I'll see some of the potential new crop varieties to grow in the future. Input costs and cash flow for harvest next year look challenging, and planning now is essential. I see more and more farmers moving down the regenerative route who find their cropping and input costs reduce as their soil starts to adjust.

Change, as always, needs to be thoroughly thought through and I always take now to be as good a time as any to start. Hopefully, I may get a chance to say hello to a few *CPM* readers at this summer's events before harvest.

Martin Lines is an arable farmer and contractor in South Cambridgeshire with more than 500ha of arable land in his care. His special interest is in farm conservation management and demonstrating that farmers can profitably produce food in harmony with nature and the environment. He's also chair of the Nature Friendly Farming Network UK.
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> *"These new models now introduce the most exciting developments in 10 years of MF TH production."*

Telescopic handlers

Handle this

Telehandlers are without doubt one of the most adaptable and useful bits of kit on farm; able to lift, load, stack, scrape, haul and fit into surprising spaces. *CPM* looks at the latest launches of these magic machines.

By Melanie Jenkins

If a job needs doing on the farm and there's a telehandler available, chances are it's first choice for the task. On busy yards these machines could well be working harder and logging more hours than any other machine, meaning its essential they're hard wearing, versatile and up to a multitude of operations.

Manufacturers are constantly looking to improve the capabilities of telehandlers, so the past year has seen a raft of new releases and improvements to help farmers and operators get the job done. Here's a look at the latest machines to hit the market.

Merlo

Merlo has joined the electric revolution and launched its new EWorker compact telehandler for the agricultural market, which is available in two different sizes.

The new machine is part of Merlo's 'Generation Zero', this means there's no fuel consumption, noise or vibration, and no emissions.

The EWorker was built from the ground-up, specifically as an electric vehicle and so isn't a reworked diesel model.

The first of the two agricultural models is the 2WD, 60hp (44kw) 25.5 - 60 and the second is the 4WD, 90hp (66kw) 25.5 – 90. Both have a 2.5t max lift capacity, to a lift height of 4.8m.

The 2WD version has a fixed front axle and is steered from the rear axle to give it maneuverability. Two electric motors are mounted to the front of the machine and the rear axle has up to 80⁰ turn on the hub. There's also an axle on the rear which oscillates 7⁰ to help with rough terrain capabilities.

The 4WD drive version is slightly different, using a Merlo patented design it has a vertically mounted third motor on the rear axle.

Practically, this means that the 2WD version will turn on its front wheel, with 2.5m turning radius whereas the 4WD has a slightly larger turning radius of 3.2m.

A 48-volt lead acid battery is used to power the machine, with a 960amp capacity. The battery pack consists of 24 replaceable cells and weighs 1.5t. The chassis has been designed around the battery pack which gives the machine a low centre of gravity and acts as a counterweight, which gives it its lift capacity. According to the company, this also permits for a larger battery pack and should optimise the running time of the machine, allowing it to do up to eight hours of continuous work.

For those familiar with Merlo telehandlers, the EWorker has the same interface and controls inside the cab as its diesel counterparts.

Merlo sees the new electric machines as an addition rather than a replacement for its diesel telehandlers.

Bobcat

Visitors to LAMMA will have been among some of the first in the UK to see Bobcat's new R-Series telehandler range.

The range consists of seven new models; three compact and four large, with lift heights ranging from 6-8m, lift capacities from 2.6-4.3t and all with Stage V engines.

A number of operating functions have been included in the R-Series to help with productivity. This includes Job Manager, where users can adjust and save settings for multiple attachments and jobs. There are two drive modes, a flex drive control to separately managed engine rpm and drive speed, and automated boom functions.

The R-Series interior has been updated with a new finish, Grammar Maximo Dynamic air suspension heated seat, a suspended armrest with joystick and a new LCD colour display and a larger 18cm touch screen.

The top of the range model, the TL43.80HF has a maximum lift capacity of 4.3t to a height of 7.5m, with a top forward reach of 4m on standard 61cm tyres.

Kramer

At the end of 2021, Kramer, added two new models to its Kramer-Werke GmbH range of ▸

The EWorker was built from the ground-up, specifically as an electric vehicle.

A LONG WAY TOGETHER

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Bobcat's new R-Series consists of seven new models; three compact and four large, with lift heights ranging from 6-8m.

▸ telehandlers.

The new KT144 is a compact model with a height of less than 2m and a width of around 1.6m. With an operating weight of approximately 3t, it's the smallest model in Kramer's telehandler portfolio. The pallet fork has a stacking payload of 1.45t and a lift height of around 4.5m.

Kramer's quick hitch system with mechanical locking is fitted as standard to this vehicle. Hydraulic locking is also available as an option, as are various common quick hitch systems, including the Euro quick hitch.

Additionally, the machine is available with two engines. The basic version has a 25hp (19kw) Yanmar engine but can be upgraded with a 45hp (33kw) option.

The KT144 also comes with an electronic parking brake with hill-hold function as standard, which means that as soon as the machine stops, the parking brake is engaged automatically. A touch of the drive pedal automatically disengages the brake.

Alongside the all-wheel steering, both front wheel and crab steering are optionally available. If necessary, the machine can be fitted with low-speed control and hand throttle, as well as up to four different operating modes.

The second new model is the KT3610 all-rounder with a 9.5m stacking height. Without a bucket the machine is 5.03m in length, 2.28m wide and on 61cm tyres is 2.31m in height. Weighing 8.2t (depending on options), the model has a maximum payload of 3.6t.

The KT3610 is fitted with familiar Kramar features including, Smart Handling, intelligent overload protection, automatic bucket return and the telematics solutions — EquipCare.

Fendt AGCO

The new compact Cargo T740

Fendt's new Cargo T740 features TopViewCab capability, meaning the cab can be raised to different levels.

telehandler from Fendt offers a lift height of 7.7m, a lifting capacity of 4t and a 4.15m turning radius.

A key feature of the machine is that it has Fendt's TopViewCab capability, meaning the cab can be raised to an eye level of 4.1m to allow operators a higher viewing platform when undertaking certain tasks.

The hydraulics have a flow capacity of 170 l/min to allow for sensitive control of all hydraulic functions, including the lifting arm and cab.

The machine has a four-cylinder Cummins engine, producing 136hp which is able to achieve speeds of 20km/h as standard, but can be optionally adjusted to reach 30km/h and 40km/h.

The Cargo T740 has a four-cylinder Cummins engine, producing 136hp which is able to achieve 20km/h as standard.

Massey Ferguson AGCO

Massey Ferguson has introduced its new MF TH Series, which boasts a completely new cab and further changes to enhance comfort, operation and productivity.

The MF TH Series consists of six models, starting with the semi-compact MF TH 6030 and goes up to the latest MF TH 8043, which provides a maximum lift capacity of 4.3t and height of 7.5m and can be equipped with a 3500-litre capacity bucket.

"These new models now introduce the most exciting developments in 10 years of MF TH production," says Thierry Lhotte of Massey Ferguson.

As well as a new seat, there's also a new joystick for control of the hydraulics and transmission, while a new colour display provides a range of operating information.

Additional automation for the boom suspension, parking brake, boom height setting and third hydraulic function controls further ease operation.

All models are powered by four-cylinder, Stage V engines, with power increasing to 135hp on the MF TH 6534, MF TH 7038 and MF TH 8043, while remaining at 100hp for the other models.

The two smallest models measure 2.1m wide and 2.1m high for working in confined spaces. Both of these semi-compact models and the larger MF TH 7035 have a ▶

Claas has introduced the new Torion 530, a 46hp entry-level model to its range of compact articulated wheel loaders.

Doosan has added a new five model range of 3.5t to 5t compact wheel loaders.

▸ 100litre/min hydraulic flow which provides a 3t lift capacity. The MF TH 6030 can take loads to 6m, and the MF TH 7030 can lift up to 7m. The larger MF TH 7035 has a 3.5t lift capacity up to 7m.

All MF TH telehandlers now come with left-hand MF Power Control lever as standard. Sitting just under the steering wheel, it has three fingertip-operation functions: shuttle forwards and backwards, shift hydrostatic speed ranges up and down and select neutral. This leaves the right hand free to control loading operations, while a flick of a finger on the left hand controls the transmission.

A new standard, 12.5cm colour terminal clearly displays operating information and can be used to select the steering modes, which include a new semi-crab setting.

Claas

Claas has introduced the new Torion 530, a 46hp entry-level model to its range of compact articulated wheel loaders. In addition, the Torion 535 and Torion 639 models have also received more engine power.

The Torion 530 has a Yanmar four-cylinder engine with a 2.2-litre displacement. The hydraulic system delivers 61 l/min at 230 bar and enables an articulated tipping load of 3t. The parallel-guided Z-kinematics of the conical mast allows for a bucket pivot point of 3.18m to be dumped over heights of up to 2.82m and maximum reach of 1.46m. The mast and attachment are using a joystick. Alternatively, the two additional control circuits can be controlled using an additional lever or at the push of a button.

On the larger Torion 535 and Torion 639 models, power from the 2.1-litre Yanmar four-cylinder engine has been increased to 74hp. Both are optionally available with either standard or High-Lift Z-kinematics. In the standard version, overreach heights of 2.82m (Torion 535) or 2.98m (Torion 639) can be achieved, while the High-Lift version can reach 2.97m to 3.18m.

Manitou

Manitou has also introduced two compact models to its range of telehandlers. The ULM 412 H and the ULM 415 H are ultra-compact, at less than 1.5m wide and 1.92m high.

Weighing 3.5t and equipped with a 35hp engine, the machines can lift loads of 1.25t or 1.5t, respectively, up to a height of 4.3m. Both models are 4WD with an oscillating rear axle.

The roof grille has been removed and replaced by a transparent, impact-resistant polycarbonate window to enhance safety.

Both machines can be equipped with 20 accessories including, a floating fork carriage, an all-purpose bucket and a bale clamp.

The new compact wheel loaders have Stage V engines, hydrostatic 4WD, 100% differential lock on both axles and high lift capacity.

Doosan

Doosan has added a new five model range of 3.5t to 5t compact wheel loaders. Comprising the DL60-7, DL65-7, DL80-7, DL85-7 and DL80TL-7 models, the new Doosan compact wheel loaders cover a wide range of applications, including agriculture.

Like the heavier telehandlers produced by Doosan, the new compact wheel loaders have Stage V engines, hydrostatic 4WD, 100% differential lock on both axles and high lift capacity.

The DL60-7 and DL65-7 are driven by a Stage V engine providing 66hp (48.5kw) of power at 1600rpm. The Stage V engine in the DL80-7, DL85-7 and DL80TL-7 provides 75hp (55kw) of power at 1500rpm. The DL60-7 is the lightest model in the range, with an operating weight of 3.75t, and the DL80TL-7 is the heaviest, weighing 5.2t.

The brake pedal provides an inching function: with no pressure on the brake pedal, full power is available for the drive system. Light pressure on the brake pedal reduces travel speed, with more engine power for the working hydraulics. When full pressure is applied to the brake pedal, the machine stands still and full engine power is available for the working hydraulics.

An optional tandem pump, a double-acting spool valve in the rear and up to three double-acting spool valves on the lift arm mean that hydraulic power should always be available to the operator.

The loaders can be equipped with three types of kinematics to suit operator preference, depending on model; a Z-bar, a pull-bar and a telescopic arm.

Dieci

The new award-winning Adaptive Load Sensing (ALS) from Dieci and Walvoil, aims to minimise energy waste in the hydraulic system of telehandlers. According to tests carried out by the company on its Agri Plus telehandler, it's able to decrease energy loss by 28% during boom operations and up to 45% during vehicle manoeuvres.

ALS is made of a directional control valve, an electronic joystick, and an electronic control unit, with customisable modular software developed by Walvoil. The control unit collects information from the operations on the controls and from the machine sensors, and acts on the load sensing device, adapting the hydraulic pressure differential to the maximum efficiency value required by the vehicle.

The differential pressure value can also be selected by means of two push buttons on the joystick, the precision function, which increases the movement controllability and precision, and the boost function, which increases the pressure value for a higher movement speed without need to install pumps with higher flow rates.

