Black-grass control.

Smart choices have big rewards.

Keeping on top of black-grass populations comes from taking every opportunity to increase overall control levels. An integrated weed management approach that includes the best cultural and chemical choices can be the difference between populations increasing or decreasing.

Every percent of control counts

95.5% control = black-grass populations stay the same

97% control = black-grass populations can reduce by over 30%
Helping to make your hard work count

Getting the highest levels of cultural control comes from a lot of hard work and informed decisions. That's why at Bayer, we're committed to giving you everything we can to help support you in your fight against black-grass.

And of course, chemistry still has a huge role to play, which is why we are continuing to bring you new formulations such as Atlantis® OD and new products such as Monolith®, alongside proven performers to help you get the very best control every season.

6% more control in autumn¹
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Find our advice and resources for helping you maximise your black-grass control by visiting cropscience.bayer.co.uk/black-grass

¹ Based on 1,000 seeds in the seedbank and 25 seeds/plant/yr (AAAM Black-grass species, June 2018).
² Compared with other non-Bayer formulated fluridone + diflufenican products.
³ 14 independent replicated trials (2015-2019), average populations in untreated = 251 weeds/m².
⁴ Compared with Atlantis® WL, 10 independent replicated trials (2016-2018), average population in untreated = 14 weeds/m².
⁵ Compared with Atlantis® WL, 10 independent replicated trials (2016-2018), average population in untreated = 14 weeds/m².

Liberator contains fluridone and diflufenican. Atlantis® OD and Atlantis® WL contain mesbromifuryl and atrazine. Monolith® contains fluralin and propyzamide. Use Liberator, Atlantis and Monolith are registered Trade Marks of Bayer. Use plant growth regulators carefully. Always use the latest and product information before use. Pay attention to the risk indications and follow the safety precautions on the label. For further information, including contact details, visit www.cropscience.bayer.co.uk or call 0800 1958522. © Bayer CropScience Limited 2018.
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Volume 20 Number 8
August 2018

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Minimum soil disturbance
All-year round ground cover
A diverse crop rotation

There's a pretty solid programme of seminars, addresses and workshops, and these are quite different to the technical sessions you'd expect from Cereals, Croptec, or the plethora of local events organised by distributors or AHDB. What you get, generally, is a kind of evangelism — a story of how someone's tuned into their soils and found themselves in the process, for example. Brace yourself to be told that fertiliser is the scourge of mankind, that organic growers are the only real farmers, and that Big Ag is the cancer that pervades the industry — one speaker even apologised for mentioning glyphosate as if it was a swearword.

So you're not sure how much science there is in it, but what's interesting is that Groundswell brings in a wide range of international speakers, as well as those from the UK. And there are one or two elements you would recognise — drill manufacturers have been quick to latch onto the event and give a remarkably good demonstration of the no-till options on offer (see our report on p75).

In amongst the evangelical zeal, you get some gems — ideas that simply hadn't occurred to you, but might just fly. Even the far-out ideas, although they sit on you a bit like a hair shirt, are quite instructive — they make you question your own beliefs. What's more, looking around the dimly lit barns and seminar tents at Groundswell, I spy a few friends — CPM readers and farmers we've featured. I'm clearly not alone in my curiosity.

So have I come back from Groundswell reborn? Am I ready to consign all signs of ammonium nitrate to history, to tell Messrs Bayer, BASF, Syngenta etc I'll no longer be needling their expensive potions? And will I bury the plough, rather like the Cherry family's statuesque masterpiece you find at the entrance to the event?

No. Because life requires a little more realism. Yes, I have a responsibility to the land, but I also have a responsibility to the thousands of people it feeds — if I start experimenting and it goes wrong, people will starve, or at least someone else will have to take up the slack, and may do so at a greater cost to society. If I manage to fill my barn each year, I'm actually doing a pretty good job, not just for the bank balance, but for mankind, and farming's critics should acknowledge this before they send me on that guilt trip.

That's not to say I shouldn't experiment at all, however, and to dismiss all of these ideas would be woefully short-sighted. As conventional farmers, we're trained — indoctrinated even — to be guided by science. If science can't determine the statistical difference in a new way of thinking, we should ignore it, we're told. But we're not scientists, and there have been plenty of instances where farmers have done something out of gut instinct and it's worked. Sharing, adapting, developing these ideas can be a scientific approach in itself, I'd argue.

So, on the face of it, the proponents of Conservation Agriculture are wrong in my view — it just simply wouldn't work on my farm. But I do see there's scope for a hybrid system, rather as in plant-breeding — you take an interesting element from one area, combine it with something completely different and you can get a staggering result. That's why it's worth going to the Conservation Ag church of Groundswell — it won't make you change your life, but if you keep an open mind, you might just develop something that's life-changing.

Tom Allen-Stevens has a 170ha arable farm in Oxon, and the plough is the last thing its rock-hard soils will take just now.

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When you start notching up enough harvests as a farmer to make it equivalent to a decent innings on the cricket pitch, then they can start to blur and become forgotten.

But there are still some that stay in the mind like a sweetly hit six –– 1984 where even the badly established weedy crops of wheat seemed to do four tonne to the acre (10t/ha). Then there was the bitter-sweetness of 2008 which was a combination of bumper yields, wet weather and crashing prices — a bit like a sweet cover drive that suddenly gets fielded as you are between the wickets.

Then there were the ducks, like 2012 which proved a wash-out that reduced the hardest of arable men to tears. Another harvest of note was the infamous drought year of 1976. I was only a school boy at the time, but I can remember Dad's frustration how the lack of rain had left him with half a harvest.

I suspect 2018 will become another remembered harvest. The absence of rain in June and July coupled with hot sunny days left many of us feeling we were suddenly farming in a Mediterranean clime. The key difference between the drought of 1976 and the one in 2018 was that 1976 followed on from a droughty year in 1975 in contrast to this year which comes on the back of wet weather. For us it seems the moisture deep in the subsoil has saved us from widespread 1976 yields. I hope yours proves much the same.

No smoke without fire

The first field we cleared this harvest of both its grain and straw was a field we call Smokey. In an exceptionally hot dry year where fire risk was at the forefront of many of our minds, having a field called Smokey seems to be tempting fate. Indeed the field adjoins a run of back gardens where it’s not unknown for garden bonfires to be started on our side of the fence.

The considerably increased fire risk this year has put us on a greater level of alert. We are discing breaks round most fields the moment the combine leaves the field and every machine involved in the harvest campaign carries a fire extinguisher. I’m also having friendly chats with non-farming neighbours about the need for everyone to be more vigilant.

But despite all this, research shows that the origin of this odd field name of Smokey is nothing to do with combustibility but rather from ‘Smock’ which is an old word for the Church tithe which was the bane of many a farmer until the 1920s.

It’s a bit of a barometer field for me as it has rank clay at the bottom with gravel at the top and a nice rich loam in between. As such it gives an indication of how crops different soil types are going to perform for the coming harvest. So this year Smokey did OK — yields from the six-row barley variety Volume were better than we expected albeit we weren’t expecting much.

There are other reasons why this field has special place in my heart, one is that it has nice views over St. Osyth creek and the old village harbour, not to mention the old priory. It was also Dad’s favourite field and when I’m sitting in the combine cab fond memories of my late father return.

I’m not sure whether they get CPM magazine in Heaven but if they do I’m keen to report to the dear departed that we are still looking after Smokey and Smokey is still looking after us.

A brief reminder to all past readers, whether in this world or the next, it’s simple to get yourself reinstated and continue receiving CPM — just go to www.cpm-magazine.co.uk/subscribe/
‘We see technology playing a big part in our future, for efficiency, productivity and benchmarking. That’s why we work with Frontier.’

Georgie Cossins joined the family farm two years ago and has taken a lead on developing new technology to help the business. With 760 hectares of combinable crops to manage as part of a highly diversified farm, the Cossins family are keen to maximise efficiency in order to improve productivity. Linking with the latest thinking and technology is a vital part of the Cossins family’s strategy.

Frontier advises the family on all aspects of arable crop production, including the use of SOYL precision technology to manage variability. Georgie’s close relationship with the Frontier team allows her to keep up to date with advances in technology and how they will benefit the farm. The Cossins use Frontier MyFarm to manage their arable records, enabling them to analyse the cost of production and make future cropping decisions based on that data.

To find out more about how Frontier works in partnership with the Cossins family, visit our website and click on MyView to read the full story and watch the video.

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To till or not to till?

Technical
Weed control

In the battle against difficult grass weeds, some farmers are turning back to the plough to seize control, while others are cutting out cultivation altogether. CPM spoke to two farmers using opposing systems to understand how they are controlling blackgrass.

By Lucy de la Pasture and Rob Jones

Five years ago, Matthew Denby was losing large areas of crop due to the high levels of blackgrass. But with the use of continuous ploughing, he says weed levels are fast diminishing. Matthew farms 720ha of winter cereals and oilseed rape near Alford, Lincs alongside his brother, father and grandfather.

“We’ve trialled different methods of control on the farm including min-till, cover crops and spring cropping but they led to very poor blackgrass control. One particular area of spring barley had to be entirely sprayed off because the grassweed levels were far worse than the rest of the field which was ploughed.

“After ploughing for cereals two in every three years and using our Simba SL with low disturbance legs for drilling OSR, we have since seen a significant reduction in blackgrass. We get very good levels of control using OSR as a cleaning crop by using glyphosate pre-drilling, followed by clethodim and propyzamide.”

Within five years, the farm has gone from red-mapped fields having thousands of blackgrass heads/m², to now being in a position to hand rogue any remaining heads.

Ploughing early

“Blackgrass is now at low levels with no need to spray anything off. The key for us has been ploughing early because it enables us to get a really good seedbed. Ploughing in late July/early August following OSR enables our soils to withstand plenty of rain and produces an excellent seedbed. The soil is mellowed and conditioned by the wetting and drying process from rainfall in late summer.

“There seems to be a couple of key reasons why drilling later has benefited the farm. It’s a fact that less blackgrass germinates the later a crop is sown and there is more time to create a stale seedbed using glyphosate. Added to that, the soil is more likely to be moist, producing better efficacy from the residual herbicides.”

Cereal drilling commences on 1 Oct on the farm’s historically cleaner land and after 10 Oct on dirtier land with a blackgrass history. All winter cereals receive tri-allate granules applied pre-emergence as well as a liquid stack of residuals split across pre-em and early post-emergence.

With a mix of medium marsh land and heavy clay soils, Matthew says their options...
PUTTING THE PRIORITY ON THE BEST AUTUMN MANAGEMENT

Increasingly disappointing post-emergence herbicide performance makes first class autumn black-grass, brome and ryegrass control critical. Alongside other cultural controls, the most effective glyphosate treatment ahead of cereal crop emergence is essential; especially in a low black-grass dormancy year.

**Match Cultivation to Weed Population**
Ploughing every 4-5 years can be valuable for all species, with the timing of intervening cultivations geared to the particular weed population. Early shallow tillage is the best approach in most cases.

**Plan Drilling to Weed Risk**
Wheat should be drilled late on badly-infested ground to give time for the best pre-planting weed kill. Moving the least soil at drilling, high seed rates and competitive varieties are also advisable.

**Use the Most Effective Stubble Treatment**
Time and weather constraints make it important to use glyphosate formulations that work best under hot, dry conditions, are least affected by rainfall and have the shortest cultivation interval.

**Employ the Best Spraying Practice**
Attention to detail in glyphosate rates, water volumes, nozzle types, spray pressures and forward speeds will all pay dividends in ensuring pre-planting applications work first time and as hard as they can.

**Consider Pre-Emergence Glyphosate**
Where drilling is delayed more than a few days after pre-planting treatment, an approved glyphosate included in the pre-em mix can be invaluable in dealing with rapid weed growth.

**STewardship**
To minimise the risk of resistance development it is important to integrate pre-planting treatment carefully with stubble cultivations and to appreciate that no amount of adjuvant will make up for insufficient glyphosate.
Balancing autumn grassweed and volunteer OSR control

Where blackgrass is a problem on the farm most management decisions revolve around the grassweed as other potential problems pale into insignificance. But this doesn’t need to be the case, believes weed management specialist Barrie Hunt, who runs the Roundup technical support service.

He has no doubt that autumn is the best time to deal with both grassweeds and OSR volunteers. And he has a proven way of overcoming their conflicting management needs based on the best understanding of OSR and grassweed biology.

