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In this issue...

Agroforestry page 42

Mixing trees and cereals

Fit for the Future page 22

Autumn sown spring crops

Real Results page 18

Unpicking the urea regulations maze

New fungicide page 8

Broad spectrum fungicide debut



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The Editors pick

Recent pronouncements from the heart of government suggest the current administration is starting to row back on its green agenda and delaying the targets for Net Zero.

This has come as something of a shock to the tractor manufacturers who over the last few years have been hard at work developing alternatives to the tried and trusty diesel engine. The news will have little effect, as change will surely have to eventually happen and the tractor manufacturers are already too far down the line. We take a long in-depth look at what several manufacturers are doing to approach a carbon free future (page 50). Whether it be hydrogen or cooking oil, the next few years are going to be certainly interesting and short-term policy changes are not going to change the direction of travel.

We also pay a visit to a farmer in Cambridgeshire (page 42) who has taken a novel approach to making his farming more sustainable and maximise his productive space by growing crops in alleys between rows of mostly apple trees. The rows of trees act as a natural windbreak to prevent the fenland soil blowing away and also create a wind tunnel effect which keep the crops relatively free of any fungus based diseases, an added benefit for his organic cereal production. This is certainly a truly novel approach to sustainable and organic production.

On the subject of sustainable and regenerative production this month's issue features a visit to Nuffield scholar Chris Taylor (page 38) who has travelled the world trying to understand how reducing greenhouse emissions from fuel and fertiliser as well as adopting a regenerative style of farming can help the industry reach its target of net zero. It is worth noting that he is firmly of the belief that following Government guidelines to

sequester carbon by planting more trees and cutting down live-stock numbers is not particularly viable and we must be looking to find ways of maintaining or even increasing production and profitability by reducing carbon inputs and reaching net zero.

In our continuing series of Real Results in conjunction with BASF (page 18) the new stewardship guidelines regarding the use of urea set to be implemented in 2024 take centre stage. Whilst they are guidelines and not regulations it is essential that we take note and start to take action. The approach taken in England is a voluntary one monitored by Red Tractor which is expected to reduce ammonia emissions by 11,000t per year. The article also tries to clarify some of the grey areas in the guidelines to help growers through this particular minefield.

We also take a look at the interesting subject of planting spring crops in the autumn. (page 22) It features some encouraging data suggesting that spring crops sown in November or December have more of a chance to get established before any potential spring drought, an increasingly common occurrence in the last few years.

Finally just a brief word to introduce myself as the new full time editor of CPM. Many of you will have probably seen me lurking around the press tent and various press briefings at shows over the last 20 years. There is more about me on page 75 in The Last Word. Anyway, here I am following a redoubtable line of previous editors, in particular the two most recent, Janine and Lucy who are providing me with both spiritual and practical advice. It is a great pleasure and honour to be editing such a magazine and I will endeavour to do it justice.

John Swire

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Opinion

- 6 Smith's Soapbox** - Garnering enthusiasm for stewardship crops
- 41 Nature Natters** - To drill or not to drill
- 68 Talking taties** - Short term profit from large corporations nothing new
- 75 Editors pick** - Migrant labour impasse

Technical

- 8 Iblon to bring broad spectrum disease control**
New fungicide from Bayer
- 13 Companion conservation**
Companion crops for weed control and CSFB control
- 18 Reducing ammonia pollution**
Clarifying the grey areas on ammonia regulations
- 22 A window of opportunity**
Drilling spring crops in the autumn
- 26 Seasonal challenges**
How varieties have coped this year
- 30 Defending maize**
Can maize shrug off bad reputation
- 35 An intelligent harvest**
Quick decision making to alleviate pressure

Sustainable farming

- 42 Farming in 3D**
Cereals between the trees
- 44 Sustainable farming**
Going fungicide free
Fungicide free wheat for beef cattle

Machinery

- 46 Tyred of compaction**
Minimising soil compaction
- 50 Filling diesel's shoes**
Diesel alternatives for net zero
- 58 Forage on**
Latest options in forage harvesters
- 62 Farming red**
Autonomy and sustainability in Austria

Roots

- 69 Sprout Suppression after CIPC ... industry learnings three years on**
Since the withdrawal of CIPC the industry has been on a learning curve
- 71 Breeding, research and development is key for sugar beet**
Seed breeding crucial for industry





smith's soapbox

by Guy Smith

Scrum down

It's been a slow start to this autumn's drilling campaign on account of a long and impatient wait for rain. Having said that I know that for others this autumn has been more the case of a long and impatient wait for a dry window. And just to add a note of congratulation to those of you Goldilocks farmers out there who caught this autumn's

weather just right, neither too wet nor too dry — I'm not at all jealous of your good fortune.

Having written that, I now realise my teeth have become somewhat clenched and gritted while my complexion has taken a hue that could best be described as 'envy green'.

By mid-October my only fields with anything emerged were my August drilled AB15 Countryside Stewardship options. Instinctively it is difficult to generate much enthusiasm for the emergence of a crop that you know will never be harvested but maybe I need to change my mindset. For starters I've now learnt to identify things like Trefoil seedlings whereas before I was rather clueless. When it comes to assessing crop emergence, it is still important to

know what is from a seed you've actually drilled and which is a weed even if you are never going to worry about putting on a selective herbicide. I've also taken care to create decent seedbeds as opposed to adopting a 'chuck it on and hope it comes up' mentality. If options like AB15 are now going to be regular additions to my rotations, then it makes sense to endeavour to make the most of them even if their financial return has nothing to do with the successfulness of the crop in terms of the measurable end-point of a harvested yield.

This in turn leads into the debate as to whether these various stewardship and SFI options should be assessed in terms of their prescriptions or in terms of their outcomes. With my box ticking hat on I tend to favour prescription rather than outcome. As long as I know I've photographed how I've followed the rules and that I have kept the seed invoices then I can rest assured I can prove I have done all that was asked of me. My iPhone now has quite a library of some very mundane field activities. On the other hand, with my old fashioned 'good-stewardship' hat on there is some pride to be taken from growing a good break crop that delivers what was intended — namely bio-diversity, carbon capture, nutrient optimisation and non-chemical weed control. And not necessarily in that order.

There will undoubtedly be two perspectives on this. The micro-perspective whereby the farmer/practitioner will assess for their selves whether the Stewardship option they have implemented was a success in the field. Then there will be a macro perspective whereby these new national policies will need to be assessed by policy makers. As to whether Defra and its various agencies have the wherewithal to

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

@essexpeasant

make this assessment with robust metrics and thorough methodology remains to be seen. What concerns me is that, like many farmers, I have been involved with various Stewardship schemes for many years. My on-farm view is that they have achieved quite a bit in terms of improved bio-diversity. In contrast I read the latest 2023 State of Nature report to be told that across the piece things are getting significantly worse and farming is to blame. The question is as to whether this will still be the headline in ten years time even if many of us do our earnest best to lock our farming shoulders in the new ELMs scrum.



I'm happy enough with this year's spring sown AB9 but the question remains as to whether I actually know what 'success' looks like.

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Iblon to bring broad-spectrum disease control



Fusarium

Disease control

A new broad spectrum fungicide is about to appear on the scene which should deal with a range of crop diseases that were prevalent in the last growing season due to the favourable weather conditions last spring and autumn.

By Rob Jones

For most growers, the spring of 2023 will be remembered as one where fungicides showed their worth, after several seasons where foliar diseases proved to be unreliable adversaries. But it was not just the usual foes of yellow rust and *Septoria tritici* that challenged growers, stem-based diseases too threatened to cap a difficult year.

That disease presented such a widespread challenge should not come as a surprise. Conditions were near perfect. Across England and Scotland, the average temperatures recorded during the spring months were either broadly in line with the 30-year average (1991-2020) — itself an increase on the 1981-2010 average — or above it.

Weather extremes

For rainfall, it was a case of extremes. In both England and Scotland, April and May were unseasonably dry while March was a deluge. Scotland recorded 130mm of rain in March, equivalent to 104% of the 30-year average. In contrast, England had the wettest March since 1981 with 119mm of rain, equivalent to 204% of the 1991-2020 average. July too was unseasonably wet with 150% and 181% of the 30-year average for Scotland and England, respectively.

While the favourable weather of spring enabled disease to spread quickly, it was the above average temperatures of last autumn that gave it the platform from which to build once conditions allowed. Autumn temperatures in Scotland and England were significantly above the 1991-2020 average at +1.3°C and +1.4°C respectively, according to Met Office data.

“That disease presented such a widespread challenge should not come as a surprise. Conditions were near perfect.”

These conditions were especially favourable to the complex of stem-based diseases, notably eyespot (*Oculimacula* species) and Fusarium (*Fusarium* and *microdochium*).

Couple the mild autumn with the early drilling performed by most growers and the risk of disease was always going to be high, believes Jonathan Blake, technical director of crop production for ADAS.

“The risk models of yesteryear returned a higher risk of eyespot if sowing before 7 October. I would speculate that the mild autumn of 2022 was akin to bringing sowing forward by seven to ten days.

“In addition to the autumn conditions ▶

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“Importantly, it has demonstrated strong persistent protection and curative activity as a result of being active against these pathogens at all stages of their lifecycle,” adds Rosalind.

▶ that influence eyespot, rainfall in March, April and May is also significant and March was the wettest in both Scotland and England since 1988,” says Jonathan.

Although conditions of last autumn and this spring were near perfect for inoculum spread, it was not beyond fungicides to deliver reasonable control.

“Fungicides at T0 and T1 would have been able contain stem-based diseases, but it is worth noting that they will not provide full protection. A typical azole-based fungicide would provide at best 50% of control,” says Jonathan.

The mere presence of eyespot, however, doesn’t mean there will be a yield response to treatment. The disease needs to be sufficiently severe that the flow of nutrients up the stem are restricted. This is not always the case.

Risk increased

“What we can say with greater certainty, however, is that the movement away from inversion tillage regimes means the risk of stem-based diseases has increased significantly, especially Fusarium. If the previous crop was a host to eyespot, the chances of this developing will increase too,” says Jonathan.

There are many reasons why some growers are moving towards non-inversion or even zero tillage forms of establishment, but better control of stem-based diseases is not one of them.

“It is quite plausible that the Mycorrhizal fungi that many seek to promote may be beneficial in reducing the incidence of stem-based diseases, but I am yet to see any evidence that supports this hypothesis. In fact, the evidence supports the opposite. By leaving the pathogen closer to the growing plant, it dramatically increases the chances that infection will occur,” says Jonathan.

Research has shown that in severe cases, eyespot can inflict yield losses of up to 30% even without lodging. Despite this undeniable threat, stem-based diseases in general have received far less research funding compared with



“Iblon is excellent on both yellow and brown rust and very good on Septoria,” says Jonathan Blake.

the dominant foliar diseases.

“Yellow rust and Septoria are far more reliable and the capacity of these diseases to inflict significant losses means they tend to dominate fungicide programmes — and research priorities. As an industry, we don’t have the same depth of insight into stem-based conditions that we do with foliar diseases,” says Jonathan.

The difficulty in generating good data on eyespot is perhaps exacerbated by it being visually difficult to distinguish from sharp eyespot despite the two not being related. There are also two forms of the eyespot — the W and R types — though most infections are often a mixture of the two. ▶

What is Iblon and how good is it?

Iblon is the brand name for isoflucypram, a new class of SDHI fungicide from Bayer that offers unrivalled broad-spectrum disease control. It will be available with Proline (prothioconazole).

Iblon has strong activity against the principal foliar threats meaning growers can achieve comprehensive protection without having to compromise on one or more disease.

Against Septoria, Iblon has demonstrated strong protectant and curative activity, delivering significantly better protection than the benchmark standard, Ascra Xpro (bixafen + fluopyram + prothioconazole).

In fungicide trials managed by Scotland’s Rural College (SRUC), Iblon performed impressively to deliver protection that was comparable with that of mixtures containing either mefenftrifluconazole (Revysol) or fenpicoxamid (Inatreq).

“In our trials, Iblon sits in the top rank of

Septoria products which is good news for growers as it brings another means of control, but it’s important to consider other diseases too,” says Fiona Burnett, professor of applied plant pathology at SRUC.

“Iblon, with its broad-spectrum control, is a powerful product to have. Its strong activity against yellow rust provides the foundation for a programme that will carry through to early Septoria protection. In combination with prothioconazole its spectrum of activity is extended to include stem-based diseases such as eyespot and Fusarium and a useful contribution to mildew control,” adds Fiona.

In protecting against disease, fungicides serve to promote crop health which in turn enables extended green leaf retention. Research has shown that for everyday after flowering that the green leaf area is maintained at 37% or above, yield increases by 0.15t/ha. Bayer trials

found Iblon extended green leaf retention by eight days over the untreated and by three days over that of Ascra Xpro.

“The ability of SDHI fungicides to extend green leaf area was especially valuable in spring 2023 given the weather through this period. We have seen that Iblon has performed impressively in retaining green leaf area and this benefit was reflected in the yield,” says Fiona.

A feature likely to be appreciated by growers is the Leafshield formulation also used with Bayer’s Xpro range of fungicides that ensures high-level efficacy without compromising crop or equipment safety.

“Leafshield is a formulation that growers know well; they know it is reliable and delivers a consistent performance. This will reassure growers that they shouldn’t be concerned about any crop-safety or sprayer issues,” says Fiona.

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* The highest wheat yield is 17.95 tonnes/ha (39572.97 lb/ha) and was harvested from 8.2920 ha (20.49 acres) by Tim Lamyman (UK) in Louth, Lincolnshire, UK, on 10 August 2022. Data from Guinness World Records.



The movement away from inversion tillage regimes means the risk of stem-based diseases has increased significantly, especially Fusarium,” says Jonathan Blake.

▶ Several breeders have claimed the presence of the Pch1 Rendezvous gene, which is believed to confer better resistance to eyespot, but there is a lack of understanding as to whether this is specific to both types or one and not the other. Of the varieties on the 2023-24 Recommended List, five claim to carry the gene, but as is evidenced by Skyfall with its eyespot score of 5, it doesn't mean strong resistance.

“What we can say with confidence is that prothioconazole does have a positive impact against eyespot. Whether it is used at T0 or T1, it is likely to reduce eyespot development. We have seen



Against septoria Iblon demonstrated strong persistent protection and curative activity.

this enough times to say it has a clear affect,” says Jonathan.

For many growers, control of stem-based diseases is often achieved through the incidental protection delivered by fungicides applied for yellow rust and Septoria. However, these vary considerably in their efficacy against eyespot.

Iblon – new broad-spectrum fungicide

In spring 2024 Bayer intends to offer its new broad-spectrum fungicide Iblon to growers. For those who have seen it in trials over the past four years, it has delivered impressive control.

Isoflucypram the active substance available under the brand name Iblon is the first fungicide active to be approved by the Chemicals Regulation Division post-Brexit. This makes Britain's growers the first in Europe to have access to this new fungicide and only the second worldwide after New Zealand.

“Iblon is excellent on both yellow and brown rust and very good on Septoria,” says Jonathan. “It is a more active SDHI on Septoria than existing standards, and the flexibility it will add to programmes will make it a valuable addition at either the T1 or T2 timing,” he adds.

Bayer claims Iblon is a “groundbreaking new active that delivers unrivalled broad-spectrum control” and has presented data that supports the assessment of Jonathan Blake.

“In a trial by the University of Nottingham using Skyfall, Iblon delivered better preventative and curative activity on yellow rust than products containing Solatenol (benzovindiflupyr), such as Elatus Plus,” says Rosalind O'Hare, Bayer campaign manager for combinable fungicides.

“Against Septoria, Iblon was far better than Solatenol and on a par with both Revystar XE (fluxapyroxad + mefentrifluconazole) and Univoq (fepicoxamid + prothioconazole). Importantly, it has demonstrated strong persistent protection and curative activity as a result of being active against these pathogens at all stages of their lifecycle,” adds Rosalind.

The advantages of improved disease control are perhaps most evident in a high-pressure season, but the physiological benefits of fungicides often exist regardless of the disease pressure. This is widely accepted, but the extent to



In a trial by the University of Nottingham Iblon delivered better preventative and curative activity on yellow rust.

which these benefits result in extended green leaf retention varies between products. Bayer investigated the ability of Iblon to extend green leaf area retention in comparison with Ascra Xpro (bixafen + fluopyram + prothioconazole) in trials performed in 2019. At 36-days after application, the green leaf area of Iblon-treated crops was about 35% more than Ascra Xpro (when applied at the T1 timing) and about 50% more than the untreated.

This was seen in AICC trials performed in 2020. The disease incidence in untreated crops was assessed as being less than 5%, yet Iblon-treated crops yielded 0.5t/ha more [than the untreated].

“The greater green leaf retention seen in Iblon-treated crops has been shown to result in better yields, even in the absence of disease. This supports the value proposition of Iblon irrespective of disease pressure,” says Rosalind.

Although new to Great Britain, Iblon comes with proven performance. It has been used in New Zealand since 2019 and has been successfully applied to more than 50% of the wheat area. During the 2023 season, Iblon was made available to members of the Bayer Forward Farmers network across Britain for assessment and comparison. As part of this programme, Iblon was applied using 40 different farm sprayers without issue. ■

Companion conservation

Weed control

Is it possible to successfully companion crop oilseed rape to help control cabbage stem flea beetle and claim SFI payments, while keeping weeds firmly under control? CPM investigates.

By Janine Adamson

Planting a companion crop alongside oilseed rape is far from breaking news and is something growers have been exploring, often in a bid to overcome cabbage stem flea beetle pressure. But equally, the past season has caused mischief in terms of weed control. Can both objectives be achieved simultaneously?

Frontier's Dr Paul Fogg says companion cropping is of clear interest to growers especially since it can be financially rewarded through the Sustainable Farming Incentive (SFI), however, there are implications for wider crop management.

"Although it doesn't have to be present for the full duration of the OSR, the companion crop has to be around long enough to be eligible for the SFI payment of £55/ha, in that it achieves the action's aim and its intended purpose.

"In this case, that's supporting an IPM approach by acting as a mask which disguises the OSR from CSFB while

hopefully attracting beneficial predators. Unfortunately, depending on the species of the companion crop, some herbicides will prematurely take those plants out," he explains.

According to Paul, there are 'three OSR crops' across the country — growers who were able to drill early due to optimum soil moisture and therefore may have forward crops, those who planted in late August and are struggling with establishment, and then the late drilled crops which are seemingly okay but slow to grow. At the time of publishing, reports from the field suggest all are being hit by CSFB to some degree.

Prolonged emergence

Then there are the weeds, both grass and broadleaf. The wet summer not only caused havoc for harvest, but also prolonged weed emergence following what's already proved to be a challenging year.

ADAS's Dr Sarah Cook says although it's a case of the 'usual weed suspects', other problems could arise as a direct result of trying to maintain green cover. "Many varied species are being used as cover and companion crops and these may have been imported with additional weed species.

"It's always important to keep an eye out for any survivors so potential problems can be nipped in the bud. Umbellifers (for example hemlock, wild carrot and cow parsley) remain an issue but greater knowledge has improved their control. Look out for them and target early before they grow too big," she stresses.

But bearing in mind Paul's advice, which OSR herbicides can be applied, if any, that

“ Depending on the species of the companion crop, some herbicides will prematurely take those plants out. ”

support the retention of a companion crop for as long as possible until it reaches its natural conclusion? ▶



Although it doesn't have to be present for the full duration of the OSR, the companion crop has to be around long enough to be eligible for the SFI payment, says Dr Paul Fogg.



According to Dr Bill Lankford, Falcon presents good selectivity for linseed and buckwheat which are commonly used as companion crops.

▶ The first watch-out is residual herbicides and the subsequent impact of whether they're used or not. This is because difficult weeds such as poppy, chickweed and groundsel are usually kept under control through residuals which prevent them from growing to a significant size.

But unless a companion crop is already established and robust prior to planting the OSR, products such as metazachlor can prove too much, meaning growers could be reticent to use them therefore unintentionally allowing weeds to proliferate.

Equally, Adama's Dr Bill Lankford says it's often later season herbicides which hit companion crops the hardest, however, it

does depend on the species. "Clovers (for example berseem) are an interesting group because if they establish well, they're incredibly resilient to being knocked back. Conversely, all herbicides seem to affect them if they aren't up and away.

"Falcon (proprazinefop) offers some selectivity on clover when targeting volunteer cereals, ryegrass and brome, but there is a risk of damage. It's not solid on everything, but presents good selectivity for linseed and buckwheat which are commonly used as companion crops," he says.

With wet weather conditions continuing into autumn, Bill says there's a high risk of rapidly emerging cereal volunteers, which in OSR, can prove deadly.

Volunteer impact

"These are a priority and have to be taken out as soon as possible, even when there's a companion crop in place. Volunteers have a significant impact on OSR yield, particularly in less vigorous crops. Falcon can be applied before flower buds are visible and 90 days before harvest."

Another option for weed control is Fox (bifenox) which has an EAMU for the control of geranium species in OSR, however has recently been granted a full label in readiness for 2024/25. For this season, product with the existing MAPP number (11981) and associated EAMU (20142318) must be used.

According to Bill, Fox has a good profile and offers selectivity on N-fixing companion crops such as clovers, vetch and lupin.



It's important to consider the wider benefits because companion plants aren't just in the ground to deflect CSFB, says Robert Nightingale.

"Trials in Europe have shown great promise so it's encouraging to have this product which tackles the likes of cranesbill. Being pragmatic, I imagine there will be a slight knock-back on the companion, but it shouldn't be significant," he says.

Corteva's Clare Stapley recommends sticking to a post-emergence approach with registered products from the company including Belkar (halauxifen-methyl+ picloram), Astrokerb (propyzamide+ aminopyralid) and Kerb Flo 500 (propyzamide). Korvetto (clopyralid+ halauxifen-methyl) can also be used from ▶

Impact of herbicides on companion crops (Corteva)

Companion crop	Belkar - halauxifen-methyl+ picloram	Astrokerb - propyzamide+ aminopyralid	Korvetto - clopyralid+ halauxifen-methyl	
Buckwheat	XX	X(X)	X(X)	Doesn't survive winter frost
Vetches	XX(X)	XX(X)	XX(X)	Frost tolerant
White mustard	X(X)	-	-	Mainly used in Clearfield varieties
Phacelia	XX	XX	X(X)	Doesn't survive winter frost
Beans	XXX	XXX	XXX	
Berseem/crimson clovers	XXX	XXX	XXX	Many don't survive winter frost
Oil radish	-	-	-	Mainly used in Clearfield varieties
Fenugreek	XXX	XXX	XXX	
Lentils	XXX	XXX	XXX	

XXX – 85-100% kill of the companion crop

XX – 70-85% control

X – less than 70% control



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2. If your chemical store has a maximum capacity of 2,000 m³, what should the bunding, as a minimum, be able to hold?
A: +5% B: +10% C: +15% D: +20%
3. Who was the winner of FS00TY in 2023?
A: Mark Jelley B: Matt Fuller C: Steve May D: Luke Haynes



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Similar to a cover crop, companion crops improve overall soil health and function.

► 1 March onwards.

But again, it all depends on which species is being used as the companion crop, with guidance provided on the impact of the herbicides to assist decision making (see table).