JCB

Also new to the market is the 542-70 Agri Pro Loadall. Powered by a JCB 4.8-litre DieselMAX engine developing 173hp (129kW) and 690Nm of torque, the machine has a JCB DualTech VT half hydrostatic, half direct mechanical drive 50kph transmission (see full report in *CPM* June 2022, p85). ■

The iCON in iconic?

JCB launches

JCB, by its own admission, is synonymous with precision engineered machines and with a raft of new releases has it outdone itself? *CPM* checks out its latest launches to get the low-down on its innovations.

By Melanie Jenkins

> *"The handler has become the most important machine on the farm."*

Anyone who's seen JCB's global headquarters, just outside Uttoxeter in Staffordshire, will know the company doesn't do things by half, and its latest set of launches are no exception.

The international launch of not one, but three new machines at the end of April, boasted bespoke operator experience, more power, greater torque, refined finesse, enhanced performance and accessible precision put right into the hands of the operator.

Fastrac iCON

JCB fans rejoice, for after several years of its interior and precision controls unit lagging behind its competitors, the Fastrac has had a serious make-over.

The company has spent the past four years revamping the Fastrac with the aim of improving cab trim, mechanical structures and software development, according to the company's Greg Fitton. "Our primary focus was on the user interface — the interaction between operator and machine."

JCB's aim was to create a bespoke operator experience with easily configurable controls that integrated modern precision agritech, namely GPS guidance and ISOBUS implement control.

"But the increasing sophistication of the machine shouldn't compromise the simplicity of the operation," he adds.

The new models incorporate three core aspects. Firstly, iConfigure, the ability to configure controls across the armrest and joysticks to create customised control profiles. Secondly, iConnect, the introduction of level two ISOBUS technology and JCB GPS guidance to help optimise precision operations. And thirdly, iControl — brand new drive control software, smart transmission control and the ability to seamlessly switch between driving style.

Inside the cab is where the big differences have been made. The iCON features a new armrest, and the old basic side-mounted display has been replaced with a new high definition 30cm touch screen mounted on the armrest.

The armrest houses a new main joystick with assignable RGB LED colour-coded levers giving proportional control of electrically operated spool valves; PTO and hitch controls; an auxiliary joystick; and hard keys plus an encoder dial as an alternative to using the touch screen.

Operators can use the touch screen to set up bespoke control configurations, allocating controls to preference or to the job at hand. Hydraulic functions can be assigned freely to the five main joystick buttons and also to a four-way auxiliary joystick with its four buttons and rocker switch, with LED colour backlights identifying which spool valve is allocated to which control.

Swiping right on the screen brings up a more detailed running screen, which includes settings for up to six front/rear electric spool valves. Another two screens retain essential vehicle status information while providing a remote camera view and an ISOBUS 2 Universal Terminal screen, and a fifth screen is dedicated to JCB's new satellite guidance and precision farming options. And JCB Headland Turn Assist now has as many as 50 individual sequences with up to 50 steps each.

The iCON now has integrated ISOBUS control of rear and front mounted implements using the touch screen, with the auxiliary joystick providing further bespoke control allocations.

A fully integrated GPS guidance system is also available, comprising a Novatel Smart-7 receiver, a steering controller and JCB user interface, with section control and variable rate control available as options.

The new machines also feature JCB Rapid Steer, which reduces the number of steering wheel turns needed for headlands and other manoeuvres, and JCB's Twin Steer is available for the four-wheel steer Fastrac 4000 Series tractors, which provides individual axle guidance.

A new drive control has been developed for the iCON, called Smart Transmission Control (STC). It allows the operator to set the required forward speed and the software then manages the engine speed and gear ratio automatically.

Switching between pedals and joystick driving modes now happens automatically when either is used. Operators also have the choice between JCB Classic settings — changing ground speed by moving ▸

JCB's new Fastrac iCon features three core principles; iConfigure, iConnect and iControl.

▸ the joystick left and right and selecting direction by moving it forwards and backwards — or JCB Pro, where forward and backwards alters speed, left operates forward/reverse and right engages the roller switch to allow for fine speed adjustments.

For comfort, the seat has been updated and is both heated and ventilated. It uses an electric heating element as well as a built-in fan to circulate air through the mesh fabric of the seat.

A new fully automatic climate control air conditioning system has been introduced, complete with solar load sensor and ambient cab temperature monitoring to react quickly to changing conditions.

The steering column has been retained from the previous generation of Fastrac but the dash has been replaced with a new 18cm LCD display.

The iCON isn't a complete redesign, however. It carries over the existing engine, transmission, chassis, suspension and axles from the latest Stage V model and externally the new Fastrac looks almost exactly the same as its predecessor, with the exception of its grab handles which are now painted in JCB yellow.

By definition, icons are 'worthy of veneration' and once the Fastrac iCON roles out on farm — hopefully later this year — owners and operators alike will be able to make up their own minds if JCB's latest launch deserves the accolade.

AGRI Pro Loadall handler

According to JCB's John Smith, the agricultural materials handling market is growing. "Many more farmers and contractors have switched to dedicated machines and the handler has become the most important machine on the farm."

It was only in 2021 that JCB launched its Stage V engine range of Loadalls and now it's adding to its well established stable of handlers, with the new 542-70 AGRI Pro Loadall. The new model boasts a 173hp engine and a new top speed of 50kph – 10kpm above anything else in the range. It's both the most powerful and the fastest Loadall JCB has built.

As well as more horsepower than the previous AGRI, AGRI Super and AGRI Xtra models, the 4.8-litre JCB DieselMax engine in the Pro also delivers 690Nm of torque at 1500rpm.

To achieve its top speed, the AGRI Pro has a JCB DualTech VT half hydrostatic, half direct mechanical drive transmission.

To handle the added power and speed, a new hydraulic braking system has individual circuits for the heavier duty 10-stud front and rear axles. In addition to running in rear-wheel drive on the road for maximum towing traction and stability, the AGRI Pro automatically engages 4WD when the brakes are applied to ensure the maximum tyre/surface contact patch for shortest stopping distances.

For undertaking handling and loading work, the Loadall has a higher capacity hydraulics package, which comprises a 72cc variable output piston pump

The engine of JCB's new wheeled loader produces 282hp with 1200Nm of torque, providing a power to weight ratio of 14hp/t.

The JCB Agri Pro has a 4.8-litre JCB DieselMax engine in the Pro also delivers 690Nm of torque at 1500rpm.

delivering up to 160-litre/min.

Other elements of JCB Smart Hydraulics technology featured on the new model include regenerative cylinders that allow the boom to be lowered and retracted faster for speedier loading cycles; cylinder end-stroke damping on the boom lift and retract rams; and automated bucket or fork 'rattle' to shift sticky material or dispense products such as wood shavings and sawdust in a controlled manner.

There is also a new auto-engage JCB Smooth Ride System boom suspension with optimised accumulators and hydraulic counterbalance valves for increased boom oscillation, isolation from vehicle movements, reduced risk of loads being spilled or dislodged, and a more comfortable ride for the operator.

The new Loadall also has climate-control air conditioning and a half leather heated and ventilated air suspension seat with electric lumbar support adjustment.

Wheeled loader

In 1983 JCB introduced its first agricultural wheeled loader, the 410 Farm Master. And 39 years later, the company has launched its largest flagship model within its agriculture range — the 457S.

The model has been purpose built for agricultural use and the 'S' version has a new rear chassis and counterweight, and new transmission, axles, wheels and tyres. "It's a machine targeted at end-users in biogas, sugar beet, grass and maize silage as well as manure handling," says Joe Eddleston of JCB. "It's not just a bulk handler, it can perform on the silage clamp too."

The engine produces 282hp with 1200Nm of torque, providing a power to weight ratio of 14hp/t, from a 6.7-litre six-cylinder Cummins B6.7 engine.

With an operating weight of 20t, the machine can carry payloads in excess of 6t on either 710mm or 800mm radial traction or hard surface tyres.

There's a choice of a standard loader arm with a lift height of 4.3m or a high lift option which offers 4.8m lift height.

At the heart of the loader is a new powershift transmission with six forward and three reverse ratios, with torque converter lock-up giving direct mechanical drive available in all six forward gears as the standard configuration.

The loader has a top speed of either 40kph or 48kph for when it's on the move and a 20-tonne capacity Rockinger tow hitch to which a drawbar location camera can be added, together with either twin-line hydraulic or air-ready trailer braking.

Those wishing to use the loader on the clamp can add a new 4.88m wide, 7.10m^3 capacity folding grass fork, developed specifically for the new machine. ■

On Farm Opinion

A soil-first approach

Changing his farming system meant changing his drill for an Oxfordshire farmer. *CPM* finds out what drove him to seek more versatility from his machinery.

By Rob Jones

Versatility was the key factor which determined the choice of drill for Adrian Taylor, who farms on the Oxfordshire/Northamptonshire border just outside the aptly named village of Claydon, five miles north of Banbury.

Adrian farms 750ha at Clattercote Priory, of which 170ha are owned and 580ha are on stubble-to-stubble contracts within a 12-mile radius. Though mainly arable, the farm also operates a bed and breakfast pig enterprise, a small Aberdeen Angus suckler herd, together with holiday let cottages attached to the Priory house.

"In terms of soil types, we have a mix of everything here, from ironstone to Warwickshire clay," explains Adrian. "Strip seeding has been used for the past eight years and now the plough only comes out as a last resort, specifically if there's an issue with meadow grass or sterile brome.

"We began strip seeding in 2014 with another make of strip till drill, a 4m Mzuri trailed unit which was cumbersome to operate in smaller fields, very heavy and needed a lot of power. Even the 360hp/400hp Caterpillar we had at the time struggled to pull it.

Difficult conditions

He also found it was expensive on wearing metal and couldn't handle difficult conditions, so it came to a halt when the weather turned wet. "When that happened in autumn 2015, we borrowed a Claydon Hybrid from P A Turney at Middleton Stoney. Its versatility and ability to deal with varying soil types and conditions persuaded us to change."

Pictured with the farm's 4.8m Claydon Hybrid are Adrian Taylor and his daughter Pippa.

Adrian decided to purchase a 4.8m Claydon Hybrid in spring 2016, a mounted unit with 15 seeding tines which he chose for its greater manoeuvrability, an important consideration with field sizes from 3.5ha to 23ha.

The standard set up incorporates Claydon's leading in-line tine design which alleviates compaction and creates drainage and tilth in the seeding and rooting zone. This leaves the soil profile intact and provides an ideal growing environment.

Adrian's drill set-up also features a 1750-litre front-mounted tank. Not only does this double the seed carrying capacity during the busy autumn period but it also allows DAP fertiliser to be applied, either above the seed or below it, when drilling spring oats and linseed.

The new drill has lived up to expectations as Adrian finds the Claydon is easier to operate in small fields and to move from farm to farm than the previous trailed unit. When it arrived, Adrian sold the 360hp Caterpillar and since then has come to appreciate the Hybrid's ease of use, lack of complexity and low operating costs. Despite being slightly less powerful than the previous Caterpillar, the farm's current 315hp New Holland T7.315 tractor handles the Claydon Hybrid well, pulling it at up to 12km/h, he says.

This season, Adrian is growing 360ha of winter milling wheat, with 120ha of Group 1 Skyfall on contract to Warburtons, the

> *When you begin looking at the soil as the solution to tackling blackgrass, you start to unravel one of the most complex and fascinating living organisms on Earth.*

largest bakery business in the country which contracts over 150,000 tonnes of quality milling wheat in Britain each year. The remainder is Group 3 biscuit varieties. In addition, he has 110ha of winter beans, 72ha of OSR, 94ha of spring linseed, 92ha of spring oats on a low-gluten contract, together with 8ha of herbal ley and 4ha of wildflower meadow.

Average yields on the farm are 9t/ha for wheat, 5.5t/ha for winter beans, 2.4t/ha for spring linseed and 6.4t/ha for spring oats.

"Since we introduced the Claydon Opti-Till System, our soils have become much easier to work and drain much better," he explains. "On heavier clays we sometimes use a He-Va Stealth low-disturbance subsoiler in front of the drill, but you have to know when some soil conditioning is needed. You also have to recognise when you shouldn't drill, because the Claydon Hybrid will travel even when you shouldn't be there," he highlights.