Cultivation immediately after harvesting has become standard practice for growers wanting the best control of problem grassweeds ahead of winter cereal drilling. But it’s about the worst thing they can do after oilseed rape if they also want to deal with the volunteers that can be so problematic in arable rotations, he says.

“Volunteers are an inevitable consequence of OSR growing. A small amount of seed loss is unavoidable even with the best pod shatter resistant varieties, combining technologies and harvesting practice.

“This wouldn’t be a problem but for two things. First, every 10kg/ha lost is typically more than one and a half million seeds (or around 170 seeds/m²). And second, a proportion of these can remain viable in the soil for a good 10 years,” he says.

“So, as well as getting in the way of your first wheat and providing an ideal environment for slugs, volunteers can seriously interfere with the management and productivity of your future OSR crops. They’re also a prime culprit in the erucic acid contamination of ‘double lows’ on land once used for HEAR growing,” comments Barrie.

“On the plus side, we’re dealing with seeds specifically bred to germinate readily and reliably when at or very near the soil surface. Often — as autocasters will testify — a combination of chaff and dew are sufficient. This means we can stimulate the vast majority of shed OSR seed to grow by not burying it to anything more than a couple of centimetres. Cultivating it down any deeper will only encourage dormancy and future trouble,” he says.

Not cultivating stubbles immediately following OSR harvesting appears to fly in the face of the best grassweed management practice. But Barrie stresses that it needsn’t do so if growers follow a simple ‘twin-track’ approach.

Having left OSR stubbles uncultivated for up to four weeks then spraying-off the volunteers and any very low dormancy blackgrass, he recommends light tillage and consolidation to minimise moisture loss and set up a stale seedbed. This will bring on the bulk of the grassweeds for spraying off just ahead of drilling.

“If you have bad blackgrass, ryegrass or brome you shouldn’t be drilling wheat until mid-Oct at the earliest. So with OSR coming off before the end of July, you have plenty of time for this approach. The beauty of this is it enables you to deal with both volunteers and grassweeds in the best possible way, without compromise,” he explains.

“On the one hand, you leave any shed seed open to predation by birds and mammals and get the maximum flush of small, poorly rooted volunteers which are especially vulnerable to glyphosate. And on the other hand, you achieve the surface cover needed for the maximum flush of blackgrass, ryegrass and sterile brome for control ahead of your wheat drilling.

“This twin track approach also helps you get rid of any soft, meadow and rye brome seed which needs surface after-ripening before burial to stimulate germination, together with perennial weeds which are best left to grow out of the stubble before spraying.

Cultivation between glyphosate sprays is important to minimise the risk of resistance development, adds Barrie, along with using sufficient rates of the most active glyphosate formulations and the best application practice.

“With such unreliable post-emergence herbicide performance these days, the most effective autumn treatment is critical in managing difficult grassweeds. This makes it vital your pre-planting sprays work as hard as they can in every way.”
CLETHODIM CONTINUES TO PERFORM DESPITE PERSISTANT BLACKGRASS PRESSURE

Continued monitoring of clethodim performance has shown that it remains highly efficacious, maintaining its position as a leading graminicide for the control of ALS-resistant blackgrass.

Trials, which investigated the application of clethodim to a blackgrass population with ALS herbicide target site resistance mutation ile-1781 - the most prevalent resistance mutation found in UK blackgrass, showed excellent efficacy when the weed was at three leaf stage up to 5 tillers.

Arista LifeScience Product Development & Technical Manager for UK & Ireland, Don Pendergrast said: "We conducted new studies to fine-tune the application of clethodim, to help to support growers to achieve optimum blackgrass control.

"It's reassuring that the product performs consistently whether the blackgrass is at an early three leaf stage, or a more advanced five tiller stage. These studies have proven that when applied correctly, clethodim can effectively control resistant blackgrass."

One of the studies, conducted by Silsoe Spray Applications Unit, also investigated the influence of nozzle choice on spray quality.

Dr Clare Butler Ellis, Research Manager of Silsoe Spray Applications Unit, said: "While an induction nozzle is unlikely to be optimum for control of small grass weeds, in the situation where plants are susceptible to the applied dose, this study showed that applying clethodim with drift-reducing nozzles can achieve high levels of control as well as reducing spray drift."

To further support the work, speaking of in-field experience, Mr Pendergrast explains that: "Efficacy is optimised with the addition of water conditioners to a 1L/ha rate of clethodim, applied in 200L of water. Although selected water conditioners should not contain a built-in adjuvant, as an adjuvant is already part of the clethodim formulation."

Clethodim has an established stewardship scheme created to minimise the risk of phytotoxicity, which has historically included two application cut-off dates - one being for early drilled crops and earlier flowering varieties.

With current trends moving towards earlier drilling and earlier flowering varieties, Arista LifeScience has now moved to one cut-off date for all clethodim applications - October 15.

When applied correctly, clethodim can effectively control resistant blackgrass in oilseed rape applications - October 15.

The stewardship applies to all clethodim-based products, including Centurion Max®. Mr Pendergrast said: "Following the recent trials, moving to one date for all scenarios will ensure that applications are made onto actively growing blackgrass, which will help to boost overall efficacy.

"This will also minimise any risk of phytotoxicity and help to simplify the stewardship guidelines. Above all, our recommendation is to always exercise best practice and to adhere to the stewardship."
Rotational ploughing is still one of the key elements in integrated blackgrass control but is only effective if good inversion is achieved.

→ straw and germinates consistently at the same time.

This means any emerging blackgrass plants can be sprayed prior to drilling, targeting the majority of the problem before it can become established.

“As a result of our low soil disturbance, blackgrass is very shallow rooted and we’re also finding our Liberator (flufenacet+ diflufenican) and Atlantis (mesosulfuron+ iodosulfuron) are working better than ever before. The improved soil structure and shallow rooting means we’re targeting much smaller plants.

**Deeper rooted**

“During cultivation blackgrass seeds can be spread 7-10cm deep and spread throughout the soil profile and you can’t tell when they’ll germinate. They also become much deeper rooted and established. Our blackgrass control is not 100% but I don’t think ploughing or cultivation would solve the problem. Blackgrass typically grows in unhealthy, poorly drained soils so I hope over time populations will naturally diminish.”

Independent weed scientist Dr Stephen Moss explains why although rotational ploughing is valuable, no-till conditions also have potential to implement some blackgrass control.

“Historical research shows quite conclusively that blackgrass is encouraged by reduced tillage because you’re keeping seeds near to the soil surface from where seedlings can readily emerge. But there’s no denying that low disturbance techniques can be effective in getting on top of blackgrass, and this may be down to the increased...
Glyphosate is an invaluable tool in a no-till or min-till system to take out blackgrass plants prior to drilling.

“If this is the case, it may explain why some people have got on so well with very shallow tillage, especially when combined with other changes such as delayed autumn sowing or spring cropping. However, if prevention of blackgrass seed return cannot be maintained, shallow tillage is a recipe for a very rapid population increase.”

Rotational ploughing is still one of the key elements in the integrated control of blackgrass according to Stephen, but he also believes there’s a reason many farmers may not be seeing the best results.

**Good inversion**

“Rotational ploughing is only really effective if you get a good inversion. A lot of farmers are failing to achieve the benefits because they’re ploughing in unsuitable conditions, going too fast or perhaps using the wrong type of plough,” he says.

“The benefits of ploughing are very dependent on how many seeds you are burying compared to how many you are bringing up. This is why rotational ploughing still has a very useful role when used every four or five years, because not many blackgrass seeds will survive that long in the soil.

“If you’re ploughing continuously it will tend to stop blackgrass suddenly building up very rapidly, but you could argue that if you’re trying to eradicate blackgrass, ploughing could make the problem persist for longer.”

There’s no simple ‘ideal’ cultivation strategy for blackgrass because the best approach depends on the individual farm, soil types and crops grown, he says.

“The key to long-term blackgrass control is to show commitment to the ‘5 for 5’ strategy which involves five key elements: stopping blackgrass seeding, appropriate cultivations, later sowing dates, greater crop competition and an effective herbicide programme.

“Farmers need to plan a strategy at the individual field level for the next five years to make real inroads. You can’t expect to get on top of things in just one or two years because 25% of blackgrass seeds survive from one year to the next. But over five years substantial reductions are possible.

“This year people saw good control from pre-ems which could lull farmers into a false sense of security thinking their blackgrass problem has ‘gone away’. But start to drill early again or cut back on post-ems and it will be back with a vengeance, especially if autumn conditions are less favourable for pre-em herbicides.”

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“Rotational ploughing is only really effective if you get a good inversion. A lot of farmers are failing to achieve the benefits because they’re ploughing in unsuitable conditions, going too fast or perhaps using the wrong type of plough,” he says.

“The benefits of ploughing are very dependent on how many seeds you are burying compared to how many you are bringing up. This is why rotational ploughing still has a very useful role when used every four or five years, because not many blackgrass seeds will survive that long in the soil.

“If you’re ploughing continuously it will tend to stop blackgrass suddenly building up very rapidly, but you could argue that if you’re trying to eradicate blackgrass, ploughing could make the problem persist for longer.”

There’s no simple ‘ideal’ cultivation strategy for blackgrass because the best approach depends on the individual farm, soil types and crops grown, he says.

“The key to long-term blackgrass control is to show commitment to the ‘5 for 5’ strategy which involves five key elements: stopping blackgrass seeding, appropriate cultivations, later sowing dates, greater crop competition and an effective herbicide programme.

“Farmers need to plan a strategy at the individual field level for the next five years to make real inroads. You can’t expect to get on top of things in just one or two years because 25% of blackgrass seeds survive from one year to the next. But over five years substantial reductions are possible.

“This year people saw good control from pre-ems which could lull farmers into a false sense of security thinking their blackgrass problem has ‘gone away’. But start to drill early again or cut back on post-ems and it will be back with a vengeance, especially if autumn conditions are less favourable for pre-em herbicides.”
No quick-fix for blackgrass

On this site it was too soon to return to winter cropping after just two spring wheats.

Technical Blackgrass

Spring cropping is one of the main cultural controls for blackgrass but the million-dollar question is how long for? The rotational trials at Project Lamport indicate it may be longer than you think. CPM reports. By Lucy de la Pasture

Cultural methods are now well established as playing an important part in any strategy to control blackgrass. But how to put together the many pieces of the puzzle to achieve the best possible control isn’t always clear. And that’s where the long-term Agrovista trial at Lamport in Northants is proving illuminating.

Project Lamport is coming to the end of its fifth season, originally intended to be its last. With the results from the trial highlighting there are still many lessons to learn, the work has been extended for the foreseeable future. A decision encouraged by an increased interest in soil health which, along with a changing political landscape and a ‘Green Brexit’ on the horizon, means the work at Lamport has never been more relevant to the problems growers may increasingly face, believes Mark Hemmant, Agrovista’s technical manager.

Rotational decisions

The site has been running 14 different rotational trials over the past five years and these are now beginning to yield some interesting results, with the ‘right’ and ‘wrong’ rotational decisions plainly obvious to see. There have been disasters in terms of blackgrass control, as well as crop failures where different spring crops have been experimented with. But there are also some very clear trends becoming apparent, particularly regarding cover crops and the number of years a spring crop is needed to keep blackgrass populations from exploding again.

Mark says one of the things that has become obvious at Lamport is that less steel and more roots has really benefitted soil health. “Where we’ve used cover crops in the rotational strips you may not see a difference, but you can certainly feel it when you walk over the strips. The ground is noticeably tighter where cover crops haven’t been grown.

“It’s one of the reasons we recommend using black oats in the cover crop mix because they root more deeply than tame oats,” he says. “Improving soil health also means less blackgrass because crops are better able to compete with the weed.

Mark Hemmant says any effect on soil health of the different rotational systems is going to be assessed in future years.

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- Apply as part of the pre-emergence 'stack'
- Appropriate boom height, water volume, nozzle choice and forward speed

Key tips - Avadex Excel 15G
- Use all relevant IPM strategies before using the herbicide 'stack'
- Get your applicator calibrated and continue to check the "pipework" and deflector plates regularly through the season.
- Applying on the back of the drill? Ensure the Avadex is being applied to a well consolidated surface and maintain a 4cm drilling depth for winter wheat.
- Applying on the back of the rolls? Is the operator P4G certified? Make sure drilling depth is correct - 4cm for winter wheat.