For growers struggling with weed control due to the continued wet conditions and protracted germination, and in some cases ALS-resistance is present too, the time will come to weigh up the pros and cons of

Wider weed watch-outs

Due to robust herbicide stacks aimed at tackling blackgrass and Italian ryegrass, it seems the diversity of broadleaf weeds is declining, says ADAS' Dr Sarah Cook. "Broadleaf weeds have always been controlled well by grassweed herbicides, many of which have a wide spectrum of control, umbellifers being the notable exception."

While cultural methods such as delayed drilling and spring cropping may prove successful for grassweeds, Sarah says there's little or no chance of success with broadleaf weeds. However, of the species, a full year fallow gives a moderate chance of depleting the seedbank of cleavers.

"This weed has a shorter persistence than other weeds (2-3 years) and offers a peak germination period in October and November. Cultivations can stimulate emergence and delaying drilling will give time for the control of the plants," she says.

At the other end of the spectrum are poppy and fat hen



Dr Sarah Cook says a full year fallow gives a moderate chance of depleting the seedbank of cleavers.

— species with very high levels of seed production and long persistency. In fact, poppy seed can survive for more than 50 years in the seedbank.

"Repeated cultivations have only been shown to deplete the seedbank of these species by, on average, 31-32% annually," comments Sarah.

keeping the companion crop at all.

Robert Nightingale, national technical sustainability specialist at Frontier, says it's important to consider the wider benefits because the companion plants aren't just in the ground to deflect CSFB. "Similar to a cover crop, companion crops improve overall soil health and function, often through rooting and a capacity to break up compaction as well as providing a greater diversity in the field.

"They can also improve crop nutrition, for example, annual legumes begin to fix nitrogen within around 8-10 weeks. These should be destroyed in the spring to allow the nitrogen to be released to the OSR later in the season."

He says from a structural perspective, a companion crop can protect against pigeon damage, the idea being to create a canopy above the OSR. "This can be successful with very strong beans left as stalks but other species would have to be left until pigeons aren't a problem in the spring."

SAM2 eligibility

For those wondering whether a companion crop can count as a multi-species winter cover crop and therefore be eligible for SAM2 at £129/ha, it's perhaps unlikely. Firstly the companion crop has to protect the soil until February, therefore not be a species susceptible to frost and secondly SAM2 has a requirement for no fertiliser to have been applied.

Robert says some have tried using brassicas such as mustards which are difficult to control in OSR other than in Clearfield varieties. "Only the Clearfield herbicides will give good enough control of the brassicas to stop them being a problem in the OSR grain, even then it's still a risk.

"Brassicas are also very competitive for nutrients, particularly nitrogen, so these species should be controlled as early as possible, around the end of October," he explains.

Beyond the companion crop versus herbicide conundrum, Clare says a key consideration for weed control in OSR, whether companion cropping or not, is propyzamide stewardship. "The product should be applied in the right place, at the right time and at the right rate.

"Appropriate planning and ongoing management goes a long way towards mitigating the risk to water. Stewardship begins with field choice — before the seed is even sown consider where you'll be planting your OSR."

She explains that it's preferable to grow

the crop in a field which doesn't slope towards water, that is less susceptible to run-off, or is far away from any watercourses. Then, when putting in tramlines, ensure they don't create a direct route for water to leave a field.

"Use of buffer zones reduces the chance of run-off reaching a watercourse. The Voluntary Initiative recommends a six-metre buffer, and, if possible, wider buffers are advisable in particularly vulnerable areas such as at the bottom of a slope adjacent to a watercourse," explains Clare.

In addition, establishment technique, direction of working travel, soil type and topography are also important parameters. "Growers should avoid applications when heavy rain is forecast within 48 hours or when field drains are running," she concludes. ■



Clare Stapley says a key consideration for weed control in OSR, whether companion cropping or not, is propyzamide stewardship.

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Reducing ammonia pollution

New urea fertiliser regulations are finally set to be finally implemented in the coming season, but there are still some grey areas that need clarifying.

By Mike Abram

After a year's delay the industry's new stewardship programme governing the use of urea fertilisers is set to be implemented in 2024.

The programme is not legislation, stresses BASF business development manager Jared Bonner. "It's a new stewardship programme to prevent future government legislation, so it's not legislation as so much regulation and rules."

The background to these requirements goes back to the government's Clean Air Strategy policy put in place in 2019, which committed to reducing ammonia emissions by 16% (48,000t) by 2030 compared with a 2005 baseline.

Ammonia damages sensitive environments and contributes to particulate pollution in urban areas, with agriculture accounting for 87% (230,500t in 2021) of UK's total ammonia emissions, with 16% derived from inorganic fertiliser applications, according to research conducted by Rothamsted Research.

"A significant part of that is from the volatilisation of ammonia into the atmosphere when urea fertilisers are applied," Jared notes.

Industry consultation

That led to a government consultation where originally three options were presented: to ban solid urea fertilisers outright; to limit the times of year when solid urea could be applied to land to between 15 January and 31 March; and to limit applications of solid urea to only being possible with the addition of a urease inhibitor.

After consultation with the wider industry including fertiliser manufacturers, port authorities and haulage companies, where the knock-on impacts on storage, haulage, competition and availability were considered, an option 4 was proposed by various stakeholders, such as AIC and NFU, and ultimately accepted by government.

Ian Lutey

“It's a new stewardship programme to prevent future government legislation”

Option 4, which only applies to English farmers, is a non-regulated approach and effectively combines the option to restrict the dates untreated urea can be used, and the requirement to treat urea with urease inhibitors outside of those dates.

It will be monitored as a new Red Tractor farm assurance standard (see panel), limited applications of uninhibited / unprotected fertiliser containing over 1% urea — both solid and liquid — to between 15 January and 31 March each year. Protected / inhibited solid and liquid urea fertilisers can be



The same products were used for the three splits, after an initial ammonium sulphate application.

applied outside of these dates.

In total, the change is expected to reduce ammonia emissions by 11,000t/year. Government figures suggest the spreading of inorganic fertilisers contributed 36,200t/year of ammonia emissions in 2021.

There are some grey areas in the interpretation of the new regulations that need to be clarified before next January, Jared acknowledges. That includes the caveat that says unprotected / uninhibited liquid fertilisers containing urea can be applied after 1 April if agronomic justification is provided by a FACTS-qualified farmer or adviser.

“In practice, they are saying if it is a foliar liquid feed then there is a case for that to be applied without an inhibitor,” Jared suggests. The grey area is what the agronomic justification for leaving it out is.”

Framework needed

“Currently what has been floated is that it should have the same environmental benefit from having it in, but it is a bit woolly and companies writing recommendations will need a good framework to use. Hopefully by the end of the year we get an explanation of what it means in practice.”

A second area requiring clarification is whether urea-based slow-release fertilisers with protected coatings can be applied outside of the closed period, Jared adds. “These are referred to as protected, which is creating confusion. But these don’t contain a urease inhibitor.”

Urease inhibitors help slow down the breakdown of urea into ammonia, Jared explains. “The plant needs ammonia because it can’t use urea. But we want that process to happen in the soil because when it happens on the surface there’s the potential for volatilisation.”

Volatilisation happens when, usually in dry conditions, the urea prill, which is hygroscopic, pulls in moisture creating a ▶

What are the new restrictions on application of urea fertilisers?

Fertiliser containing urea must only be applied where the following requirements are met:

- protected/inhibited fertilisers containing solid urea can be applied within any product use by/best before dates
- protected/inhibited fertilisers containing liquid urea can be applied with the prescribed rate of protector/inhibitor for the application, and within any product use by/best before dates
- in England, unprotected/uninhibited solid fertiliser containing urea can only be applied between 15 January and 31 March
- in England, unprotected/uninhibited liquid fertiliser containing urea can be applied between 15 January and 31 March
- in England, unprotected/uninhibited liquid fertiliser containing urea can be applied between 1 April and last application in autumn only if agronomic justification is provided by
 - FACTS-qualified farm personnel or
 - advice specific for the crop has been provided by a FACTS- Qualified Adviser and been followed
- in Northern Ireland, Scotland and Wales fertiliser containing urea (solid and liquid) can be applied as per relevant legislation

Source: DEFRA consultation response, March 2022



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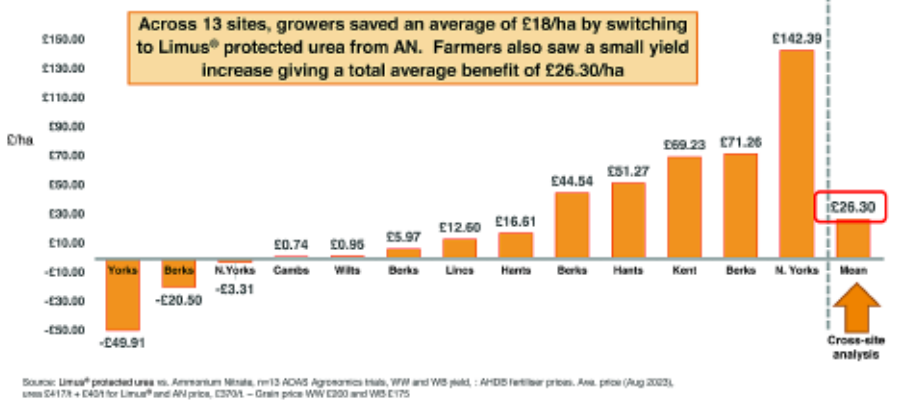
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► water halo around it. “What that water is doing is creating a pH spike, and it is that pH that causes ammonia gas to be formed and released [when the urea is broken down by the urease enzyme].

“So when farmers use urea there needs to be some moisture to get it into the soil, which can be tricky at some points of the year. What the urease inhibitor does is inhibit the urease enzyme, which gives time for the urea prill to get wetted down and taken into the soil.”

There are three recognised urease inhibitors available in the UK, all with very similar names: NBPT (N-(n-butyl) thiophosphoric triamide); NPPT (N-(n-propyl thiophosphoric triamide); and

Mixed fertiliser purchasing provides Cambridgeshire farmer with flexibility

Buying a mix of different fertiliser types should help Cambridgeshire farm manager Ian Lutey manage the new regulations without too much change.

Farming 1400ha of combinable crops for RH Topham & Sons near St Neots, 50% of Ian’s current fertiliser purchases have been unprotected urea, with 40% ammonium nitrate and 10% liquid UAN.

“We’ve still got more to buy,” he says. “And I’ve still got some urea to be delivered so I’ve got the option to add Limus to that.”

Historically he has been an earlier purchaser of fertiliser, which two years ago worked out very positively, last year less so although supply concerns still made it a good decision, he says. But he is considering buying less forward in future so he can judge how much treated urea he will require nearer the use date.

The split of different fertiliser types helps him spread risk, he says. “I can manage my options, adjust to the weather and use the appropriate option.”

In wheat, historically he’d apply around 220kgN/ha to winter wheat, although in the past two seasons that’s been cut back to 180-200kgN/ha given the high prices and changes in break even ratio. Grain nutrient analysis through ADAS YEN has highlighted that last year he cut back too far.

“My learning was that our

historical nitrogen levels were about the right level, so I think this year, depending on grain prices we might be back up again. I’m interested in minimising costs of production per tonne, not how little nitrogen I can use, as long as it is economic. At the moment the market is not paying huge prices for carbon offsetting.”

Around 60-70% of his N will be applied to wheat before 1 April in a typical year, but he thinks the new regulations might incentivise farmers to put more on earlier, even if that’s not the right thing to do. He also points to the uncertainty about how to interpret the regulations around FACTS qualified advisers providing agronomic justification for not using inhibited products.

“If you’re FACTS qualified, my grey area of understanding is that you don’t necessarily need to use inhibited product if you’ve got the justification for doing it without — the right weather or you’re going to incorporate it, etc, etc,” he says.

“Any good farmer wants to get the maximum out of his fertiliser — it’s not cheap — so why would you put it on in conditions when you are going to lose a percentage of it? It’s in our own interests to use it as efficiently as we can.”

His experience of Limus protected urea in trials, so far, has supported his opinion that it’s not needed all the time if uninhibited product is applied in the right conditions. “Limus has a place, but I’m still learning how and

where to use it, where you do and don’t need it.”

Two years ago the trials as part of BASF Real Results programme compared liquid UAN with and without Limus Perform in a tramline trial analysed by ADAS Agronomics. The same products were used for the three splits, after an initial ammonium sulphate application, rather than Ian’s usual policy of applying different fertiliser types during the season.

“There was no measurable difference in yield,” he says. “There was a hint of slightly higher grain protein with the Limus Perform, but it was only a hint.”

He puts the lack of the yield improvement — on average BASF trials suggest Limus Perform increases yield by 4% over liquid UAN — down to application timing. “I actually questioned whether we should carry on with the trial because of the [wet] weather at time of application. My educated guess at the time of application was that we didn’t need it, which, with the benefit of hindsight was probably proved correct.”

The trial harvested this summer

compared ammonium nitrate and solid Limus-protected urea. This time, despite no differences evident between treatments when analysed by NDVI imagery, the Limus protected urea gave an estimated 0.41t/ha higher yield than the ammonium nitrate, according to ADAS Agronomics analysis, with a less than 1% likelihood was the result of underlying field variation.

Ian says the second application was delayed to April, which impacted yields, and he wonders whether some of the ammonium nitrate was lost as nitrous oxide as it was wet when applied.

“Grain analysis results might help further in explanation of the results.”

The result has given him more confidence in using protected urea in future, he says. “If it’s better for nitrogen use efficiency, for the environment and for my pocket, it’s a win: win for everyone.

“But the more you get to know a product, the more you are in an educated position to make the call where you need it — you just need to have the right stuff in the shed at the right time.”

Real Results Fertiliser trial treatments at RH Topham & Sons

Farm standard		Limus
9th February	56 kg N/ha as urea	
5th April	70 kg N/ha as AN	70 kg N/ha as Limus
26th April	90 kg/ha Polysulphate	
2nd May	70 kg N/ha as AN	70 kg N/ha as Limus

2-NPT (N-(2-nitrophenyl) phosphoric triamide).

There are several products available containing NBPT, which is now off-patent, while German manufactured 2-NPT is less commonly-found in the UK market. The third active, NPPT, is an in-house BASF product. Sold as Limus for solid urea fertilisers, and Limus Perform for liquid urea it contains both NBPT and NPPT.

More efficacy

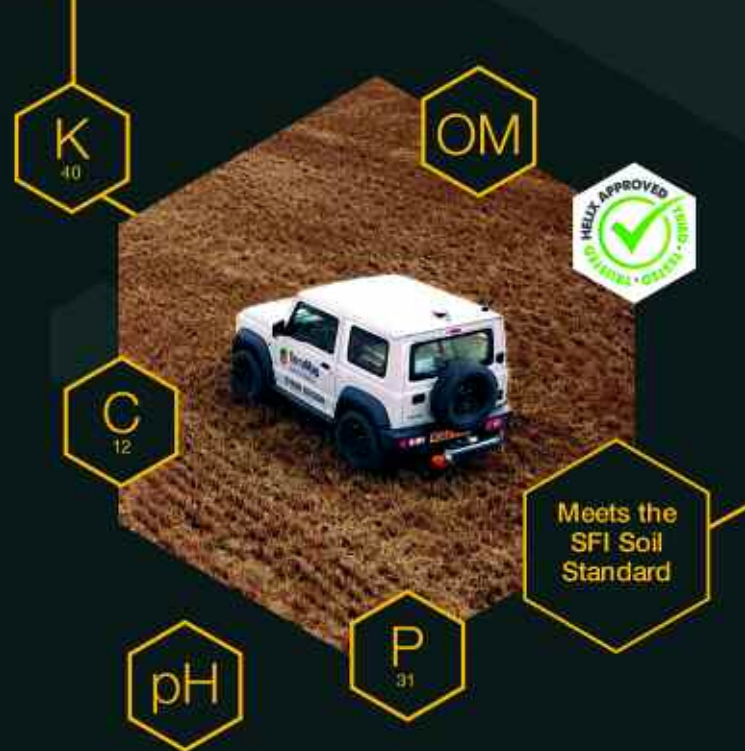
“That’s important because urease enzymes are ubiquitous, and there are a lot of different enzymes that fall under that umbrella,” Jared says. “So the NBPT and NPPT are slightly different sized molecules so they can inhibit a larger part of the urease enzyme population. In tests we see about 5% more efficacy compared with NBPT alone.”

In lab tests under various different soil types volatilisation can be reduced up to 98%, and on average 83%. “In the field, from 93 trials, the average reduction is 70% so obviously a few more environmental factors come in, and in some cases nearly a 100% reduction. It’s a consistently big reduction,” Jared stresses.

Obviously, there is an increased cost to adding an inhibitor to fertiliser. At the height of the fertiliser price increase, Limus was costing around £50/t extra. That’s dropped a bit to around £40/t premium with the generic NBPT products slightly cheaper. Limus protected urea is still on a per kilo N basis cheaper than ammonium nitrate, Jared adds. “So there is an upfront saving.”

As importantly, according to BASF trials, while usually you would expect ammonium nitrate to give a higher yield than using the equivalent unprotected urea, there is no yield penalty from using Limus protected urea, Jared says. “That’s because you’re not losing ammonia to volatilisation. You’re keeping it in the ground in the place where the plant can use it.”

In 13 winter wheat and winter barley Real Results trials, analysed by ADAS Agronomics across England, growers gained an extra £26.30/ha on average from using Limus protected urea rather than ammonium nitrate, he adds. Around £18/ha was saved through the lower cost of fertiliser, with a small yield increase pushing that to £26.30/ha (see chart). ■



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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 more than 50 farmers to conduct field-scale trials on their own farms using their own kit and management systems. The trials are assessed using ADAS’ Agronomics tool which delivers statistical confidence to tramline, or field-wide treatment comparisons

— an important part of Real Results. The features also look at 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.



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A window of opportunity

Fit for the Future

With drier springs becoming the norm, could growers see a better return on investment by drilling spring crops in the autumn? *CPM* finds out more...

By Charlotte Cunningham

As the years go on, defining a 'normal' season is becoming more and more tricky...

Recent years have seen washout summers, 40°C harvests, and everything in between. Looking at springtime patterns, the past three springs have been unusually dry, meaning establishment of spring crops has been tricky for many due to lack of soil moisture, with spring barley in particular suffering due to its disdain for dry seedbed conditions, explains Olivia Potter, technical specialist at KWS. "Dry springs have been a noticeable feature of the past three seasons and for spring crops this has meant that while many have established, they've struggled to develop to their full potential.

"This year of course, we saw the reverse with no rain in February but very good seed beds, with moisture at drilling depth. So while early spring wheat drilling went well, it then didn't stop raining in March meaning drilling at the optimum time in mid-March was challenging."

Inclement weather

With these inclement weather patterns and challenging conditions in the spring now seemingly becoming the norm, breeding is advancing to help growers tackle this, she adds. "Having an array of crops to suit different situations is vital. This means considering both winter and spring options and selecting varieties with a wide drilling window to accommodate the changing UK environment.

"It's also important to look at drought tolerance across all species in breeding programmes as it's this tolerance that will help keep crops growing should things turn dry in the spring," notes Olivia.

As well as this, questions are currently being asked about whether it's possible to improve both establishment and crop performance by sowing spring crops in the autumn in order to avoid that vital establishment period coinciding with drier, hotter weather.

While this might be a slightly novel concept for UK growers, in France this is already common practice — with a significant proportion of the country's ▶

“Conditions at drilling are so much more important than a date in the calendar.”



Recent dry springs have meant that spring cereals have struggled to reach their full potential, believes Olivia Potter.

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The autumn drilling of spring barley in the central region of France is now common practice for 80% of the crop, Nicolas Dezobry.

► spring crop now sown in November. “The autumn sowing of spring barley began around ten years ago in central France — near Bourges — initiated by the large co-operative, Axereal,” explains Nicolas Dezobry, cereal product manager, KWS France.

The aim was to reduce irregularities in spring-sown spring barley yields which were dramatically fluctuating due to climatic changes — namely, drier and warmer springs, he says. “As well as the

impact on yield, the hot and dry springs were also causing issues with crop quality, leading to poor grading.”

As such, the decision was made to switch to autumn drilling and in this central region it is now common practice for 80% of the spring barley, says Nicolas.

Frost risk

While arguably the lower frost risk over winter in this region has been helpful to encourage growers to switch timings, Nicolas says work has been done over the past three years to develop protocols for autumn sowing to expand uptake in the northern area of the country — north of Paris — where the frost risk is higher.

Nicolas says that while things were looking promising after moving to a November drilling date, this year’s harvest results have showed issues with grading and no clear yield advantage.

So what can growers learn from their fellow French farmers? “To be successful when sowing spring crops in the autumn, the main issue to manage is disease — specifically, rhynchosporium,” believes Nicolas. “In order to manage this in France, co-ops select varieties based on their rhynchosporium resistance and also incorporate seed treatments when drilling to protect seed from the start.”

Back in the UK and Dyson Farming has also been looking into the potential of autumn sowing spring crops on its own farm and under the company’s research division, explains Amanda Farrow, crop research consultant at Dyson Farming Research. “There is a paucity of information about how spring barley varieties behave in this autumn drilling slot, so our interest is in researching the behaviour and performance of crops when they are drilled in this position. The thought is that certain varieties might be more suitable than others and so we’ve now started conducting trials, involving spring barley cultivars, to see if we’re able to pick out those which are better suited to this window.

“The driver for this is that we’re habitually getting these dry springs, meaning that spring crops are very much at risk and vulnerable to these conditions. We know that for spring barley in particular, the conditions at drilling are so much more important than a date in the calendar.”

For Dyson Farming, Amanda says that autumn sowing contributes to a more reliable performance on light land. “Our spring barley on the lighter land is drilled in November, and we have a lot of clients on eastern ground who do the same thing

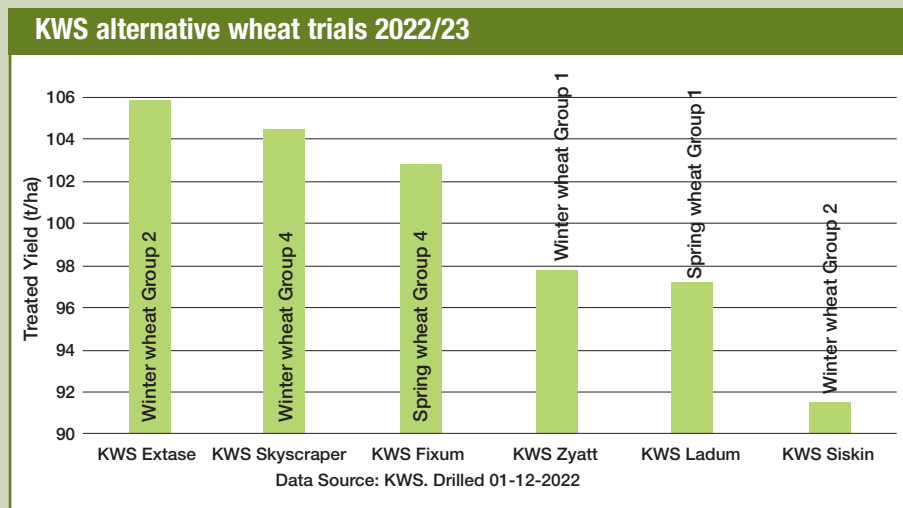
Autumn-sown spring wheats trial results



Recent KWS trials have shown that autumn-sown spring wheat yields are competitive with winter types, says Kirsty Richards.