Under his now regenerative farming system, soil health is improving and that brings many benefits, says Adrian. "Our soils have also become much more supportive, so they carry the weight of following machinery much better without becoming rutted, as was the case when we ploughed. This is important because our 24m Sands Vision sprayer goes through the wheat up to seven times and the 24m Kuhn Axera H-EMC fertiliser spreader is used up to three times.

"The top layer is improving, yields are stable, establishment costs are under ▸

The Claydon TerraBlade takes out weeds growing between the rows of band-sown crops.

Versatility on his ground was the key factor which determined the choice of drill for Adrian Taylor.

The 4.8m Claydon TerraBlade operating in a crop of wheat at Clattercote Priory, providing mechanical weed control.

▸ control and worm counts have gone from just two or three in a spade full of soil, to 30-40 worms. Keeping traffic off the field is a vital part of the approach," he says.

"We leave about 25cm of stubble behind our 2017 New Holland CR9.80 SmarTrax combine, which runs on 600mm tracks to reduce compaction, then go in with the 7.5m Claydon Straw harrow behind one of our 225hp New Holland T7.260s tractors a week or so later. The Straw Harrow is used two or three times as it's a cheap, quick way to encourage an early chit of grassweeds and aid slug control. We intend to add a seeder to it to establish cover crops," adds Adrian.

"Drilling wheat begins during the last couple of days in September on cleaner ground and we aim to finish by the end of October. Seed goes in 20-30mm deep and generally we start with a rate of 300 seeds/m2 and increase that up to 450 seeds/m2 when it's late, or conditions are cold. Those numbers are higher than for our old intensive tillage system."

To extend the benefits of the Claydon System, Adrian has added a 4.8m TerraBlade inter-row hoe, which is used on a New Holland T5.120. This gives him an added non-chemical means of controlling blackgrass, and this is working well, he says.

The TerraBlade is a low-cost, mechanical method of controlling weeds in band-sown crops. "It keeps the space between the seeded rows clear of weeds during the initial stages of crop grown, reduces competition for nutrients, light, air, and water, which allows plants to grow away strong and healthy.

"Fuel and metal use has dropped significantly using strip seeding and although our main tractor — the New Holland T7.315 — is doing similar annual hours, it's covering a much larger area in that time," adds Adrian. "Fertiliser and chemical use are not noticeably less, but this may change as we get more into regenerative agriculture. No insecticides have been applied for two years." ■

Farm facts

Clattercote Priory, Claydon, Oxfordshire

- **Area:** 750ha
- **Cropping:** winter wheat, winter beans, OSR, spring linseed, spring oats
- **Soil type:** Ironstone to Warwickshire clay
- Mainline tractors: New Holland T7.315, 315hp; New Holland T7.260, 225hp; New Holland T5.120, 120hp
- **Combine:** New Holland CR9.80 SmarTrax combine
- **Cultivation equipment:** 7.5m Claydon Straw harrow; He-Va Stealth low-disturbance subsoiler; Terra blade inter-row hoe, 4.8m
- **Drill:** Claydon Hybrid, 4.8m Fertiliser spreader: Kuhn Axera H-EMC, 24m
- **Sprayer:** Sands Vision sprayer, 24m

A regenerative step

Adrian visited Jeff Claydon's farm in Suffolk after purchasing the new drill, which is on some very heavy land, and he describes it as time well spent. "Jeff listens to what you say and always wants to improve his company's products. I learned a lot from that visit."

Accompanying Adrian was his agronomist, Ben Taylor-Davies, also known as Regen Ben, who favoured the change to strip tillage and encouraged him to adopt a more regenerative approach to farming.

Ben's ethos is to use sound biological, peer-reviewed methods to produce crops in a way that doesn't require vast amounts of artificial inputs. A director of the Oxford Farming Conference, Ben owns the 224ha Townsend Farm at Ross-on-Wye, which produces potatoes, oilseed rape, spring barley, winter wheat, winter rye and grass. He says he loves breaking the boundaries of farming techniques, reducing pesticide use and the farm's carbon footprint, improving soil health and looking after the environment as part of growing nutrient dense high welfare food.

In 2016 Ben became a Nuffield Scholar and his study was based around the control of blackgrass. But, he says, it soon became apparent that the solution to the problem was not herbicides. What was needed was a change in soil management.

"We had created a perfect environment in which blackgrass could thrive by damaging the functionality of soil and causing moisture-holding clay soils to become wetter and wetter. The solution was not to treat the symptoms but the cause.

"The huge yield-robbing effect of blackgrass means that some fields and farms are becoming unfarmable. When you begin looking at the soil as the solution to tackling blackgrass, you start to unravel one of the most complex and fascinating living organisms on Earth, one that is largely ignored. Understanding the complexities of the soil makes you realise that, as a farmer, the very thing you consider to be one of your key assets is the very thing you are destroying," believes Ben.

"Soil is a living organism, so the key is to limit mechanical, chemical, and physical disturbance of soil. Tillage destroys its structure by constantly tearing apart the 'house' which nature builds to protect the living organisms that create natural fertility. Soil structure includes aggregates and pore spaces, so tillage causes erosion and wastes precious natural resource.

"Ploughing has been the mainstay of agriculture for 4000 years, but the problem is that for 3920 years ploughs were pulled by animals. Their limitations meant that this was once only a very shallow operation which kept the soil biology in an aerobic situation, so soils continued to function well," explains Ben.

"Over the past 80 years — with the anything but 'green' revolution — farms became larger, which meant machinery got bigger and heavier. Pulling ever larger ploughs deeper and deeper destroyed the living soil biology, while synthetic fertilisers, herbicides, pesticides, and fungicides all had negative impacts on life in the soil," he believes.

"The main principles of regenerative farming we're trying to implement are things nature has formulated well for well over half a billion years. Soil amour keeps soil covered at all times. Living roots put sugar-rich carbon into soils and that feeds the biology naturally. In return, the soil biology provides plants with nutrients that are locked up in the soil."

Ben's approach is that soil disturbance should be kept to an absolute minimum. "Mother Nature doesn't plough, add synthetic fertilisers, or use hydrocarbon pesticides. Diversity mixtures of plants and species will reduce the pressure that nature places on a mono-crop system by trying to balance these unnatural environments, invading them with what we call pests, weeds, and diseases.

"Where possible we should integrate livestock and their manures in the system, as nowhere in nature are animals devoid," he adds.

The previous system had created a perfect environment for blackgrass to thrive by damaging the functionality of soil and causing moisture-holding clay soils to become wetter and wetter, says Ben Taylor-Davis.

Soils at Clattercote Priory continue to improve as a result of switching to strip seeding and the adoption of a regenerative farming approach.

> *"It's a practical vehicle rather than a luxury one."*

LAMMA

LAMMA low-down

LAMMA returned to the NEC to marks its 40th anniversary after two years of absence due to the pandemic. *CPM* traversed the halls to scope out new machinery launches, innovative technologies and hear from experts on various topics.

By Melanie Jenkins

For the first time in over two years the halls of the NEC were filled with tractors, cultivators, tyres, forage harvesters, balers and every kind of mechanical implement farmers, contractors and operators could imagine?

Despite having taken the decision to run the event fairly late in May, the halls were packed end-to-end with both exhibitors and visitors.

For those who couldn't make it, here's a look at some of the key topics covered in the seminar programme as well as a breakdown of the kit being showcased at the show.

Funding sustainability

Amid the call for more sustainable farming practices and the increasing pressure to home in on efficiencies, all while running a profitable business, Frontier tackled the subject of funding sustainability on its stand at LAMMA.

Speaking at Frontier's stand, Jim Egan of Kings Crops discusses the different ways of getting funding for farming. "If you're not already in Countryside Stewardship scheme this year, don't dismiss it," he advises. "It's well worth going into it as it can be well integrated into the farm."

And coming up on the horizon is ELMs, says Jim. "A lot of people think you have to wait until 2024, but the Sustainable Farming Incentive actually starts to get rolled out this year and will impact every farm in the country and it'll reward you for soil management."

There's also the option of looking at getting funding from water companies, he says. "These are falling over themselves to talk about cover cropping, catch cropping, under sowing maize and reducing water pollution.

"There's also things like the Landscape Enterprise Network", he adds. "There're lot of opportunities out there, but the key thing with all of these is planning, management and recording."

Tom Parker of Frontier agrees and suggests growers prepare before signing up to any agreements. "Spending time and using the data available to you can help you incorporate your agreement into your production system and that will pay off in the long run.

"Using data tools, such as the MySOYL app, you can make sure both your rotational and non-rotational features are in the right place for the lifetime of the agreement," he says.

"Yield data is a good place to start. Identifying areas which are consistently low yielding gives the opportunity to place environmental features where they're best suited. For those without yield data, biomass data or satellite imagery is a good proxy for how crops are performing.

"And soil type maps can also help

The new iPASS from Mzuri features a 5000-litre pressurised tank to meter and convey high application rates for seed and fertiliser.

determine which options are best suited to which soil type, alongside your data of the farm," adds Tom.

It's also important to record performance, he advises. "But remember a cover crop won't have a clear metric to record performance in the way cash crops have yield, so recording performance using tools such as biomass imagining throughout the year can be useful. It's likely to be a legislative requirement to record this, so choosing the right tool to do it is crucial."

Mzuri

Garnering interest in Hall 19 was Mzuri's new iPASS drill. The iPASS features a 5000-litre pressurised tank to meter and convey high application rates of seed and fertiliser, has four variable speed electric metering units; two to control fertiliser and two for seed.

The drill has been designed to be capable of drilling into a range of surface types, including cover crops, stubble, grassland and cultivated ground. The leading disc should cut through the surface residue, slicing the field surface to promote lower disturbance of the following coulters. The primary knife coulter clears the trash from the till and band places fertiliser below the seed zone. A secondary seeding coulter follows on a ball joint system to allow the coulter to self-steer behind the path of the band fertiliser.

The Mzuri iPASS is available in widths of 4m, 4.8m, 6m and 8m and operators can choose between two row spacing options per model.

Claydon

Claydon launched several new machines from its stand in Hall 6, including its new Evolution drill which has incorporated updates designed for customers who drill into cover crops and grass leys. Seed depth adjustment of the drill is now controlled hydraulically, improved access to the metering unit should allow for easier calibration, while front-mounted discs which are operated hydraulically from the tractor seat can be specified for seeding into high residue situations.

Other features include quick-fit knock-on/knock-off coulters for the standard leading tine and A-Share and low disturbance twin disc and tine options. The multiple seed tool allows a wide range of crops to be drilled across different soil types and situations, while the quick-change facility allows fast, easy modification when required. A large, easily accessible toolbox incorporated into the step frame is also standard.

Add-ons include GPS variable seed rate capability, pre-emergence marker arms, front disc toolbar stone protection, micro fertiliser applicator, low-disturbance twin tine kit, slug pelleter, blockage sensors and a light and vision kit.

The Evolution comes in both a rigid grain model and a fertiliser model with a 50/50 split hopper. The drill has working widths of 3m, 4m, 4.5m, 4.8m, 5m and 6m, and incorporate nine, 13, 15 or 19 tines and most feature a 1910-litre hopper. The Evolution will be available from the coming autumn.

Also launched at LAMMA was a new 9m mounted straw harrow from Claydon. Aimed at bridging the gap between the company's 7.5m and 12.5m models, it achieves working speeds of 15-25km/h which are necessary to create a micro-tilth in the top 30mm of soil.

The new model incorporates 75 double tines, each of which is attached to the frame

The iPASS has been designed to be capable of drilling into a range of surface types, including cover crops, stubble, grassland and cultivated ground.

Claydon's new Evolution drill is designed for customers who drill into cover crops and grass leys.

Kubota's stand featured the all-new 122-162hp M6002 series and the recently updated flagship M7003 models.

by a unique fixing that enables the tine to pivot and absorb shock loads when working in stony conditions or turning. As standard, it has five rows of heavy-duty 14mm-diameter tines, but 16mm tines are available as a cost option for exceptionally tough conditions.