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Almost no blackgrass was visible in the plot of spring wheat following an autumn black oat and vetch cover crop (System 5).

> helping keep numbers lower than where the soil is compacted.

At Lamport the most successful of the rotational systems are all using spring crops after a cover crop. Over the years a blueprint has been developed to get the best results in terms of yield and blackgrass control.

“The cover crop mix needs to allow the blackgrass and other weeds to germinate to effectively reduce the seed in the seed-bank and any potential competition in the spring crop. Black oats and vetch have proved ideal to get this ‘flushing’ effect and because it has a low C:N ratio, the mix doesn’t rob nitrogen from the following crop,” explains Mark.

“Every year at Lamport, including an autumn cover crop in the rotation has worked, regardless of the season’s weather conditions. We use a stale seedbed, with a shallow pass with the X-press cultivator and drill the cover crop in early Sept to get good establishment.”

Direct-drilling the cover crop has been attempted at Lamport but resulted in a failed crop, mainly due to poor trash management on the surface, notes Mark. The most successful establishment method has been a culti-drill, which also promotes a flush of blackgrass, and this autumn it will be used after the stubble has been raked.

> We’re looking at using less cultivations but we’re not quite there yet with the cover crop,” he admits. “By Christmas the cover crop will be gone because we’ve found the spring crop grows better, yields are higher and there’s less blackgrass if the cover crop is removed early. Where blackgrass is a consideration, this is crucial so that the blackgrass doesn’t get too big when the cover crop is destroyed. If it does then shading becomes a problem, resulting in poor blackgrass control, which isn’t a good glyphosate resistance management strategy either.”

Most consistent

The system that has proved most consistent in terms of yield and blackgrass control is a cover crop followed by spring wheat. Five years on, blackgrass numbers are consistently at around 2 heads/m² under this regime. One of the systems trialled adopted this approach for the first two seasons and then received a deep cultivation before returning to winter wheat in year three — an approach many farms are taking as they introduce spring cropping into the rotation but want to return to winter cropping as soon as possible.

> It showed us that on this site it was too soon to return to winter cropping after just two spring wheats. The blackgrass population in the winter wheat increased to 129 heads/m² (from 13 heads/m² the previous year), but the real problems occurred in the following crop,” says Mark.

In an effort to get back on top of the blackgrass the decision to return to a cover crop followed by spring barley was made, following the rule of thumb that when blackgrass populations reach 40 heads/m² it’s the trigger for a drastic change in management, such as a switch to spring cropping.

> In the autumn there was so much blackgrass that it almost out-competed the cover crop. When it was sprayed off in late winter, there was a wet mulch of dying blackgrass which then dried up to form a crust. We sprayed a second glyphosate pre-drilling in the spring but surviving blackgrass was protected by this crust and grew. There was so much blackgrass in the spring barley that we made the decision to destroy the crop to limit seed return.

> The following autumn there was still a lot of blackgrass in the cover crop, but it was destroyed at the end of Nov. The spring wheat currently in the ground was drilled mid-April and looks great, with very little blackgrass to be seen,” he notes.

Another of the valuable lessons learned
Blackgrass exploded where winter wheat was planted after two cover crop/spring wheats in the rotation. The population was so high the following spring barley crop was destroyed.

“Blackgrass is the importance of maintaining the seed rate when drilling spring crops. The reasons are two-fold, explains Mark. “In the spring, the percentage establishment achieved can be low and we need a good plant population to compete with any blackgrass that may germinate within the crop. We’ve used 550 seeds/m² for spring wheat and the seed rate comparisons in the min-till plots mean we will probably plant 600 seeds/m² in 2019. The first concern of growers is always that it’s an increased seed cost, but our view is that the increases in yield possible, due to less blackgrass competition, more than compensates for the up-front expense.”

For spring barley, Mark recommends 450 seeds/m² of KWS Irina and doesn’t believe there’s much room to go any higher without having a negative effect on barley quality through increased screenings. Spring oats are also being looked at this season and the crop of Elyann at 400 seeds/m² looks full of promise, says Mark.

In a blackgrass situation, spring oats may not seem the ideal crop to help control a tricky grassweed with limited herbicide options, but Mark’s not fazed by this problem. The spring oats were direct-drilled in mid-April and received 50g/ha DFF as a pre-emergence herbicide, which with excellent competition from the crop appears to have done a good job.

“We planted a black oat and phacelia cover crop in the autumn before the spring oats to flush out the blackgrass. It’s important to be aware of the potential pitfalls using this mix because phacelia can set seed in a mild autumn, so it may need to be topped off to prevent.”

**Different tillage systems**

Other large-scale plots at Lamport continue to investigate different tillage systems, with winter and spring crops established under various cover crop and cultivation regimes. For the first time since the trial began, rotational ploughing has been introduced on a large scale, with half the plots being turned over last autumn to mimic what’s likely to be common practice on many farms. The remaining plots were established using ongoing min-till regime.

“Where we ploughed and there was no cover crop, there was soil erosion over the winter which has made the blackgrass worse. In general though, there appears to be less blackgrass after the plough compared with the min-till, though the crops look very similar at the moment.

“If the dry weather continues, I’d expect to see wheelings begin to show up in the crop where the ground was ploughed because the soil is fluffier and the drill was heavier,” says Mark.

The success of blackgrass control and crop establishment using two different minimal disturbance/zero-till drills –– the Weaving and Sky EasyDrill after cover crops or fallow is also being compared at Lamport.

“Interestingly it wasn’t the same drill that came out on top last autumn as in the previous year, which shows that the best tool for the job is likely to vary with seasonal differences each year,” he comments.
Blackgrass control is a persistently hot topic, and farmers are frequently adapting strategies to keep populations at a minimum.

But a well-balanced programme – in conjunction with other cultural practises – can help growers get the best out of existing chemistry.

By Charlotte Cunningham

Blackgrass is continuing to decimate arable yields across the country, so it comes as no surprise that in a survey carried out by Adama and CPM, 32% of growers revealed that the amount of blackgrass was increasing year-on-year, and a further 29% saying the infestation number was staying the same (see chart on p21). “Information about blackgrass control is gradually being adopted,” says David Roberts, technical specialist at Adama. “However, the seed return from blackgrass is such an issue, meaning growers have to be rigorous in terms of control – we can’t afford to turn our backs for one minute.”

Positive comments
This year, pre-ems have appeared to have worked well, with positive comments noted up until the spring. However, blackgrass is clearly a problem that is not going away, adds independent weed expert, Dr Stephen Moss. “The issues are predominately in new blackgrass areas — we need to focus on the non-traditional places being affected.”

Ben Burrows, independent agronomist at Crop Management partners agrees: “Areas that aren’t traditionally affected are probably the ones that are seeing an increase in populations, as they are less likely to be implementing a full range of control measures.

“Almost every decision I make on farm with growers is based on how it would or could subsequently affect blackgrass. It’s still a major issue, in fact, it’s the number one issue for a lot of farmers.”

So, what exactly are the options for controlling blackgrass and which is likely to give the greatest benefits? According to the survey, 51% of growers believed adjusting their rotations had given them the biggest benefit over the past two to three years (see chart on p21). “For me, the benefit of adjusted rotations is twofold,” explains David. “The first being spring cropping and the second is the inclusion of break crops — increasing the fallow period for blackgrass germination. Using break crops allows an alternative mode of action.”

Increasing spring cropping in the rotation can be a very quick way to help keep a lid on blackgrass, adds Ben, “Where this isn’t possible, delaying drilling of winter crops is also a useful way of reducing levels.”

While historically, around 50% of winter wheat in the UK was in the ground before Sept, now growers are moving into early to mid-Oct, which can have a positive impact on blackgrass control, adds David. “If there are fields where you know there are higher blackgrass populations, drill them right at the end — do the cleaner fields first.”

It gives an additional window for stale seedbed creation and in most situations, pre-emergence herbicides will work better because there’s usually more moisture in the soil later in the year.

Though only 5% of growers stated it had given them the biggest benefit, rogueing can be very useful in certain situations: “It’s certainly something I’d encourage growers to do,” says Ben. “It can be extremely beneficial — taking one plant away could be 1000 less blackgrass seeds to worry about.”

“It’s not practical for everyone, but even just doing it to the worst parts of a field can be very beneficial. Especially for those with low levels of blackgrass — it’s a no brainer.”

Chemical control has been the go-to solution for blackgrass control for many years, but pressure is mounting on growers...
Blackgrass survey

How big of a problem is blackgrass on your farm year-on-year?

- The number of blackgrass plants is reducing
- The number of blackgrass plants is increasing
- The number of blackgrass plants is staying roughly the same
- I don’t have any blackgrass on my farm

Which of these has given you the greatest benefit on your farm in the past 2-3 years?

- Adjusted rotation
- Changed drilling date
- Variety choice
- Rogueing
- Cover crops
- None of the above

Blackgrass survey to optimise alternative controls given the increasing concerns over resistance. The extent to which resistance has become an issue was highlighted in the survey with 53% of growers revealing they do not test for resistance as they just assume it. “This is interesting as blackgrass resistance was first detected over 30 years ago but there are still a significant number of growers that have never had any form of testing done,” explains Stephen. “However, I am sure farmers are correct as there is resistance of some degree on virtually every farm where herbicides are used regularly.”

While farmer experience and knowledge provide a sound indication of blackgrass and resistance, testing can be of value where new land is taken on or especially in areas where blackgrass is only just starting to appear, he adds.

That said, regular testing can help concentrate the mind and give growers an opportunity to rethink their management strategy, explains Stephen. “At some point, you have got to make a decision about whether individual herbicides are still working and if you should still be using them or not.”

“Growers need to consider how herbicides are working on individual fields as the impact of resistance may vary considerably.”

Only a small percentage of growers noted lack of knowledge and the cost as the reason they don’t test. While there is a cost, this pays back in terms of what there is to be gained by having this knowledge, says David. “Organisations like ADAS provide very clear instructions on timing and how to harvest seed. Costs of testing can be recouped very quickly if you can get a sound understanding on how to tackle blackgrass — it’s crucial to know your enemy.”

Knowing what pressures may
According to the survey, 51% of growers based their decision on whether to use a pre-em herbicide on anticipated weed pressures, while 24% work from an agronomist’s recommendation (see chart right). “There are very good self-advised growers out there, but there’s also lot of very knowledgeable agronomists,” says David. “I’m very supportive of a collaborative approach as this broadens the knowledge base in the industry — farmers will be one step ahead if an agronomist has already seen a problem you don’t have yet.”

Though most farmers stated weed pressure as the main factor in making decisions, even those with fewer issues can benefit from pre-em applications, explains Ben. “Even in the low-pressure areas I’d still recommend growers think about it, but to go for a less robust option. It can still be very worthwhile. When we get into the spring and potentially facing quite big weeds, it takes the pressure of post-ems.”

For those growers with high infestations it’s worth considering whether autumn cropping is the most sensible option, warns Stephen. “The efficacy of pre-ems is largely dependent on soil moisture so it’s intrinsically variable for reasons that are out of your control. Spring cropping, even for several successive years, is the best way to deal with severe infestations.”

Taking one plant away – via roguing – could be 1000 less blackgrass seeds to worry about, says Ben Burrows.

To pre-em or not to pre-em?

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SEEDING THE FUTURE SINCE 1856
Blackgrass survey

Top tips for blackgrass control

- Get as much info as you can – knowing your enemy is the crucial starting point.
- Don’t over use or rely on certain herbicides
- Consider delaying autumn drilling where possible
- Use the ‘5 for 5’ approach devised by Stephen Moss — plan strategies at the individual field level involving the following five components: Stop seeding; Appropriate cultivations; Later drilling date; Encouraging crop competition; Appropriate herbicide usage. A five-year time frame is needed as it takes this long to appreciably reduce the blackgrass seed burden in the soil.
- Have a clear plan in place in your mind and ensure the whole farm is familiar with it and the goals you are trying to reach.
- Use previous years as a guide to blackgrass pressures and to what does or doesn’t work on your farm.

Growers have got to make a decision about whether individual herbicides are still working and if they should still be using them, says Stephen Moss.

- weed mapping. Is it done via a drone? Looking from the edge of a field? Or from a tractor? And what are they using the data for? Blackgrass is more ‘visible’ in some crops and years than others, so consider whether your mapping method will cope with this variability.