As the only UK breeder with a dedicated spring wheat breeding programme, the team at KWS has been looking at the potential of sowing spring crops in the autumn at the trial site in Thriplow.

A number of winter and spring varieties were drilled on 1 December 2022, with yield



assessed during harvest this year. “Yield is still king for many growers, and we know that timing drilling just right is conducive to good yields at harvest time,” says KWS’ Dr Kirsty Richards. “Therefore, the aim of these trials was to look at if, and how, yield was affected when drilling was shown, the headline result from these trials is that

it’s possible to still get good yields from autumn-sown spring wheats, and in fact, they were competitive with winter types.

“This is good news for growers and means there is a new window of opportunity for those looking to spread the risk and ensure their rotations are as sustainable as possible for the future.”

— and have done for quite a few years — sowing anywhere from mid-November to early December. It enables us to drill into moisture and get crops up and away before any potential spring drought.”

While there is additional cost compared with conventionally drilled spring barley due to an extra rhynchosporium spray carried out to protect crops over that winter period, this is counteracted by improved performance, she believes. “From a cost of production point of view, it’s actually much more advantageous for us to have a spring crop sown in the winter than a winter barley — which is more expensive to grow — on this lighter land.”

Better suited varieties

Olivia picks up the conversation and concurs with Amanda that some varieties are likely to be better suited to this autumn/winter drilling window. So what are the main varietal considerations UK farmers need to take into account if they too want to make the switch to autumn sowing of spring crops?

“As Nicolas and Amanda alluded to, for autumn-sown spring crops, good disease resistance and standing power is vital,” explains Olivia. “Essentially this is to build resilience to get crops through a longer growing period.”

“Getting spring wheats away early will also help plants compete better against blackgrass and stronger crops will cope much better if we see some late frosts, which has happened the past couple of years. Increasing the seed rate also has a large effect on blackgrass competitiveness if you are sowing in a high blackgrass situation.”



Good disease resistance and standing power are vital traits for getting autumn-sown spring crops through the winter.



Dyson Farming is conducting trials involving spring barley cultivars to understand better which varieties are more likely suited to autumn sowing.

Looking to the KWS portfolio, there are a number of spring cereal options which meet the criteria for successful autumn sowing, believes Olivia.

“Starting with spring barley, KWS Curtis is a new two-row variety suited to both autumn and spring sowing. It’s easy to grow and has excellent standing power and good disease resistance — key traits for those planning to autumn drill.”

Turning to the stats, in KWS trials KWS Curtis scored an 8 for lodging and disease-wise a 9 for mildew and a 7 for rhynchosporium. In terms of yield the variety boasts a UK yield of 104% and does particularly well in the East with a score of 105% (based on autumn sowing data).

As far as wheat offerings go, new Group 1 KWS Ladum is likely to appeal to those growers looking to combine quality with yield and good disease resistance and is so far showing good results when sown in the autumn in KWS trials (see graph). “Spawning from a KWS Sywell x KWS Talland parentage, Ladum is the first of KWS’ next generation of spring wheat varieties which combines top milling and

baking quality with excellent yield potential — 7% ahead of the market leader, Mulika, when spring-sown.”

With robust disease resistance being one of the foundation stones for successfully drilling spring crops in the autumn, KWS Ladum comes up trumps here too with a good all-round package, scoring 7 for mildew, 6 for yellow rust, 7 for brown rust and a 7 for septoria, adds Olivia.

Alternative Group 1 and Group 2 offerings include KWS Alicium and KWS Harsum, respectively — both of which boast high yields and good disease resistance packages, with Harsum taking top spot as the highest yielding Group 1 spring wheat on the 2023/24 Recommended List.

“As we’ve seen in France and in KWS trials, there is real potential in moving to autumn drilling of spring crops in certain situations,” concludes Olivia. “While the future of climate change is unknown, we can put measures in place now to protect crop production and rotation sustainability as much as possible — and it all starts with careful variety selection.” ■

Fit for the Future

In this series of articles, *CPM* has teamed up for the sixth year with KWS to explore how the cereals market may evolve, and profile growers set to deliver ongoing profitability.

The aim is to focus on the unique factors affecting variety performance, to optimise this and maximise return on investment. It highlights the value plant genetics can now play in variety selection as many factors are heavily influenced and even fixed by variety choice. KWS is a leading breeder of

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Seasonal challenges

Wheat performance

After a season that presented a combination of weather conditions that left growers unable to act, and then chasing their tails, *CPM* takes a look at how wheat crops performed and what the main issues were.

By Melanie Jenkins

A rather peculiar year has resulted in reports of high levels of lodging and low specific weights in wheat crops. So what happened, how have varieties coped and what can be done to be more prepared for the coming year?

February was a fairly dry month, meaning a number of growers went on with fertiliser expecting to be back in the field to apply a PGR within a few weeks, says Agrii's John Miles. "But March was a wash-out in many places and conditions were difficult. It provided exactly the opposite of the conditions we'd want, with over 100mm of rain."

And the wet March conditions also opened the door wide for disease to run rampant through crops. "There was a huge amount of disease about because of the

conditions. Septoria got a particular hold on crop, so that by the time people got onto crops in late April to apply a T1, the septoria was very evident."

In the trials John looked at, there were certain varieties that stood out as being cleaner, while others were dirtier. "Although it was early in the season, this did correspond with how we'd have ordered varieties. The poorer ones already had septoria in leaf three, but we weren't surprised by this because of the early pressures."

Caution needed

But other varieties, such as Champion (scoring an 8.1 for resistance to septoria on AHDB's Recommended List), Fitzroy (7.4 in Agrii's data) and KWS Extase (7.8). However, John was cautious about drawing conclusions so early in the year because varieties like Extase were faster moving and leaf three was out ahead of other varieties such as KWS Dawsum and LG Typhoon. "These two varieties were very slow to move the spring, so Extase was under high pressure, whereas Dawsum's infection period was potentially smaller."

Much of the pressures crops experienced did stem back to establishment date last year, he says. "Those varieties which were drilled in mid-September were under much higher pressure than those planted in

“A PGR is almost an insurance policy, if you don't pay in, it won't pay back.”

October," he explains.

"Dawsum, for example, has been touted as a Costello type, meaning it should be stiff and clean, fitting the bill as a variety to



According to John Miles, there was a huge amount of disease around because of the conditions in March.

drill early. But as the season progressed to T1 timing this year, it looked to have a really high level of septoria present, but it's rated at a 6.4 on the RL and we know that for every two weeks of earlier drilling a variety loses 0.6 of its score against septoria. So for those that drilled in September and not October, the impact was really noticeable this year."

At a similar time, instances of yellow rust were reported, adds John. "It first appeared early on, with reports of it in the field from the end of February in varieties like Skyfall (3) and KWS Zyatt (3). The yellow rust seemed to disappear for a time, probably because although March was wet, it probably wasn't warm enough, and we didn't see the disease kick on as we'd expect it to. But by mid-April it exploded."

However, yellow rust only had a short window to have much impact because May became too dry. "Yellow rust struggled to keep the momentum after its explosion in most places, however, many trial sites saw the disease present from February all the way through."

April was a normal month for most, according to John. "But because of the conditions in March, a lot of people were

chasing their tails after having put fertiliser on in February. PGRs and T0 sprays weren't applied until early April, as soon as growers could travel. Then by mid-April in England, we were into T1 timing — so there was a good window early doors where crops were quite exposed."

Early fertiliser

In the eastern counties, John has observed more fertiliser being applied early, with many going on in February this year during the good conditions. "Top dressings used to consist of 30kgN/ha but now we're seeing anything from 60kgN/ha to 90kgN/ha. Between this and PGR programmes being so late, it raises questions about how well they worked. The PGRs appeared to work but then a number of crops fell over, so the question is why?"

Across southern England there was a reasonable amount of rain at the beginning of May, but the remainder of the month was very dry, says John. "Our trial site in Dorset didn't get rain for 40 days, starting in the second week of May up until 19 June, then there was 20mm and it was dry again for the remainder of the month. This was a long period without a



Poorer varieties had septoria in leaf three, but this wasn't a surprise given the early pressures.

reasonable level of rain. Septoria was still present in a lot of our trial plots, but because there wasn't any rainfall it didn't become rampant."

Although May provided a good level of daylight hours and June remained dry, there was no increase in sunlight on May, says John. "In addition, the southern half of the country experienced a week where ▶



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PGR approach

The early harvest in 2022 meant a lot of growers were potentially able to drill earlier than normal, but for every 10 to 14 days early a wheat crop is drilled, it loses 1 resistance point against lodging, explains Stuart Kevis of BASF.

This is one of the reasons Dawsum might have struggled with lodging so much this year, he says. "Drilled earlier, varieties won't be as resistant to lodging as their score on the RL indicates."

The variety's suitability to early drilling along with the dry February which allowed for early fertiliser applications, followed by delayed PGR applications which went on in a cool April, could well have led to the extensive reports of lodging, he notes.

"Generally, we find that if a T0 isn't applied, growers won't go on with just a PGR, so if the T0 got missed this year and T1 sprays were delayed a little then the PGR was also late. And when PGRs were applied in April, conditions were cool and we know that some actives are less effective in these conditions."

T0 and T1 are the most critical timings for

PGRs, explains Stuart. "You're not just trying to shorten the first lower internode at this point, you're also trying to thicken the lower stem and some actives will impact rooting and the root plate, making it grow better and wider. You can't build this foundation later in the season."

"PGRs applied at the T2 timing are going to shorten the top internode section but won't impact the roots or lower stem."

So the difficulties in applying a T0 and later T1 timings in the 2022/23 season are what could have resulted in a lot of late lodging, he explains. "If a better foundation is built, then crops are able to withstand wind forces better. And where stiffer varieties have fallen over, this could be because their stems aren't flexible and so don't move in the wind. But had a PGR been applied early, this would have provided better anchorage to resist the leverage force of the wind."

To tackle this Stuart suggests looking at T0 and T1 timings differently. "Applying a PGR at these times isn't about the weather at that point in time, it's about what the crop could come up against in the coming months. It's important to understand



Applying a PGR at T0 and T1 isn't about the weather at that point in time, it's about what the crop could come up against in the coming months, says Stuart Kevis.

that you're building a foundation and you can't predict the weather ahead. A PGR is almost an insurance policy, if you don't pay in, it won't pay back."

► temperatures were above 26°C in May which likely had a biological impact on crops.

"Most felt that crops didn't look stressed

— in fact, they looked good — but the long period without rain will have had consequences for those on poor soil structure or thinner soils.

"We hoped July would be more forgiving with good levels of solar radiation, it was dull, dark and wet — sites in the East had 80-90mm of rain,

Northern England and Scotland

In the north of England and throughout Scotland, autumn 2022 was the third mildest on record, allowing crops to be drilled into good conditions. This was followed by a cool February, allowing spring crops to be drilled which, according to Agrii's Jim Carswell, was the right thing to do because of how wet March turned out to be.

"But in the northern regions of Scotland where they'd normally plant in March, drilling was delayed because of the weather, making for a harvest of two qualities and we're still yet to see the full legacy of what this has done to grain quality," he says.

Wheat crops had established well, but the wet March saw septoria really start to get going. "However, the dry May arrested the complete explosion of the disease.

"Interestingly, yellow rust came in earlier in the season than the previous one," he notes. "It was present a month earlier, particularly in varieties such as Skyfall and Zyatt in March and later we saw the disease in Extase (8), Skyscraper (7), LG Redwald (7), RGT Grouse (5), Gleam (5), and to a lesser degree in Graham (8) and RGT Lantern (7). Extase is such a popular variety, I do

feel we could see high levels of yellow rust pressure on it in the future."

Despite high levels of rainfall in July, Jim was pleased with specific weights on the whole. "Considering the conditions, it's a surprise that specific weights were as high as they were — it just shows the leaps and bounds that breeders have made in this direction."

One of the surprises of the season for Jim was the extent of lodging seen in Dawsum. "It's rated a 7 against lodging — both treated and untreated — but we've seen more extensive lodging in the variety in northern England and into Scotland," observes Jim. "I think part of the reason it went down is because of the wet weather in March and April and because PGRs may have been mistimed because of this. But I expect it'll be grown again this season but perhaps with more attention paid to it in the spring."

"However, when crops have been combined, farmers have been pleased with the yields and specific weights. Although specific weights were down on Harvest 22 levels, if you discounted that year, this harvest has been generally reasonable."

According to Jim, although Champion had good



Despite high levels of rainfall in July, Jim Carswell was pleased with specific weights on the whole throughout the north of England and Scotland.

standing power in some places, in others it lodged. "The same happened with Skyscraper but Redwald didn't lodge as much as its score (5 for treated and untreated) suggests."

Varieties that stood well include Typhoon, Gleam and Insitor. "The main variety, Extase, will continue strong this year," he adds.

while sites in the West had 80-100mm and the South West trial sites had 100-120mm. This provided an opportunity for septoria to hit in force. So all of the preceding issues were exacerbated by the conditions during grain fill in July," he explains.

"We saw reasonable ears on crops but grain quality was low because July didn't provide the conditions to fill them up. Where crops have done well, they've produced surprisingly good yields despite low specific weights."

But varieties with good septoria scores have done best in most trials, says John. "SY Insitor has had a reemergence because of its septoria rating (6.4) and its good grain quality."

Tried and tested

Where trials weren't focused by disease but on soil type, Skyscraper performed well and as expected says John. "In southern and eastern regions, some of the tried and tested varieties have done very well. Skyfall and Zyatt are both tried and tested and have done well on farm, meaning growers aren't moving away from them as quickly as anticipated.

"In the East, Gleam also falls into this category — they perform well in different situations and it's why they stick around for so long," he adds. "Other varieties that performed well include Champion Extase and Dawsum."

One aspect John suggests looking at in closer detail is how varieties are blocked together. "Variety scheduling is an area

After appearing early on in February, yellow rust seemed to disappear for a time, but by mid-April it exploded.

I think should have more consideration because we can be clever about how we block varieties so that drilling dates and management throughout the year match up.

"There was a lot of talk about how slow Typhoon and Dawsum were to move this spring, whereas Extase was quick. Consequently, where people had blocked Dawsum and Extase together hoping to have one spray timing, they ended up with two. So there's a challenge to block varieties together to allow you to time the workload in sync." ■



In Agrii's East Anglia trials there were certain varieties that stood out as being cleaner.

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Maize

Defending maize

Can maize shrug off its reputation of being a much-scrutinised crop that damages the environment and poses a flooding risk? CPM joined growers at Severn Trent's Stoke Bardolph AD site to learn how to maximise yields in a sustainable way.

By Janine Adamson

Whether it's for grain, forage or biogas, maize has faced much scrutiny over the years. In fact, around 10 years ago it caught the attention of environmental campaigner George Monbiot, who at the time proclaimed: "Maize farming could scarcely be better designed to cause soil erosion, compaction and run-off, which threaten the fertility of the land, the health of our freshwater ecosystems and the homes at risk from flooding."

But times have undoubtedly moved on — net zero, sustainable agriculture and regenerative farming are words which frequent not only the media but on-farm conversations too. It's widely accepted that the industry has a valuable role to play in ecosystem preservation, and as a

result, various funding pots are available which reward growers for making appropriate actions.

Yet where does maize stand in all of this? Is it really the Lord Voldemort of a cropping rotation? According to John Morgan of the Maize Growers Association (MGA), the crop is more of a Hagrid — rather misunderstood, and yes, large and hairy too.

Preferred feedstock

"This is a call to arms — we should defend this great crop which has much to offer," he says, with a slightly indignant tone. And given he was speaking at a specialist event for maize growers who supply Severn Trent Green Power (food waste recycling and green waste composting network), it could be said he was preaching to the converted.

However, when presented with the evidence, does he have a point? For a start, maize is a C4 crop meaning it's particularly efficient at converting sunlight to biomass through photosynthesis. For comparison, other C4 crops include sugarcane and sorghum.

It's also relatively low-cost from an input perspective — fungicide requirements are minimal and it has the potential to scavenge for nutrients meaning less reliance on bagged fertiliser. Finally, it's a preferred feedstock, whether that's for cattle or anaerobic digestion (AD).

To make the most of these positive attributes, the challenges of the past have

“We should defend this great crop which has much to offer.”

to be overcome whether that's related to water quality or soil degradation, says John, and that a long-term problem is nitrate leaching.



According to John Morgan, it's best to harvest maize in September when soils are drier.

"In the past, thanks to readily-available slurries and muck, too much nitrogen has been applied to maize compared with its actual requirements. This leached nitrogen can end up in aquifers and being pumped up through bore holes. Nitrate leaching is a big problem but it also poses an opportunity if we can solve it," he says.

Then there's soil compaction, which John believes centres around later harvesting dates. "Soils are dry in August due to minimal rainfall but this is often followed by a wet autumn. Soil strength quickly disintegrates in this type of scenario meaning travel should be discouraged to avoid compaction.

"Ideally, it's best to aim to harvest maize in September when soils are drier, so it's about finding ways to enable an earlier harvest date," he explains.

According to John, this starts by asking whether the field is suitable to grow maize in the first place and conducting a simple risk assessment is the easiest way to find out. "The MGA has a tool which produces a score that translates to a guide on variety choice. The lower the score, the more suitable the field is for maize. On the contrary, if it exceeds the guidance, the crop shouldn't be grown.

"We've conducted trials which also show that the sooner maize is in the ground, the sooner it can be harvested. Drilling should be targeted for April assuming the seedbed is good."

John played down concerns that early drilled maize could be hit by frost,



Severn Trent has been investigating how best to grow maize for more than 10 years, including undersowing with grass.

explaining the crop's vulnerable growing point is 'safe' because it remains underground until around 5-leaf stage. However, drilling conditions play an important role in facilitating an earlier planting date — adequate soil moisture is a fundamental factor and soil temperature should be 8-10°C for 4-5 consecutive days.

"It's all about seedbed quality — maize likes a fine tilth that isn't over-cultivated. Soil testing is essential too and something to become accustomed to, even if you've not done much of in the past," stresses John.

Recent years have seen undersowing maize become increasingly popular, which John says can help to address various challenges associated with growing the crop. For one, the enhanced root mass ▶



Overwintering a cover crop before planting maize pays dividends in terms of nutrition, says John Jackson.

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The Maize Growers Association has done trials which show the sooner the crop is in the ground, the sooner it can be harvested.

► improves soil structure which makes for easier travel at harvest.

The technique also reduces both soil erosion and nutrient leaching (for the latter, research shows between 18-58%) while building soil fertility and organic matter. And done correctly, John says there's no

yield penalty for the maize crop.

"When undersowing with grass, you shouldn't plant the two crops at the same time because maize doesn't like competition during early establishment. Equally, timing is key to avoid damaging the maize.

"In low grassweed pressure scenarios, choose slower growing species such as fescues and plant when the maize is at 4-5 leaf stage. If weed pressure is high, drill when the maize is at 7-8 leaf stage using a faster growing species," explains John. "Alternatives to grass for undersowing continue to be trialled and offer opportunities for those not keen on having grass in the fields."

Stressing the importance of reducing nutrient leaching through such tactics, farmers at the event learned it costs Severn Trent around £20M to install nitrate removal facilities, which then cost £250,000 to operate each year.

In addition, a water treatment works spends around £150/ml of water to remove pesticides via the Granular Activated Carbon (GAC) method, which is commonly used to remove chemical contaminants. According to the company, some pesticide actives are harder to remove than others such as metaldehyde. However, nitrate leaching is high risk and remains a key focus for Severn Trent.

To encourage best practice, the Severn

Energy for Anglesey

Ensuring enough feedstock is grown to fuel an anaerobic digester and livestock in North Wales, and doing so in a mindful way, is the challenge both farmers and agronomists have, says Merfyn Parry.

Merfyn has been providing agronomic advice across the region, including Anglesey, for more than 40 years. His priority is helping mixed farmers to balance growing feed crops for livestock, and energy crops such as maize, hybrid rye and spring barley.

Whereas some may turn to undersowing maize after drilling to improve its sustainability credentials, Merfyn works with the management team on a large Anglesey estate to diversify the cropping rotation and avoid a maize-monoculture.

"Fields are never empty over the winter. Instead, once the maize comes off at the end of September, digestate is applied and hybrid rye is sown min-till to grow an energy crop for the digester which is harvested the following June.

"The ground is then lightly cultivated and sown into ryegrass (Italian or westerwold) for a crop of silage in August before being grazed by lambs over winter. This is followed by spring barley — some of which goes to the digester and the rest for whole crop silage for local dairy farmers, usually harvested in mid-July."

Merfyn says it's then ryegrass before finally

going back into maize. "The majority of crops harvested for the digester are taken in between 30-34% dry matter (DM). The idea is to continually rotate the maize around the arable area to avoid a monoculture," he explains.

Before this rotation was introduced, ground could be left bare following maize whereas stubble turnips followed spring barley or potatoes. But after the stubble turnips were grazed, there was a risk the land would be left bare again, which neither Merfyn or the estate supported.

With an AD plant commissioned on Anglesey he says it created an opportunity for a new partnership — the estate would grow the energy crops and the plant's digestate would be applied to the land in return.

"Not only does it look better from a visual perspective, but it makes sense agronomically. The soil structure of the field has improved significantly and both weed and disease pressure are reduced because of the wider rotation."

According to Merfyn, the requirements of an AD plant and a cow are rather similar. He says they both require starch and energy, not just green leaves, which means maize and hybrid rye have to deliver on quality.

As a result, Field Options (part of the ProCam group), is running maize trials on Anglesey to



Merfyn Parry works with his customers to diversify cropping rotations and avoid a maize-monoculture.

understand which varieties deliver the greatest DM yields within the island's unique microclimate. He explains it's important that varieties have a high score against eye spot and fusarium to maximise yields on the West Welsh coast which can be exposed to high winds.

"A lot of maize is grown in North Wales with average fresh yields between 44-51t/ha (14.5-17t/DM). Compare that with Anglesey, where you're looking at 37-49t/ha (12-16t/DM) depending on the season," concludes Merfyn.



Undersowing maize is becoming increasingly popular because it can help to address some of the challenges associated with growing the crop.

Trent Environmental Protection Scheme (STEPS) was devised to offer farmers in the catchment region financial and technical support to invest in solutions to help tackle diffuse water pollution, and protect and maintain biodiversity and the natural environment.

Undersowing claim

One STEPS funding option is for cover crops (STEPS008) which includes the option to claim for undersowing maize (tall fescue and/or perennial ryegrass) — £136/ha/yr for groundwater catchments and £60/ha/yr for surface catchments.

For cover crops planted following maize, the crop must remain in place until at least 15 January, after which it can be destroyed by chemical or mechanical means, or by grazing.

As for maize specifically, Severn Trent has been investigating how best to grow the crop for more than 10 years. Back in 2010, the company commissioned its energy crop AD plant at Stoke Bardolph in Nottingham.

The site, which generates 5.6MW of energy, was established to help power the nearby sewage treatment works using crops grown on adjacent farmland such as maize.

According to Severn Trent's farms manager John Jackson, crop nutrition can be carefully balanced through a variety of means. "We only use

diammonium phosphate (DAP) if it's truly required because most phosphate comes from the application of organic manures, the crop rarely wants more."

He says he's found that most maize requires around 200kgN/ha whereas digestate provides a source of both potash and sulphur. However, overwintering a cover crop before planting maize pays dividends. "The cover crop delivers the nutrients that maize requires at the right time in the crop's lifecycle due to the break-down period in the soil. From our experience, radish helps especially because it scavenges for nitrogen while breaking up any compaction."