Weighing 1850kg and suitable for use on a Cat3 linkage, the 9m Straw Harrow folds to 2.99m wide and 3.55m high for transport.

Kubota

Hall 12 housed an impressive display from Kubota, including its new 2022 line-up. Tractor highlights included the all-new 122-162hp M6002 series, the recently updated flagship M7003 models from 130-170hp, plus the latest generation EU Stage V compliant M5002 and M4003 models covering the 66-115hp sector.

The M7003 series builds on the success of its predecessor, according to Kubota's Mel McGlinchey. "This new series uses recent advancements in technology to further increase the sustainability and performance of the engine, and improve manoeuvrability and efficiency."

McHale

Taking centre stage in Hall 10 was McHale, which showcased a broad number of machines from across its range. Most notable was its new V8 range, now its largest variable chamber balers, capable of producing a bale up to 1.9m in diameter.

The V8940 non-chopper and the V8950 15-knife chopper balers feature increased size of the lateral feed augers to improve uptake, automatic adjustment to intake in accordance with material flow and a drop floor unblocking system.

As standard, a 15-knife chopper unit is available on the McHale V8950. With all 15 knifes engaged on the McHale V8950, a theoretical chop length of approximately 65mm can be delivered. Knives in the V8950 baler can be engaged and disengaged from the tractor cab.

An optional selectable knife system is available which consists of two knife banks that allow for various knife configurations to be chosen to allow none, seven, eight, or 15 knives to work.

As standard, all machines in the V8 range come fitted with three heavy-duty endless belts.

All McHale V8940 machines are fitted with a Primary Drive to aid belt and material rotation. On the McHale V8950, a secondary drive is fitted. In difficult conditions, such as wet short grass, should the primary drive slip, the secondary drive will engage to ensure material rotates in the chamber.

Continental

Continental launched its new telehandler and skid-steer loader tyre at the show. The CompactMaster AG tyre is the first to be designed with a new Turtle Shield tread layer and twisted steel belt. "This is a reinforced tyre with a hard shell and a more flexible steel wire construction to help prevent cuts and damage, while offering greater stability for materials handling work," explains Continental agricultural tyre specialist, Richard Hutchins.

Capable of operating at speeds of up to 50kph, the CompactMaster AG tyres are available for 24-inch wheels, size 460/70R24 159B.

Precision technology

DroneAg made things interactive at its stand with the latest development of its Skippy Scout mapping and reporting drone technology in the form of a 3D map on a large touch screen.

Using a drone to view and photograph fields from above, a high definition 360° view of the field and surrounding farmland is created and can be viewed from any smartphone, tablet or computer. Growers can select points of interest in their fields from the large map and send the drone out to photograph specific points in detail, helping to detect problem areas.

Image quality is so high resolution that weeds, insects, insect damage, pigeon damage, leaf discolouration and the fine details of any exposed soil can be identified, including water logging or drought.

Users can move between fields simply by tapping points on the screen and can get real-time analyses of crop performance, including crop cover, GAI, crop uniformity and weed percentage among the crop. This can then be easily compared with previous reports.

Opico presented a fully autonomous, solar-powered robot capable of precision drilling and weeding at LAMMA (see full report in *CPM* May 2022, p104).

Offering pesticide-free weed control with zero fuel bills, the FarmDroid is the brainchild of two Danish farmers.

The FarmDroid uses GPS to record exactly where it places each seed, so that on each subsequent weeding pass it has no need to identify what's a weed and what's not – it simply knows where the crop plants should be and works around them, using blades to slice off anything between each crop plant in the row.

This approach means that unlike other similar machines, it doesn't need to employ any high-definition cameras and complex computers to identify and target weeds. It also means the machine can start the weeding process before the crop has emerged.

"We believe robotics will form the backbone of the next major step in technological development for agriculture," explains Opico managing director James Woolway.

The new V8 range from McHale features its largest variable chamber balers, capable of producing a bale up to 1.9m in diameter.

"FarmDroid has come up with a unique solution that is suited to large and small-scale farming systems. While it's early days, we're coming to the UK market with a product that is tried and tested. The timing couldn't be better with rising energy costs, labour issues and environmental factors at the forefront of UK farmers' minds."

Farm vehicles

For those who've been pining after the Land Rover Defender of days gone by, Ineos may well have the answer in its new Grenadier all-terrain vehicle.

Ineos, originally a petrochemical company owned by Sir Jim Ratcliffe, has produced its own 4x4 utility vehicle aimed at filling a gap in the market.

DroneAg made things interactive at its stand with the latest development of its Skippy Scout mapping and reporting drone technology.

The vehicle has gone from concept to production in about four years — something which usually takes about ten years. This is due to bringing in component parts from across the industry, according to Dave Axford, Ineos' product expert.

On display at LAMMA was an interior prototype of the new Grenadier, which is due to go into production in July, with the first deliveries to the UK market expected in October.

Production specification prototypes are currently being built at the firm's plant in France for testing purposes.

The machine has been designed from the ground up. Set on a ladder-framed chassis, it has multi-link suspension with separate coils and dampers to maximise traction.

Available with either petrol or diesel BMW three-litre, six-cylinder turbo charged engines. The diesel has 550Nm of torque and 1700rpm and both come with a ZF eight-speed automatic gear box, with Ineos' own transfer box for high and low range, and has lockable differential as standard.

The vehicle has Carraro solid axles for both reliability and durability and it has a 3.5t towing capacity.

The Grenadier is the new 4x4 all-terrain vehicle from Ineos.

Three vehicles are due to be launched this year; the two-seat commercial priced at £49,000, a five-seat N1 classification starting at £52,000 and two versions of the five-seat passenger vehicle both priced at £59,000.

All come with a full range of practical options including winches and roof racks. "It's a practical vehicle rather than a luxury one," says Dave.

The company hopes to be able to introduce a long wheel-based double cab pick-up to its range next year.

Looking ahead

LAMMA 2023 will be held on 10-11 January at the NEC, Birmingham. ■

> *“It does open up a different window to control grassweeds that we’re currently not exploiting in the UK.”*

Weed potential pulverised

On Farm Opinion

Growers grappling with grassweeds are investigating the efficacy of harvest weed seed control. *CPM* visits the first unit of its type in the UK and reports on a ground-breaking farmer-led trial taking place this harvest.

By Tom Allen-Stevens

The first thing you hear on arriving at West Stoke Farm is a distant whining noise. Harvest is in full swing, and Nick Rowsell can be found rapidly feeding the dryer.

He breaks off briefly before the next trailer of wheat arrives. “The noise? It’s the Redekop Seed Control Unit doing its thing.” He gives a wry smile, “It hasn’t gone unnoticed in the village, especially when we had it engaged late one night when harvesting oilseed rape. We’re in the suburbs of Winchester and crops are seen as an inconvenience. So currently, we bring the unit in and out of action depending on the field we’re in.”

Nick is the first farmer in the UK to try one of the first European prototypes of the Redekop SCU. It’s a mill that processes the chaff, retrofitted to his John Deere S680i combine harvester that was purchased in 2017. He’s been trying it to see how harvest weed seed control (HWSC) can contribute to tackling grassweeds, and how the prototype model can be adapted to the North European climate, harvest and weed spectrum.

Sterile brome

“Spring barley is our biggest crop, so blackgrass isn’t really an issue. Sterile brome is becoming a problem, though, and options to control it, especially in barley are very limited. HWSC is another option, and an area that hasn’t really been explored in the UK, although it’s proven successful in Australia and elsewhere, I understand. That’s why I was keen to give it a go.”

Just then, another trailer arrives and Nick heads back to the loader, waving an instruction to “find the combine — just follow the noise.”

He farms 1400ha of the rolling Hampshire fields north of Winchester. Everything overlies Andover series chalk, whether that’s clay caps or the thinnest top soil, and there are some steep slopes with a high flint content. So the business has two JD 680i Hillmaster models that bring it all in. The newer one, working its way through a field of Skyfall winter wheat, has a 9.16m header and is fitted with the prototype SCU.

Apart from the noise, there is a lot of dust. The unit sits at the back of the sieving shoe and processes all the chaff. Any weed seeds that pass through the combine and come out through the chaff are received by two vertical axis rotors. Operating at 2850rpm, the rotors move the seed through a series of rotating and stationary tungsten carbide-coated columns at up to 400km/h.

It’s the thrashing the chaff receives that destroys 98% of harvested weed seed and results in the fine dust that plumes out the back. Inspecting the residue, it does look very different, and you can see to a line where the SCU was engaged once the headland had been cut. It operates

Nick Rowsell is the first farmer in the UK to try one of the first European prototypes of the Redekop SCU.

independently of the chopper, that hasn't been engaged. So in between the undisturbed swaths you can barely make out any residue at all, let alone weed seeds.

Operating the combine is Andy Young, and on joining him in the air-conditioned cab, as soon as the door closes, the noise dims to a distant hum. "You can hear it, which is kind of reassuring, but it's no bother," he says. "And although there's a lot of dust it's guided out the way and doesn't clog up cooling grills.

"We've had John Deere combines since I started here in 2005, and I've always liked the CTS (cylinder tine separator) system. The current model has Auto Adjust features that ensure the feed and threshing settings achieve the optimum sample. The Hillmaster feature seems to work particularly well, and never overloads the sieves, even on the steepest slopes," notes Andy.

The Redekop SCU was developed first for John Deere combines and can be retrofitted to larger 600i and 700i-series combines. "It wasn't a simple Ikea job to fit this one. There were quite a few modifications. The main one was to the rear axle — it sits quite low and the rear wheels had to be adjusted to accommodate. This has widened the turning circle and can make it awkward when navigating narrow lanes.

"There have been the inevitable teething problems — there are latches which hold the doors that channel the chaff. These broke and in the end we had to weld them. We've worked closely with the Deere dealer, Hunt Forest, to sort out any issues."

Conscious that the European prototype would present a number of design challenges, Redekop has followed progress closely. The turning radius issue has now been resolved, and newer units are narrower. The latches have been adjusted, says the company, to ensure the internal doors operate correctly, and work has also gone into altering the design to reduce the noise.

Andy Young (left) finds putting the unit in and out of work relatively quick and simple, with a rather neat clutch disengaging the drive (right).

Engineering thought

When engaged in operation it works well, and Andy appreciates the engineering thought that's clearly gone into the design to integrate it with the combine. The control systems come up on the ISO-compatible terminal in the cab with settings and adjustments easy to make. Maintenance is straightforward, he says, with three extra grease points to attend to.

"Having the unit engaged does make a difference to power and fuel use," he notes. It's a good sunny day with a ripe crop, and the combine's currently using 14-15 l/ha of fuel. This is more like 12-13 l/ha with the SCU disengaged.

"We've only had one crop it hasn't been able to process — we tried it on some buckwheat, but the long stems wouldn't go through the rotors. It doesn't like particularly green or weedy patches of oilseed rape, and it struggles with

The rotors receive the chaff and weed seed from the back of the sieving shoe and move it through a series of rotating and stationary tungsten carbide-coated columns.

unripe oats," he adds.

The SCU runs in common harvest conditions without issue, says Redekop. The company's aware of bridging and plugging issues, that equally cause difficulties for the combine threshing mechanism itself, and a number of solutions to improve crop flow have now been developed.

Andy finishes the field and stops the combine to take the unit out of play. A simple and rather neat clutch disengages the drive — there are no belts or pulleys to move. The SCU moves on chopper slide rails allowing access to rear internals. A series of doors are then adjusted to redirect chaff flow.

In all, it's a 2-3 min job, although Andy notes that engaging the SCU after a period working without it takes longer. "You have to clear off the chaff that's built up in various areas before you can bring the doors back into position, and you have to ensure the mill is clear of debris before it starts up," he notes.

Catching up a few days later with Nick, he talks through the cropping and herbicide strategy and how the SCU fits in. "We don't have a fixed rotation but we do have rules," he says.

Only first wheats are grown, making the most of market opportunities. Spring barley is the main crop, with winter and

BOFIN farmers look to weed-seed destruction

A farmer-led trial is taking place this harvest to put the Redekop Seed Control Unit through its paces. Three units have been imported and fitted to the combines of growers who are members of the British On-Farm Innovation Network (BOFIN). The results will be closely monitored by NIAB weed scientists.