  “For blackgrass specifically, weed mapping is important for knowing where the worst affected patches are. It’s then beneficial to spray off those areas in successive years. Blackgrass won’t disappear straight away, but it may be less obvious, so it’s important to keep tackling it to prevent a yo-yo effect.”

  With arable technology developing at a rapid rate and providing increased functionality for farmers, weed mapping can be a useful tool to use in conjunction with sophisticated sprayers, adds Stephen. “Ideally, with really good weed maps, that will allow sprayers to automatically target specific areas.”

Integral part

Pre-emergence herbicide applications have become an integral part of control where blackgrass is an issue. This was reflected in the survey where 80% of growers said they have always used a pre-em during the past five years. “With increased resistance to post-emergent herbicides there has been more emphasis on pre-ems,” notes Stephen.

For the maximum effect of herbicides, putting pre-ems at the forefront of priorities is critical, adds David. “Pre-ems are fundamental. The application of active ingredients post-em will not give growers 98% control.”

However, while pre-ems play a very important role, it’s vital that this is in conjunction with an integrated control strategy, says Stephen.

But it’s not just about when you spray but also what you spray. When asked which active ingredients were being used in their blackgrass control programme, 83% of growers said flufenacet, while a further 76% said diflufenican and 68% stated the use of pendimethanlin (see chart on p22). “To get the best out of chemical controls,
Congratulations to our three lucky winners; Ruth East from Lincolnshire, Giles Benson from Northants and Chris Green from Gloucestershire, who responded to the CPM/Adama survey on blackgrass control. They have each won a fabulous prize of a pair of tickets to this year’s British Touring Car Championship at Silverstone.

All three CPM readers responded to the survey and completed the tie-breaker question, explaining their strategy for blackgrass control in 25 words. The common theme that impressed the judges was reference to an integrated strategy which is so crucial to blackgrass control.

Answers included: “Follow the advice given 30 years ago by Racing ahead on blackgrass control

Dr Stephen Moss, which is to use an integrated approach with chemicals as last defence,” from Ruth. “Make sure every part of your control strategy is to the best of your ability, be it rotation, drilling dates or correct active ingredients at correct rates,” said Giles. Chris suggested: “Do everything better: timing, application quality, rotation, stale seed beds, maximising glyphosate, crop competition, variable seed rates, compaction reduction and ensuring activation moisture, for example.”

The aim of the survey was to explore the most successful control methods and strategies used on farm. To take part in the next survey, make sure we have your correct details by emailing

arque@cpm-magazine.co.uk

growers must be using a combination of active ingredients,” notes David. “It’s also good to see tri-allate up there — the adoption of Avadex granules is paying dividends.”

Very beneficial

Despite concerns about diflufenican’s efficacy on grass weeds as a stand-alone product, it is proving to be very beneficial as part of mixtures, says Stephen. “Diflufenican definitely adds something in terms of control.”

Flufenacet has been rising in popularity over recent years, so it’s no surprise that 60% of growers revealed that most of their cereal crops benefit from applying it pre-em. “Flufenacet applied at 240g/ha is a fundamental part of pre-em programmes. However, it should always be in combination with other products,” warns David. “Growers who aren’t using it may want to consider why not.”

While flufenacet appears to be the active least affected by resistance at the moment, it’s crucial to mix and match it with other actives to protect its efficacy in the future, explains Ben.

“Flufenacet is the corner stone of blackgrass control. However, it’s important not to rely solely on it and stack it with other pre-ems or we risk causing problems for ourselves in the future.”

Tri-allate is also becoming more frequently used and can be very useful in terms of blackgrass control. “The downside of tri-allate is that it requires specialist kit to apply it,” explains Ben. “It’s a cost, but it’s worth it.” This was reflected in the survey where 56% of growers stated they had invested in application machinery or were using a contractor to apply tri-allate.

Though herbicides and chemistry are essential weapons in the armoury for controlling blackgrass, they are not a silver bullet and must be used in conjunction with other strategies. “The right chemistry can work at the right time, but cultural and non-chemical approaches are equally important,” says David. “There’s value in collaborative approaches too — take the opportunity to learn about different techniques from others that you could apply to your own ground.”

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The impact of verticillium wilt is believed to be becoming progressively worse in the UK. Symptoms are often not visible until late in the season, but damage can start in the autumn when establishment is key. *CPM* investigates.

By Rob Jones and Lucy de la Pasture

Technical OSR agronomy

Severe infections have been found to cause stunting and chlorosis of infected seedlings.

Oilseed rape is a crop well known for its variable performance from year to year. While some of the factors which affect it are easily identified, others are more insidious and weaken plants, making the crop less resilient to other problems. Verticillium wilt is just one of these.

It’s reckoned to hit yields by up to 25%, although in extreme instances where the canopy collapses and seed shedding occurs, losses have been far higher. Perhaps most worryingly, verticillium wilt is a problem with no easy solutions and one that’s getting worse in the UK.

Despite the apparent threat, little is known about the disease including how it arrived in the UK or what level of inoculum is needed to cause yield loss, says Tim Boor, research consultant at ADAS.

He believes environmental factors such as soil type, soil temperature, and soil moisture influence disease incidence, but to what extent is not fully understood.

Greater severity

“We’re seeing greater severity of infection and an expansion in the area affected,” says Tim. “Verticillium wilt is a relatively new disease in the UK, and this is part of the problem facing researchers in developing our understanding of it and its impact.

“This means we haven’t been in the game that long. We simply don’t have the decades of research that we have with other diseases such as light leaf spot,” he adds.

Another of the big challenges with verticillium wilt is how the disease manifests towards the end of the growing season.

“Assessing its incidence and consequential impact is complicated because it’s often difficult to diagnose in the field until seeds start to ripen. Early symptoms may appear at flowering and, at this time, affected OSR plants show chlorosis of branches and leaves. Despite its name, distinctive wilting symptoms are rarely seen,” he adds.

Its occurrence can also be masked by other diseases, particularly phoma stem canker, explains Tim.

“Verticillium wilt symptoms can be distinguished from other diseases as it causes vertical yellow or brown stripes.”

Tim Boor explains that the symptoms of verticillium wilt can be masked by other diseases, particularly phoma stem canker.
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A route to better OSR establishment

Robert Atkinson grows oilseed rape together with berseem clover to aid establishment and direct-drills the crop using a Moore drill.

Companion plants in OSR are helping one South Yorks grower boost the crop’s establishment, providing valuable insurance with reduced cultivations and on heavier soils.

Good soil structure is vital to help OSR make the best start, says Robert Atkinson, who grows 40ha of the crop at Adwick Grange, Woodland, near Doncaster. He’s moving to a low-till/direct drilling regime across the farm, mainly to help control blackgrass, which he admits requires something of a leap of faith with a small-seeded crop, like OSR sown at low rates.

Wet, compacted soils can also be a problem on his heavier land. “OSR needs to get its roots down quickly, and anything that compromises that must be avoided,” he says.

To help optimise establishment and root growth, Robert now grows berseem clover alongside most of his OSR area. It’s strong rooting action can also allow a light cultivation to be omitted on the better land, says Robert.

He started companion cropping four years ago with a half-field trial for Agrovista. “I didn’t actually notice much of an improvement, so I was a bit sceptical. But Chris Martin (Agrovista technical manager) persuaded me give it another try.”

Robert chose a wetter field, with a red clay subsoil. “This time, we could see to a line where we had been using the berseem clover — it was like chalk and cheese.

“Since then, I have used it widely each season. It can certainly cope with minor compaction, giving me more confidence where I am reducing cultivations and on heavier soils, where it allows a bit more leeway on how you set your machines.”

Better-land OSR crops are usually direct-drilled with a three-year old 3m Moore disc drill, bought primarily to sow spring cereals after cover crops. Where a light cultivation is required he’ll bring an old 3m Claydon SR tine drill into service instead.

Heavier land can be direct-drilled, but if deep compaction is present he uses an adapted three-leg flat lift fitted with Metcalfe low-disturbance legs, with subsequent cultivations decided on the day.

The OSR and clover seed are each drilled at 3kg/ha. A maximum of 4ha worth is put into the drill to ensure a thorough mix. Seedbed nitrogen is important, believes Robert, and is added to give both species a boost. At Adwick Grange this is delivered via manure from the farm’s pig unit or biosolids.

In addition to the rooting benefits, Robert believes the additional biomass from the berseem clover can help shield young OSR plants from pests, particularly slugs, and there may also be a beneficial effect on flea beetle, though he’s not observed it.

“Having more green material gives you additional warning that something might be wrong, so you have extra time to react. If you are only planting 3kg of OSR, if there’s a slug problem, you don’t have to lose much before there’s nothing left.”

The berseem clover is taken out by a routine application of Astrokerb (aminopyralid+ propyzamide) targeted at poppies and blackgrass in late Nov/early Dec. “By this time the roots are 15cm down and the clover has done its job.”

At less than £10/ha, Robert says berseem clover is relatively cheap insurance. “While I can’t say hand on heart the technique improves yields in good crops, it certainly does improve establishment elsewhere and I have seen a reduction in cultivation costs.”

In trials, yields of OSR on stronger land have consistently been up by 0.5t/ha when established with companion plants, and in a difficult rooting season, such as this year, there’s likely to be even greater yield benefits, adds Chris.

“If it’s not removed by a late-autumn herbicide, it will be killed off by frost over the winter after it has done its work. Unlike many other companion plants and other varieties of berseem clover, Tabor will not need removing with synthetic chemistry in the spring.”

The variety of berseem clover is also key to aiding OSR establishment, he adds. Tabor is tolerant to most pre-emergence and early post-emergence herbicides, except clomazone.

“During the first week in May, we spray propyzamide (not a residual herbicide, but a post-emergence), and as long as there’s a light cultivation, it will not penetrate.

“Typically OSR roots will be around 20% bigger when combined with the berseem clover,” says Chris.

Berseem clover is a powerful rooter that can open up soils, enabling the relatively weak OSR roots to penetrate these areas, boosting access to moisture and nutrients.

The difference between OSR grown with berseem clover (left) and without can be clearly seen in this photo.
"Charlock, runch, cleavers... everything’s against you when you’re growing OSR."

"Clearfield has transformed the way we grow OSR, the performance is phenomenal."

Robin Aird, Farm Manager. Charlton Park Estate, Wiltshire

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Applying pre-emergence herbicides to OSR is the key to achieving control of blackgrass and other problematic weeds such as hedge mustard and groundsel, according to Agrii agronomist Steve Portas.

“We need to learn from the on-going challenges associated with eradicating grassweeds in wheat and adopt similar strategies in the OSR crop. Cost-effective weed control needs to start early using a portfolio of actives to minimise resistance build up and improve control, in a similar manner to the stack of herbicides used to control blackgrass in wheat,” he says.

“Early applied herbicides such as Centium (clomazone) or Circuit (metazachlor + clomazone) should be used to take out broadleaf weeds and also sensitise blackgrass, which can then be controlled with post-emergence options such as Crawler (carbetamide) or Kerb (propyzamide).”

For the past three or four years Steve says growers have delayed their herbicide applications in case the crop is hit by a flea beetle attack. A severe attack can result in a crop failure, in which case any early applied herbicides would be considered a waste of money.

“Some growers have traditionally followed a ‘wait and see’ strategy before applying herbicides, but the problem with this approach is that OSR is susceptible to early weed competition,” he says.

“There’s been a reliance on early post-em herbicides rather than pre-em options such as Centium because of other management pressures, including cereal harvest and land preparation which may all be taking place at the same time. But problem weed species, such as hedge mustard, can only be successfully controlled at the pre-em timing,” he stresses.

He recommends that in high blackgrass situations, a pre-em application of Centium or Circuit to sensitise blackgrass and take out broadleaf weeds early, followed by low rate Crawler or Centurion Max (clethodim) is advisable. If blackgrass is still a problem, following this with an application of Kerb in Nov presents the most robust strategy, he says.

“We want to take out blackgrass completely, but we rarely achieve this because of the pressure on existing chemistry,” he explains. “What growers often do is apply Kerb at full rate at the end of Oct, which is too late for deep-rooted blackgrass. Instead they should be applying Centium pre-em to sensitise the blackgrass to subsequent herbicides.