John Jackson also stresses the importance of minimising crop competition during early establishment. "The first six weeks are critical in terms of avoiding weed competition, you have to hit them early. We tend to use a pre-emergence spray of pendimethalin, to ensure maize can get up and away."

When it comes to harvesting energy crops, it's all about achieving the most DM/ha, which John Jackson says can still be achieved through a lower seed rate. "Because of lodging risk, we reduced our seed rate from 110,000 seeds/ha to 85,000 seeds/ha. It actually allows more sunlight into the crop to achieve earlier maturity. You want around 32-34% DM for the best gas yield," he concludes. ■



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An intelligent harvest



Forward-thinking farmers

Real-time monitoring of field operations has helped one Hertfordshire grower to keep on top of harvest and make agile decisions without being in the combine cab. CPM unlocks the benefits of digital platform, FieldView.

By Janine Adamson

Harvest can be one of the most stressful times of year in the farming calendar particularly if it's stop-start and plagued by inclement weather, as experienced by many recently. But having the insight to make decisions quickly and adapt to change is a means to alleviate some of that pressure.

For those not driving the combine, one way to access that critical intel might be through a quick phone call to the operator, who would no doubt prefer to be left to get on with the job. However, there's a more

convenient solution which caught the eye of Ben Cannon of Hyde Hall Farm.

The Buntingford farmer says because he doesn't drive the combine himself across the 200ha site, or the 800ha managed through contracting agreements, the FieldView digital platform offers him real-time information without having to bother his team.

"During harvest, rather than drive the combine, I'm the one with the trailer or at the store so I wanted a way to access the cab information without having to keep asking the driver questions."

Accessible data

"Combine manufacturers deliver similar levels of data, but in reality, it's not always easy to use. It has to be real-time and easily accessible so I know how to manage harvest most effectively. It's useful knowing field progress but real-time data on yield and moisture is the greater value," explains Ben.

FieldView, from Bayer, was originally developed for the United States, but is now used globally having been launched in the UK in 2020. Its purpose is to give farmers a deeper understanding ▶

“ Digital platforms like this will play a huge role in farm management in the future. ”



Ben Cannon doesn't drive the combine during harvest so wanted a way to access the cab information without asking the driver questions.

Forward-thinking farmers



One underutilised function of FieldView is the scouting pins, says Edward Lawton-Bradshaw.

▶ of their fields to make informed operating decisions.

The platform provides instant data on field progress from drilling, spreading, spraying and harvest, including yield and moisture levels whether that's for one machine, or an entire fleet. Simply put, it reflects all of the information which would usually be accessed from the cab.

According to Ben, it's proven invaluable when overseeing the

contracting side of his business. "Aside from accessing the information in real-time, the platform also provides reports which reduce the administrative burden of contracting. It's there ready to share straight away in an e-mail which saves time and effort when working across multiple sites and customers," he says.

Min-till approach

The crop rotation is based around wheat, oilseed rape, spring and winter barley, and beans, which are mostly managed through a min-till approach with rotational ploughing if required. OSR is direct drilled using a Horsch Avatar and followed up by an application of digestate, which Ben believes helps to keep cabbage stem flea beetle at bay.

To mix things up, this year he's aiming to grow all milling wheat at the home farm and feed wheat across the contracting sites. As a result, he hopes to use FieldView



The purpose of FieldView is to give farmers a deeper understanding of their fields to make informed operating decisions.

to understand performance variability on a per-field basis.

"As with most farmers, I'm interested in identifying the poorer performing areas of the field. Often we experience a yield loss on the headlands and have been trying to improve that through playing with seed rates and being more conscious of compaction," explains Ben.

"There's a lot of untapped potential in the FieldView maps but interpretation is key. Harvest 2023 was our first year using the tool, so I think we'd benefit from some additional guidance."

With four digital activation specialists on hand to provide such help, that shouldn't be a problem. Bayer's Edward

Part of a bigger picture

Ben Cannon firmly believes that the future of Hyde Hall farm lies in food production, but acknowledges the importance of incorporating environmental best practice. This is because despite being on prime arable land, he says there are opportunities which make economic sense without compromising on the cash crop.

For 10 years he was in Higher Level Stewardship (HLS), implementing actions which offer 'significant benefits' to high-priority areas. The farm has since transitioned to a combination of Mid-Tier and SFI (Sustainable Farming Incentive), alongside other complementary schemes.

"Much of SFI we were already doing, such as managing crops insecticide free — we'd not used one in five years. We also have a fencing and amenity side to the business which offers hedge and tree planting schemes, so it aligned nicely," he explains.

With 20ha of grassland under Mid-Tier, Ben is able to graze cattle through 'B&B', which supports an independent producer who sells at local farmers markets. He also has 20ha of woodland and is in the process of planting an

additional hectare. Although this isn't core to the commercial enterprise, Ben says it helps to spread labour costs and supply for logs has gone from 75-250t which generates additional revenue.

Furthermore, the farm's restored a series of ponds with support from the Farming and Wildlife Advisory Group (FWAG). This is part of the District Level Licensing (DLL) scheme which aims to compensate for the great crested newt habitat lost to housing development.

As for the commercial side of the business, Ben has been working to optimise his cropping rotation by incorporating legumes and cover crops. "We're eligible for Thames Water's Catchment Fund so that's another way to be rewarded for best practice such as cover cropping, which protects water, which is of course in all of our best interests.

"In honesty, we've had mixed results with pulses and legumes because their performance is so unpredictable. However, we've grown good wheat crops in the following rotation, due to the legacy effect," he says.

In terms of the enterprise as a whole, Ben's aim is to help support his local area and as a



As well as the farming enterprise, Hyde Hall has become a local hub for business owners.

result, has converted a series of former farm buildings into business rental units. The farm also regularly hosts school visits.

"We're trying to do our bit when it comes to farm to fork. Those from more urban communities often know little about farming and food production so it's our way of helping them to understand it better," he concludes.



FieldView links data from various sources with other agronomic information such as satellite imagery, as-planted, as-applied, and yield data.



Moisture fluctuated a lot during this year's harvest at Hyde Hall Farm, meaning the team found the real-time data from FieldView was helpful. Photo: Charlie Cannon.

Lawton-Bradshaw works across Ben's patch and before working for the company was a farm manager and early adopter of digital tools.

He says one underutilised function of FieldView is the scouting pins (based on GPS coordinates) which once dropped into a field map can be shared with interested parties such as agronomists or sprayer operators. "This is great for getting a second opinion and allows someone to find that exact reference point at a later date. It's all about data sharing across stakeholders," says Edward.

And whereas Ben has used the tool to improve harvest management, there's even more to be gained if it's used alongside on-farm trials. According to Edward, it's a 'failsafe' way to log and measure success regardless of size or complexity.

"FieldView simplifies the process of conducting an on-farm trial. We often hear that because a commercial crop takes priority, trials can be left until last or feel like an additional burden," he says.

"Whereas using the platform, you automatically log what's been applied where from the beginning. For those who use variable rate seeding and nitrogen applications, you can access a banded yield breakdown at harvest. This is

much more quantifiable than trying to achieve the same measurements by eye."

Importantly, rather than duplicate entry, FieldView connects with other farm software for data interoperability and to minimise ambiguity. All that's required is a FieldView Drive and an iPad with a data connection and the information feeds straight in and can be viewed remotely from anywhere.

According to Bayer, FieldView has been adopted quickly on a global scale and currently helps to manage more than 80M hectares worldwide.

Comprehensive data

Edward says a likely reason for this is its compatibility with a wide range of equipment manufacturers. "It doesn't matter what colour the tractor, combine or sprayer is, through using Fieldview Drive or API FieldView, data can be captured. That's important because many farms aren't exclusive to a single machinery brand," he says.

Another reason, he says, is that the captured data is more comprehensive than what's possible with telematics alone. "FieldView seamlessly connects with telematics systems, thus providing further layers of insight. This ability to link data from various sources with other agronomic information such as

satellite imagery, as-planted, as-applied, and yield data, enables growers to evaluate field performance. This can only help to refine crop management strategies."

So on reflection, having now trialled it on-farm, what did Ben think of the tool? "I found myself regularly checking FieldView during harvest to gauge how things were going. I know I didn't use it to its full potential, but that's because I'm just finding my feet with it.

"Harvest was very stop-start and are our yields were around average for the farm, whereas in 2022 we had ideal conditions and yields were amazing.

Because moisture fluctuated a lot this year, the real-time data from FieldView was really helpful.

"I hope there's the potential to link the platform into our agronomy advice which will be particularly useful for managing the home farm and to prioritise field walking. I imagine digital platforms like this will play a huge role in farm management in the future."

Farmers can still apply for a demonstration of FieldView by signing up for a one-year free trial via the Bayer website. This allows a thorough evaluation of the platform without the commitment to a year's subscription. ■

Forward-thinking farmers

With robotics, gene mapping and molecular markers, digital technology and bio-chemistry, it is a dynamic time for anyone involved in agriculture.

Challenges lie ahead for UK agriculture, such as improving productivity while minimising its environmental footprint. But farmers have always had to deal with change and adopt new ideas and technology.

Bayer is at the core of these agricultural advances, working with farmers throughout the UK and further afield to trial and develop new diagnostic tools and evaluate different

farming strategies, coupled with exciting plant breeding and product development programmes. It will help us develop innovative solutions and services to assist farmers achieve profitable and sustainable agronomic practices.

Despite the challenges facing UK agriculture there is much to look forward to. This series of articles focuses on how innovation and partnership between farmer and industry will help us face the future together.





“ Meeting net zero targets as an industry will be a balance of reducing greenhouse gas emissions, while also sequestering carbon. ”

Nuffield

How can growers cut greenhouse gas emissions on farm? Agronomist Chris Taylor's Nuffield scholarship looked at how regenerative farming could help.

By Mike Abram

Nuffield lessons

Enough carbon footprints have been carried out on arable farms over the past few years for it to become obvious that addressing the two biggest emission factors — fuel and fertiliser — are going to hold to be a key to reducing agriculture's impact on the environment.

“Around 60 to 70% of the greenhouse gas emissions on the average UK farm are coming from the production and application of nitrogen,” explains agronomist Chris Taylor. “Another 10-15% result from other fertiliser inputs, while 20% comes from fuel use.”

Understanding whether and how regenerative farming systems can address those two major emission factors became a key part of Chris's Nuffield Farming Scholarship, which looked at the role regenerative farming could play in UK

agriculture meeting net zero.

“Meeting net zero targets as an industry will be a balance of reducing greenhouse gas emissions, while also sequestering carbon. But I don't think it enough for us to just rely on sequestration.”

He also feels strongly that net zero must be achieved while keeping both food production and farm profitability together.

“A lot of government plans seem to be about planting more trees and cutting livestock numbers. It's more about shutting down farming and sequestering carbon in a way that changes land use.”

landlord, the other side he was farming for himself. “The landlord wouldn't let him use the same practices he used on his own land. So we walked across his half which was direct drilled with a John Deere 750a following sunflowers, and there were worm middens everywhere — it was covered in life with a dense mat of trash.

“The other side was where Jean had to plough begrudgingly and he's kicking the

Global population

“But when we're expecting global populations to rise that doesn't make sense to me. I feel farms are being steered towards a future where producing food is not their primary purpose, and I wanted to research whether regenerative agriculture system brought both productivity and profitability, and more of a land sharing approach.”

From Chris's visits which took him to the USA, Canada, Brazil, France, Norway and Denmark, as well as to farms and conferences in the UK, he found plenty of evidence that regenerative farming could help tackle both fuel and fertiliser emissions, as well as contribute towards carbon sequestration.

For example, Jean Bruno, a French farmer from Moulins, showed Chris a split field. One-half he farmed on behalf of a



“I feel farms are being steered towards a future where producing food is not their primary purpose,” says Chris Taylor.

soil saying it's like the moon, it's dead. He was savage that he'd had to plough this field he'd worked really hard to get into a no-till scenario."

Equally stark were the differences in costs. Direct drilling with the John Deere 750a cost €80/ha and just 7 l/ha of fuel, according to Jean, while the plough and combi-drill has added about a €100/ha to establishment costs including an extra 38 l/ha of fuel.

"He was farming 400ha in combination with his neighbours and tenants, so I extrapolated these costs to his entire area and calculated the saving to switch to a no-till regenerative approach to be €40,000 and 15,000 litres of fuel, as well as a time saving, which is priceless in a catchy autumn or spring," Chris says.

Switching to a no-till system, and indeed a wider regenerative system, needed careful planning, he learned in the US. "Many hear of many farmers in the US that have been using zero tillage for the past 20 or 30 years. What no one had told me before I went there was how they had earned the right to do that.

"I spoke to Dale Launstein, who farms in Iowa and spent eight years transitioning through strip-till before he started using no-till. He was suggesting he saved about 10 l/ha of fuel from moving to no-till from strip-till, which was saving him US\$12,000 per annum on his 1200ha farm.

"He'd also seen his soil organic matter rise to between 3.5 and 5% where the local average was 2%."

Those kind of fuel savings will be an important step in helping arable farms reach net zero, he points out.

Planning such a transition in the UK also requires careful thought, he stresses, with strip-till potentially a good transition tool in our conditions as well.

"Some of the best farmers here that I've seen transition from a very traditional sort of establishment method to no-till have used strip-till, as well as rethinking their rotations slightly.

"There are also some easy wins. For instance, no-till winter wheat after beans works well, especially if you have strip-tilled the beans, so you've at least done a little tillage the previous spring."

One conclusion Chris made through his trips was that regenerative farming was a system and that the principles couldn't be cherry-picked or taken in isolation.

"I think it is easy to undermine the regenerative farming movement by perhaps practising two or three principles and claiming to be regenerative. That can be

very misleading and undermines some of the best examples I came across in the world."

In the best regenerative systems, it is hard to unpick what the farmers are doing into each of the five or six principles as they were all very much inter-linked, he says. "A very good example of keeping the ground covered, for instance, might be partly because the farm is no-till or very low disturbance."

There wasn't one "silver bullet" to reducing fertiliser requirements Chris found during his studies, but rotational change or fertility building cover cropping were perhaps the most common techniques farmers Chris visited were using.

Reduce nitrogen

"If growers had a hungry cash crop with a big nitrogen requirement, then they were looking to place generally a pulse crop or a fertility cover crop before it to reduce their carbon to nitrogen ratio and the nitrogen requirements for the following crop."

In France, he visited a farmer who was growing oilseed rape after spring beans, which has the dual benefit of encouraging early growth of the oilseed rape crop as nitrogen became available, but also reducing the amount of applied nitrogen required by two-thirds.

"His traditional approach was to apply around 180 kgN/ha, which he'd managed to bring down to around 60 kgN/ha. Rotation planning like this offers a quantifiable way of reducing nitrogen inputs."

Rotation adaption was often seen by farmers venturing into following regenerative principles as primarily there to help to adopt a regenerative principle, such as using



Field split between no-till wheat and ploughed land in France.

zero-tillage, or agronomic challenge rather than to cut fertiliser use, Chris notes. "By doing that the fertility benefits came almost as a side benefit."

That also applies to those using fertility building cover crops, which was another common practice that was helping to cut fertiliser requirements. "Some growers put in an overwintered cover crop followed by spring barley or spring oats rather than a winter crop because of blackgrass.

"They are then finding they have reduced their fertiliser requirements by 30-40% by growing a legume-based overwintered cover crop, or through capturing nutrients that would have otherwise been lost through runoff, leaching or erosion.

"I found people weren't necessarily focused on cutting fertiliser use initially and had found them via a different way — they started off as fringe benefits before they realised the bigger picture." ►

Living mulch to replace cover crop option?

Living mulches of clover or lucerne were being used to cut N requirements, as well as provide other benefits, including potentially replacing cover crops.

Woody van Arkel in Ontario was finding clover understories were cutting N requirements, as well as providing ground cover to minimise weeds, capture sunlight and increase soil organic matters, Chris reports.

Frederic Larsen in Denmark used a similar approach with lucerne in oilseed rape. "He felt his living mulch of lucerne could replace cover cropping for four or five years, while retaining the benefits of cover crops with just one seeding and establishment cost.

"He said it was the perfect cover crop

replacement with a low carbon to nitrogen ratio, which he could cut and sell to livestock producer, so he had a revenue coming in.

"It wasn't going to replace as much N in his system as you might think — maybe 30-40 kgN/ha, but that could increase over time — it was very early in his system to know, he said.

"It was also competitive with his oilseed rape, so he was having to knock it back with chemicals, which was a challenging tight rope to walk.

"But I could see lucerne being a good option in the UK. It seems to come back quite readily after cultivation, but maybe it's not quite as aggressive as white clover."



Chris Taylor and Blake Vince a no-till producer from Ontario Canada.

▶ Talking to growers about cover crops helped Chris clarify the importance of carbon to nitrogen ratio in cover crops selection, and how that was crucial in understanding nutrient release. “It also really complemented management of cover crop residues.”

A visit to the Dakota Lakes Research Farm, operated by South Dakota State University, which has been using and researching regenerative farming practices since 1983, was particularly enlightening around how to manage cover crop residues.

“The farm is long-term no-till, with a particular focus towards soil and water conservation. South Dakota is reliant on capturing snow melt during and after winter, and conserving that during the dry spring and summer,” he explains.

“To do that they use a high residue

cropping system — with an aim to grow at least 75% high residue crops in the rotation. What they felt they wanted was a soil surface with very little visible soil surface so it captures rainfall, prevent runoff and stopping too much leaching. The residue acts like a giant sponge and stops evapo-transpiration.”

Impressive infiltration

Trials had shown the rotation provided very impressive infiltration potential. “Using Cornell University’s infiltration measurement where they subject the soils on the farm to a simulation of 250mm of rain in an hour, they had no runoff. It was all captured either in the soil profile or being absorbed by this residue mat on top to prevent any runoff.”

The Research farm puts its success down to how it manages the residue on the surface, Chris says. “But I quickly realised there were pros and cons because if you put in a nitrogen-hungry crop you were going to starve it and not get the best out of it.

“So this is where I realised we could manipulate residue levels on farm to maintain them if we’ve got a low requirement for nitrogen in the following crop, or to try and reduce them before a cash crop with higher nitrogen requirements to release fertility at the right time.”

In a UK context that helps simplify cover crop species selection depending on following crop requirements. “For example, I’ve started implementing cereal rye as a cover after winter wheat before a legume crop or maize in the spring.

“That puts in a high carbon to nitrogen ratio crop that will sequester more carbon. The lack of nitrogen fertility in the spring doesn’t matter that much as the legume crop will either fix its own nitrogen or, in the case

of maize, will have a much lower inherent nitrogen requirement than a spring wheat, for example, perhaps partly because of use of organic manures.

“I’ve been using a lot of cereal rye before beans, peas or even lupins.”

Those covers are not necessarily just cereal rye, he adds. “I’ve been manipulating multi-species crops in the same way to have a higher carbon to nitrogen ratio. Cereal rye has just about the highest but it’s mostly about balancing species.”

In contrast, before a spring cereal or crop that has a higher nitrogen requirement, he’s growing cover crops with much lower carbon to nitrogen ratios, such as ones with vetches, bursen or crimson clovers.

“The penny drop moment was understanding for low carbon to nitrogen ratio covers the residue will not stay around for very long as soon as it is destroyed, while high carbon to nitrogen cover crop residues will hang around,” he concludes. ■



No-till wheat in central France, showing large worm casts and beautiful crumb structure.

Advice sector needs to catch up

While there are some good examples of agronomists, both independent and within distribution firms, of providing advice on how to implement regenerative practices on farm, in general the advice sector is still trying to catch up in the UK, Chris says.

Peer-to-peer learning from other farmers, not least through events like Groundswell, is quite often a key way farmers learn what works and what doesn’t when changing approach.

“The same applies in many parts of the world where peer-to-peer learning is crucial. In the US, for example, I heard about the Sussex Conservation District in Delaware, which ran a caffeine cover crops morning, a drop-in session

for local farmers to talk to other farmers, who were soil health champions,” he says.

Advice in the US came mostly through research farms, such as Dakota Lakes and some university state extension services but it was in Denmark and Norway he found a model that could potentially be the blueprint for the UK.

“They had specialised companies offering advice on conservation agriculture which amounted to specialisms on direct drilling, cover crops, rotation and nutrient planning,” he explains.

There are some examples of similar already in the UK, such as Indigo, Hutchinsons agroecology department, Edaphos and

RegenBen, but, in general, it is a tiny proportion of advisers compared with conventional agronomy. That’s slowing adoption on farm of practices that could cut greenhouse gas emissions, as well as improve profitability, Chris suggests.

Access to good training is lacking, mostly requiring individual investment or peer-to-peer learning, while business models and fear over risks of not using recommending products also are barriers to scaling regenerative approaches, he adds.

“I think there’s an opportunity for BASIS or another organisation to offer an industry-wide training course to create a known benchmark.”



nature matters

by Martin Lines

The weather dice: when to drill or not to drill

Our autumns are becoming increasingly unpredictable, bringing with it the gamble of when to drill. Last year, we had a dry summer and autumn with little opportunity to germinate volunteers and weeds. This year has been the opposite, and we've achieved some very good flashes of weeds, which helped to reduce the seed bank and put less pressure on a pre-emergent herbicide.

With the ever-decreasing range of products we can use to remove weeds pre-emergence or in-crop, it's becoming increasingly important to eradicate as many as possible before planting. It's now time for the annual gamble of predicting when the weather will break, and our soils will become too wet or delaying enough to get a good kill on the black glass oats and brome. Here on our heavy soils, the black glass seems to germinate around the 15th of October and planning near this date is the optimal time for us. Input prices continue to rise, but grain prices aren't, so we're trying to minimise using products from a can and, instead, doing as much as possible with an integrated

pest management approach.

Over the past few years, we've seen our weed burden change from a heavy black grass problem reliant on chemistry to control it. Now, our focus is more on wild oats, brome and creeping thistle and stopping these weeds from becoming the next burden. Not long ago, the focus was on drilling early and with low seed rates, but this ended up creating more black grass and higher chemical bills. Not just in herbicides but in needing early spring fungicides, and the risk of barley yellow dwarf virus (BYDV) was higher. What we've found is trying to go as late as possible with higher seed rates has improved our financial returns, especially if we can use varieties that are better resistant to BYDV pressure on the earlier fields.

Our local agricultural show is the last Saturday in September, and this year, I was chatting with a number of local farmers about the changes we've seen in the previous 30 years. The show used to be a catch-up after harvest and before starting drilling. Then, the date moved, so some farmers wanted to have a field drilled before the show to say they had started. Next, it was all the first wheats done before the show, then it was who was finished by the show rolled around. Then everyone found the cost had gone up, and black grass had become a bigger problem impacting yields. Now, this year, most people hadn't started yet and were watching the weather forecast with plans to begin in a week or two. Like many things in farming, this merry-go-round always brings us back to working with nature instead of trying to fight it with more inputs.

One of the risks of drilling later on heavier soil is once it turns wet, it stays typically wet until the spring. Focusing on improving our soil health, structure, drainage, and organic matter can help improve the window within which we can operate. One of the current downsides is the weight of many drills and tractors. We can use the best tyre technology and tyre inflation systems, but we still have a large weight moving over our soil. There continues to be a debate on whether a disc or time is better in different conditions. Most of us only have one drill, so it's usually a compromise. Several neighbouring farmers seem to be working together: one would have a tined drill and another a disc drill, and they choose the light drill for the right conditions.