The unit was developed by Redekop, a company based in Saskatoon, Canada, best known for its MAV straw chopper, that has already achieved notable global success. The company had set its sights on bringing growers a total residue management solution, explains Redekop co-owner and president Trevor Thiessen.

"We'd already put significant work into developing residue management systems, so looked to design an HWSC mill that was as seamless as possible — one that was easy on, easy off, so growers could bring it in and out of play with the minimum of fuss," he says.

HWSC systems have proven popular with Australian growers in particular, who struggle with glyphosate-resistant ryegrass. The Redekop mill itself is a step-on from an integrated unit developed by researchers at the University of South Australia, funded by the Grains Research and Development Corporation (GRDC). "Researchers found if you hit a weed seed hard enough four times it renders it unviable," explains Trevor.

What's different about the Redekop mill is that this is achieved with five rings of tungsten-carbide coated columns — two rotary and three stationary — that clobber the seed at speeds of up to 400 km/h.

The company worked with Dr Breanna Tidemann of the Canadian Government's Lacombe R&D Centre to establish its efficacy and weed spectrum. "Following a known protocol, independent testing established up to 98% of weeds are destroyed. We also tested a wider spectrum of weeds compared with the GRDC-funded Seed Terminator," notes Trevor.

"While the SCU has been a success in Canada and Australia, we're seeing a significant increase in interest in Europe, driven by the need to find alternative weed management solutions. As well as working with NIAB in the UK, we have been developing understanding of the SCU's efficacy in European conditions with French crop-research institute Arvalis."

A second unit was imported into the UK last year and fitted to a Case IH 7230 combine used by NIAB at its farm near Cambridge. This was tested on a field infested with meadow brome, notes NIAB senior trials manager Will Smith.

"We counted weed panicles in a test area before harvest and assessed shedding and combine header losses. Based on these assessments, we calculated that on average 77% of the seeds were harvested and passed through the mill," he reports.

Monitoring of weed seedlings that germinated in the following crop showed the SCU reduced the population by 83%.

As well as John Deere and Case IH combines, units are also now available for recent Claas and New Holland models and can be retrofitted. Redekop is working with Howard Marshall in the UK, a company with specialist experience in fitting and running the units.

The concept of conducting an on-farm trial this year was put to BOFIN members and strong interest came back from farmers keen to take part. The three farmers selected not only have compatible combines but also a weed spectrum likely to give useful results.

Jake Freestone of Overbury Enterprises in Worcestershire is having his new John Deere S790 combine fitted with the unit to tackle a tricky problem with meadow brome. In Suffolk, Adam Driver has found his Claas Lexion 8800 puts blackgrass seed into its chaff lines, so results from the SCU will be monitored closely to gauge the difference it makes. For Ted Holmes, Velcourt farm manager in Warwickshire, who operates a New Holland CR9.90, ryegrass is grassweed enemy number one.

Researchers found if you hit a weed seed hard enough four times it renders it unviable.

Will Smith found that that the SCU reduced the population of meadow brome seedlings that germinated in the following crop by 83%.

A keen interest was common among the dozens of other growers who came forward. They've been brought together into a 'Knowledge Cluster', co-ordinated by BOFIN, of 69farmers, weed scientists and knowledge exchange managers who met at an introductory webinar last month. The group will be given regular updates, will share experience and help shape the project, which may run for two years, depending on first-year results.

Trevor believes it's a system that'll appeal to UK growers who are proactively seeking alternative methods to control grassweeds. "The SCU is a tool farmers can use to future-proof their weed control system, as herbicide resistance grows and chemistry loses its approval for use. Farmers who use it say it's a tool that can help them get on top of a weed problem before it gets on top of them," he concludes.

● For more on the weed seed destruction Knowledge Cluster, which is free to join, go to *bofin.org.uk*

spring oats, including a contract for Jordans. There's also winter linseed and 200ha of OSR in the rotation.

"Our biggest problem is controlling sterile brome in spring barley. It gets a cover crop in front of it which we treat with graminicides. The jury's still out on when's the best timing for burning down the cover — we've applied glyphosate eight weeks earlier, six weeks and the day before drilling. We seem to get best control of sterile brome somewhere between six weeks and the day before," he reasons.

"But there's plenty that appears in the crop, and rogueing doesn't help — you still get immature green plants that come through to harvest."

The farm hasn't used a plough since 2003 and has two drills: a 6m Horsch Sprinter with Dutch openers that are changed from 25mm width up to 90mm, depending on the job in hand, and a 6m Amazone Cayena. "I'd really like two Horsch drills, but we're looking for something with less disturbance. We've tried the Avatar and the Sky EasyDrill. The Avatar did a good job, but won't last long on our flints," he notes.

Feeling that he's already making best use of the cultural options available is what led Nick to HWSC. "It does open up a different window to control grassweeds that we're currently not exploiting in the UK. The other element is that our current system is heavily dependent on glyphosate and I wanted to gather some experience in case we lose it as an option," he notes.

Installed in time for harvest 2020, the SCU was engaged for most of the cropping. Last harvest, the West Stoke team were more selective in how it was used. "The milling process definitely happens, but what we haven't done is a proper scientific assessment of the results. As a consequence, it's very difficult to understand the benefits, and just what proportion of weed seed passed through the unit."

Nick's taken the decision to remove the SCU for this harvest. "It hasn't proven to be the most reliable machine, but then a lot of that is probably down to the fact it's the first unit in the UK and the unfamiliarity with it of everyone involved.

"But I'm glad I've had the experience. I'm now looking forward to seeing how the technology develops in the UK and hearing the experience of others. The balance of chemistry is never going to weigh in growers' favour, so now is absolutely the right time to explore HWSC," concludes Nick. ■

Having the unit engaged does make a difference to power and fuel use, requiring around an extra 10% of each.

Farm Facts

West Stoke Farms, Stoke Charity, Winchester, Hants

- **Farm Size:** 1400ha
- **Cropping mix:** Spring barley, winter wheat, winter and spring oats, oilseed rape, winter linseed
- **Soils:** Andover Series chalk with clay caps and high flint content
- **Farm staff:** Three full time, one part time, plus Nick Rowsell
- **Mainline tractors:** John Deere 6215R, 6195R, 6155R
- **Combine harvester:** 2x John Deere 680i Hillmaster with 9.16m header
- **Drills:** 6m Horsch Sprinter; 6m Amazone Cayena
- **Main Cultivation equipment:** 2x 4.6m Simba Xpress; 7.5m Claydon straw rake
- **Sprayer:** 24m Knight self-propelled with Airtec and 4000-litre tank

Research targets virus yellows solutions

BeetField22

In another difficult season for virus yellows control, *CPM* finds out about some more radical approaches to aid control at BBRO's BeetField22 open days.

By Mike Abram

> *"The reason why aphids are a good vector is that they don't really like sugar beet, so happily migrate through the crop."*

Research into different options has started despite BBRO waiting to hear whether Defra funding for a more extensive package will be given, says Dr Alistair Wright, BBRO's crop protection scientist.

The lack of clarity over funding has reduced the organisation's ability to deliver crucial research this spring, with no guarantees of future derogations for neonicotinoid seed treatments, he admits.

Rothamsted modelling predicts virus yellows levels of 69% in the absence of any control measures this season, with its associated prediction of first aphid flights by 19 April shown to be accurate to 24 hours.

Some non-neonicotinoid treated crops had already been sprayed twice by mid-May, while treated crops require close monitoring from eight weeks after drilling, with follow up sprays likely to be required with slow spring crop growth, says Alistair.

As the search for alternatives to neonicotinoid seed treatment continues, BBRO is taking an 'ABCD' approach to controlling the aphids which transmit virus yellows in sugar beet.

Alternative approaches

The high pressure makes it a good season to test more radical alternative approaches, alongside ongoing breeding efforts, with the 'A' in 'ABCD' standing for attractants, or alternative hosts to pull aphids away from sugar beet, says Alistair.

"The reason why aphids are a good vector is that they don't really like sugar beet, so happily migrate through the crop. Each time they land and feed they're transmitting virus, producing progeny, and then carrying on."

BBRO has found growing an alternative host, brassicas, has been reasonably effective at pulling aphids away in its variety trials. "In the autumn and next spring, we want to follow this up with some field strips. But asking growers to take several beet hectares out of production is an expensive exercise, which is why we need the funding from Defra to do it."

Beneficial biological control forms the 'B' in BBRO's programme. Last season a farm in the fens experimented by introducing beneficials, but no conclusive results were possible due to low aphid numbers, explains Alistair.

However, buying-in beneficials is very costly and not particularly hardy after ▸

A high-pressure season for virus yellows will help test the merits of different approaches for control, according to BBRO's Alistair Wright.

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ABCD approaches to virus management

A – Attractants (alternative hosts)

B – Beneficials (biological control)

C – Camouflage (cereal cover crops)

D - Deterrents (essential oils)

▸ being reared in the glasshouse, so this year's trials are concentrating on building natural populations of beneficials. That's happening at Morley in Norfolk, where flower strips have been sown in beet fields to provide a bridge to move beneficials out into the beet crop, he continues.

"Research papers claim beneficials, such as lacewings and hoverflies, should move around 100m away from the flower strips. At Morley last year we saw a green border around the flower strips, but unfortunately only about 10m into the crop.

"It does work and hopefully with more research we can get some better results."

'C' is for camouflage, after some evidence from 2020 suggested growing cereal cover crops showed major reductions in virus yellows, says Alistair. "The idea is to use barley to obscure the beet from the aphid — they require contrast between the green and brown. The barley will compete with the beet for nutrients and water, especially in a dry spring, and in 2020 we also saw that yields were severely hampered (if competition wasn't removed early enough)."

BBRO has asked beet growers to test and help optimise this technique, particularly the timing for barley destruction, by growing strips of barley cover with non-cover strips. BBRO will use a combination of drone, satellite, and grower observations to assess the impact on virus levels later in the season.

Another way being tested to remove the green/brown contrast is spraying blue, red and green natural dyes to fields, says Alistair. "How long the dyes last will be affected by the weather and the soil colour, but it could extend the period before you need to use an aphicide."

A similar theory is to use essential oils to repel aphids — the 'D' for deterrent. "We're hoping to look at lavender, mint, garlic, and molasses to see if spraying these on when aphids are migrating into the crop causes them to fly in a different direction or avoid fields altogether."

Variety choice

Analyse sugar beet varietal performance on farm, both during and at the end of the season, to help guide decision-making for the following season, urges BBRO's head of knowledge exchange Simon Bowen.

While BBRO/BSPB's Recommended List and other variety trials provide a lot of information, performance can vary massively by soil type, he says. "I'm a great believer that some varieties suit some soil types or areas, and we can't always pick that up in the data."

Key characteristics to monitor are early canopy vigour, and later in season disease levels and vigour again, he suggests.

"Some varieties retain vigour and grow more strongly towards the end of the season, and clearly if you lift late, those are the kind of varieties you want in your mix."

Growth habit is also important — some grow very upright, such as BTS1915, he adds. "We think that's good for intercepting light in the autumn and good for late harvesting, but there's also a weed control consideration. In those varieties we have seen some later germinating weeds, such as fat hen come through."

Simon reckons the more prostrate varieties are probably more useful where there are problematic and high weed densities. "Think about those growth habits in relation to weed control, which is something we haven't had to do as we've had good chemistry. But as we lose chemistry, we have to understand how to use varietal traits."

Within a portfolio of varieties, as well as considering whether any specialist traits are required — such as tolerance to beet cyst nematodes, ALS-herbicides, beet mild yellows virus or aggressive rhizomania — look at drilling date suitability, recommends Simon.

"With the weather patterns we're having, we seem to have an opportunity to drill quite early. So it's worth having a variety that has a low resistance to bolting in your portfolio to take advantage."

Sugar content is another characteristic to look at, he adds. "There is variation,

BBRO is experimenting with novel approaches to prevent virus yellows in sugar beet crops, including spraying essential oils as an aphid deterrent.