“Set up the field early to achieve the desired results. You get more for your money where Centium has been included in herbicide programmes than many probably realise,” he says. “It works well sequenced with early post-em products at appropriate rates.

“It’s a low-cost insurance because if flea beetle comes into the crop later and ruin it, there’ll still be time to re-drill the field with a second cereal crop without compromising the yield and quality potential. At the same time, up to 30% control of blackgrass is achievable when pre-em herbicides are applied, as well as giving good control of problematic weeds such as hedge mustard,” he says.

Steve points out that broadleaf weeds are becoming more of an issue in OSR crops and one of the worst offenders is hedge mustard, particularly on the headlands where the seeds at harvest can be transferred into the field by the combine. The result can be a thick band of the weed taking hold around the outside of fields that becomes increasingly difficult to control as it increases in size during the season.

“Utilising Centium in the herbicide programme as a pre-em application has several important benefits. Firstly, due to its unique encapsulating formulation there is no issue with volatilisation, so it breaks down evenly over time. It’s also quite immobile in the soil profile so there is no buffer zone requirement, which is critically important when it comes to tackling blackgrass and hedge mustard on headlands near watercourses,” he explains.
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Scraping back the surface of the stem reveals the pathogen in the vascular tissue.

Carl Gibbard says verticillium wilt can be damaging in the autumn, even though most symptoms aren’t seen visually until later in the season.

The brown band up the face of the stem is typical of verticillium wilt infection.

grey discolouration where the pathogen is present in the vascular tissue. Often only a small proportion of the stem circumference is affected so the vertical band and number of small branches affected is quite small. In some plants however, the whole circumference is affected and the whole plant ripens prematurely or dies.”

Verticillium wilt was officially confirmed in England in 2007 (on farms in Kent and Herefords), but general reports since suggest it’s now widespread across the southern, eastern and central regions of England. It’s thought to be less endemic in the north of the UK. But while the UK situation is typically less severe than that seen in some European countries, we shouldn’t be complacent, believes Tim. “The area of crop severely affected with verticillium wilt may not be on a par with that in some other countries, but it’s worth noting that there are no chemical solutions to this problem. That means other strategies need to be relied on to prevent the disease from being worse.

“These include using long rotations, with at least four years between brassica crops, and selecting appropriate varieties,” he says.

Outside the UK, the causal pathogen Verticillium longisporum has been widely reported in Germany, Poland, Ukraine and southern Russia, but it is perhaps the experience of Sweden that is most valuable to the UK.

“Sweden is still coping with the legacy of the short OSR rotations that were common in the 1950s. It was recognised as the most important disease of OSR in Sweden in 1960 and even today, yield losses as a result of verticillium wilt are generally cited as being up to 50%,” says Tim.

He also highlights another potentially valuable lesson for UK growers, referring to German studies which considered the role of cultivation strategy and length of growing season in supporting disease incidence.

“Conservation tillage gave slightly more verticillium wilt than ploughing, while extending the growing season from a standard 45 weeks (315 days) to 46-48 weeks increased substantially both disease incidence and micro-sclerotial populations in soil,” he comments.

The extended season was achieved mostly by earlier sowing. “Whether delayed sowing can reduce the risk of severe autumn infection under UK conditions has not been tested. When it comes to sowing date, a balance must be drawn to ensure that oilseed rape plants are still well established,” he adds.

Soil-borne inoculum

While most infestations are thought to be the result of soil-borne inoculum — it’s generally accepted that microsclerotia can survive in the soil for long periods, probably more than 10 years — transmission via seed is also a distinct possibility.

“Because of this possibility, it’d be prudent to avoid the use of home-saved seed from affected crops,” says Tim.

So what about variety choice as a means of reducing the risk of yield losses from verticillium wilt?

The impact of the disease has been troubling breeders for more than a decade. This is partly because resistance mechanisms are poorly understood, but also breeders are having to look to other brassica species for resistance, explains Carl Gibbard, KWS oilseed rape breeder.

KWS is one breeder which suffered an unfortunate lesson with the disease. Its variety Quartz came to market in 2010 and quickly caught the attention of growers only to suffer a premature end after being found to be highly susceptible to verticillium wilt.

“Verticillium wilt simply wasn’t a disease we considered during our variety screening and UK assessment process at the time,” he explains.

“Our focus has always been on selecting varieties that are well suited to the UK, but we were slow to recognise the importance of verticillium wilt and the incidence of disease on farms as a consequence of short rotations or early August drilling. Quartz was a harsh lesson and, as a result we are now ahead of the pack and have been screening all UK and continental material for tolerance since 2012,” he explains.

“We’ve dropped promising varieties purely because of poor tolerance to verticillium wilt. In Barbados and Campus, we have varieties that have demonstrated excellent tolerance across several seasons, while Flamingo is the new benchmark standard,” he adds.

Using a pot test developed by Peter Gladders during his time at ADAS Boxworth, varieties are inoculated and the impact on vigour measured against uninoculated
No crop has more herbicides under stewardship guidelines than OSR and these have now been rolled together under the banner of the Voluntary Initiative (VI) campaign, ‘OSR herbicides? Think Water’.

The OSR herbicides being detected in water are metazachlor, propyzamide, carbetamide, quinmerac and clopyralid. Propyzamide is the most frequently detected, while quinmerac and clopyralid are more difficult for water companies to remove.

The OSR herbicides? Think Water initiative has launched a new set of guidelines to provide farmers and spray operators with practical advice to prevent OSR herbicides entering water.

Nigel Chadwick, operations director of the VI, explains that OSR herbicides are critical to growing a successful crop and that any restrictions on their use could threaten its economic viability.

“It’s vital that stewardship steps are followed this season to help protect water and, as a result, the actives themselves,” he says.

He summarises the three practical steps which boil down to managing tramlines, understanding risks in the field, employing appropriate buffer zones and following product label conditions for use.

“This applies to everyone, but if land falls within a Drinking Water Safeguard Zone (DWSgZ), you need to take extra care. If your land is in one of these areas, speak to your local water company catchment officer or agronomist to establish the potential risk on a field-by-field basis.

“It then comes down to employing best practice agronomy and getting ahead of the season as much as possible, while using an IPM approach all year round. Essentially if we work together to ensure these steps are followed, the risk of OSR herbicides entering drinking water will be reduced,” he adds.

For more information on the OSR Herbicides? Think Water initiative please visit: www.osrherbicides.org.uk

OSR herbicide stewardship

OSR Herbicides? Think Water

IPM steps

• Manage tramlines, pathways and gate ways to minimise compaction and reduce surface water run-off
• Implement a 6m vegetative buffer strip between OSR fields and surface water
• Before making applications, always refer to product specific labels and the VI Water Protection Advice Sheets (WPAS) which can be found on the OSR Herbicides? Think Water website.

plants once the plant reaches four true leaves.

“Severe infections have been found to cause stunting and chlorosis of infected seedlings with death occurring within a month, so verticillium wilt can be highly damaging in the autumn. With ADAS’ assistance Catana was identified as having the best resistance of all varieties available at the time. With that in mind, our aim since is to have tolerance as good as or better than Catana,” says Carl.
The seed trade is predicting the area of Clearfield oilseed rape could double for the fourth year in a row this autumn, bringing its area to around 20% of the national crop. CPM finds out why.

By Rob Jones

There’s a quiet revolution going on when it comes to oilseed rape varieties and it’s being led by growers. Many have thrown the AHDB Recommended List out of the window and are putting lower risks ahead of bumper yields.

OSR is a crop plagued by uncertainty during its establishment phase. Combine this with a large up-front herbicide spend and for many growers, it’s become a gamble, particularly since the loss of neonicotinoid seed treatments. But some feel that all changed with the introduction of the Clearfield trait.

Interest from growers across the country has grown to such an extent that leading merchants foresee the current 60,000ha of OSR varieties with the trait increasing to as much as 120,000ha this autumn. Depending on the level of OSR planting this autumn, this would give it a market share of 17-20%.

Many growers who dipped their toe in the water for the first time last autumn are going completely Clearfield this time around, according to Openfield’s head of seed, Lee Bennett. “We’re also getting 100% Clearfield orders from large businesses that have never grown it before,” he says.

Spending on herbicides
But why is the trait gaining in popularity? According to Lee, it’s because growers like waiting until they know they have a crop and knowing what weeds they need to control before spending on herbicides.

“They like having the most reliable control of cruciferous weeds and OSR volunteers. And they like the extra protection they get against erucic acid contamination with a Clearfield variety,” he says.

Based on our seed orders to date and all the indications from those still to place them, I have no doubt Clearfield plantings will increase very substantially once again this autumn, with DK Imperial CL our biggest seller. I see 20% of the market as a very realistic expectation.”

David Waite and his seed management colleagues at Frontier are finding exactly the same thing, with early orders for their main variety, DK Impression CL, and interest in growing Clearfield at an all-time high. So much so that they expect the increased stocks of seed they have for this autumn may sell out before the current OSR crop is harvested.

“Worries over erucic acid contamination are a major factor behind the increased demand we’re experiencing,” he explains.

“Even people who have never grown HEAR in the past have been having problems at the crush — presumably as a result of cruciferous weed contamination, farm-saved seed or both.

“The Clearfield system is an ideal solution here, especially with the sort of cast-iron seed quality assurances and the free pre-movement erucic acid testing of...”

Lee Bennett believes one of the things attracting growers to Clearfield varieties is that the system enables them to wait and see if they have a crop before spending on herbicides.
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Seed trade expectations could underestimate the growth in the UK Clearfield OSR area this autumn, according to the latest national grower intelligence.

A late-June OSR establishment study run independently for leading breeder Dekalb, gathered information from more than 120 winter OSR growers across the country and backs-up the seeds-men prediction of doubling the Clearfield acreage from its current level.

The study involved growers from 21 counties, harvesting a total of more than 11,500ha of winter OSR this season. Their planting intentions suggest a further noticeable year-on-year rise in the national OSR area is on the cards for harvest 2019, with Clearfield accounting for the vast majority of this increase.

The figures indicate Clearfield plantings are set to rise by 110% from 2018 levels — the majority of current growers planning to significantly expand their crops this autumn and nearly twice as many farms overall intending to plant CL varieties. At the same time, more growers are looking to go 100% Clearfield.

“As ever, the extent to which these intentions will translate into actual plantings will depend, more than anything else, on the weather,” notes Dekalb northwest Europe commercial manager, Geoff Hall. “But they clearly indicate grower confidence both in OSR in general and in the sort of high performance, high reliability Clearfield varieties in particular.

“European OSR market prospects have been noticeably stronger of late and analysts are more positive about the future than they’ve been for a while. Alongside this, the lack of yield lag and lower establishment and marketing risks associated with our leading Clearfield varieties are clearly proving an obvious attraction for growers.”

Geoff Hall believes OSR markets look positive and expects an increased acreage of the crop to be planted this autumn.
marketing risks,” he says.

“Managing up-front cost of winter OSR growing and improving the crop’s chance of establishment has become a key priority to minimise the risks of crop failure from a dry autumn or flea beetle attack.

“It’s also important to overcome volunteer OSR and cruciferous weed problems which can compromise spraying programmes, canopy management and desiccation timing. Planting 55 seeds/m² of a variety with the traits you want, but actually growing 100 plants/m² or more of a mixture of plants with very different and less desirable qualities, doesn’t make for effective or economic use of expensive crop inputs. Equally, the last thing you want when sending your crop to the crush is a hefty claim for high erucic acid levels.

No yield sacrifice

“The popularity of Clearfield is growing by leaps and bounds as more and more growers see these advantages for themselves or learn of them from others and appreciate they no longer need to sacrifice yield for the character.”

Agrii seed manager, Matt Richardson insists the tremendous progress made in improving both the yield and agronomics of Clearfield varieties is every bit as significant in the continued expansion of the system.

“The first CL variety to join the AHDB Recommended List in 2013/14, DK Imagine CL, was well off the pace in its gross output and had a decidedly average agronomic package,” he recalls. “It was a breakthrough, allowing OSR to be grown economically on land with serious charlock or runch problems, but that was about all,” he says.

“In complete contrast, our growers are finding today’s varieties very much on a par with mainstream ‘double lows’ in performance in the field. Both DK Imperial and new stablemate DK Impressario have strong phoma and light leaf spot resistance ratings, are vigorous to establish with rapid development in the autumn and have pod shatter resistance. Combine this with all the advantages of Clearfield and what’s not to like?”