There may be Sustainable Farming Incentives (SFI) coming to reward the action of low disturbance or direct drilling. So, instead of needing a capital grant to buy one drill, you could buy a service from another farmer with a machine suited to those conditions. We're already seeing many within the supply chain, including brands, starting to offer premiums or incentives for actions that reduce carbon footprints and improve biodiversity. The added bonus

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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“ Now, our focus is more on wild oats, brome and creeping thistle and stopping these weeds from becoming the next burden. ”

is that these payments can be stacked or combined with other SFI or CS Agreements. Hopefully, more information on the SFI for 2024 and other incentives will be available soon so we can plan ahead.



Papley Grove Farm. Photo: Wild image Photography.



Agroforestry

Farming in 3D

With prime arable land at a premium and the human race limited to a finite planet, surely it's impossible to create more productive outdoor space? Not according to one Cambridgeshire grower who believes it's wholly achievable and can balance sustainability too.

CPM reports.

By Janine Adamson

Think maximising productive space within an upward sphere and the mind might jump to the world of controlled environment agriculture and vertical farming. However, there is an alternative that doesn't involve complicated infrastructure and instead capitalises on a wholly natural interaction.

That being agroforestry — agriculture with trees. But whereas hedgerows, parkland and wood pasture have been features of rural landscapes for centuries, one grower believes opportunity lies in formally integrating the two — growing alleys of productive trees interspersed by arable cropping.

"I've made my farm bigger but in 3D," explains Stephen Briggs, during an open day at the 113ha organic site in Peterborough. "It's about utilising the

space above and below ground to achieve productivity gains, that's what agroforestry is about."

So what first initiated Stephen to grow perennial and annual crops together in this way? He says it was part of a strategy to add value to the tenanted land, which back in 2007, was severely degraded from a soil perspective.

Fenland soils

"Our fenland soils have 23% organic matter content but when we took over the tenancy I was staggered to see the level of erosion from the winds — on a 'fen blow' day you can see the soil disappearing over the ditch," he explains.

"Windbreaks were an obvious solution but we also wanted to generate an income which is what inspired the silvo-arable system we've designed on the farm. At 52ha it's the largest agroforestry system in the UK."

Following in-depth conversations with Stephen's landlord, permission was granted and the trees were planted at Whitehall Farm in 2008/9, each with a post, tree guard and mulch mat. Years later, bar the odd tree loss, the system remains in situ.

It's based around 27m wide rows between lanes of fruit trees (mostly apple), planted at 3m spacing with a 3m pollen and nectar strip beneath. Cereal crops are grown in 24m-wide alleys and are managed through a controlled traffic farming system with 6m tramlines.

Of course, this meant investing in new 6m-wide equipment including a cultivator, drill, hoe and combine as well as a 6m Garford Robocop vision guided hoe,



whereas before, the largest piece of kit was a ride-on mower, muses Stephen.

"As tenants we had to design a system which would see an economic return within the tenancy period, hence the fruit trees. We use semi-dwarf rootstock that grows to about 12ft (3.7m) which creates a microclimate, and compared with commercial orchards, we keep the trees small and pick regularly.

"Because of the spacing and good



Stephen Briggs used the land equivalent ratio (LER) calculation to understand the productivity of his farm under the agroforestry system.

air flow we can maintain organic management without the use of fungicides.”

The farm grows around 13 different types of apple, a mix of heritage and modern varieties which yield an average of 5t/ha (harvesting 20t/year). For picking efficiency each row is a different cultivar, and pruning takes place annually in the autumn.

In terms of cereal cropping, the rotation includes gluten-free certified oats, spring and winter wheat, and spring barley, all of which are organic. Cover crops also play a role. “In conventional arable systems, crops don’t make the most of peak sunlight hours from around July to September — this is traditionally harvest time or when fields can be left bare.

“But nature figured out this conundrum a long time ago, stacking different plant species to maximise sun capture and avoid bare soil,” explains Stephen. “When you mix perennial and annual crops together, they access resources such as water, light and nutrients from different ‘spaces’ at different times during the season, ensuring you maximise farming’s most important input, sunlight.

“This is how you increase production — accessing two metres above and one metre below the surface.” But of course the question is, does this have a negative impact on the yield of the cereal crops?

To start, because the farm is organic, cereal production output is around 65-75% of a conventional system which Stephen says is offset by the improved market value and lower working capital requirements. “Our reliance on artificial inputs is also significantly reduced so we have limited dependence on third parties which minimises risk,” he says.

Stephen has then used the land equivalent ratio (LER) calculation to understand the productivity of his hectareage under the agroforestry system (relative yield of each tree and crop species), compared with if it was managed as a monoculture.

“Our calculation is 1.25 meaning we achieve more yield overall from two crops planted together than if we planted one alone. The yield advantage is 25%, so we’d require 25% more land to achieve the same yield from a monoculture. Plus remember that the trees account for just 8% of our land area whereas 92% functions as it did before.”

Although in some instances there can be an ‘edge-effect’ where crop yields are

lower when adjacent to the trees rather than in the centre of the alley, Stephen has found that for crops such as oats, agroforestry encourages competitiveness resulting in the reverse.

Then, there are the wider benefits from planting trees, one of which is a reduction in N leaching, up to 50%, because trees capture N not used by the crops. Their deeper rooting systems aid drainage as well as ‘lifting’ or redistributing water to the subsoil through a process known as hydraulic lift. Because the ground is covered, evapotranspiration and soil erosion are reduced.

“The trees have helped to reduce wind velocity at ground level which minimises crop damage and the spread of fungal disease spores. As for biodiversity, we have more birds, pollinators and beneficial soil fungi in abundance. This is because we’re providing rich, varied habitats which also act as refuges for beneficial insects,” he explains.

Building organic matter

And not neglecting the bigger picture, which according to Stephen is where trees really come into their own. “High input monoculture has its challenges such as product costs and at the same time farmers are being asked to contribute towards achieving net zero. We have to adapt to tackle climate change and I believe agroforestry can play an important role.”

This is because he says there’s nothing better than a tree to accomplish goals such as sequestering carbon from the atmosphere, building soil organic matter and soil carbon, and maximising resource capture throughout the season.

So does Stephen have insight for why agroforestry hasn’t been more widely adopted in the UK? To start, he thinks it could be a knowledge gap — farming and forestry are two completely different fields. “The people, terminology, goals and objectives are all distinct. From a basic level, it’s a case of short versus long-term management practices. Trees are in the ground for a lot longer than a cereal crop,” he says.

“It also adds complexity, although that can be managed. We’ve learned that agroforestry is do-able at a commercial scale and it can make a profit, however, people want to see it for themselves before committing.

“But you don’t have to do the whole farm at once — remember to start at an appropriate scale, learn and



Cereal crops are grown in 24m-wide alleys and are managed through a controlled traffic farming system.

then expand later.”

To add even more value to the business, Stephen and his wife Lynn opened a farm shop in 2019 which now includes a deli and education centre. Whereas before the apple harvest was sent to a cider production plant, it’s now sold as fruit juice through the shop.

“Profitability remains a challenge, but it’s the same for everyone. Our local authority landlord has to increase our rent to cover budget cuts elsewhere, but our margins haven’t increased at the same rate,” comments Stephen.

“For others perhaps there’s the potential to share a business model such as ours and combine enterprises, so different individuals manage the trees, cereal crops and so on. We’d love to integrate poultry but our tenancy doesn’t permit it. Ultimately, we just want to add value to our small farm,” he concludes.

The open day at Whitehall Farm was organised as part of the Farm of the Future event series from Innovation for Agriculture (IfA) and RASE. The charity has organised two study tours for November which are taking place in Lincolnshire and Herefordshire. Visit www.i4agri.org/events for further information. ■



Stephen and Lynn Briggs opened a farm shop in 2019 to add further value to their business.

Going fungicide-free

Sustainable transitions

From fungicide-free wheat to blended varieties, farmers across Staffordshire are working with independent agronomists to build towards a more sustainable future. CPM finds out what they've been trialling.

By Janine Adamson

Staffordshire farmer Steve Brandrick's aim is for self-sufficiency — not for himself, but for his livestock. He wants to ensure the beef cattle at Heatley Bank Farm in Abbots Bromley receive a quality, nutritious ration, which he believes is best done homegrown.

With just 64ha, which Steve acknowledges is small-scale compared with many farms featured in *CPM*, he has to maximise his cropping area, which is currently split between grass, herbal leys, oats, winter wheat and winter barley.

And he's making a success of it — this year buying in only beef minerals. So, what made him take a chance on growing

a crop of fungicide-free wheat last season? Steve says it was on the suggestion of his agronomist Daniel Lievesley who he's been working with for the past two years.

"Daniel was recommended to me through word of mouth because he understands livestock which is important to me as a mixed farmer," says Steve. "I'm running lower stock numbers at the moment (100 vs 140 head of beef) so it's a good opportunity to try something new, hopefully reduce input costs and improve soil health, before ramping back up."

Cover crop blend

Having committed to giving it a go, Costello winter wheat was direct drilled on 18 October at 220kg/ha into an eight-way cover crop blend of buckwheat, linseed, phacelia, fodder and tillage radish, gold of pleasure (*Camelina sativa*), common clover and sunflower. Daniel says the original intention was to drill spring barley or oats, but the cover produced ample biomass and conditions were suitable to establish a winter crop instead.

"The cover crop was sprayed off with a blend of glyphosate and humic/fulvic acids to help absorption as well as give back to the soil biology. The wheat grew steadily throughout the winter and wasn't treated until February which consisted of a foliar phosphorus, manganese and PGPR plant growth-promoting rhizobacteria, mix," explains Daniel.

He says his aim as an agronomist is to replace conventional fungicides with optimised plant nutrition, supported by

"I'm looking for the optimum way to provide the best feed for my cows while being profitable."

regular SAP analysis, leaf tissue testing and Brix readings, to ensure a crop receives what it requires throughout its lifecycle.

But up until now in the story, Steve says



Despite a slow start, Steve Brandrick says he admits the fungicide-free wheat looked great come late spring.

he remained a little dubious. “In honesty, the wheat was slow to get moving compared with a crop grown under a conventional programme. It was drilled into one of our lighter fields at the farm, a sandy clay loam, but perhaps it was a fortnight too late. We don’t suffer from high blackgrass pressure so aren’t tied to delayed drilling,” he says.

Although striving to avoid fungicide use, the crop did require a spring herbicide application of mesosulfuron+ iodosulfuron+ DFF, mainly to keep annual meadowgrass at bay. It was then treated at T1, T2 and T3 with a bespoke biological treatment, mixed according to the results of the tissue testing and SAP analysis.

Daniel says he recommended this approach because biological treatments are becoming integral tools in a more holistic farming model, to solve challenges and stimulate growth with less chemical dependence.

To support the experiment, Steve brewed his own compost teas in IBCs on the farm. These ‘biological brews’ included beneficial microbes, molasses-based microbe food, and trace elements such as Epsom salts.

With the crop having improved considerably, Steve says he was starting to come around to the idea. “I have to admit it looked great come late spring, but I’m usually a plough man so this was a completely different approach for me. I think it’s definitely a case of holding your nerve and there is a trade off — the crop didn’t look amazing in the early days but it came through in the end,” he says.

The wheat was harvested on 17 August ahead of going into winter barley (Tardis), and other than the one herbicide spray, received no fungicide, insecticide or PGR. Because the wheat is going straight back into the farm as a feed ration, Steve says the figure on the combine is somewhat irrelevant, as long as the quality is there.

“I’m looking for the optimum way to provide the best feed for my cows while being profitable, so being able to save on input costs means I can tolerate a lower yield. I’m a one-man-band with my own equipment so do everything myself other than this year paying for a contractor to direct drill.

“I know this approach isn’t necessarily possible for larger systems and maybe it’s easier on a smaller scale because there’s greater flexibility,” he admits.

Daniel says Heatley Bank Farm is the ideal site to trial such principles, because it’s one-to-one between the grower

and advisor. “There’s a lot of talk of regenerative agriculture and sustainability will always be a priority of mine as an agronomist. However, it’s important to be realistic. For those on larger farms, perhaps it’s a case of trialling something new on a small area and seeing how it goes.

“We were really pleased with the fungicide-free wheat and it shows what can be achieved when everything comes together,” he says.

Daniel advises growers as part of his family’s business, DJL Agriculture. Whereas Daniel takes care of the arable side of the business, dad David focuses on dairy and understanding the relationship between animal productivity and soil health.

David says their philosophy is to promote biological farming solutions to achieve a healthy well-balanced system for the health of the soil and the plant, which in turn helps the health of both livestock and humans.

Over at Bentley Hall Farm in Blithbury near Rugeley, Tim Ellis is about to embark on growing his first crop of fungicide-free wheat. The 134ha arable business operates a rotation of mostly wheat, oilseed rape and spring beans.

Insecticide free

This is Tim’s first season under the guidance of Daniel, having switched to the independent agronomist in a bid to find more ‘out of the box’ thinking. “We’d gradually been reducing our fungicide use while exploring biostimulant type products for the past few years. It finally felt the time to make a leap towards a more regenerative approach,” he explains.

The farm has already achieved three years insecticide-free which Tim says he thinks has resulted in more wildlife and pollinator activity. Less productive land is used for Mid-Tier countryside stewardship such as two-year sown legume fallow (AB15), wild bird seed mixture (AB9) and nectar flower mix (AB1).

A recent purchase has been a Simtec direct drill as part of a drive to improve the health of his sandy loam soils. Where the Simtec isn’t appropriate, a combi drill and min-till approach is used.

Going fungicide-free is the next step in the journey. “I’m unsure you can truly encourage soil biology if you continue to rely on multiple applications of fungicide. That’s what inspired me to trial going without — being more considerate towards the environment,” says Tim.



Daniel Lieslesley recommends biological treatments because they’re becoming integral tools in more holistic farming models.

So for this season, the farm will see a third of its wheat area planted as a blend of varieties with the aim of being managed without fungicides. If the trial goes well, Tim says he hopes the whole wheat area will be fungicide-free come 2024/25.

“Introducing a greater diversity of genetics through the blends should help to reduce disease risk which is often exacerbated through monoculture cropping. That will of course help in terms of our fungicide requirements.

“Not only is reducing our inputs beneficial for the environment, it also makes financial sense. We’re a small family farm so any means of reducing risk is welcomed to ensure we have a future,” he concludes. ■



This season, a third of Tim Ellis’ wheat area is being planted as a blend of varieties with the aim of being managed fungicide-free.

“The heavier tractor with better tyres can work at lower pressure which will be better for the soil.”

Innovation Insight

Protecting and preserving soil health has never been more important, and using the right tyre at the correct pressure can play a big role in this. *CPM* takes a look at how advancing tyre technology can lead to healthier soils.

By *Melanie Jenkins*

Tyres are more than just a practical aspect of operating a tractor, and as tyre technology advances, their functionality brings an increasing number of benefits to the field and machine operation, not the least of which is minimising soil compaction.

The necessity to make soils more resilient is becoming increasingly important, says soil specialist Philip Wright of Wright Resolutions. “There are many ways of doing this, but they’re all about optimising soil structure to enable free pathways for the roots, air and water to pass through it.

“Soils have to be aerobic for roots to interact with the biology and to allow efficient

plant growth. But to achieve this there has to be good drainage and a balance of air and water in the soil pores. In an ideal situation there’d be about a 50/50 split of porosity to solid fraction.”

Reducing porosity

But unavoidably, when machinery is driven across soils it causes ground compaction by squeezing soils together, reducing the porosity and ability for soils to store air and water, he explains. “To reduce this, we have to minimise the amount of pressure applied to the ground, which means using very flexible tyres capable of supporting weight at such low pressures.”

Over the past four years, Philip has measured the impact of tyre pressure on cereal yields on two different regen farms, with varying soil types. “One farm uses a Weaving direct drill and the other a Horizon single undercut disc direct drill — neither with eradicators.”

Tyre pressures were set at three different levels: 1bar, 0.8bar and 0.6bar. “The yield of each un-trafficked area was compared with that of the drill tractor wheel lines to determine the impact pressure had on this,” he explains. “If the un-trafficked area yield amounted to 100%, then 1bar of pressure produced yields at around 60%, which is quite worrying. In a scenario with 710 tyres, the two tyres will have a width of 1.5m, and if

you’re using a 3m drill, this could potentially be creating a yield loss of 40% across half your farm.”

But by reducing the tyre pressure to 0.8bar, the yield average went up to 70%. Reducing the pressure further to 0.6bar saw yields achieve just over 90%. “Evidently, the less pressure applied, the more the soil maintains porosity and structure, helping drainage, crops and yields. Another big ▶



According to Philip Wright, central tyre inflation systems go hand-in-hand with protecting soils.



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When machinery is driven across soils it causes ground compaction by squeezing soils together, leading to issues such as waterlogging.



Soils have to be aerobic for roots to interact with the biology and to allow efficient plant growth.

► factor is that better crops are more competitive, helping to reduce instances of weeds such as blackgrass in the wheel lines.”

But only reduce tyre pressure if it's safe to do so, warns Philip. “If you go below the safe minimum level the tyre can collapse and fail, which is expensive. I'd advise involving your manufacturer as most will come to your farm if you operate

their tyres, bringing a weigh cell to check axle loads, configuration and ballasting to determine a safe minimum pressure to help you avoid instances of underinflation.”

Another consideration related to tyre pressure is fuel efficiency. “A highly inflated tyre will increase fuel consumption because tyres slip more in this situation, meaning each rotation

requires more power from the tractor.”

Other than optimising tyre pressures, there's also the option of implementing controlled traffic farming to limit the areas of the field impacted, but turning in headlands can still be problematic. “We're still going to have to drive somewhere in the field, so it's still important to minimise the impact in these areas,” says Philip.

And there's always the issue that road speeds are much faster than field speeds, requiring higher pressure in the tyres. “This is where central tyre inflation systems go hand-in-hand with protecting soils. These can be implemented upon entry or exit to a field without the driver having to exit the cab to use an airline, which they're unlikely to be willing to do multiple times a day.”

Philip also warns about oversizing the tyre system for a tractor. “If a tyre with too much volume is fitted to a lighter tractor, there won't be enough weight to push and flex the tyre properly, meaning there ends up being a smaller than optimal contact area.”

But when faced with difficult field conditions, he would always advocate a slightly heavier tractor with high-tech tyre rather

than a lighter tractor with high pressure radials. “The heavier tractor with better tyres can work at lower pressure which will be better for the soil.”

One of the key drivers in tyre development has been the increased interest and pressures related to soil health and protection, explains Denis Piccolo of BKT. “Due to the changes of agriculture's approach to this, we've felt a necessity to introduce a tyre that's able to reduce the contact pressure on the soil.”

BKT's solution has been the Agrimax V-Flecto, which is suited for use with high horsepower tractors and has been specifically designed for soil tillage and haulage applications ensuring a reduced soil compaction and self-cleaning properties. “We aimed to meet the growing requirement for technology and higher performance on these types of machines.

“This tyre is designed to deliver both performance and reliability, proving high resistance against greater stress levels as well as faster speeds, even on paved roads.”

The Very High Flexion tyre technology (VF) reduces the contact pressure and can help increase profitability of

Minimising compaction

Third-generation farmer, Luca Gabaldo owns and farms Azienda Agricola Gabaldo Luca in Bologna, Italy. He's based in Imola with lands in the surrounding municipalities, such as Castel Guelfo, Dozza and Massa Lombarda, in the provinces of Bologna and Ravenna.

“My farm is specialised in growing crops and seeds, cereals and vineyards, covering an area of around 90ha,” explains Luca. “I work at the cutting-edge of production but there's always a lot of scope for improvement, especially because technology never stops advancing.”

Luca first started using BKT tyres in 2010 based on advice from his trusted tyre specialist. “Since then, I haven't looked back. The first tyres I bought were narrow ones for horticulture and I still remember how impressed I was at their durability.”

Ever since that first purchase, he's chosen

BKT tyres for work which requires low pressure to avoid soil compaction. So in 2020 he decided to use the latest generation of tyre from the firm, the Agrimax V-Flecto. “These have been very satisfactory in terms of noise reduction and have a great consumption and performance ration.

“Working the land can hide numerous traps and problems, which is why it's essential to have reliable and high-quality tyres. I've managed to achieve minimal compaction, high performance and a decent economic saving, both on the purchase and durability.

“The Agrimax V-Flecto has helped me in solving the challenging demands of both technology and performance for high-power tractors. This tyre is ideal for soil tillage and haulage applications thanks to reduced soil compaction and self-cleaning properties. Thanks

to the VF technology, I'm able to carry heavy loads with a lower inflating pressure, reaching high speeds, compared with standard and IF tyres,” explains Luca.

The tyres also feature the Narrow Rim Option that allows him to mount standard rims on the tyre. Luca feels that another important aspect regards the design of this tyre. “The optimised geometry enhances driving comfort both in the fields and on the road and reduces fuel consumption as well. It's a product which guarantees at least an extra 10% added to the life cycle compared with its standard equivalent, guaranteeing a marked reduction in operating and maintenance costs.

“Having good quality tyres means a lot to us,” says Luca. “It means a saving in fuel and operating times, as well as reducing costs over the years.”



BKT's Agrimax V-Flecto, is suited for use with high horsepower tractors and has been specifically designed for soil tillage and haulage applications.

harvesters, says Denis. "If the standard tyre at 1.6bar can safely support a given weight, then the Improved Flexion (IF) and VF will support 20% and 40% more, respectively. Alternatively, these IF and VF tyres could run at 20% or 40% reduced pressures for the same weight."

According to Denis, the market trend has become more and more focused on VF tyres. "These assure the maximum soil protection thanks to their technical characteristics. In the past few decades there's been progressive compaction of farming soils: the losses attributed to this are estimated to amount to about 20% of the total harvest. Limiting soil compaction is an urgent practice we have to work on to help maximise the yield per hectare."

To target this, Denis explains that the Agrimax V-Flecto shows an optimised footprint and a 10% larger tread profile compared with a standard tyre of the same size. "This leads to a notable decrease in soil compaction, resulting in major overall efficiency in terms of both farming operations and business

profits, helping to assure good yields in the following season."

The Agrimax V-Flecto has been developed for the purpose of meeting the requirement of maximising load capacity. "Ordinary VF tyres carry 40% heavier loads compared with a standard tyre of the same size and same inflation pressure. However, the VF tyre normally requires a wider rim. In order to provide users the opportunity to fit VF technology tyres without changing the original rim, the narrow rim option (NRO) tyre was introduced. A NRO marked VF tyre is also able to sustain 40% more weight compared with a standard tyre of the same size with same inflation pressure and on the same rim."

This tyre also differentiates from standard tyres because it has a long product life cycle giving a more optimised return on investments, says Denis. "Compared with an equivalent standard tyre, it ensures longer life, resulting in less overall operating costs without compromising performance, strength and long wear over the time."

The Agrimax V-Flecto should

provide comfortable driving conditions, he explains. "This is becoming a more and more essential element for today's farmers. That's why it has been designed with optimised geometrical features, aimed at reducing operator's fatigue, vibrations and lower noise levels in the cabin."