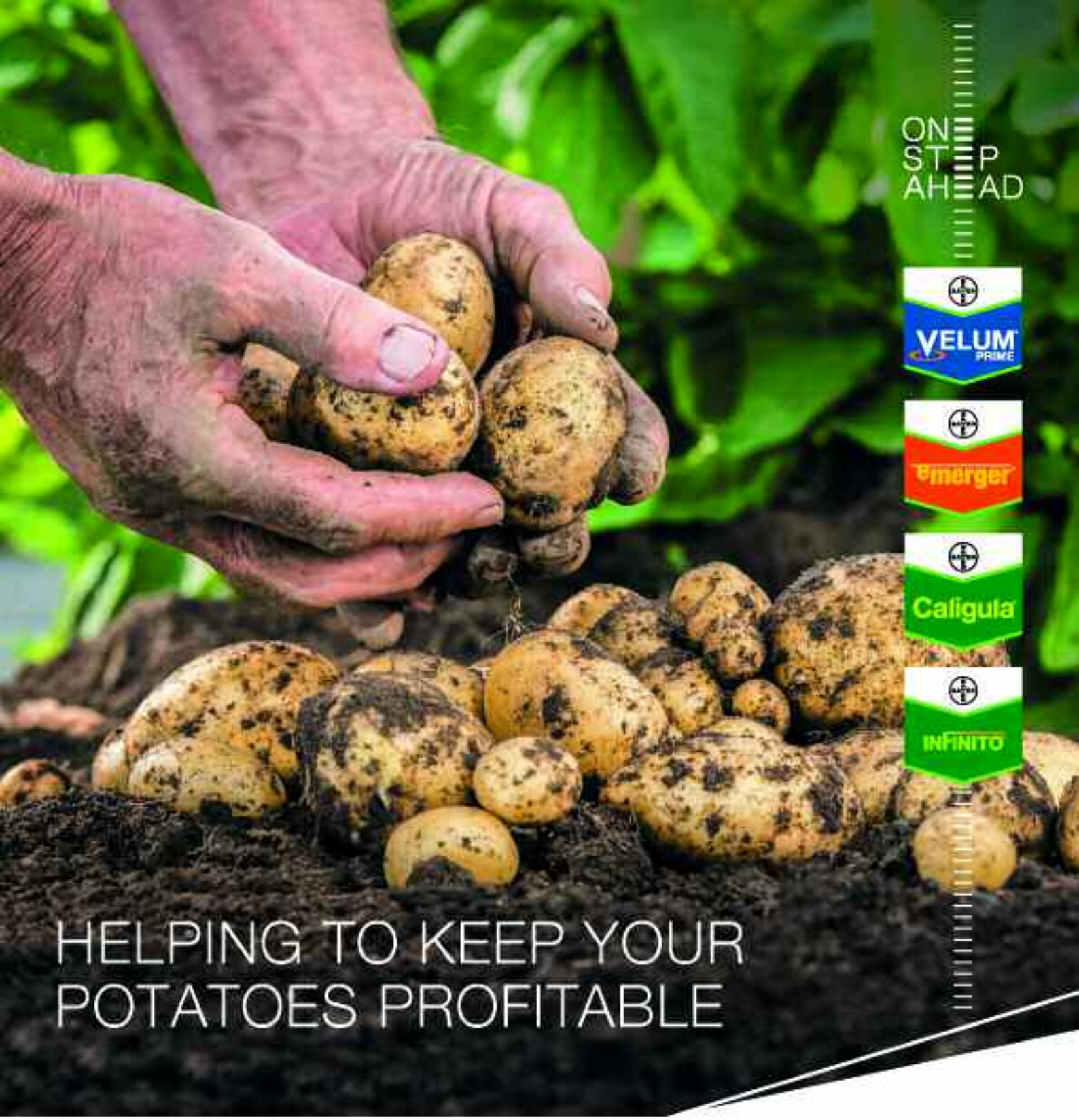
with the highest at 17.5% and lowest at 16.5%. If you're early lifting, avoid varieties with lower sugar content as they can proportionately be affected more bysummers like last year with low sunshine hours."

Finally, disease susceptibility is something else to consider. Cercospora ratings have been added to the RL after two years of trials, says Simon. "There's not much useful resistance currently but there are some differences. So use that rating and particularly for rust, where there are some bigger differences if you're later lifting."

Fungicide shortages?

Be aware of a potential shortage in options for sugar beet disease control this summer, warns Prof Mark Stevens. ▸

In the absence of Escolta, Mark Stevens is nervous about having an 8-10 week gap between sprays of Priori Gold or Angle in mid-July and mid-September.



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Analyse variety performance and characteristics to help select next year's beet varieties, suggests Simon Bowen.

▸ Previous seasons' market leader Escolta (cyproconazole+ trifloxystrobin) is in its use up period and is no longer available to buy. Industry estimates suggest there's enough stock already in sprays sheds for one spray on around 10% of the beet area, says Mark.

That leaves Priori Gold and Angle (both azoxystrobin+ difenoconazole), plus Impact (flutriafol) as the remaining approved options, with the beet industry struggling to obtain an emergency approval for Bayer's Caligula (fluopyram+ prothioconazole).

One potential issue, particularly where Escolta isn't available, is a long gap between applications of the azoxystrobin+ difenoconazole products if Impact is used in between, he notes.

"Impact has activity against cercospora and ramularia, but it can open the door for rust and mildew. In a conducive year, it would make me nervous having an 8-10 week gap between sprays of Priori Gold or Angle in mid-July and mid-September. We need to think about all the diseases under UK conditions."

Focus on nutrition

Foliar feeding sugar beet crops might be worthwhile to push crops to get to the 12 true leaf stage as quickly as possible, particularly in dry springs that are becoming the norm, says Simon.

There are six key nutritional drivers for early canopy development: nitrogen, phosphate, magnesium, manganese, sulphur and boron, he explains.

Readily available phosphate is important for root growth, while magnesium and manganese are integral for chlorophyll production. Sulphur, if it hasn't been applied in the seedbed or the land isn't manured, can run short, while boron deficiency is becoming more common on light sandy soils or more acidic soils.

"With the dry springs these crops are struggling to get these nutrients at a time when they want to grow very quickly," he says.

Timing is key with foliar feeding — there needs to be enough canopy but before the crop is showing deficiency symptoms. "Feeding through the leaves can be more effective than through the roots, but application conditions need to be right."

Simon suggests that means temperatures below 20°C with some humidity, typically early morning or early evening, are ideal as this is when crops are actively growing. Keep droplet size relatively small to avoid scorch, he advises.

"I favour a little and often regime, with seven to 14 days between applications — depending on how stressed crops are. And if the product you're using doesn't have a sticker adjuvant, think about adding one as that helps stick the product onto the leaves and helps with penetration."

Simon also highlights the nitrogen response curve in sugar beet flattens off considerably above 90-100kgN/ha. With current high fertiliser prices means it's uneconomic to apply above that level, and is why BBRO recommends a 15-20% reduction this season, he says.

For next season he highlights some other areas to consider when thinking about nitrogen management. These include accounting for what nitrogen is already in the soil, especially after cover crops and manures, potentially using a soil mineral nitrogen test.

Using nitrogen more efficiently is obviously critical, he adds. "Make sure you're managing pH so your soils are working for you. When pH drops below 6.5, nitrification in the soil slows down and less nitrogen will be converted. So get it measured and make sure it's above 6.5 and ideally around pH7."

Placing nitrogen in a band 7-8 cm below and to the side of seed is another possible way to use fertiliser more efficiently. "We've shown it can advance canopy growth. Some growers using it on farm have found they can cut back rates from broadcasting 120kgN/ha to placing 100kgN/ha, which obviously with current prices is a big saving. It might mean changing a drill, but we are seeing agronomic advantages," he concludes. ■

BBRO has found growing an alternative host, such as brassicas, has been reasonably effective at pulling aphids away in its variety trials.

Slight differences in vigour could be seen at BeetField22 between neonicotinoid-treated sugar beet (right of larger row spacing) and untreated (left) in mid-May.

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> *If we lost MH, it would be a bigger blow than losing CIPC for a medium-term storage operation like ours.*

The jewel in the crown?

Potato agronomy

Closed transfer systems can improve both operator safety and efficiency of spraying operations. *CPM* speaks to two Herefordshire farms that have reaped the rewards when using Crown (maleic hydrazide) in their potato crops.

By Rob Jones and Lucy de la Pasture

Since the withdrawal of chlorpropham (CIPC), potato growers have had to adapt fast to maintain cost effective control of sprouting in store. Many now start their storage programmes in the field with a foliar application of maleic hydrazide (MH), a product that has been familiar to potato growers like Tom Powell for many years.

Based at Yazor, near Hereford, the farm produces some 900ha of arable crops, including winter wheat, oilseed rape, spring beans, winter barley and potatoes. Other enterprises, include cider apples for Thatcher's and a broiler unit.

Potatoes have long been part of the rotation, but his area has been scaled back in recent years largely due to the fierce competition for good land within the local area, and he now grows about 70ha of processing varieties, Royal and Innovator, for McCain.

Volunteer control

As Tom's trying to keep production within the farm's boundaries, MH has been used regularly for volunteer control over many seasons. His approach forms part of an integrated pest management (IPM) strategy by minimising potential sources of blight inoculum and reducing the propagation of soil pests and diseases in between potato crops — all of which helps to make the farm's potato enterprise more sustainable.

"We have widened the rotation to one in six and are only growing potatoes in fields that should have them, both from a topography and soil type point of view," he explains.

"We've reached a happy medium, where it's comfortable for one harvester. That's particularly important in this area, which historically has produced maincrop varieties harvested in late September or early October under weather pressure."

Tom has seen the benefit of MH for sprout control — previous veiled by the availability of CIPC — in the farm's ambient bulk stores, which keep potatoes in good condition until January-March delivery. Royal is the first to go in January and over the past two seasons the variety has remained dormant until then, using just a well-timed application of liquid MH. The Innovator follow in February and March and the stores holding the HZPC variety have ethylene introduced using the Restrain system to maintain sprout control for the final weeks before loading out.

The sequence of MH then ethylene is working well too, with some of the Innovator going out the door in April this ▸

A closed transfer system has been added to Tom Powell's Agrifac Condor 5 sprayer and is used to transfer liquid maleic hydrazide from an IBC to the tank.


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We create chemistry

MH should be applied applying to an actively growing crop 3-5 weeks before haulm destruction, when the temperature is below 25°C and relative humidity is higher than 50%.

▸ year without any problems, says Tom. The only investment that's gone into the stores to make the approach work has been extractor fan systems to remove CO_2 and protect fry colours.

Planning is everything

As the 2022 maincrop begins to develop, potato growers are turning their attention to blight control programmes at a time when strains continue to evolve and the tools to control the disease are diminishing.

Last year, blight began to show itself during rain events in May, and by the time the rapid growth phase started in early June, Hutton Criteria was being met in most locations across the UK.

"We had an outbreak in the south and east, starting in Kent in mid-June," said Craig Chisholm, field technical manager for Corteva Agriscience. "Those conditions were met pretty much continuously through the season, though the focus tended to remain in the south and east where innoculum levels meant blight pressure was greatest."

Data from the James Hutton Institute reveals that strains of blight found in the UK continue to evolve, making for a particularly dynamic and challenging population. The 6_A1 strain continues to account for a significant portion of the population, although it's being steadily displaced by the more aggressive 36_A2.

The resilience of 37_A2 within the UK late blight population continues to cause concern because of its insensitivity to fluazinam and the 41_A2 strain, which has started to dominate the Nordic region, was discovered in one sample in Scotland, relatively late in the season.

"While not something to be unduly concerned about at this stage — it was a single sample in 2021 — it's another reason to maintain a tight spray interval and a robust programme in 2022," believes Craig.

Meanwhile, the chemistry available to growers remains limited as the number of active ingredients permitted to control late blight continues to dwindle, he adds. "Resistance to the phenylamines has been present within the UK blight population for some years now, resulting in their loss from UK programmes. Insensitivity to fluazinam restricts our options further."

Although dithiocarbamates are currently available, their future looks uncertain, says Craig. "Dithiocarbamates are no longer authorised for use in Europe but are currently still available to us in the UK. We want to make use of that for as long as we can."