At Hubbards Seeds, Barnaby Patchett is also finding Clearfield demand is higher than last season but urges growers to be discerning in their variety choice.

“As the system has become more popular the number of CL varieties to choose from has increased dramatically,” he points out.

“You certainly don’t have to sacrifice output these days to take advantage of imazamox resistance. Nor do you have to accept less good disease resistance, slower autumn development or the pod shatter resistance that can be so useful with Clearfield varieties to minimise volunteers as much as maximise yield.”
The South West of France is well known for its culinary delicacies and fine wines. But it’s also home to a company with an interesting ethos and a very French reverence for their raw ingredients. CPM visits the home and factories of De Sangosse.

By Lucy de la Pasture

A few miles outside Agen in South West France lies the small town, Pont du Casse. It’s the home of a French company where the employees own 78% of its shares, with 14% held by the founding De Sangosse family and just 8% in the hands of investors.

Nicolas Fillon, De Sangosse directeur général and CEO, believes there are some unique advantages to an employee-owned company. “With no shareholder dividends to pay, all the profit goes back into the company enabling innovation and a strong entrepreneurial spirit. It gives the staff, who are our key asset, a commitment towards the aims of the company.”

He believes the business model of De Sangosse makes them ideally suited to niche markets with speciality products, where they have an international presence.

“De Sangosse have launched 31 speciality products in the past three years, have a further 44 in development and have 1200 registrations in 50 countries,” he says.

Huge growth potential

One of the markets Nicolas sees as having a huge growth potential is in biostimulants, an area which De Sangosse have been involved in since 2008. The emphasis on biocontrols in French agricultural policy is also driving the growth trend in Europe.

“Even though some biocontrols only have 35-40% efficacy, they can form a useful part of the solution, allowing a decrease in the use of conventional chemistry,” he says.

The focus on producing food in a more sustainable way is being driven by societal, regulatory and stewardship pressures, says François Benne, global marketing and project manager for baits. In France, where government policies in agriculture are increasingly green, ferric phosphate is registered as a biocontrol product rather than a pesticide, he comments.

“Baits are the only pesticide used in agriculture that involves being first found by the pest and then ingested in sufficient quantities to cause its death. To achieve

The bait is every bit as important as the active ingredient it contains.”

Nicolas Fillon explains because the staff are the major share-holders, all the profit goes back into the company enabling innovation.
De Sangosse are the largest employer in Agen, with a modern, state-of-the-art facility at Pont-du-Casse.

Slug control

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The focus on producing food in a more sustainable way is being driven by societal, regulatory and stewardship pressures, says François Benne.

this the bait is every bit as important as the active ingredient it contains,” he says.

De Sangosse have two laboratories dedicated to R&D in bait technology, looking at more effective product formulations, screening for new active ingredients and specific quality control. The company’s trials capability extends beyond the lab with cage trials and field trials used to evaluate new developments.

In true French tradition, the company pays the same respect to the ingredients that go in to their bait products as the they do to the champagne and foie gras the region is famous for. It’s all about quality and creating a product to be proud of.

Manufacturing heart

Close by the living walls which envelop he modern building which is De Sangosse HQ lies Borie Industries, the manufacturing heart of the company’s bait business. Stepping inside one of the factories, its gleaming stainless steel, spotless surrounding and the slightly sweet smell of durum wheat flour mixing with warm water gives the distinct impression of a food factory, that is until closer inspection reveals the pasta dough is bright blue in colour.

On the day of our visit, the factory was in full-flow, producing slug pellets containing metaldehyde. Manufacturing director Arnaud Hot explains the factory runs 24 hours a day, seven days a week, and has a production capacity of 100t/day.

“There are 10-12 different raw materials that go in to making a metaldehyde slug pellet and quality of ingredients is really important,” he says.

Durum wheat is grown on contract and must meet the De Sangosse spec, with every load tested on intake. “It’s very important that we are able to produce a uniform pellet which is why we’re so fussy about the spec of the flour,” explains Arnaud.

Once the ingredients are mixed into a uniform dough, it’s passed through an extruder to produce a pellet. The pellet is still plastic when formed and has to be gradually dried by passing through a series of six driers.

“Drying must be a slow process because if the moisture content is reduced too quickly, the pellet could crack and would be less consistent,” he says.

At the moment the slug bait facility produces 80% metaldehyde and 20% ferric phosphate pellets, with the UK very much leading the way where the newer active is concerned, says Simon McMunn, commercial manager for the UK and Ireland.

Predicting the product requirements for a pest whose pressure is influenced so
much by the weather is difficult at best, says Simon, but De Sangosse is in a unique position to respond to demand because all their slug pellets are manufactured ‘in-house’.

Arnaud explains that in order to switch the factory from metaldehyde pellet manufacture to ferric phosphate involves a two-day clean down procedure. To provide more manufacturing flexibility De Sangosse are in the process of building a new state-of-the-art factory, which will be up and running this autumn.

“It’s a strategic investment costing €10M and will enable us to respond more quickly to variations in the market because we can produce slug pellets containing different active ingredients at the same time,” explains Simon.

### Slug biology

One of the things that makes slug pressure so difficult to forecast is their biology. “Slugs are hermaphrodite and a single slug can lay 100-500 eggs in 10-50 clusters. The time the eggs need to incubate depends on temperature, with hatch in 2-3 weeks at 20°C or it can take 5 months at 5°C.”

“Slug activity depends on light and temperature, with 18°C the optimum. Humidity is necessary for movement, with slugs able to travel 2-7m/day under favourable conditions,” he says.

Simon believes slugs are an important part of the ecosystem as one of nature’s recyclers, so agriculture needs to be able to live alongside them but not to the detriment of the crop. That means an integrated approach to slug control is needed that employs cultural controls, takes the tillage systems used on a farm into account, identifies the risks and monitors slug populations in an effort to reduce the need to treat.

“Treatment decisions should always be based on likely economic damage to the crop and take into account unintended consequences of actions on the farm on slug numbers. For example, the loss of neonicotinoid seed treatments will probably result in more pyrethroids being sprayed, which will affect natural slug predators such as carabid and ground beetles,” he points out.

Simon believes the industry has been fooled into considering the number of baiting points as crucial for good slug control. “Around 6-10 slugs are killed per pellet, depending on their size and species. If the number of baiting points is 30m² and each pellet kills 10 slugs, then that’s 300 slugs/m². If slugs were present at this population, the ground would be moving,” he says, explaining why more baiting points aren’t necessary.

But there’re also further consequences of making product choices by the number of baiting points.

### Good control is all in the application

In a summer reminiscent of 1976, it’s hard to imagine slugs are able to survive the drought. But when wet weather returns, slug populations have an uncanny ability to recover. Where slug pellets become necessary, application is as important as the choice of pellet, explains Charlotte Foxall of SCS Spreader & Sprayer Testing. She advises some simple measures to make sure growers get the best out of the pellets they’re applying.

“Monitoring comes first and foremost when it comes to slug control and can help establish real-time populations to base application decisions on. Once slug population levels have been established, inspect your machinery to ensure the spreader is fastened correctly, the electrics are functioning, and the discs, vanes and agitation mechanism are in good condition and turning correctly.”

Pellet quality also has a big impact on spreading accuracy, explains Charlotte. “There are four main characteristics that combine to make a good quality slug pellet. This includes size, which is best between 2-3mm, a uniform shape, a strong pellet that has a crush strength over 3kg, and a density over 0.7kg/l.”

Once a robust pellet is selected, Charlotte advises carrying out a full-width tray test to establish an accurate spread of the pellets, aiming for a balanced number of pellets per tray.

“This is vital to ensure maximum impact at minimum cost, and reduced wastage which is all better for the environment,” she says. “When switching between products it’s also important to recalibrate between, or after, each use.”

With ongoing pressure on metaldehyde usage and the introduction of 10m buffer zone guidelines from the Metaldehyde Stewardship Group (MSG), growers are increasingly using ferric phosphate as well as metaldehyde, with some switching entirely to ferric phosphate due to its efficacy and environmental benefits, explains Chris Charnock, Certis’ arable product manager.

“As Sluxx (ferric phosphate) isn’t soluble in water, it has an extremely good environmental profile and fits particularly well in high-risk situations, such as vulnerable drinking water catchment areas. It’s a high quality, uniform, wet process pellet so is a good choice this season as it spreads well, is rainfast and has anti-moulding properties. “If all the tips above are followed then an accurate, cost effective and environmentally aligned slug pellet application can be achieved,” he concludes.
No change yet for metaldehyde

The future of metaldehyde and any statutory requirements that may accompany it’s reapproval are still in the hands of the regulators. With the slug pellet application season fast approaching, it’s business as usual as far as metaldehyde is concerned and all the enhanced stewardship measures remain in place.

Alison Hall, spokesperson for the MSG, explains that while it was hoped that metaldehyde product re-registrations would come through ahead of the 2018 slug pelleting season, the process is still ongoing.

“There’s still no decision, but we’ve been making a strong case to the authorities, particularly as to how stewardship is delivering environmental benefits,” she says.

Of the key stewardship measures, the larger buffer zone introduced last season is important to ensure no pellets fall within a minimum of 10m of any field boundary or watercourse, reminds Alison.

“The buffer was historically six metres and it only applied to watercourses. But increasing it and applying the zone to all field boundaries helps protect birds and small mammals, as well as providing additional protection to water,” she adds.

“With the view to helping minimise slug infestations and reduce the need for treatment, metaldehyde slug pellets should be used as part of a wider Integrated Pest Management (IPM) programme.

“Factors such as soil and stubble management, planting methods, weather, trapping and monitoring should all be considered as part of slug control programmes. And if treatment is necessary, remember to refer to the full set of MSG guidelines,” she says.

of baiting points they provide, believes Simon. “A smaller pellet won’t demonstrate consistent ballistic properties, resulting in poor application. It also represents a higher surface to volume ratio, which potentially can lead to increased leaching of the active ingredient and degradation of the pellet. All of which will result in reduced levels of slug control.”

There’s an old French proverb which says ‘long after the price is forgotten, quality remains’ which seems to hold true for champagne, foie gras and slug pellets!
describes the novel spore-trapping devices as a new type of precision agriculture. “The technology will enable growers to apply fungicides more precisely, particularly when diseases are difficult to control or sporadic in occurrence,” he says.

The information the Rothamsted DSS will provide will also help growers with management decisions outside of the normal timings, he explains. “Fungicide applications at T1 and T2 are made to protect the top three leaves of the cereal crop. It’s a sure sign that when an innovation is being worked on simultaneously by different groups of pioneers it’s likely to be a game-changer. It happened with the light bulb, the telephone and the aeroplane, and right now it’s happening in agriculture.

Scientists at both Rothamsted Research and Fera have independently developed systems to monitor the levels of disease spores in the air. These spore traps work automatically, drawing in a sample of air, preparing it for testing and running a DNA test to identify and quantify the disease spores present.

Disease models
Both research institutions have also built disease models which use weather data to help interpret the spore trapping information and predict the risk of disease developing in crops. It’s an important technology that will provide decision support services (DSS) to help growers better manage diseases and the fungicides that are used to control them, explains AHDB’s Cathryn Lambourne.

“DSSs are a necessity for IPM approaches, which are key to managing crops with a reducing number of active ingredients. But it’s not just about fungicide loss, they will help reduce fungicide use by providing disease-risk information in near real-time,” she says.

AHDB have involvement with both projects, co-funding the research at Rothamsted in partnership with the device manufacturer. AHDB are also partners in CHAP, the agritech centre responsible for Crop Health And Protection. The CHAP work is being carried out in partnership with Fera, with funding support from Innovate-UK.

Rothamsted’s Professor Jon West describes the novel spore-trapping devices as a new type of precision agriculture. “The technology will enable growers to apply fungicides more precisely, particularly when diseases are difficult to control or sporadic in occurrence,” he says.

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The spore trap being developed at Rothamsted sucks air in during the day and runs its diagnostic tests at night, sending the results by text message.

plant which are the biggest contributors to yield. But where the device may prove helpful is in identifying whether crops may need an earlier spray for yellow rust or a late spray for the wind-dispersed spores of septoria, which can infect the flag leaf late-on in the season when earlier-applied fungicide sprays may have degraded.