Trailer technology

The VF technology has also been introduced on trailer flotation tyres (V-Flexa) to grant the maximum soil protection during the harvesting season, says Denis. "The V-Flexa is a tyre specifically designed for agricultural trailers and is steel belted to increase the tyre resistance against impacts and punctures.

"BKT developed the VF tyres by looking closely at the impact of tyres on soil using phenolic sponges. This system gives us the possibility to easily study through a 3D model, and precisely measure the impact of the tyres on soil compaction."

Besides reduced soil compaction, there are also applications where the most important job for the tyres is the load capacity, he explains. "Here the role of the tyre becomes fundamental. In these instances, using a narrow size row crop tyre like the Agrimax Spargo, fitted on self-propelled or high clearance sprayers can be very beneficial. This tyre is specifically designed for row crop application; the strong casing and an increased number of lugs ensure better stability both in field and on the road."

The development of the VF tyres required the introduction of new technologies and materials, which carried its own challenges, says Denis. "The most critical difficulty to overcome was the overheating of the sidewall and the construction of the bead. The sidewall is continuously subjected to elongation and compression that can cause overheating, consequently resulting in cracking and separation on the sidewall area.



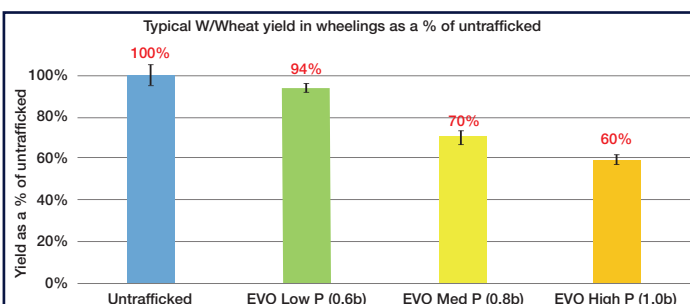
Ordinary VF tyres carry 40% heavier loads compared with a standard tyre of the same size and same inflation pressure, says Denis Piccolo.

This difficulty was solved by introducing polyester cords and special compounds for the casing plies.

"In addition, the special polyester casing enables the tyre to rapidly regain its correct shape even after longer standstills," he explains.

The bead shape and material used have also been assessed to assure good clamping on the rim at low pressures. "This is something that is required during soil preparation, or when there are heavy loads. It's also useful when there are lateral forces acting on the tyres during road rolling with the narrow Row Crop tyres."

Tyre choice will therefore come down to the task being undertaken, says Denis. "The larger VF tyres are best for soil preparation, but for spreading activities the narrow tyres are more suitable as they help to reduce root damage." ■



Reducing tyre pressure has shown to minimise yield loss in tractor wheel lines.

Innovation Insight

CPM would like to thank BKT for kindly sponsoring this article, and for providing privileged access to staff and material used to help put the article together.





Filling diesel's shoes

Alternative fuels

Diesel is an integral aspect of modern agriculture, but despite its enduring efficiency and affordability it will be phased out, but what will replace it? CPM explores the intricacies of alternative fuels and what could possibly be filling diesel's shoes.

By Melanie Jenkins

There'll come a time when UK agriculture no longer has access to red diesel but although this might seem like reason enough to explore alternative fuel options, the bigger picture includes looking at the long-term future of the industry and planet as the world strives to limit the impacts of climate change.

The past few months have seen some controversial decisions by government, namely the authorisation of the Rosebank oilfield — with the potential to add 200m tonnes of CO₂ to the atmosphere — and the delaying of the ban on the production of new petrol vehicles. In addition, the attempts to slacken the environmental restrictions on

building regulations also raises questions surrounding the government's stance on climate change and reducing greenhouse gas (GHG) emissions.

Although none of the decisions could be said to directly affect agriculture or provide any certainty in government legislative direction, there's still tremendous pressure on the industry to cut emissions and operate in a more environmentally friendly way. And while it might seem like petrol and diesel vehicles will be around longer than expected, the net zero mandate remains in place.

Action needed now

According to Dr Nick McCarthy of Cenex, the time to start taking action is now. But, in agriculture this might seem like a bit of a non-starter for many. Diesel is still the most widely used and indeed, the most cost-efficient way to operate farm machinery. But the manufacturers haven't been sitting on their laurels just churning out new diesel machines. Instead, across the industry, a raft of innovations and developments are seeking to provide greener options for agricultural production.

"The direction of travel is certain," says Nick. "Net zero is coming and although agriculture is still able to use red diesel,

“You're a steward of your organisation, so it's about taking steps to safeguard it.”

there'll be a point where legislation on non-road mobile machinery (NRMM) will result in the red diesel duty rebate being phased out and diesel engines will stop being produced.”

However, this is something the NFU is advocating against until there's definite support from government for alternative solutions, says

Dr Jonathan Scurlock, the NFU's chief adviser on renewable energy and climate change. “It should be quid pro quo because there'd be a tremendous cost to businesses if there's no access to red diesel. The industry has to be presented with alternatives so that we can see the way out of using red diesel in the long term.”

As a whole, agriculture is responsible for approximately 18% of global GHG emissions, says Nick. “Around 2% is from farm machinery and the rest is from crop and livestock production. But it's easier to remove that 2% by using a fuel that isn't fossil based than it is to cut the remaining 16%.”

But he feels the transition has already been left very late. “There's been a real push from the scientific community since the start of the decade to cut emissions, but we're still waiting for this to come through in policies and law and it looks increasingly likely that we'll surpass limiting global warming to 1.5°C.” ▶



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At the start of October, Claas announced that all its agricultural machinery that meets the latest emissions standards (Stage V) has been approved for operation with HVOs.

► But he believes that waiting to be forced to take action is more detrimental than taking steps now. “In terms of the impact of climate change, as an individual it’ll cost you and your business more in the long-term if you do nothing now, instead of taking steps to mitigate the effects immediately. The faster we act, the more the negative consequences will be reduced.

“However, we can’t do everything without diesel just yet,” he admits. “Some agricultural processes have to use diesel, especially when larger machinery is involved. But there’s technology available now that offers a big reduction in GHG emissions for many farm operations and adopting these is better than waiting 25 years for a completely net zero technology to be available.”

There are a number of drop in or replacement fuels already available, one of which is hydrotreated vegetable oil (HVO). HVO is one of the most accessible alternative fuels to use in the short-term because it can usually be put into diesel internal combustion engines (ICEs) without alteration, says Nick.

This is generally made from used cooking oil and recovered fat feedstocks, says Jonathan. “There’s not a huge amount available on the market at the moment, but it’s basically identical to diesel.”

However, HVO is only a justifiable alternative if it comes from a sustainable source, explains Nick. “Its source will dictate

whether it reduces your carbon footprint or not.”

Certifying the origin of the feedstock which HVO comes from is a way to determine its sustainable credentials, but if it’s sourced from palm oil or land which has recently been deforested, it won’t meet these, explains Jonathan.

Cost premium

Another issue with HVO is that it comes at a cost premium to diesel, adds Nick. “And although it’s a drop-in fuel that can be used in almost all new machinery, it’s worth double-checking with older equipment and with your insurance and warranties before putting it in the tank. However, storage equipment won’t require changing from diesel set ups,” he adds.

At the start of October, Claas announced that all its agricultural machinery that meets the latest emissions standards (Stage V) has been approved for operation with HVOs.

According to Dr Martin von Hoyningen-Huene, of BU Tractor, there are no real alternatives to the combustion engine for high-performance agricultural machines in the foreseeable future. “So we require solutions that reduce fossil fuel emissions associated with this type of drive, yet don’t have significant adverse effects on manufacturing costs, consumption, weight and durability. HVOs are an ideal choice because they already exist, and their

positive environmental impacts are immediately apparent.”

In March of this year, AGCO announced the launch of its Core75 engine which is capable of running on recycled and potentially green fuels. The engine is a feature of Fendt’s 700 Vario Gen 7 tractor and is compatible with HVOs.

In addition, the engine has been designed to be compatible with future fuels such as hydrogen, ethanol, methanol, biogas and could potentially operate as an electric hybrid with further development.

Fatty Acid Methyl Ester (FAME) biodiesel blends is an alternative fuel which has been available for some time, but if it’s being stored on site it requires a different set up to diesel, says Nick. “If you source this sustainably then it will reduce your CO₂ emissions, but you’ll have to factor in changing seals and filters more often and ensure that no moisture gets into stores or tanks. It’s important to think about the extra steps that might be required when switching to an alternative fuel.”

Deutz’s ICEs have been able to run from 100% canola oil since 2006 and in 2018, Valtra made the decision to fill all of its new tractors with biodiesel which, according to the firm, produces up to 90% less GHG emissions compared with fossil fuel diesel.

John Deere engines are able to run off different levels of biodiesels depending on the engine, but HVO can be readily used. And the firm also has aspirations to produce further working low and near zero carbon power solutions by 2026. As part of these aims it’ll have a concept 9-litre ethanol compatible engine on display at Agritechnica in November.

According to Jonathan, biomethane is a great alternative fuel that is being used more frequently in heavy goods fleet vehicles. “It’s a relatively mature technology and firms such as John Lewis have taken to using it.”

Using biomethane present significant CO₂ reductions, says Nick. “New Holland, which commercially launched its T6 100% methane powered tractor in 2022, claims that

biomethane is a like-for-like replacement for diesel. And if you can get fuel grade biomethane to your site, then it’s a viable option as it can reduce overall emissions by 80% when using farm supplied biomethane.”

One consideration with biomethane is having a regular supply able to meet the demands of the tractor, says Nick. “When you want more diesel, you call for a new delivery, but increasing biomethane output isn’t as simple yet because it requires a guaranteed input. If you’re producing your own, do you have a contingency plan if you ►



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New Holland's T6 100% methane powered tractor was commercially launched in 2022.

► lose enough cows to impact your supply? This could mean falling back on fossil methane which isn't environmentally friendly."

Another issue Nick flags with biomethane is that the system has to be leak free in order for it to be a sustainable solution. "If there's a leak and you accidentally emit CO₂ and methane in the production process, then you lose all of the environmental benefits of using this fuel."

Jonathan concurs that there won't be any GHG savings if there are fugitive emissions associated with the handling of the gas but is interested to see the results of New Holland's partnership with Bennamann, which involves capturing methane from slurry units and converting it to good quality, compressed biomethane on site.

Hydrogen is a fuel source that has a lot of conversation revolving around its potential, but utilising it in a fuel cell involves a different power train and research is still on-going to produce an effective system, says Nick.

However, JCB has managed to alter its ICE telehandlers and plant loaders to run off hydrogen without having to develop an entirely new fuel cell. "JCB's hydrogen combustion engine is a significant achievement despite being largely the same as its ICE counterpart," he explains. "The firm can use its existing production line because 75% of the engineering for a diesel-burning engine and a hydrogen-burning engine is the same. Although this is more targeted at construction customers at the moment, farmers could well use the telehandlers."

JCB's project, which cost £100m and involved a team of 100 engineers, went from conception to commercial reality in just two years. Although the idea of fuel cells was explored, the firm determined these to be too expensive, complex and not robust enough for construction or agricultural use yet, hence the hydrogen combustion engine was developed.

According to JCB's owner, Lord Bamford, the unique combustion properties of hydrogen enable the hydrogen engine to deliver the same power, the same torque, and the same efficiency that already powers JCB machines. "By leveraging diesel engine technology and components, they do not require rare earth elements and critically, combustion technology is already well proven on construction and agricultural equipment."

According to Jonathan, JCB has achieved something commendable, but he feels the safety case has to be made. "This technology really works and might become available in larger machinery, but because of hydrogen's combustibility, the safety element must be tackled."

Hydrogen drawback

Although hydrogen could pose a solution to diesel in the long-run, one issue with it at present is that not all hydrogen is produced in an environmentally friendly way. "There are various types of hydrogen available, but the main three are grey, blue and green," explains Nick. "Grey is made from fossil fuels with the residual CO₂ released into the atmosphere — this isn't a green option. Most fertiliser we use has been produced using this method.

"Blue hydrogen involves splitting methane into hydrogen and CO₂ with the latter being sequestered. However, this is very rare and difficult to get hold of. Green hydrogen is a renewable energy that is produced through electrolysis, whereby an electric current is used to separate hydrogen and oxygen in water."

One of the drawbacks with hydrogen is how expensive green hydrogen is. "This is at a premium and is likely to be expensive to run at present, but post 2030 it'll probably be more viable," he adds.

Fendt is one of the firms that has been researching hydrogen fuel cells, according

to the company's Ed Dennet. "The use of hydrogen is just one of many alternatives we are researching to help farmers reduce their carbon footprint. The H2Agrar project is exploring the potential of a hydrogen infrastructure in agriculture. The further development of H2 tractors also depends strongly on an infrastructure that has yet to be built, technical progress, and also the availability and price development of green hydrogen."

Deutz has also done work on a hydrogen engine, in partnership with AGCO. Due to be commercially launched in 2024, its six-cylinder TCG 7.8 H2 engine meets all of the eligibility criteria set by the EU for zero CO₂ emission engines.

Another fuel source being explored is ammonia, but like hydrogen it also requires a different power train to diesel, says Nick.

Ammonia, as a concentrated fuel, has an energy density three times that of compressed hydrogen and can be more viably stored as it doesn't have to be kept at low temperatures or high compression, explains Jonathan. "It's still a toxic gas, so caution has to be taken to avoid fugitive emissions and Defra already has concerns with ammonia related to fertiliser spreading."

But ammonia could be the solution to safely transporting green hydrogen, he says. "The ammonia industry already transports it around the world in bulk carriers, but this could be further employed as an energy storage medium to move it internationally in a safe capacity."

Battery electric vehicles (BEVs) are a good alternative, except for their power density and work rate, says Jonathan. "We're seeing a lot of smaller tractors and



In March of this year, AGCO announced the launch of its Core75 engine which is capable of running on recycled and potentially green fuels.

prototypes being produced, as well as telehandlers becoming available. If farms have solar arrays or renewable sources, BEVs can be charged using this on-site electricity."

Smaller tractors can probably be trickle charged on site but a large electric vehicle will require a sufficient charging point on site to charge the machine at night so that it can be used during the day, says Nick. "And power capacity will depend on how close you're located to the grid, and this can be very expensive."

In addition, intensive charging will require bigger cables and charging equipment, he adds. "Electrification means changing your habits to ensure that the electric vehicle is charged up ready for use."

However, there are limitations with the duty cycles of larger machines, says Jonathan. "No manufacturer has yet solved the issue whereby harder working machines can't store enough power without battery swapping.

"Currently, electric power seems more suited to smaller machinery. But interestingly, Ford has recently launched its F-150 Lightning pick-up truck which provides 10kW of power and has a 100kWh battery that electrical appliances can be plugged

into in the field without depleting the car battery – it's basically a workshop on wheels for farmers."

A further consideration with electric vehicles is that batteries do reduce in their output over time, says Nick. "But manufacturers predict this and are building batteries that will be able to meet their original output seven-10 years down the line. And even with ICE vehicles, we understand that these will perform very differently when they're 15-40-years old compared with when they're new.

"Just check when you're buying an electric vehicle that it'll have the range to do the duty cycle that you want it to — not just straight off the forecourt, but 15 years down the line," advises Nick.

Disposal concern

Another concern related to batteries is the disposal of and waste created by them. "The disposal and recycling of batteries is an area that is undergoing research. And we can't continue to supply all the batteries that are likely to be required without recycling them because there just isn't enough of the base materials available."

Addressing the concerns surrounding the carbon emissions of battery manufacturing,



JCB has altered its internal combustion engine telehandlers and plant loaders to run off hydrogen without having to develop an entirely new fuel cell.

Nick points out that with an electric car, once it's been driven 35,000 miles, it'll have paid off its carbon debt.

Battery systems can also be very expensive and are unlikely to reduce in price much in the long run, he adds. "Small vehicles with small batteries may be cost-effective compared with diesel over the vehicle's life (if worked hard enough). ▶

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Alternative fuels



Steyr announced the launch of its hybrid CVT tractor in September. The tractor's E-CVT function means that this tractor is powered purely by hybrid-electric at up to 75kW and 1100rpm.

▶ The larger the battery gets, the harder it becomes to justify the price over the vehicle's life."

At present, a number of manufacturers have already produced commercially available small electric tractors, including Fendt which is launching its e100 Vario at Agritechnica. Currently, the overall package of size and weight of the energy storage unit and the available power only fits a machine between 50kW and 100kW, says Ed. "Research and development on batteries is continuing. It's therefore conceivable that in the future batteries with less weight and size will achieve a higher power density and longer range."

Merlo and Faresin have both produced fully electric telehandlers that are already available for use on farm. Merlo's eWorker has the capacity to work for eight hours without recharging and can lift to 4.8m, with a maximum reach of 2.6m and has a total

load capacity of 2.5t. Faresin's Full Electric range was launched in 2018 and has four-wheel steering and all-wheel drive. It has a small and large range, with total load capacity ranging from 2.6-4.5t and lifting height from 5.9-16.4, while the small range has a 24kWh battery capacity and the large a 45kWh one.

Hybrid steyr

Taking a different approach, Steyr announced the launch of its hybrid CVT tractor in September. The hydro mechanical CVT drive to the rear axle and the hybrid module on the front axle means that although this tractor is based on the 180hp 6175 Impuls CVT platform, it has the power output of the larger model, which produces 260hp. The E-CVT function means that this tractor is powered purely by hybrid-electric at up to 75kW and 1100rpm.

Last year, John Deere launched

eAutoPowr, its first continuously variable transmission with an electro-mechanical power split. The transmission allows for up to 100kW of electrical power for external consumption. Along with Joskin, the firm has developed a slurry tanker with two electric drive axles. The eight-wheel drive system allows for a more efficient transmission of tractive power.

Because no single alternative fuel is being touted as the 'answer' to diesel, one of the issues for farmers is how many times they change direction before a permanent one is fixed. Nick admits that this'll be part of the transition process and that tractors are often changed on a regular basis, however, fuel suppliers also have to change their infrastructure. "There's a wider societal issue at stake based on the direction alternative fuels take.

"In my opinion, I think we have to change from diesel to another fuel now — which will likely be HVO. This'll probably be the case



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until 2035 and then we'll possibly end up having to change again to something with lower emissions, which could be hydrogen."

It might appear there's no set direction in which fuel to adopt but Nick is in favour of multiple fuels being researched. "Anything that will reduce air pollution and contribute less to global warming now is a favourable alternative to diesel."

But before investing in a new fuel source, he flags that it's vital to understand the energy vector that's put in place is actually from a green source. "We're fortunate in this country that a lot of energy put into the grid is from a renewable source, but you still have to check."

Further considerations when adopting an alternative fuel is to train staff in using and storing them correctly, creating appropriate risk assessments, having conversations with insurance companies and involving local health and safety executives, advises Nick.

A significant issue with a lot of alternative fuels is the ability to refuel and diesel, FAME and HVO are still the most energy dense options. "The regularity of refuelling or recharging a vehicle will depend on numerous factors including how energy intensive an operation is, soil and weather conditions and crop type.

"Running out of fuel or charge in the field is a big issue and battery swapping in remote locations isn't yet viable. Neither can you hook up to the grid in each field, so you either have to get it delivered to the site or have another vehicle to tow the one which has run out of fuel. This will be an issue that will require adaption to overcome."

Developing new technology is a slow and iterative process, says Nick. "There's a lot



Last year, John Deere launched eAutoPower, its first continuously variable transmission with an electro-mechanical power split.

involved between the inception of an idea and looping the production process until a product is ready for commercial development. This is the case with hydrogen fuel cells — there are prototypes out there, but they're a long way off becoming a commercial product."

But as with everything, more money and investment is required to progress this area faster, says Nick. "Money rules everything. The same way that if manufacturers of equipment and fuel could make more profit they'd invest more, if farmers could significantly reduce their operating costs, they'd make changes right away. Our current system is built around fossil fuels, and we can't adopt a technology that will bankrupt us, so it's about looking at cost-effective solutions."

One way to make adopting new technologies more affordable is to apply for funding, but this is limited and competitive. "If you want to go down this route, I'd recommend finding a technology partner and involving a company like Cenex, as well

as approaching RASE or the NFU for advice. If you can get a working prototype on your farm, this is a huge plus toward winning funding."

The NFU would like to see more support from the government so that this emerging technology can be demonstrated more, says Jonathan. "We really have to see these funded so that they can go beyond the research and prototype phase. Farmers must be able to see low carbon agricultural machinery in action, they have to be able to drive it and try it out before they're going to invest."

Alternative technologies are coming through, but they have to be cost-competitive compared with existing options, says Nick. "Although it'll still be some time before true net zero tractors with a consistent power supply are available it's more important to understand that just because you don't feel it affect you now, it will in future. You're a steward of your organisation, so it's about taking steps to safeguard it and steer it for whoever will be operating it in 20- or 50-years' time." ■

A New Holland advertisement featuring a combine harvester and a truck in a field at sunset. The combine harvester is on the left, and the truck is on the right. The sky is a mix of orange, purple, and blue. The New Holland logo is in the bottom right corner.

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Forage on

Foragers

The demand for forage harvesters isn't slowing down and as improving productivity becomes more important, the demand has risen for more high-tech machines. *CPM* takes a look at a number of different options on the market.

By Melanie Jenkins

Whether forage harvesters are being used for silage production or for anaerobic digesters, the demands on them haven't decreased. Below are some of the latest options available.

Fendt

First introduced in 2013, Fendt's Katana is currently available as either a 650 or 850 model, both Gen3. The 650 has a V8 straight six engine, and the 850 has a six-cylinder 18.3-litre Liebherr engine producing 847hp.

One of the biggest points about these machines is their six feed rollers which are designed to provide good, consistent chop quality, explains Fendt's Dan Woodward. "The metal detector spans the 930mm from the drum, so that nothing will get past it."

Drums are available with 20, 28 or 40 knives — with the latter aimed at the biogas

market — providing a chopping range of 2.6mm up to 42.3mm.

"The Gen3 models have a greatly improved crop flow compared with previous models," says Dan. "Everything from the pendulum frame backwards has been changed."

The pendulum frame itself now has more rotation, able to rotate 14° up and down the field. In addition, the feed rollers have been changed slightly to reduce maintenance, and although the drum is the same, the rollers are easier to take off. "It used to take 20 minutes and now it only takes five," he says.

To provide a more consistent cut and to reduce wear, the knife sharpening system now adjusts as it goes across the blades, rather than at either end, explains Dan. "Instead of winding down at either end, which resulted in the end knives being sharpened more than the central ones, the stone is adjusted all the way across."

Fendt has gone away from using a hydraulically folding corn cracker and Gen3 models now come in two variants with 300mm rollers. The first variant is the R, where the cracker gears are intermeshed with one another to produce a straight but, and the second is the RS which is a helical shape and will shred crops.

The spout is now bigger and longer with better extension, so it can reach 6.8m, says Dan. "With increased height and a flap angle — so it can flow straight into the trailer at 90° — there's full control and it can be set to remain at the centre of the trailer."

Both machines come with several fuel tank variants, including a 1430-litre diesel only option, with a 190-litre AdBlue at the rear of the chassis. A further option consists

of a 1215-litre diesel tank and a 215-litre tank for an additive.

For working on steep banks or uneven fields, the forager is equipped with a balanced grip system which transfers torque to the wheels that require it, says Dan. "If the upper wheels start to slip, power will be reduced to those and move it to the lowers ones, helping to save the sward and reduce compaction."