Craig suggests growers make use of mancozeb while it's still permitted too, because it provides strong protectant activity against alternaria. He advises mixing it with Corteva's Option, a straight cymoxanil.

"When blight pressure is high, we've been mixing Option to give a bit more curative activity to protectant fungicides," he explains. "And there's a good argument to say that we should be mixing it in with single active products as part of an anti-resistance strategy."

Trials from 2021 reveal significantly better levels of blight control were achieved where Zorvec (oxathiapiprolin) was included at a 10-day interval rather than using an alternative spray at seven days, particularly where it was included at both rapid growth and stable canopy phases of the crop.

"Blight came in later in our trials, and there was lower infection during the rapid growth phase. in 2021 we saw a more pronounced benefit, in all trials, from retaining at least one or two applications of Zorvec for use during the stable canopy phase when late blight infection was at its highest."

Data from the James Hutton Institute reveals that strains of blight found in the UK continue to evolve, making for a particularly dynamic and challenging population.

Craig Chisholm advocates Zorvec during rapid growth and again at stable canopy, with a max of four applications permitted.

Craig claims Corteva's oxathiapiprolin-based chemistry has been instrumental in meeting growers' needs to get a start clean. Two applications in the rapid growth phase, making use of both its curative and systemic activity, provide a clean base on which to build an effective programme, he says.

"Its ability to deliver robust protection for 10 days, versus the industry-standard seven, means that if weather prevents sprayers from travelling, or capacity restricts visits to more distant crops, they will still be protected. In addition, its curative properties also deliver kickback on any latent disease in the crop."

With up to four applications permitted on a potato crop, growers are advised to apply two applications of Zorvec early in the season and retain the other two for later in the season, as blight pressure demands.

"Your strategy for using Zorvec isn't going to change that much for 2022. It's still an insurance policy with late blight. We want the cleanest possible start to the programme and having good curative material, with systemic movement into new growth, is going to be of benefit during the rapid growth phase.

"But then retaining Zorvec for the stable canopy phase, so you have one to two sprays kept in reserve, certainly makes good sense," he concludes.

"We were always late appliers of CIPC, and MH was allowing us to do that. Now we don't have CIPC, we're seeing the full benefit of MH and it's helping us control costs — Restrain is double the price. I think if we lost MH, it would be a bigger blow than losing CIPC for a medium-term storage operation like ours. It's the number one sprout suppressant option out there now," notes Tom.

Like with any crop input, there's a concerted effort to get application correct to achieve maximum uptake and subsequent efficacy, he says.

Guidelines include applying to a healthy, actively growing crop 3-5 weeks before haulm destruction. It should also be applied when temperature is below 25ºC, and relative humidity is higher than 50%. Tom has also ensured that no rain is forecast for at least 24 hours, used high water volumes of up to 400 litres and angled nozzles for optimum coverage.

Last year, he added a closed transfer system (CTS) into the spraying operation to transfer liquid maleic hydrazide, Crown MH, into the farm's Agrifac Condor 5

from a 600-litre intermediate bulk container (IBC).

It proved to be an easy process to adapt the sprayer for use of the Wisdom System's Fastran 850, which delivers the chemical into the sprayer quickly. Tom says a major benefit has been much reduced handling for his staff, with the product moved to the fill up area with the telehandler rather than handling bags of granular product. "We also like the formulation, as it foams much less than granules," adds Tom.

MH has historically been used to keep on top of volunteer potatoes but its contribution to sprout suppression in storage has become invaluable since the loss of CIPC.

Another fan of the non-foaming formulation is David Innes of FM Greens at Ditton Farm, near Ross-on-Wye, who operates the outfit's 36m 4000-litre Household Harrier. The business manages about 1,400ha of crops, including wheat, barley, OSR, sugar beet, beans, beetroot and just over 300ha of potatoes.

The farm grows a mixture of chipping varieties, Innovator and Challenger, for Lamb Weston and crispers Brooke, Taurus, VR808, Lady Rosetta and Lady Claire, with some crop used to produce hand-cooked crisps for the Two Farmers brand.

Avoids foaming

In previous roles on other farms, David had been using granular formulations of MH and he says the biggest bugbear was foaming when filling. In many instances, he had to run the sprayer tank three quarters full to avoid either filling it right up and spilling dilute chemical on the ground or waiting for the foam to settle. "That meant doing at least a tank less a day," explains David.

The switch last season to Crown MH in IBCs with a Fastran 850 CTS eliminated the foaming problem and allowed him to realise the sprayer's full capacity. There's also the bonus of a much safer and more efficient filling process, with less lifting, ripping, and pouring of bags into the induction bowl, he says.

According to David, setting up the sprayer for the Fastran 850 is simple, with a three-way valve plumbed into the venturi on the farm's newest Household sprayer before delivery. Calibration is straightforward, with Wisdom Systems providing a calibration factor chart for various products with different viscosities, he says.

"It's surprising how much time you can waste moving boxes and bags around. For other applications, it allows you to draw from an IBC while introducing additional products into the hopper.

"We've pushed for a lot more product in IBCs this year. Not just Crown MH, but Roundup (glyphosate), magnesium, and trace elements because the system is just that much easier and more efficient for the operator," says David.

He adds that he saves about 10 minutes every time he fills and reckons that if you were doing 10 loads in a day, it would be possible to squeeze another load in using the CTS and IBC combination.

Along with running two sprayers, this helps the business cover ground quickly when conditions are ideal for MH application and the sprout control results in the farm's 8000t of storage have been good.

At Ditton Farm, David Innes says the move to liquid MH and a Closed transfer system has eliminated the foaming problem seen with granules and allowed him to realise the sprayer's full capacity.

In the first season using MH when CIPC was withdrawn, David says the farm's Lady Claire — a notoriously difficult variety to store — didn't require any in-store treatment using mint oil until March.

"In the past, I've seen crops of Lady Claire struggle to be held with CIPC, but we've been really impressed with how the MH has performed since we started using it. We've only applied two applications of mint oil to see the crop through until June this year, when lifting green top Lady Rosetta starts," explains David.

He adds that the Fastran 850 is relatively inexpensive, with Wisdom Systems quoting £595 plus VAT for the unit itself, which is supplied with a 3m hose. Customers then choose their own fixtures and fittings, depending on the sprayer.

David reckons it's worth the investment, as many growers are moving to liquid nutrient products like Nutrino Pro or Efficie-N28-t in cereals, which are also available in IBCs. "That's why we've bought a second system now for our Sands sprayer. It's so straightforward and takes a lot of mess out of the operation.

"We also like the reduction in packaging. We simply empty the containers and send them back for recycling or refilling. It would be good to see more manufacturers adopt a similar system with their product," adds David. ■

techtalk

Patience always pays

Over the past couple of seasons it's been a steep learning curve as the industry gets to grips with desiccation in the post-diquat era. *CPM* gets the gen on how to use PPOs to best effect.

By Lucy de la Pasture

Desiccation is one of the most important processes in potato production. Get it wrong and the price is paid in loss of marketable yield and potential problems during harvesting and storage.

With the PPOs now the only chemical option remaining, planning desiccation strategies has never been more necessary. To plan effectively it's important to know how the chemistry is working so that it can be used to achieve the best results. And that means also understanding the factors that may make the job more difficult.

James Cheesman of Certis Bechim has been working with the PPOs for a long time, both as an agronomist and latterly in his technical role at the company. He talks through the essentials to ensure desiccation success at the business end of the season.

What makes a good desiccant?

One of the main purposes of desiccation is to 'stop' the crop so that marketable yield is maximised by preventing a fraction of tubers from becoming oversize. But although tuber size is a major consideration, desiccation also aids stolon detachment from the tubers — essential for ease of harvesting — and enhances skin set, which is of particular importance for tubers going into store.

Speed of kill is an important quality of a good desiccant, something that both sulphuric acid and diquat were renowned for. Rapid haulm removal is the most effective way of stopping tubers from bulking and reducing the threat from late blight. However, the PPOs work in a different way and their efficacy on leaves is lower than with previous options, resulting in a slower speed of kill. This means it's important to monitor crops and plan desiccation programmes, working backwards from the ideal date of lifting to allow for the extra time that's required using all PPO or flail and spray strategies.

How do PPOs work?

PPOs inhibit an enzyme called protoporphyrinogen oxidase in the chloroplasts within the leaf of the potato plant. The role of this enzyme is to facilitate the conversion of protoporphyrinogen IX to protoporphyrin, which is a precursor for production of chlorophyll. So one of the actions of PPOs is to interrupt photosynthesis, but there are additional indirect effects that are destructive to plant tissues.

The application of PPO inhibitors also results in the production of damaging free radicals which disrupt cell membranes and cause leakage of cell fluids, leading to desiccation.

> *"Planning and patience are the key to effective desiccation using PPOs."*

Visually the symptoms seen in

James Cheesman warns not to 'chase crops' at lifting time as patience pays dividends.

leaves after PPO application also differ from the rapid effects seen with now obsolete desiccants, such as diquat. These are much slower to appear, particularly in older leaves. However, the hormone cascade has already been triggered which causes the plant to start to shut down.

Blocking the PPO enzyme pathway causes a build-up of ethylene in the plant, triggering senescence — seen as yellowing of the leaf tissues which is followed by browning, sometimes surrounded by a reddish ring.

PPOs also cause an upregulation of abscisic acid which causes leaves to drop and stolons to detach from the tubers, aiding harvesting.

What factors influence this?

One of the big influences on the efficacy of PPOs is the weather. Because one of the effects of the PPO inhibitors is to cause leakage of the cell contents, warm weather enhances their effect as the plant is actively growing. Application on overcast or cool days slows down the desiccation process.

Nitrogen should be tailored so that crops start to senesce just before the desired desiccation timing.

As well as temperature, high light intensity helps get the best out of this group of chemistry. While a bright sunny day is ideal, the time of application is also influential — with Belchim trials in Belgium indicating the best window is between 10am and mid-afternoon, when the sun is at its most powerful during the day.

Because PPOs don't move in the plant, good coverage is the key to good activity. That means nozzle selection should be considered to give the best deposition of spray on the leaf and a minimum water volume of 300 l/ha is necessary, with higher volumes giving the best results.

There are also a lot of agronomic factors which influence the effectiveness of PPO applications. These include variety — whether a determinate or indeterminate growth habit, whether the crop is senescing, physiological age of the seed, nitrogen management and soil ▸

Meeting the challenge

There's been no shortage of challenges since the loss of diquat, according to Richard Tressider of Agrovista. He looks after potatoes in the south of Cornwall, with varieties including Casablanca, Wilja, Sagitta, Eurostar, Markies and Caberet.

"Diquat was really the answer to desiccation in a can. It was very effective at opening up the canopy and to be honest, I miss it."

Richard is far from alone with that sentiment and, like the rest of the industry, has been finding the best way to tackle desiccation for his growers. With very few employing a flail in his region, that means PPOs have now become his mainstay.

"The number of applications needed really depends on the vigour of the crop but a full dose of one of the PPOs gets the ball rolling, with a follow up application 7-10 days later. If the crop is starting to senesce at the first application, then two sprays are usually enough to do the job," he says.

PPOs have been around for a long time and typically were used to desiccate the stems once diquat had opened up the canopy, says Richard. "But you don't get the leaf 'blow off' effect with PPOs so their action isn't as visible as diquat. We also have to rely much more on the weather to get the best results so we try and apply on warm, bright days if we can.

"Maintaining blight control during the desiccation process is also important, right up to the point of death," he adds.

The biggest difference has been in mindset, in particular understanding why it's necessary to start the desiccation process earlier and why including a blight fungicide has become even more important, says Richard. He also believes close communication between grower and agronomist is crucial.

"I do a lot of sizing and yield monitoring with my growers so that we're talking about the market requirements and where the crop is at. That means we're well prepared to start desiccation earlier than we were used to because PPOs aren't as quick to act, and we can't afford to let tubers get oversize."

Tailoring nitrogen to the crop requirements is something Richard works closely with growers on. "This year, more than ever, there's a keen interest in not overapplying nitrogen. We want to be sure we don't starve the crop but don't want to overfeed so that we're dealing with oversize tubers and a crop that stays green until Christmas.