The spore trapping device has been designed by Burkard Manufacturing. It’s mains-powered, enabling a powerful cyclone to suck in 300 litres of air/min, which is about 30 times more than the capacity of its predecessors, explains Jon.

“Air is sucked in during the day and the device runs its diagnostic tests at night. To do this the spores are broken open to release their DNA and a liquid reagent is added.”

The spore traps employ loop-mediated isothermal amplification (LAMP) which uses assays developed for specific diseases, which are the really clever bit of technology ‘under the bonnet’ that required extensive research to develop. It’s now even possible to identify azole and SDHI insensitivity in the DNA of airborne spores, he adds.

The assays contain carefully designed primers that bind to the target DNA, replicating it many times so that the amount of DNA in the reaction increases greatly. This all takes place at a constant temperature, with each device able to test using three different disease assays at any one time. The DNA is quantified by its degree of fluorescence when a light is directed at the reaction tube, which is every five seconds in the device, explains Jon.

Text message
“Having made its diagnosis, the spore-trapping device communicates its findings by text message, providing the grower with information to assist spray or no-spray decisions which can be combined with weather data to further refine the likelihood of the disease developing, providing a forecast of risk.”

Within the AHDB project, a lot of work has been carried out to find the best siting for the spore-trap. “We looked at different mounting levels to see how it affected the number and type of spores being detected. We found that when mounted on a rooftop at about 10m, we trapped twice the number of species of spores than when the device was mounted on the ground.

“When the device is raised the air is more mixed-up, so spores are blown in from different sources. At ground level the air is partially filtered by surrounding vegetation and crops,” he explains.

As a result of the work Jon suggests the optimum position for the trap will be mounted on a building, which will give the added benefit of improved security, but the device needs to remain easily accessible for the weekly job of changing the reagent cartridge that enables the diagnostics.

The Fera Spore Sentry has been developed along very similar lines and is using the existing Crop Monitor as its
Agronomy is touchy-feely by nature. It involves walking through the crop, pushing back the canopy to see what’s going on in the bottom of the crop, inspecting the leaves, pulling up the odd plant to look at its roots and dissecting it to establish its growth stage.

For Hutchinsons’ agronomist Kieran Walsh, all of these tools were lost to him when he took on the agronomy for the Hands Free Hectare (HFH) at Harper Adams University in Shrops. The project is the result of an idea born in a moment, he explains, made possible because the right people came together at the right time. Now in its second season and backed by AHDB funding, the HFH is attracting attention worldwide and stretching the boundaries of what’s possible without feet on the ground.

With much of the early work concentrating on the mechatronics that make the project possible, this season there’s been more time to focus on how to meet the needs of the crop without walking it.

“It’s been easier this year because we have the bits of kit that had to be designed as we went along last season. Although I can use rovers to scout the crop and soil sample, no robot can yet dissect a plant. So when I needed to establish the growth stage of the crop, we commissioned the rover to dig up a plant and bring it out of the hectare and back to mission control for me to look at,” explains Kieran.

“When I wanted to take leaf samples for tissue and disease analysis, we had to design a claw that fits underneath the big drone so that it can fly in and grab a sample. We’re also able to use the claw to collect ears so we can test the moisture content of the grain before harvest.”

This season Kieran has also had information from a spore trap which he’s found invaluable.

“It’s really given an extra edge because disease and pest levels are the two most difficult things to monitor effectively with a drone. With the spore trap data and information from a weather station, we’ve known when there have been peaks in septoria infection and have been able to adjust rates and timings accordingly.

“Thanks to Bayer, we’ve also taken leaf tissues to be tested at Fera for latent septoria infection and when the results come back we’ll be able to see if we made the right spray decisions,” he adds.

Will this new technology replace the agronomist? Kieran emphatically believes that won’t happen, but it will provide a useful management tool, freeing up time currently spent scouting and driving from field to field.

He also believes that spore-trapping will enable growers to manage out-lying land more reliably, giving them more freedom to choose varieties with the greatest margin potential.
Automated spore traps can be set to monitor three different diseases at a time, with septoria a prime target for wheat growers.

It’s as important to have information on where no blight symptoms are being seen in crops as it is to know where blight outbreaks have occurred. These negative findings help us test and validate the new models for blight forecasting but do rely on the participation of agronomists and growers. “Although the models are robust, they don’t work in complete isolation so it’s important to keep feeding real-life information back to us, so they can continue to improve in accuracy,” she points out.

In-field diagnostics in field vegetables has also moved on with the introduction of lateral-flow devices (like pregnancy tests) which use an immune-assay to provide a positive or negative for the presence of a pathogen, says Cathryn. “The test picks up the presence of spores carried in the air around crops in the field. Used alongside weather data, test results could indicate how likely a disease is to develop, allowing growers to decide if crop protection methods are needed or not.

“Currently a LFD is available for ring spot and light leaf spot in brassicas and is being developed for downy mildew in onions. It’s a step in the right direction before a DNA-based system of monitoring becomes available for use in vegetable crops,” she comments.

“Research Roundup

AHDB Project No 21120002-2140021 - ‘Arable Crop Disease Alert System’ ran from April 2015 to March 2018 at a cost of £75,000 (total cost £120,000).
CHAP disease monitoring info is available at http://www.cropmonitor.co.uk/
How a crop feeds the ear in those final weeks before harvest can be critical to how it yields. CPM visits a Shrops grower whose on-farm trials are building understanding of the process.

By Tom Allen-Stevens

It’s the last week of June, and there’s little doubt that Andrew Williamson’s crop of KWS Siskin winter wheat is feeling the heat of the midday sun. The leaves are curling at the edges, limiting the surface area exposed to the generous amount of sunlight on offer for this Shrops farm that sits on high potential silty clay soil.

But the flag is very much green and clear of disease. What’s more, the N-Tester readings — the main purpose of the visit to the crop — are showing there’s still plenty of nitrogen in the leaf and chlorophyll to keep the crop photosynthesising.

It’s this stage of the season that Andrew feels is crucial to how a wheat crop delivers on its potential. “There’s a big difference between the end of green leaf area and the end of senescence,” he says. “If the leaf shuts down too early, the crop starts putting assimilate back into the straw to keep it alive, rather than into the ear, and that’s when bushel weight suffers.”

The business, Beddoes and Williamson, farms 320ha of arable land that undulates between 100-200m above sea level, based at Upper Overton Farm near Bridgnorth. A keen advocate of precision farming, Andrew’s explored the variability of the land he farms, and it’s his quest for answers that has led him to his own on-farm trials.

Helping him in this quest is Bayer’s Will Charlton, who’s joined him to inspect the crop. As a member of Bayer’s Xpro Farmers Club (see panel on p50), Andrew’s doing some Judge for Yourself trials, that put the company’s SDHI chemistry through its paces.

Monitoring performance

For the past two years, as well as resourcing and helping to administer the trials, Bayer’s been monitoring the performance of the wheat trial. This has included using a drone (see panel on p48), as well as the N-Tester, while leaves have been sent for analysis to test for latent septoria levels. There’s also a similar trial underway in Andrew’s barley crop (see panel on p48).

“The testing will tell us not only the green leaf area, but the photosynthetic capacity of the crop,” says Will. “This is the third year we’ve had Ascra in the Judge for Yourself trials, and it’s often difficult to see much in the way of a visual disease difference, but we do generally see a yield lift.

“We’re keen to attribute the causality of this yield improvement, and pinpoint how growers can make the most of it, which is why we’re working with farmers like Andrew to understand more about what exactly the crop’s doing at the end of the season.”

The wheat trial is also Andrew’s entry for the Yield Enhancement Network (YEN), that helps growers understand the yield potential of their crop and applies a scientific approach towards striving to achieve this. It’s Andrew’s third season in YEN. “I use it mainly as a benchmarking tool to compare my crop’s performance with others,” he says.

“The main aspect to aim for is to build biomass. But the biggest-looking crops don’t always give the best yield — you not only have to build the biomass, you have to sustain it too, and much of that comes down to the weather.”

Results have shown that some of the highest-yielding crops have ear counts of over 600 ears/m². Andrew’s crops have averaged around 350-450 ears/m², so he’s focused on trying to build that. “We don’t know how the weather will pan out, but if we at least set the crop up right and treat it right, then if we get the right conditions, it’ll yield.

“It’s a bit like the three little pigs building their houses — if there’s no wolf then all three houses are fine. But in farming, there’s always a wolf, so you need to start with the strongest foundation.”

Initial results suggest the crop could have built the potential he’s after. “Last year our ear count was 300 ears/m², but this year it’s up around 500 ears/m²,” reports Andrew. “Considering the conditions we had in early spring, the crop’s not done bad. I would...”
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What the eye can’t see, a flight over a crop with a drone generally can, especially if it has the right camera attached and is flown by a professional.

Russ Delaney of Agrivue previously flew Gazelle, Lynx and Apache helicopters in Bosnia and Iraq. The flights over Andrew’s cereal crops may not be quite as intrepid, but new technology is bringing some interesting results.

“The drone is fitted with a multi-spectral camera that enables us to pick out the Normalised Difference Red Edge Index (NDRE). This highlights the differences at the far-red end of the light spectrum much more clearly,” says Russ.

The images are being used by Bayer to provide more insight on what Ascra is doing for the crop, particularly towards the end of the season, reports Will. “Last year, where we flew the drone over the Judge for Yourself plots, the NDRE images picked out quite clearly some of the tramlines where Ascra had been applied, and these correlated with trials where it gave a yield advantage. We’re hoping to repeat that result this year to build a clearer picture on how the treatment is best used.”

Russ Delaney has been using a drone fitted with a multi-spectral camera to pick out the Normalised Difference Red Edge Index.

There’s a new SDHI-based product being put through its paces in Andrew’s barley Judge for Yourself trial. “Our normal practice is to apply two applications of Siltra to the winter barley, but is this the right course of action?” he queries.

As a sink-limited crop, ear number and tiller number are critical for winter barley, he notes. “You have to build a good, thick crop early on, and you don’t want to let it go yellow coming out of the winter as that’s a sign the crop’s losing tillers. We didn’t get on with the nitrogen as early as we would have liked this year.”

The new fungicide was applied at the T2 timing against Adexar. Will reports that it’s also being trialled on other farms and in spring barley. “We’re trying to keep the way it’s used consistent across trials, placing it at only one timing so we can build a clear picture on how it performs.

The leaves are curling at the edges, limiting the surface area exposed to the sun, but the flag is very much green and clear of disease.

Andrew aims to build a good, thick crop of winter barley early on, but wonders whether making two applications of Siltra is the right course of action.

Ideally, that would be T1 in winter barley and T2 in spring barley, which is the timing that tends to bring most benefit from using an SDHI,” he says.

Will Charlton is keen to attribute the causality of Ascra’s yield improvement, and pinpoint how growers can make the most of it.

New product under scrutiny in barley

Last year, the Ascra plot yielded 0.79t/ha more than the comparison treatment, and an analysis across the YEN results is quite revealing about where this came from. “Although our ear count was in the lower quartile of results, our grains/ear, at 62, was in the upper quartile. So overall our grains/m² were a shade higher than average.”

This suggests the crop was relatively successful at hanging onto its green leaf area and feeding the grains. But will it do the same this year, with the higher ear population? “The two seasons are complete polar opposites,” notes Andrew.

“Last season was fairly dry all spring, and into what the crop’s doing.”

New product under scrutiny in barley

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Russ Delaney has been using a drone fitted with a multi-spectral camera to pick out the Normalised Difference Red Edge Index.
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Going for green: the SDHI programmes on trial

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*Aviator – bixafen+ prothioconazole; Ascra – bixafen+ fluopyram+ prothioconazole; Librax – fluxapyroxad+ metconazole; Proline – prothioconazole; Siltra – bixafen+ prothioconazole; Adexar – fluxapyroxad+ epoxiconazole. Seed and fertiliser were applied at variable rate – values shown are average across the field.*

Partners in Performance

Partners in Performance is the result of a long-standing collaboration between Bayer and a group of progressive growers.

It started in 2011 with the launch of Aviator Xpro when growers were invited to trial Aviator on their farm. In these split-field trials Bayer took a back seat with the only demands being the field area for fungicide comparison and crop yield verified over a weighbridge or via combine yield monitor – everything else was down to the farmer.

Over time this developed into more of a club. Each year the farmers would meet to discuss results, listen to guest speakers and debate winter wheat management issues.