Krone

Krone's range of self-propelled foragers aim to deliver high efficiency and chop quality in all forage crop types, with operator comfort and handling key to machine designs across eight power ratings, according to Ben Davies of Krone UK.

"Starting with engine output, Krone's BiG X is available from 480hp to 630hp with a 63cm width chopping drum, while the higher horsepower models, from 680hp to 1180hp, features a wider 80cm chopping drum to maximise throughput."

The pendulum tube system, seen across the full range of BiG X foragers, allows operators to easily swap headers depending on crops being harvested, he says. "This includes grass, whole crop and maize, along with providing lateral float on uneven ground."

"For grass crops, the camless EasyFlow 300 S header has up to 58% fewer moving parts than conventional pick-up systems. This helps reduce maintenance costs and downtime, operating faster for a clean crop pick-up and increased productivity."

When it comes to cutting whole crop, Ben explains that the XDisc 620 header is designed to take in high volumes, mirroring the technology seen in Krone's range of disc mowers. "In terms of maize headers, we have the choice of either the lightweight simple technology and low input power EasyCollect available with cutting widths of 7.5m, 9.0m and 10.5m. Or there's the variable-row harvesting with rotating sickle discs XCollect available with either 7.5m or 9.0m cutting width."

Ben says crop transition into the machine is via six hydraulically driven feed rollers, which compress the crop into a uniform mat prior to it entering the drum.

Full width metal detection along with RockProtect is fitted to all machines as standard in the UK to protect the forager from damage caused by metal or stones. "The width and feed roll configuration ensures the crop is fed evenly into the drum for a uniform and consistent chop quality."

Chop length can be adjusted from the cab by altering the speed of the feed rollers, depending on dry matter content and the ▶




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Foragers



The Fendt Katana 850 is equipped with an in-line six-cylinder engine from Liebherr, with a displacement of 18 litres, it has an output of 847hp.

► requirements of the ration. The faster the crop is fed into the forager, the longer the chop length.

The drums are available with 20, 28, 36 or 40 blades, with the high blade count better

suited for customers chopping maize for biogas, requiring a much finer chop quality.

To maintain continuous and smooth crop flow, Ben explains that Krone's foragers feature a spring-loaded plate beneath the chopping drum and VariStrem- a discharge accelerator rotor.

"Compared with a standard fixed plate, the system is designed for blockage-free and smooth operation, even in varying volumes of crop. The technology allows operators to utilise the forager to its limit and use less fuel per hour," says Ben.

For maize and whole crop, the material then flows through the 30% speed differentiated 123/144 250mm or 125/150 305mm serrated tooth OptiMaxx crop conditioner for optimal digestibility. The gap between the rollers can be easily adjusted from the cab depending on the crop.



New Holland's FR650 has the largest diameter cutting cylinder on the market, which allows for high inertia and capacity.

Krone also offers a unique VariQuick system, a chain drive that moves the conditioner out of or into the crop flow in just a few minutes, for simple changeover between grass and wholecrop or maize.

"Crop throw can be controlled from the cab by adjusting a flap on the rear wall of the crop accelerator to suit the filling situation, which is referred to as StreamControl. This allows operators to adjust the throw more easily, depending on the filling situation. As the accelerator requires less power to blow a short distance, the operator can free up engine output and use it for chopping and more throughput."

To automatically adapt engine output to working harvest conditions, Krone has developed PowerSplit engine technology, says Ben. "Eco Power and X Power options for low and high output provide operators with full flexibility to optimise fuel economy.

"The transversely mounted engine allows the entire crop flow and vehicle drivetrain components, to take the engine power directly off poly V-belts, maximising overall efficiency and with a separate belt to drive the intake rollers and the header it allows them to be reversed irrespective to the chopping drum being engaged or not."

In terms of digital offering, all BiG X foragers are fitted with Krone smart telematics to provide agronomic and operational data as well as remote diagnostics for after sales support.

EasyLoad supports operators in automatically filling trailers to capacity from either side or the rear, GPS guidance, crop volume and constituent measurement are optionally available.

New Holland

New Holland's FR650 'The Beast' forage cruiser includes a number of features such a consistent chop length and quality due to having the widest feed channel on the market and a thin crop mat, says New Holland's Si n Whittingham.

"The FR650 has the largest diameter cutting cylinder on the market, which allows

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for high inertia and capacity. Drum configurations consist of 2x10, 2x12, 2x16 and 2x20 knives, with all able to have maize or grass knives fitted to allow for best cutting performance in various crops," he explains.

Auto sharpening in forward and reverse comes as standard, including with auto shearbar adjustment. It can be activated from the cab with fingertip command, providing consistent cut, saving engine power and fuel, says Siôn.

The forager has a double drive system, meaning users can independently control the header auger speed to the feedroll speed to provide greater flexibility and



Krone's Big X is available from 480hp to 630hp with a 63cm width chopping drum, while the higher horsepower models, from 680hp to

performance of feeding various crops smoothly into the cutterhead.

New Holland's MetaLoc is included, whereby an electronic metal detector feedroll will stop the feeding if an object is detected. This will stop within 300 milliseconds to protect internal components from damage.

Crop analysis is assessed using the NIR sensor (Nutrisense), he explains. "It records crop quality live, reporting details on dry matter, protein, starch, acid detergent fibre, neutral detergent fibre and ash — which allows for management of subsequent processes."

Mapping of information is done in real-time and includes information on moisture, yield or other data used for managing the farming processes, he adds.

Automation functions help to remove stress from the operator and include, PowerCruise II, which optimises capacity to the engine load and fuel consumption. Machine maximises throughput to parameters set by the operator, boosting productivity and saving fuel.

IntelliFill means that the side or rear filling of trailers is left to the software, meaning the operator doesn't have to divert attention to this.



The Fendt Katana 650 achieves a rated power of 650hp with N MTU six-cylinder in-line engine.

It's available in five models, the FR480, 550, 650, 780 and the 920 models, and has an FPT Cursor 16-litre Stage V engine.

The FR650 'The Beast' has been undertaking a demonstration tour around the country this season, says Siôn. "The feedback from the tour was very positive and customers were pleasantly surprised by how well the FR650 performed against their own machine.

"Some of the key points that impressed the customers were the chop length consistency, how well it coped with lumpy wet grass, having plenty of power and torque to deal with heavy swaths of grass.

"The longer spout was a big plus to operators as it allowed a safer gap between the forager and tractor and trailer," he adds. ■



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Väderstad and Case IH launches

Farming red

Case IH and Väderstad have joined forces to launch a host of new products aimed at progressing and improving field tasks, including autonomous options and sustainable weeding solutions. *CPM* attended a press launch in Austria to see first-hand.

By Melanie Jenkins

Envision Austria and it's hard to imagine a picture that doesn't include the Alps. But further north and at a much lower altitude, the country supports a thriving arable and horticultural sector.

This is partially why it was a great location for a joint product launch event between Väderstad and Case IH. But the country also plays host to a rather picturesque Case IH and Steyr factory in the small town of St Valentin. It was here Case set out some of its latest innovations and developments, followed by a field demonstration of one of its most exciting new products, its autonomous tractor.

Autonomous Magnum

Autonomy and sustainability are two key parts of the initiative from the team at Case IH and this has led to its autonomous Magnum. Although the tractor has been presented before at Cema 2022, this was the first time it was demonstrated working in the field.

"The demand on technology has increased a lot," according to Alesso Quatraro of Case IH. "In order to get this machine working in the field, we had to use different technologies, such as guidance and AccuTurn. The machine includes radar and a perception camera to help detect obstacles providing feedback on its surroundings."

Case IH has been working with Väderstad to help automate the full range of operations in the field. This has involved using the AFS Connect portal to upload prescription maps to manage the depth of the implement and then ISOBUS communicates this to the implement.

But this development isn't just about the tractor, adds Mattias Hovnert of Väderstad. "It will change everything that a farmer would normally do in the tractor."

Quadtrac 715

Case IH has now launched the new Quadtrac 715, boasting up to 778hp from a 16-litre FPT Cursor engine with two-stage turbo. The machine has a maximum torque of 3255Nm at a low of 1400rpm.



“The demand on technology has increased a lot.”

Although some might argue that larger tractors aren't necessarily where environmental goals are headed, the firm believes that having one machine that is capable of doing more does provide benefits, and because of its tracked system, ground impact should be reduced.

"The principle behind the development of the Quadtrac 715 is not simply more power," says Franz Josef Silber of Case IH. "Our aim was to create a machine that matches the requirements of our region's largest farms, able to operate implements at their ideal speed, at higher work rates and allowing operations to be performed at the ideal time, even in tough working conditions and to make the most of short weather windows. We also wanted to ensure soil protection via a bigger footprint and fewer passes, which also means greater efficiency and minimal trafficked land."

"The 715 has bigger, longer tracks which allows more track to be on the ground at one time, increasing power and traction while reducing compaction. The drive wheel is about 10cm larger to ensure that five tracks are permanently engaged meaning the torque is used more efficiently and this helps to maximise the lifetime of the tracks."

The bonnet can be opened electronically and provides a large access space to service points. The side panels can also be removed with one rotating push button, allowing access to air filters. "A lot of focus has been put on increasing serviceability and maintenance access," explains Franz.

Optum 340 CVXDrive

Catering for the growing market in multi-purpose, high power tractors, Case IH has launched a new 340hp flagship model for its Optum range. Along with multiple improvements, the Optum 340 CVXDrive with AFS Connect is no heavier than the existing 300 and 270 models while providing more power.

The new Optum is designed for draft and PTO applications, from tillage and seeding to mowing and transport. "The Optum 340 CVXDrive, is our new top model in this segment, to meet the requirements of large farming and agricultural contracting businesses requiring a tractor with a high power-to-weight ratio that gives it the versatility to take on a wide range of tasks," explains Case IH's Dr Solveiga Kalinauskaitė.

At the heart of the tractor is a six-cylinder, 6.7-litre Stage V FPT engine, incorporating Hi-eSCR2 emissions reduction technology. It also includes Automatic Productivity Management (APM) which optimises the CVXDrive ratio and engine speed to suit power output requirements.

The cab includes the redesigned ergonomic Multicontroller armrest, which places 95% of the most-used functions at the driver's fingertips, many of which can be operated either via the touchscreen or new integrated turn-and-press encoder dial.

Vestrum AD8

Case IH has extended the transmission choices for the 100-130hp Vestrum tractor range with the option of the ActiveDrive 8 powershift transmission in lieu of the CVXDrive continuously variable transmission (CVT), to a broader range of specification to suit user requirements.

"We saw there was an increasing demand for this format of tractor that is compact, versatile and able to undertake heavier tasks in the field," says Christel Diebolt of Case IH.

Previously available only on the 115-150hp Maxxum tractors, the ActiveDrive 8 eight-step/three-range powershift option means Vestrum customers who don't require the full capabilities of CVT now have an alternative which comes at a lower price point. Range one offers a 0-10.7km/h speed band to suit heavy draft work, while range two, with a speed bracket of 4.3-18.1km/h, should meet most work demands. For road travel, the transmission can start in range three, with a 0-40km/h speed range, a skip-shift function allows quick powershift step progression.

"By adding the ActiveDrive 8 eight-step powershift option to the Vestrum line, we are aiming to broaden its appeal by offering a greater range of specification to customers in this power segment, to meet a wider range of needs," says Christel.

"This powershift uses our double-clutch technology so there's no loss of drive or traction during speed or direction changes. It also allows the tractor to move off in the highest range, increase field speed without interrupting power to the wheels, delivering almost imperceptible gear changes and, via the Active Clutch 2 feature, come to a standstill using only the brake pedal."

Vestrum ActiveDrive 8 tractors are available with a choice of two specification packages. 'Selection' models are equipped with mechanical remote valves, an 80 or 110-litre/min hydraulic pump, three-speed PTO, front linkage options. The alternative 'Advanced' specification features additional equipment including, front linkage with Front Hitch Management, electro-hydraulic remotes, plus optional features such as Advanced Headland Management, auto guidance managed via the AFS Pro 700 Plus display, and ISOBUS options.

Whether specified with CVXDrive or ActiveDrive 8, Vestrum tractors use the same FPT NEF 4.5-litre/four-cylinder Stage V engines. Developing up to 10hp more than their rated output between 1700rpm and 1900rpm, they produce maximum torque at 1300rpm. The standard implement coupling package includes a Cat 2/3 N 5.5t rear hitch, while a 2.3t front hitch is optional, as is a 1000rpm front PTO with wet clutch.

The suspended cab options include a loader joystick with transmission control buttons. The AFS Pro 700 Plus touchscreen terminal comes with a quick-start menu and up to four camera inputs. AEF ISOBUS certification for Universal Terminal and Task Controller functionalities guarantees compatibility with AEF ISOBUS-certified implements. Optional AFS Connect telematics capability allows remote monitoring and



Autonomy and sustainability are two key parts of the initiative from the team, as Case IH and this has led to its autonomous Magnum.



Case IH has now launched the new Quadtrac 715, boasting up to 778hp from a 16-litre FPT Cursor engine with two-stage turbo.

instant data capture. Additional features including AFS AccuGuid auto guidance and AFS AccuTurn Pro automated headland turning technology are also available.

Proceed

Väderstad has been building the excitement surrounding its Proceed V seeder since the end of 2021, but now, along with introducing a whole new look to the drill, it has set a commercial availability date of late 2024.

According to Väderstad's Maria Cornelius, the Proceed represents a new category of seeding machines, where one single machine can offer the potential to maximise yield potential in a full variety of crops, including wheat, barley, oilseed rape, sugar beet, peas, maize, sunflower and many more. "The machine plants cereal seeds in singulation and the latest version has had a number of updates.

"New pre-consolidation wheels, which are hydraulically adjusted, carry the weight of the machine and also reconsolidate the ground ahead of the row units, creating the same conditions for each one," she explains. ▶

Väderstad and Case IH launches



Along with multiple improvements, the Optum 340 CVXDrive with AFS Connect is no heavier than the existing 300 and 270 models while providing more power.

► When the seeds reach the row units from the central hopper, an adapted version of Väderstad PowerShoot system takes full control of every single seed all the way down to the soil. Leaving the short seed tube, each seed is received by a stop wheel. This aims to ensure optimal seed-to-soil contact at selected depths all over the working width, says Oskar Karlsson, of Väderstad.

The newest version of the drill has an updated HD packer and the fertiliser system has also been altered so that four distributor hatches mean two sections can be controlled. In addition, there's a newly designed seed disc, which includes 192 holes, as well as updated knock-out wheels and new spiked closing wheels have been added to prevent erosion after heavy rain.

The Proceed has been designed to place the smallest of seeds at the ideal depth with millimetre precision, and Väderstad field trials have shown that Proceed can cut the wheat seed rate by half — while keeping the same yield compared with modern seed drills in the market, says Maria.

Väderstad trials of winter wheat at a seed rate of 150 seeds/m² show an increase of 102% in plant biomass, 72% in root biomass and 62% more shoots per plant, compared with a modern seed drill.

Orders will be accepted from the end of 2024, with production starting at the beginning of 2025.

E-Services TopDown and Opus

Väderstad has also introduced prescription map tillage and E-Services for its TopDown and Opus machines. This means the introduction of the iPad-based control system Väderstad E-Control, as well as the possibility to apply prescription map tillage via ISOBUS Task Control.

Starting with the model year 2024, the combination cultivator TopDown 400-700 and heavy cultivator Opus 400-700 can be equipped with gateway, sensors, and updated electronics.

"We've seen a demand from farmers to optimise the tillage operation even further," explains Wolfram Hastolz of Väderstad. "By being able to adjust the machine setting to the conditions of the field, it's possible to improve the agronomy and working results. The introduction of E-Services to TopDown and Opus is the key to this."

The introduction of E-Services on these machines allows them to use prescription maps, to control the machine setting automatically on the go using a field map. This means that individual working elements

— discs, tines, leveller and packer — can be programmed before going to the field and therefore should behave at specific spots on the field based on for example, soil type, or field characteristics. In the tractor, this prescription map is inserted into the tractor ISOBUS terminal, which then will connect to the Väderstad E-Control system to take control of the machine.

Using the iPad-based control system Väderstad E-Control, the operator will also be able to gain full control of the machine directly from the tractor cab. The driver can set the individual working depth or intensity of the discs, tines, levellers, or packer on the go. To assist the fieldwork, four pre-set buttons can be used to store different machine configurations.

As a backup, the TopDown and Opus can be switched to a manual setting and traditional control if, for example, the tractor has to be quickly changed unexpectedly.

The TopDown 400-700 and Opus 400-700 can be ordered with E-Services as an option starting from October 2023. The machines will premiere at Agritechnica in November 2023, and production will start at the beginning of 2024.

Extract V and L

Väderstad has launched a new product family of inter-row cultivators after acquiring the full product range of inter-row cultivators from the Danish company Thyregod in February of this year.

The new family of Extract inter-row cultivators will initially be sold in two models: the trailed Extract L 16-48 and the mounted Extract V 8-36. Depending on model, both Extract L and Extract V will be available with row spacing of 225mm, 250mm, 450mm, 500mm and 750mm.

"This is a new product segment for us at Väderstad, and one that we see a big potential for in the market," explains Mattias.

"With uncertainty regarding chemical regulations, there's a demand from the market for a machine that can perform mechanical weed control between plant rows. The Extract has a high main frame together with a patented solution for lifting the row units — which both avoids doing damage to the plants while also enabling inter-row cultivation for a longer period in terms of plant height."

From summer 2024, Extract inter-row cultivators will be included in the wide range of Väderstad farm machinery, fully branded in Väderstad colours. The introduction will start with Extract V 8-36, and Extract L 16-48 is planned to follow. ►



Previously available only on the 115-150hp Maxxum tractors, the ActiveDrive 8 eight-step/three-range powershift option is now available on the Vestrum.

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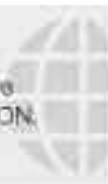


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Väderstad and Case IH launches



The new family of Extract inter-row cultivators from Väderstad will initially be sold in two models, including the Extract L 16-48.

► Tempo liquid fertiliser

The high-speed planter Väderstad Tempo L 8-24 can now be optionally equipped with a liquid fertiliser system. The system is fully integrated in the machine and works with the high-speed capacity planting of the Tempo.

“There’s been a demand from farmers to enable additional fertiliser applications with the Tempo planter,” says Väderstad’s Oskar Karlsson. “The liquid fertiliser system includes easy setting, full control, and row-by-row precision.”

The fertiliser can either be applied from a 2000-litre plastic hopper in the seed row via the row units or beside the seed row via fertiliser coulters. For ease, the system is designed to enable a wide range of different liquid fertiliser rates without changing nozzles.

For example, the machine can handle standard liquid fertiliser doses from 30 l/ha all the way up to 200 l/ha without changing nozzles on the machine, at a row spacing of 750mm and 15km/h driving speed, says Oskar.

To control the liquid fertiliser metering, flow sensors constantly monitor the output

rate. Utilising this real-time feedback of the output, the system automatically maintains the selected output rate.

Users set the desired liquid fertiliser rate in terms of l/ha. By monitoring the flow passing through the system, the machine automatically controls the output rate on the move, thereby there is no need for calibration.

The system is fully integrated into the iPad-based control system E-Control, giving the driver full control of the operation in the field. Like the seed metering, the liquid fertiliser also applies row-by-row shut off.

The new liquid fertiliser option will premiere at Agritechnica in November 2023 and will be available for Tempo L 8-24 from October 2023.

Tempo WSX

In the summer of 2024, the Väderstad Tempo F, Tempo V and Tempo L row units will be upgraded with its own-developed new electronic system WSX with brushless motors and improved cabling performance. New features also include automatic seed singulation, active hydraulic row unit

downforce as well as curve compensation.

“The new WSX system enables integration of three new features to optimise the accuracy of the Tempo planter even further,” says Oskar.

Firstly, automatic seed singulation is introduced to help ensure a precise seed singulation in the seed meter, without the need for manual setting. With sensors in each row unit, the seed singulation is continuously monitored and automatically adjusted to the optimum setting.

Secondly, active hydraulic row unit downforce will be introduced to ensure an exact planting depth, independent of the soil condition. The system will add or release row unit pressure to the ground depending on the soil conditions.

“If for example, going over a lighter field area, the pressure will decrease, and if entering an area with a harder soil condition the pressure will increase,” says Oskar. “To ensure quick response times, the system works with hydraulics. The planter can either be equipped with active hydraulic downforce with one feedback and control for the full machine width, or with individual active hydraulic downforce for each row unit.”

The active hydraulic downforce allows the driver to set an optimal row unit downforce, which is kept automatically. This ensures the planting depth precision despite changing soil conditions, as an effect of variations in soil type or soil compaction, he adds.

Additionally, this functionality can be utilised to improve the tramlining, preparing un-planted tracks for the following sprayer. Equipped with individual active hydraulic downforce for each row unit, the planter is also able to employ the system to relieve pressure and lift individual row units when making the tramlines. When doing so, the active hydraulic downforce works together with the dynamic tramlining system of the planter. This means that the tramlines will be clearly visible to the sprayer operator before the crop has emerged.

The third new feature is the introduction of curve compensation. “Gyro sensors identify when the machine is turning and adjust the metering output of each row unit to always ensure a consistent rate over the full planter width,” says Oskar.

The new features and electronic WSX system for Tempo L 8-32, Tempo V 6-12 and Tempo F 6-8 will premiere at Agritechnica in November 2023. A limited series of machines will be out in the field for the spring of 2024, with serial production starting in the summer of 2024. ■



The high-speed planter Väderstad Tempo L 8-24 can now be optionally equipped with a liquid fertiliser system.

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talkingtaties

by Andrew Wilson



Short-term profit-driven thinking from large corporations is nothing new

What a month September has been. It started here with an Indian summer that allowed us to get the wheat straw baled, cover crop drilling finished and some land work done, and ended in a stop start showery frustration.

We finally finished combining on 10 September in spring oats that replaced failed oilseed rape back in April. They yielded a very acceptable 5.4t/ha of milling quality oats (sold for £195/t) and a decent amount of straw which was eventually baled on 28 September. The spring barley cut the day before the oats did much better than it looked at 6.24t/ha, but the joy wasn't to last. Sold forward for malting at £223/t, it broke the record for high N here at 2.03%, so became feed at £168/t — then got a £2 claim for poor bushel weight (it looked fine to me!).

Winter barley tends to follow wheat on our lighter land and

was ploughed and pressed in dry conditions in early September, took the rain well and was drilled a fortnight later. Heavy land stubbles cultivated with our 6m vibroflex were rolled to encourage a chit and are in good fettle to strip till wheat as mother nature allows in the next week or so.

Potatoes are now nearly all flailed and sprayed, with just two fields left to do once maturity allows the floater level to drop a little more. Ever since the demise of diquat we have found the flail followed by a dose of Carfentrazone applied in 300 litres of water on a sunny afternoon has worked very well for us. My concern is always stolon detachment, but it isn't generally a problem. Lifting is due to start imminently, and yield digs to press look promising, we should comfortably make contract tonnage this year, all being well between now and delivery next spring.