"Nitrogen manipulation is paramount so that the nutrient package is put together to allow for natural senescence," he adds.

When the crop is vigorous at the time of first application, Richard says it can be a bit of a cringe moment. "This is when weather conditions can really help but I still find myself praying the second application will help the process."

Richard recommends PPOs are applied in a minimum of 300 l/ha water and says many of his growers also have vegetable crops so are proactive at maintaining high water volumes. "Good coverage is key and water volumes of 100 l/ha won't cut the mustard for desiccation."

In his previous role Richard was a spray operator so he's acutely aware of the difference good application can make. "I'm a fan of Guardian Air nozzles and with copious water volumes these really do give good spray distribution. We all know that flat fans probably give the best coverage but spray days when these can be used are very limited in Cornwall."

He summarises by emphasising that planning is the key when it comes to desiccation. "You have to be on the ball and discuss where the crops are at because timing is of the essence when using PPOs."

Paying close attention to application is the recipe for success for Richard Tressider and he cites weather conditions, water volume and nozzle selection as important considerations.

Effective desiccation: top tips

- **Plan ahead** – start to consider desiccation before the crop is even planted so that the strategy is matched to the variety and nutrition is tailored accordingly
- **Be canny with application** – take into account weather, with warm and bright conditions giving the best results. Good coverage is crucial
- **Patience pays** – whether it's finding the best spray window or allowing time for PPOs to work in time for lifting

▸ type. Region and weather conditions following application can also be influential, particularly if rain follows application after a dry growing season.

Salad crops can be hard to stop and because tuber size is crucial, close monitoring and pre-planning is required.

Because the PPOs take longer to burn off the foliage in an all-chemical regime, the first spray should be applied 'earlier' so that tubers don't go oversize.

How can flailing help?

Flailing has become a popular option to rapidly remove the haulm and, for many growers, it has replaced diquat where it was used to 'open up' the crop to gain access to the stems for subsequent spray application, which was often a PPO. It's particularly useful in 'hard to stop' crops, such as those grown for seed or salad potatoes which have to be burnt off before they start to senesce naturally.

Done well, flailing provides immediate removal of the foliage but, if the haulm is deposited on the stems rather than in between the ridges, the debris can hinder subsequent spray application. For this reason it's crucial to avoid this. It's also important that flailing doesn't overly stress the crop because this can result in vascular browning.

The past two autumns have provided good conditions for the flail but there are times when ground conditions don't allow entry or soil type prohibits its use. In these situations it may become necessary to use a chemical only approach, which may require multiple applications to achieve complete desiccation of leaves and stems, so flexibility is key. If delayed with the flail because of the weather, it may be useful to apply a dose of PPO to stop tubers from going oversize to buy some time for ground conditions to dry out enough to go in with the flail.

So how do I get the best results?

Planning and patience are the key to effective desiccation using PPOs. You can't chase the field to get in with the harvester where PPOs are concerned. Because they work in a different way to diquat, kicking off the desiccation process has to be brought forward a little to allow sufficient time for the anticipated number of applications and slower defoliation.

When a crop is flailed well, the debris should be deposited between ridges so that the stems are accessible when a desiccant is applied 48 hours later.

Even if the plan is to flail, it's important to understand both sides of the coin so that, should the weather force you down the chemistry route, the crop will be stopped at the right time.

Management decisions made before the crop is even planted may make the difference between successful desiccation and a crop that's difficult to stop. In particular, nitrogen applications should be tailored to the variety and optimum lifting date so there's just enough to keep the crop growing and bulk the tubers but not an excess, which would delay senescence and make the crop more difficult to desiccate at the right time.

In a flail and spray regime, a full dose of PPO — Gozai (pyraflufen-ethyl) plus methylated seed oil (MSO) should be applied 24-48 hours after flailing together with Ranman Top (cyazofamid) to protect against late blight. A top up dose may be required seven days later, depending on factors such as variety, weather conditions and maturity of the crop.

In an all-chemistry programme then 2-4 applications of PPO will be required at seven-day intervals, requiring use of both Gozai and Spotlight Plus (carfentrazone ethyl). The important thing to remember is that good coverage and bright conditions at application will help ensure good results.

Are there any restrictions?

Gozai has a LERAP B restriction and a 14-day harvest interval, which is slightly longer than Spotlight at seven days. In practice, this isn't a negative for Gozai because of the slower activity of the PPOs and instead removes the temptation to lift before the crop is fit.

The maximum dose per annum for Gozai is 1.6 l/ha, so if it was applied as a herbicide on the ridge at 0.4 l/ha then only 1.2 l/ha is permitted for use at the desiccation timing. ■

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talkingtaties

by Andrew Wilson

Roots - which way will we turn?

This month I'd like to open my column by sharing some sad news and paying tribute to a much-valued member of my team.

On Saturday 16 April, we were all serviced up, planning for a Sunday off and ready to plant potatoes on Monday morning. Unfortunately, Malc, at the age of only 36, suffered a massive heart attack at home on the Sunday and died in hospital on Monday 18 April.

Malc was a very versatile, committed and skilled operator, but also a mechanic and a colleague with vision, passion and a will to always do things better. He was essentially my right-hand man.

To say it knocked us all sideways is an understatement. Somehow, we gathered ourselves and made a rather dark and sombre start to the season. Adjustments had to be made to keep the wheels turning and various people went out of their way to help us out — the farming community is a tremendous place, never more so when the chips are down, for which I am very grateful.

This meant that our beet lifting contractor stepped in to get my sugar beet drilled, and my planned strip till and placed biological trial got shelved for this year. Instead, we're looking at alternative ways of feeding the crop, through nitrogen enhancing and foliar nutrition to boost yield and sugar content. As far north as I am (97 miles from Newark Factory), the future of beet here once again hangs in the balance. While £27/t is a useful step up from last year's price, we need that to stand still, not move forward. Hopefully we'll know more about the 2023 crop's fortunes by the time the combines start rolling. We're constantly tweaking, but there's a limit to how much more cost can be shaved off before we go backwards.

My little regenerative potato trial last year has been expanded to a couple of acres this season. With some industry support, we're following the basic regen principles of moving less soil and using less chemistry. I don't think we can avoid putting a share in the ground to harvest the crop, but it needn't be as deep as maybe it's been in the past. Fundamentally, we need to produce a crop that our customers can use, and that all starts with soil health. Like many, most of my crop is grown on land rented in as part of other farms' rotation, and as such I have control of it only for one year.

Since 2011, over winter cover crops, usually of radish, mustard, oats and beans have helped massively in reducing both nematodes and cultivations. We aim to incorporate the physical OM so that it stays in the planted row, to reduce capping, cracking, and slumping.

This year we've experimented with different cultivations, shallower depths, and various different ways to produce a seedbed. Chemical use will be much less than standard, with various alternatives trialled. Following the lessons of last year's inaugural trial, some (different) companion crops will be planted, and we'll try some straw cover again.

The interesting bit, outside the obvious yield and quality, will be comparing EIQ ratings of the different approaches, and dissecting the financial results to identify where the greatest margin was produced in an attempt to get us fit for the future, whatever that may hold.

Volatility presently is about the only constant — be it prices, disappearing tools from our armoury, weather, or market requirements. Costs are rocketing, and with it, risk. As I alluded to back in March, root crops are a big part of our family business, but as passionate as I am about them, we do need significantly more reward for the blood, sweat and toil that goes into producing, storing, and delivering our crops to our customers.

As contract growers, we're notoriously price takers not price makers, mostly to reduce the risk of two consecutively poor years. Not too many years ago, by June we had an idea of forward prices and could commit to land and sometimes fertiliser for the forthcoming season in the July. In recent years the crispers and chippers have manged to drag this out until virtually Christmas. Most have some form of indexation model, set to give us just enough to keep us planting — with eternal farmer optimism — for another year.

I can't say what's happened in the past hasn't worked, but the world is a very different place now. The UK potato industry needs action and fast, or processing companies might just find out that while they need a few spuds to slice to run a chip or crisp factory, we, the grower base, can manage to farm without the big hours, big outlay, big commitment, or big risk of producing the humble potato.

Regen or not, recent events like I mentioned at the start tweak one's perspective — we value our team greatly. Our business, and I feel the British root industry at large is approaching a crossroads of sorts — which way will we turn?

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

lastword

by Lucy de la Pasture

Search for a star

Enjoying putting pen to paper and a good grasp of science don't often go hand in hand. But many of the UK's best arable technical writers have been successful because they had a good grounding in agronomy, trials work or farming before having any aspirations to be a writer.

When I graduated from Wye College in 1990, I couldn't decide which direction I wanted to go in. On the one hand I was fascinated by agronomy and, on the other, I loved to write. Weighing up my options, I spoke to the then prolific agricultural journalist Edward Long. He encouraged me to write something and then send it to him for feedback.

That gave me a number of immediate challenges — I needed a story, to conduct interviews (how do I go about that?) and then work out how to write an article in the right style — and that was a far cry from the scientific writing I'd been doing for the past three years.

In the end, it was a start-up company based at Wye College that gave me my inspiration. Even though it was now more than 30 years ago, I remember that first story well — probably because it took me a long time to work my way through the process. The headline was 'Where there's muck, there's money' and the company it featured was Controlled Composting Systems, which looking back was well ahead of its time as its technology would be right on point today. Edward gave me a great deal of encouragement and some sage advice on my writing, though I'm not sure that particular article was ever published.

In the end I made the decision that I'd be a much better writer if I understood more about the technical aspects of agronomy than my degree had furnished me with. So I put my writing on hold and looked for opportunities to train as an agronomist. Believe me, they were few and far between for a female in the early 1990s. I was offered a trainee position but couldn't relocate for the salary, which was single figures; I wasn't selected for a job with a well-known agronomy company and eventually I got into a smaller local independent distributor through the back door — covering the office work during a maternity leave. In my interview I told them my ambition was to be an agronomist and I was promised that was a possibility 'if I was any good.'

After a while, I escaped the office for a couple of hours every other week to go out with the different agronomists — it wasn't a lot of training — and I was enrolled on a BASIS training course. Fortunately for me I surpassed expectations and passed the exam with flying colours and the company came good on its promise to put me in the field.

Several years later I was given the opportunity to write for *Crops* magazine while I was still working as an agronomist. The hardest part then was not to let my own opinions influence what I was writing — like anything in life, agronomists don't always agree on approaches to problems!

I found that writing helped my agronomy. It gave me access to researchers at the cutting edge and all the latest information. It allowed me to spend time chatting to other agronomists and farmers and taking on board their perspectives, which broadened my own. Importantly, it encouraged me to keep questioning manufacturers.

In the end the writing won over the agronomy, largely because it's the most interesting and rewarding thing to do if you have a thirst for information. Unlike many in my profession, I don't believe you need an education in journalism to become a good technical writer. Writers can be born rather than made and there is no substitute for technical knowledge when it comes to writing for a magazine like *CPM*. The finer points of writing style can be brushed up on if you already have a fair grasp of grammar.

It's fair to say that the supply industry features significantly in *CPM*, but we put our content through a rigorous journalistic filter, are never afraid to push back when we feel it's necessary and aim to always provide balance in our run of page features. Technical know-how really helps when it comes to detecting the nuggets of gold amongst the piles of earth.

So in the same spirit that Edward Long supported me all those years ago, *CPM* is launching 'Search for a Star' — an opportunity to be mentored by the editorial team (myself, Tom and Charlie) with a view to writing articles on an occasional or regular basis for the magazine.

There's probably more to write about that's exciting than ever at the moment, with farmers doing much of the innovation. If you know where to use an apostrophe, have an enquiring mind, enjoy chewing the fat with fellow farmers, agronomists and researchers, like digging into the detail behind technical decisions or exploring how technology may advance crop production, then this is one hell of an opportunity to develop as a technical writer. Don't put it off, email me today for more details on 'Search for a Star'!

Based in Ludlow, Shrops, Lucy de la Pasture has worked as an agronomist, while among the Twitterati, she's ***@Lucy_delaP.***

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