The frustration of the moment is sugar beet. Good old British Sugar have cheekily tried to jump the negotiation gun by writing to growers directly with a mildly insulting minimum price offer of £37.50/t, which in my opinion falls significantly short of where the risks and challenge of growing the crop dictate it needs to be. In my part of the world north of the Humber, with our IPM measures of cover crops, pollinator strips and nurse crops, virus yellows are seldom a problem — indeed, over half of my 2023 crop was sown without neonicotinoid dressing with

no detriment. Neither beet moth nor cercospora seems to trouble us too much either. This means that their 'Yield Protection Product' is practically worthless — our ten-year average beet delivery is comfortably over 100%, with only three years in that time under 100%, the worst being 78% in 2020/21 — suffice to say with a maximum payout covering the gap between deliveries and 80%, and a premium to pay, I will decline.

The early delivery bonus recently announced does little to boost growers' fortunes in my opinion. Had it started in the last week of September and tailed off into October, yields would be better, the bonus would be worth more per hectare, the factories wouldn't be scrabbling for beet and hauliers would be up to capacity before November. It might, just might help Newark Factory close before April too, without necessarily costing our monopoly customer any more than late delivery does currently.

What is particularly frustrating is the cut-off date for the frost insurance of 30 January. Perhaps not a worry to the southernmost growers, but to north Norfolk and Yorkshire growers, we can see some significant frosts well into March. When the factory closed in early February, the frost insurance was aligned, but as things stand currently, the risk of frosted beet and/or sugar deterioration in clamp is solely in the court of the grower. Surely an adjustment here would deliver far more value to both parties than any increase in cost?

Short-term profit-driven

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

thinking from large corporations is nothing new. Farming is and always will be a far longer-term business than any factory process or corporate executives' viewpoint could possibly muster. Not very long ago, beet was barely 20 quid a ton. The sugar market was in the doldrums and essentially the grower base stuck with our customer, with promises of sharing benefits when the market picked up. Now is the time, British Sugar, to stick to your word and share the gold. A sugar beet factory can not operate without a beet supply. Profitable growers are loyal, positive and invest for the greater good, but our patience and tolerance will not last forever.

Anyway, I have a taty grader to grease up and a store inspection to complete, best be on wit job.

Here's to a decent back end to harvest root crops, wherever you are.

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Sprout suppression after CIPC ... industry learnings three years on

Potato storage

After the withdrawal of chlorpropham (CIPC) as a sprout suppressant, potato store management has had to adapt to using volatile products such as Biox-M (spearmint oil), ARGOS (orange oil), 1,4SIGHT (1,4-dimethylnaphthalene, DMN) and ethylene (Biofresh and Restrain). CPM takes a look.

By Heather Briggs

Although approved in other countries, such as the Netherlands since 2015, the 2022-2023 storage season is the first since DMN received authorisation for use in the UK. Its first year of use in this country has been under atypical conditions because the 2022 crop of potatoes went into store at high temperature, with high rates of respiration.

Frontier Agriculture crop production specialist Dr Reuben Morris says: "We have seen from seed potatoes that last year's conditions resulted in unusual physiology, so the 2022 crop would have been challenging for any sprout suppressant.

"We knew we would need to bring the

respiration rates down as soon as possible after putting the crop in store, so we often applied two full doses of DMN early in the season — it worked well, moving these lively crops into a state of dormancy."

The potato crops Frontier Agriculture oversee are mainly for processing — including crisping - and he notes that last year significantly more DMN was used than Biox-M or ARGOS, despite it being its first year in the UK.

Focal point

Reuben explains that work at the now closed AHDB Sutton Bridge Crop Storage Research had identified that contact sprout suppressants like spearmint oil and orange oil would need something to help them. Consequently MH (maleic hydrazide) became a focal point of sprout suppression.

However, he is of the opinion this may change, at least for some varieties, because DMN is expected to offer stronger sprout suppression especially in warmer stored crops, such as chipping and crisping.

"As we get more experienced with DMN and how we can make the most of it, the use of MH may decrease on reliably long dormant varieties.

"In addition, it is quite possible that stores using DMN, which has residual activity, will not need to apply a sprout suppressant towards the end of storage to increase shelf life."

He comments that the only downside to DMN is that it has a 30-day withholding period, and that it is governed by an MRL of 15 mg/kg.

“As we get more experienced with DMN and how we can make the most of it, the use of MH may decrease on reliably long dormant varieties.”

"Since the withdrawal of CIPC the industry has been on a learning curve and as we have had different products to adapt to in a short space of time, close adherence to the manufacturer's advice has been key to optimising performance." ▶



As we gain experience with DMN and how we can make the most of it, the use of MH may decrease on reliably long dormant varieties, says Reuben Morris.



Fogging application rising to the top in store.

► Reflecting on the last few years, he notes that the industry has had no option but to adapt. “In the first year we only had Biox-M. So, it was a case of getting on with the job, ensuring the best possible outcome, and it worked well.”

Then Argos received authorisation, and although in many aspects it seems similar, because it has to be applied at higher volume fogging has to be done more slowly to prevent issues with condensing.

Reuben adds that ethylene is applied by some store managers using an automated ethylene generator.

“As shelf life after using ethylene is short,

store managers may opt for an application of Biox-M or Argos before moving potatoes from these stores.”

The new sprout suppressants are volatile, and their application needs more attention to detail than was necessary with CIPC.

So, one of the ways Frontier Agriculture has ensured best service to their customers is investment in new electro-foggers, reveals Reuben.

“Our view is that moving away from the older machines used for fogging CIPC has optimised applications so that our customers have the best possible sprout control,” he says. ■

Acceptable results despite difficult start to storage season

Because of the warm autumnal weather in 2022, the start of the potato storage season was difficult but by Christmas results became more acceptable, reflects Jon Kemp of Mercian, the UK's largest single supplier of crisping potatoes.

There were particular difficulties with ambient stores, as it was difficult to bring the high harvest temperatures down, and even those with refrigerators were suffering, partly due to the cost of electricity.

Jon says: “Temperatures are hugely important when it comes to potato storage because a lower temperature slows the crop's respiration rate and physiological activity.”

By Christmas, storage was under control for most crops, but those that had not received an application of maleic hydrazide (MH) in the field, continued to have difficulties.

“Most irrigated crops received MH, but in

unirrigated ones application was more hit and miss.

“Without the residual effect of MH, and given the warm temperatures, sprout control was not as effective as we would have liked, and there were crops which could not be held in long-term storage and needed selling to move them out of store. This highlights the importance of applying MH in the field.”

He reveals that three years ago Mercian took the decision to take on fogging of sprout suppressants for themselves.

“The aim was to understand more about it, particularly in the light of the withdrawal of CIPC and the move to newer, less tested sprout suppressants, particularly as the oils were used reactively rather than pro-actively.”

His current product choices are DMN and Argos, and in bulk stores he uses a combination of both, while in box stores he opts for DMN because it is more mobile and therefore can get through

between the boxes to give good coverage and sprout control.

Jon adds that they have used mint oil (Biox-M) in the past. “We had to make a choice because the fogging machines we use can only be used with one oil, and as both mint and orange oil are good, the decision was taken on price rather than efficacy.”

Looking forward to this year's crop, he reports that applications of MH have gone on well, and, trusting that the weather dries up in September, that the drier weather creates a relatively average storage season ahead.

“With regard to sprout suppressants, we are now in a good place as we have a choice, and each has its own speciality of when and where to use.

“In the crisping industry, we still have some more to learn about DMN, but we are finding it to be an effective and useful product.”

DMN helps potato storage industry address loss of CIPC

The withdrawal sprout suppressant chlorpropham (CIPC) challenged the storage industry as there was no like-for-like substitute. The approval last year of DMN has eased the situation, according to Tony Hull of Superfog.

“One of the important characteristics of DMN is that it works on preventing sprouting and stopping existing sprouts,” says Tony. “It is also easier to fog with than some of the other sprout suppressants, and it does a very good job.”

Last year saw some physiologically very aged, stressed potato crops going into store, he recalls. “Nevertheless, we found that two applications of DMN held the crops until March or April, depending on the variety and store management capabilities.”

He explains that, as before, sprout suppressants, all need careful consideration by contractors and store managers before, during and after an

application. Keeping product in the store as long as possible helps and store managers should consider ambient ventilation carefully.

“However, if CO₂ levels are important then they should be monitored and controlled accordingly, if possible with short ventilation periods.”

The way boxes are stacked can make even applications more difficult to attain, and he recommends the use of slow-moving fans when applying DMN to pull the product around during and for about 45 minutes after application. After that fans can be switched off and DMN allowed to distribute naturally.

“The ideal is to blow fog into open space; in bulk stores this may mean blowing over the top of the bulk heap, and then using slow fans to recirculate. In box stores it is important to have a good sized area at point of fog entry without hitting potatoes

because if DMN liquid settles on potatoes then some skin damage can occur.”

Looking back to the time immediately after the withdrawal of CIPC, the only real option available as a sprout suppressant in the processing sector had been BioxM (mint oil), he says.

“As the MH wore off, BioxM burnt off any sprouts, but the challenge was that the sprouts wanted to regrow, so as a fogging contractor, we were very busy in May, June and July.”

The next year ARGOS (orange oil) received its registration, but despite high hopes, he found inconsistent results, some were due to variety, yet there were differences even between fields.

“Now that we have DMN, an application of MH in the field followed by an early application of DMN can act as prevention rather than cure.”

Breeding, research and development is key for sugar beet

Sugar beet

SESVanderHave is a leading player in the global sugar beet industry. It specialises in every aspect of sugar beet seed including breeding, research, production and processing of seed through to agronomy and sugar processing. CPM went to meet general manager Ian Munnery at the company's Lincolnshire office.

By John Swire

SESVanderHave was created in 2005 when the Florimond Desprez Group acquired the Sugar Beet assets of Advanta. Those originated from the merger of Belgian seed company SES Europe with the Dutch company DJ Vanderhave. Between them, the two companies had almost 200 years of experience and expertise in sugar beet production. SESVanderHave UK Ltd was incorporated in 2012 in Wellingore, Lincolnshire, less than two miles from the original Advanta breeding station at Boothby Graffoe. Then in 2020 it relocated to new larger premises at

Heath Farm the site of the former RAF Wellingore.

Ian takes up the story: "The UK team has grown considerably over the last 11 years, we now manage trials across the UK as well as wider commercial and technical group roles globally. As well as delivering trials for the UK and northern Europe for breeding, research and development, the team also provide many contract trials for our partners."

Experience shared

"Sugar beet only came into being as a crop due to the Napoleonic wars as Nelson blockaded the export of sugar cane to France and Napoleon drove the development of sugar beet as an alternative. It is a little ironic to highlight that nowadays Norfolk; Nelson's county dominates UK sugar beet production. Sugar beet therefore remains an important crop across Europe, and globally we supply our blue pelleted seed to growers in around 50 countries, planting over 1 million hectares. In context the entire UK plants around 95,000 hectares each year. Our presence in every country where sugar beet is grown means that our experience of diseases, pests and environmental issues can be shared, allowing us to anticipate threats and deliver solutions. One major difference between us and the rest of the industry is that we are a privately owned company and invest heavily in research and

development, ensuring we keep ahead of the curve when it comes to research and innovation; seed production is a case in point.

"Sugar beet seed production for the UK is largely conducted in south west France and north east Italy; climate change is starting to change this so we may have to modify our way of thinking. For example in the UK we hit 43°C in the shade last year, in France it was a lot hotter. So, we need to consider when you lay a delicate little sugar beet seed in a swathe to dry and blast it with such temperatures, it risks cooking it; damaging the seed and reducing our seed crop yields or quality. ▶



Ian Munnery, general manager at SESVanderHave with the mobile tare house.



Sugar beet seed for the UK is mainly grown in south western France.

Photo courtesy: SESVanderHave.

► Similarly, seed production this year in Italy was affected by severe flooding that many of us saw on the news; we were lucky it didn't affect us too badly, but it has impacted some. It was not just that flooding washed away some seed crops, a greater threat was the impact on flowering of the male and the female plants, these need to be matched up (nicked), if not you risk reducing seed yields and potentially contamination from other beet pollen. Collectively we need to think strategically when it comes to seed production. Displacement of seed supply and volatile markets following the war in Ukraine make for a challenging supply chain for the seed industry.

"For this reason we also need to be thinking about producing seed in the UK again, not just to mitigate climate risk and ensure security of supply, but also because the Precision Breeding may

enable production and use of precision bred seeds long before the rest of Europe, both for domestic and export markets."

There are other mounting problems for the British sugar beet industry at the moment; the industry is under threat from foreign imports, increased costs and as a minor crop it lacks the scale of investment or government support as we see in other markets, suggests Ian.

Crop diversity

"However, sugar beet remains critical to crop diversity in the UK. Despite advances in genetics that have delivered yield increases of 1.5% year on year for the last 20 years, we are still fighting for the security of British sugar production and battling pests, weeds and diseases by breeding varieties for the unique maritime climate of the UK.

"Sugar beet is a good news story compared to cane", says Ian. "It uses around five times less water than cane, requires fewer food miles and is important to maintain rotations; so it has excellent carbon footprint and sustainability credentials. Unfortunately, this has not stopped the threat of competition from cane producing nations which is causing investment in the sector to shrink in the UK.

"Genetics and plant breeding can offer solutions to further improve the profitability of the crop. By breeding varieties that can reduce the reliance on chemistry, nitrogen and energy use for processing, whilst increasing yields, we can help mitigate

the threat that imports pose. More robust varieties are the answer to the problem, but breeders need the security that the UK market can be sustainable in order to invest and deliver a decent return on investment. After all it takes us 10 years to breed a variety and three years to produce the seed — so we're very much looking at the long term.

"Further efforts are also being made to increase support for UK sugar beet production and it is hoped that by advocating the importance of sugar beet to crop diversity and the economy, that a sustainable trade in British sugar can be maintained."

Breeding research and development is key to maintaining the competitiveness British sugar industry as an important fixture in British agriculture and SESVanderHave is playing a key part in this process. "We are now managing around 30,000 trial plots on around 30 hectares across the UK, across Europe we have around 150,000 trial plots," says Ian. "Our UK plots are drilled with a precision Monosem drill and harvested with the only mobile tare house operating in the UK which gives considerable flexibility and speed to wash, weigh and produce brei instantly.

"The harvester is basically a mobile tare house that has something of Trigger's broom about it, as it is constantly being updated and improved. We have a number of them across Europe. Three rows of beet are topped at the front of the machine from where it goes through a set ►

Yellowing viruses breakthrough

Since the discontinuation of neonicotinoid seed treatment, the European sugar beet industry has faced significant challenges. Aphid transmitting yellowing viruses have emerged as a major threat, causing substantial yield losses up to 50% and endangering the economic viability of sugar beet cultivation. As naturally occurring resistance traits are absent, efficient control of these viruses remains a pressing concern.

A promising breakthrough has been achieved through a collaborative effort between IfZ (Institute of Sugar Beet Research, Germany) and SESVanderHave. Research has demonstrated that susceptibility factors for yellowing viruses in sugar beet can be effectively switched off to generate virus resistance. The work provides the basis for specifically identifying natural variation in the sugar beet gene pool and making it usable for cultivation in a timely manner.

Both SESVanderHave and IfZ hold no patent on the identified gene and are committed to share their findings with the entire breeding and scientific community. The work will be funded by the German Ministry of Agriculture (BMEL)

Hendrik Tschöep, director of breeding at SESVanderHave says: "This discovery offers great potential for sugar beet breeding programmes across the globe. As an innovative sugar beet breeder, SESVanderHave, continues to invest significantly in researching this important subject and remains committed to further developments through continued investment."

Virus yellows is a complex of three viruses; beet mild yellowing virus (BMV) beet chlorosis virus (BChV) and beet yellows virus (BYV). These viruses are transmitted when aphids carrying the viruses feed on the sugar beet. The green peach

aphid *Myzus Persicae*, is the main vector, infection of sugar beet plants with the yellowing viruses cause chlorosis of the leaves, a condition where the leaves turn yellow due to disruptions in essential metabolic processes and the transport of assimilates. The presence of virus yellows alters the metabolic activities within the plants, causing increased levels of amino acids, nitrogen, sodium, and potassium in the roots. This in turn has a negative impact on the sugar extractability during processing. Moreover, the yellowed leaves become more vulnerable to secondary fungal attacks, which can further damage the leaves and aggravate yield loss. When a crop is infected with virus yellows the grower can experience substantial yield losses of up to 50% or even more when the crop is affected by other diseases like cercospora leaf spot.

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Maximise sugar beet yields by checking harvester set-up

Andrew Dear, head of technical support - agriculture

With the 2023/24 harvest in full swing, British Sugar says that roots that are over crowned could be costing growers over £40/ha in lost yield. They advise that growers and contractors need to check their topping standards.

Early-season harvesting is often tricky as many sugar beet crops are yet to fully reach maturity, having big canopies and inconsistent root sizes. The sweltering weather in early September added another complication, and made ground conditions challenging.

However, as the sugar beet industry enters the main campaign, British Sugar believes crop recovery can be improved.

Feedback from beet intake at the Bury St. Edmunds factory is that a high proportion of over-crowned crops has been received. The site also reported lorry loads with large amounts of green material from late-season weed flushes, although this may only be a transient issue.

"We have seen more over-crowned beet than we would like on the flat pad at Bury St. Edmunds," says Andrew Dear, head of technical support at British Sugar. "We revised our crowning standards 10 years ago to allow for more crown on the sugar beet and to increase the amount of crop recovered; producing higher yields for growers and more beet for us to process.

"Last season, we asked for more crown removal after the frosts growers experienced in the winter; removing the frost-damaged part of the beet which we could not process and could have led to rejections if left on.

"This campaign, the crowning standards revert to normal," advises Andrew. "The optimum is for all leaf material to be removed and the root kept fully intact. This is best illustrated by covering the crown scar on the beet with a two-pound coin."

Trials conducted by the British Beet Research Organisation (BBRO) revealed that for every 5% of over-crowned roots, 1t/ha of yield is lost, equating to £40/ha at the current contract price. The BBRO also discovered that the more prominent scar from over-crowning can triple sugar losses in store, seriously impacting the adjusted tonnage when the grower comes to deliver the stored beet.

"We are fortunate to have highly skilled sugar beet harvester operators," Andrew adds. "I would encourage growers to engage with their contractors to ensure they recover as much of their crop as possible, maximising their yield and returns."



Andrew joined British Sugar in 1996, based in the trials team before becoming an area manager supporting growers. He moved into agriculture operations and business manager roles before becoming Head of Agriculture at Bury St Edmunds. Today, Andrew leads the Technical Support Team. He is also on the British Beet Research Organisation Stakeholder Committee.



Ian Munnery says SESVanderHave manages around 30,000 trial plots on 30ha across Europe. Photo: SESVanderHave.

► of rotating 'ladies fingers' which corkscrews the beets out of the ground. It then comes up the elevator where it is weighed to get a dirty weight, before it is washed with a high pressure washer to clean off all the dirt. It is then put on the table where any stones are picked out to give us a clean weight; wet Lincolnshire limestone looks just like sliced beet so it is still a manual job for our trials team. How the soil sticks to the root is an important factor in varietal choice and why the UK has some of the lowest dirt tares in Europe. It then goes through a set of spinning saws, which turns the beet into pulp which is then put into trays and instantly frozen.

"In recent years we have incorporated a near infrared spectroscopy (nirs) unit on the harvester," says Ian. "This gives us the sugar content of each sample as we harvest. All the data is then beamed straight back to the lab. The harvester is fitted with GPS and is self steer, so the harvester does not stop but more importantly greatly improves trial accuracy with all operations operated on GPS. On a good day we can harvest and analyse 700 plots. It is essentially a numbers game to get sufficient data from a range of soil types and locations to evaluate parent lines and commercial hybrids. It is time critical, because in September/October we need to be planting the seed crops and

make selection decisions about the best varieties to sow in the coming years. To make good business decisions we need good data from our trials; so we use 2023 harvest data to make decisions for planting in spring 2024."

Next challenge

"Whilst this may sound like an obvious strategy and investment, it is frustrating to know that whilst cereals and oilseeds growers have benefited from combine yield maps and NIRS onboard for many years, sugar beet growers and harvesters still lack this capacity," says Ian. "Mapping yield at farm level against inputs, varieties and both biotic and abiotic threats at scale will be the next big challenge and opportunity given the limitation and costs of sugar beet trialling.

"The addition of drones for plant counts and other analyses mean we are keeping our growers and processors at the forefront of the UK market. It also allows us to benchmark our trials' performance with actual commercial performance from our current portfolio of varieties and technologies as well as a strong pipeline of new genetics to increase resilience for UK growers. We test our varieties under commercial conditions across the beet growing area, not just breed for success in trials." ■

If you have any questions, please contact your British Sugar account manager. You can also read the British Beet Research Organisation's advisory bulletins at www.bbroy.co.uk





“last word”

by John Swire

Random thoughts from the editor

Well, this is not where I expected to find myself as we approach the end of 2023, as editor of CPM. Life over the last few weeks has certainly been a little hectic to say the least and finally here is the first edition of the magazine under my editorship.

First of all, allow me to indulge you with a brief background. I left school in 1975 with the intention of working on the family mixed dairy farm for the rest of my life. The farm was just over 300 acres which at the time supported about 100 cows and a reasonable arable area. It was very much of its time;

supported by various grant schemes to update the milking parlour and building new cubicle buildings to replace the old run down wooden cow kennels. The arable side was very basic with my father insisting that sowing barley by broadcasting it with a Taskers Paterson wheel driven fertiliser spreader was the most efficient and economic form of crop establishment. I suppose the whole system was very much of its day, certainly in North Shropshire. The major problem was that it was a tenanted farm and so there was little room or desire for investment.

After 15 years of getting up at 5 am to milk cows, I reached a decision. After an amicable agreement to leave the business, I found myself as a mature student at university. Following this, I had no intention of pursuing the agricultural route until a chance encounter in a pub led me to be working for one of the leading agricultural PR agencies at the time. This ultimately led me in a roundabout sort of way, via various other agencies and magazines to where

I am now: an editor of a leading arable farming magazine and part time assistant to a Methodist minister/wife on the Somerset Levels. To say it has been an interesting and variable life would be an understatement, but here we are ready to start the next stage. Anyway, enough about me, although I may bore you with more stories of arable production in mid-70s North Shropshire in the future.

In more pressing matters, the Migration Advisory Committee (MOC) has published its review into the Shortage Operation List (SOL) which lists eight occupations which it recommends should be added to the list. Unfortunately, the recommendations do not include any occupations within the agriculture industry. In response the NFU has submitted its own report which lists eight occupations directly connected with agriculture, of which four are of particular interest to readers of CPM: machine harvest operator (field)/harvest operator, horticulture potato supervisor with language skills, general farm worker and machine operator (packhouse). The NFU report goes on to

say that the roles they have identified are in shortage and are vital to the maintenance of production in the UK and growth opportunities for the wider agricultural and horticultural sectors. Without an immigration solution labour will continue to be a driving factor in the reduction of UK food and a rise in imports from countries that often have lower worker welfare and poorer environmental standards.

NFU deputy president Tom Bradshaw says: “It is disappointing that the evident shortages impacting the agriculture industry have not been recognised. We know farmers are having difficulty recruiting long term for vital roles in their farm businesses.” This is a real serious concern for many sectors of the industry and all of us must take every chance we can to persuade and lobby those in power as well as opinion formers, that the industry must be treated as a special case to ensure the continued production of high quality produce within the country.

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