Farming has always been a challenging business, and with Brexit those challenges have intensified. The margin between profit and breaking even is likely to become even tighter and any incremental gain will be needed for sustainable combinable crop production.

To achieve that the industry needs to work together to share the latest research and thinking, exchange ideas and experiences.

Partners in Performance aims to bring farmers and specialists together to develop solutions to improve crop performance and investment return.

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This year the ear count’s up around 500 ears/m², but these all have to be fed, with growth sustained.

Through the club the members have benefitted from the latest research and thinking, exchange ideas and experiences.

Partners in Performance

This year the ear count’s up around 500 ears/m², but these all have to be fed, with growth sustained.

> a low disease year until T2. Then we had fairly regular rainfall. This year it’s been fairly wet throughout March and April, but you can see to a line on leaf two where the weather dried up.”

The N-Tester results have shown the crop has maintained adequate chlorophyll in the leaf throughout the latter part of the spring. “We won’t know the results nor be able to draw too many conclusions until the combine goes through. The important aspect is that we’ve captured all the monitoring data during the grain-fill period, so we should be able to draw some reasonable conclusions,” Andrew points out.

He’s also considering what other Judge for Yourself trials he’ll do through the XFC group. “I like the interaction with other farmers in the group – it’s a good forum to share ideas, and you learn things you wouldn’t if you just stayed on your own farm.”

One plan within the group is to investigate the potential of shifting the SDHI timings from T1 and T2 to T2 and T3, specifically to aid green leaf area retention. “But I think that’s a risky strategy. Where we are, you always get septoria in the bottom of the crop and need to get on top of it early to keep the crop in a protectant state — you could easily lose the green leaf before having any chance to retain it.”

But he’s keen to explore the potential of biostimulants. “I’d see them as a support to what we do to keep a crop healthy, and a means to rely less on the chemistry to do all the work. Perhaps there’s a natural immunity a wheat crop has that we tend to throw away as soon as we add fungicides.

“Stimulating these natural defences early in the season may then mean you can focus the SDHI later in the year to retain the green leaf. You can bring in soil health as well — going forward I can see there’s a lot of potential in using fungicides as a strategic component of a plant health strategy, rather than just a defence against disease,” concludes Andrew.

Although relatively clean this year, Andrew worries that it’s a risky strategy not to apply an SDHI at T1, as he always gets septoria in the bottom of the crop.

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For the majority of UK arable soils, full or at least minimum tillage is preferred for weed control, root crop or other reasons. *CPM* rounds up recent cultivator drill developments from the leading players.

By Martin Rickatson

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**Machinery**

**Drills**

With a trend towards later drilling to get maximum benefit from stale seedbeds, increased pressure to cover ground quickly means many are switching either to faster systems or wider machines, suggests Amazone. Faster workrates, reduced disturbance even among full or min-till drills and easy-to-roll seedbeds are key criteria for many buyers.

Its 12/15m Citan-C drills, which are also finding favour among those operating controlled traffic systems, now feature RoTeC pro S single 400mm boron steel disc coulters from the Cirrus drills. A new 8000-litre pressurised seed hopper is split into three sections, allowing up to three different materials to be sown simultaneously, such as a cover crop mix plus a joint application of seed and fertiliser.

Meanwhile, machine access has also been improved and controls grouped into an ‘operator station’ towards the front of the drill for convenience, enabling ground-level remote calibration via the TwinTerminal 3.0 display. ISOBUS control is standard, and the three metering rollers are driven electrically. Half-side shut-off, which can be controlled either manually or via GPS SectionControl, is also standard.

Further Amazone drill developments include a new CombiDisc mounted compact disc harrow for mounting beneath either the gravity-fed Cataya or the pneumatic Centaya drills. The 3m implement features 24 serrated 410mm discs, designed for high-speed rotation to create a seedbed at 3-8cm. Mounting/demounting is said to be swift via a QuickLink quick-coupling system.

Mechanical depth adjustment is standard, and hydraulic optional. Individual disc arms can be adjusted up or down by 30mm for an even work profile in the wheel tracks and at the sides. Packer options include a toothed roller, wedge ring roller, with or without tyre profile, and trapezoid ring rollers.

**Kuhn**

Kuhn has expanded its Espro line-up of...
Like other Kuhn Espro drills, the 4000 RC uses two rows of cultivating discs and a row of 900mm offset press wheels. Said to be designed along the same low power requirement and high output capacity principles of existing Espro models, the new drill incorporates the established Crossflex coulter bar, claimed to be key to the range’s high working speeds. Kuhn suggests the design ensures accuracy of seed placement at forward speeds of up to 17km/h. Coulters are individually mounted on polyurethane blocks to enable close contour-following, while ground pressure and seeding depth adjustment are controlled hydraulically, for consistent placement depth across the full working width even at high speeds.

Like other Espro drills, the 4000 RC uses two rows of cultivating discs and a row of 900mm offset press wheels. An additional row of single-disc coulters behind the working discs can be used to deliver either fertiliser or a second seed type or variety directly in front of the press wheels and equidistant from each of the two main rows of seed.

The 4000-litre hopper is split 2400/1600 for fertiliser and seed, with two separate...
the ability to sow one seed variety from both compartments, seed and fertiliser from the separate compartments, two main crop varieties or two seed varieties each sown to a different depth. For those looking for leading consolidation or levelling, options include front press wheels with in-cab pressure adjustment.

**Väderstad**

Väderstad continues to offer two primary alternatives for those seeking to sow combinable crops into conventionally-prepared or min-tilled seedbeds, the primary difference being the level of cultivation required. Spirit drills (3-9m) level the field surface, prepare the seedbed, reconsolidate, drill and press, and feature individual row depth control. Rapid machines (3-8m), on the other hand, remain the key option for those requiring wider versatility, preparing the seedbed, levelling it, drilling and reconsolidating, with the consolidation wheels controlling the working depth of pairs of coulters.

The company reports increasing interest in two key pieces of technology it’s introduced in recent seasons. In addition to being ISOBUS-compatible, the company’s drills can be specified to be wirelessly controlled via its iPad-based Väderstad E-Control system. This involves placing the operator’s iPad into a docking station in the tractor cab, from where it connects wirelessly to a ‘gateway’ unit on the machine headstock. The system creates its own wireless network, and so internet access is not required. Machine data is stored not in the iPad but in the gateway, which the firm says ensures that it is always secure. Claimed benefits include a relatively low display cost and a unit (iPad) that can be used for multiple other tasks, including control of other machines on the farm.

The other relatively recent introduction is SeedEye, the firm’s sensor-based seed metering system. This allows the operator to set the desired number of seeds per square metre, with the machine, once in work, then recording the number of seeds.
Lemken’s Solitair 25 now features automated calibration, operated from the tractor cab using the drill operating terminal.

Mounting behind the seed hopper, the Twin Tank option is a lightweight dual-product module that can be added to place micro-fertiliser or slug pellets with seed, or to sow fine-seeded companion crops. The metering unit operates in conjunction with the standard drill ground-speed radar but has its own in-cab control, which is said to enable the unit to be easily retro-fitted to existing drills.

Coulter options remain the standard 150mm-wide band unit, a dual product seed/fertiliser coulter and a narrow 60mm coulter for drilling peas, OSR or beans at depths down to 150mm. Also now available is a band-sowing module, which sows seed in nine 150mm-wide rows, and can be specified with standard, dual product or narrow coulters. Self-cleaning press wheels can be adjusted to deliver consolidation from 40-140kg. As an alternative, the Seedaerator can also be specified with an 18-row direct disc-drilling module, each disc placing seed in a
The most recent addition to the Alpego drill range is the Jet-M piggyback drill, available in 3.0m and 3.5m working widths.

- narrow 25mm band followed by a 210mm press wheel, with consolidation adjustable from 40-160kg per coulter.
- While the cultivating front section of the Seedaerator can be fitted with a choice of standard wing, low disturbance and wing seeder legs, a rear tool bar with one or two rows of tines or batter boards can now also be supplied. Raising the rear harrow out of work is said to leave a trash-free area above the seed bands with any crop residue remaining on the undisturbed strips of soil between rows.

**Claydon**

While its strip-till drill range remains unchanged, Claydon reports healthy early sales of its TerraStar shallow surface cultivator, and says its TerraBlade inter-row hoe, created for mechanical weeding between rows of band-sown crops, is now in full production. The front-mounted implement, available in 10, 14, 16 and 20-blade versions, is designed to work at no more than 30mm deep, and is said to be easily controlled via manual steering at forward speeds of around 6km/h.

**Lemken**

After a lengthy introduction period over multiple international shows, Lemken’s entry into the precision drill market, the twin-row Azurit 9, is now in full production. While it will be targeted primarily at the maize-drilling market, Lemken says it is also well suited to burgeoning interest in the need to match moves towards lower sowing rates for oilseed rape with precision spacing along the row.

- The machine uses pairs of residue wheels to clear a seed furrow path, a fertiliser coulter which places fertiliser between the twin rows, and a trailing trapeze packer roller to close the fertiliser groove for pre-consolidation. The firm’s DeltaRow coulters then stagger...
the seed in the pre-consolidated furrows, with the 12.5cm-spaced twin rows then closed by
a v-shaped pressure roller. The result is claimed to provide plants with 70% more
growth area than conventional spacing. Available in four, six and eight-row versions
spaced at 50cm or 75cm, hopper options include a front-mounted tank, while it’s also
possible to combine the row units with Lemken’s Solitair 25 or Compact-Solitair

The Solitair 25 now features automated
calibration, operated from the tractor
cab using the drill operating terminal
after the driver has entered
thousand-grain weight, drilling rate and
maximum working speed. Seeds are
air-distributed to a weighing unit in the
machine’s seed hopper, and when the
calibration sample has been weighed the
results are transmitted to the job computer.
The weigher automatically discharges the
seed sample into the hopper, and the
operator then only needs to confirm the
weighed result and the possible working
speed before beginning drilling.
The metering units, individually driven
by an integrated electric motor, allow
modification of the drilling rate to be
altered by adjusting the motor speed and
the stepless cell wheel. Lemken claims the
automated calibration process makes
drilling preparation faster and is less likely
to be subject to error. A more detailed
calibration or check can be performed by
calibrating individual width sections via
their respective metering units.

**Farmet**

J Brock and Sons, which imports the
Polish-made Farmet range of drills and
cultivation equipment, is adding a new 6m
grain/fertiliser combination drill to its line
for 2018-9, with a seed capacity of 4000
litres and a fertiliser capacity of 2000 litres.
The Falcon 600 Pro, which has a claimed
9.0ha/hr output depending on field size
and topography, is built using a modular
design which allows various cultivation
elements to be specified up front. These
are sited ahead of the fertiliser coulters,
after which tyre packer consolidation takes
place before the seed coulters follow up.
Options include an additional Micro Drill
for small seed-sowing.
Opico’s Maschio Centauro transfers seed from a front-mounted hopper to a rear coulter bar with two or three rows of Suffolk or two rows of single disc coulters.

Sulky
Among the most recent introductions to French firm Sulky’s drill range is its new Cultidisc 3 toolbar for the company’s Xeos Pro combination drill. Designed to boost workrates in high trash conditions, the new 415mm-diameter notched Cultidisc design is more robust than its predecessor, claims the firm, using enhanced sprung protection, and the discs can be run with or without leading press wheels according to preference and conditions. A new steel treatment is said to aid disc passage, particularly where soils are especially trashy and/or stony. Trash handling is further enhanced by the discs’ four-degree placement angle, while penetration pressure has been increased by 25%, to 100kg/disc.

Also new from Sulky is a 4-6m folding double-disc coulter toolbar, the Twindisc, for the Xeos TF, said to provide controlled drilling depth at high forward speeds. Row spacings of 12.5 or 15cm are available, and each sowing unit has its own press wheel and independent parallelogram linkage.

Alpego
The most recent addition to the Alpego drill range is the Jet-M piggyback drill, available in 3.0m and 3.5m working widths. Its coulter bar is connected directly to the 1000-litre forward-mounted hopper via a parallelogram linkage which can also be specified to incorporate the rear roller. The Airon double distribution head is positioned directly onto the coulter-bar and is made entirely from stainless steel. At its centre is what Alpego calls its Turbo Rotal distributor, which uses a spinning impeller-based design to produce more uniform seed distribution, particularly on slopes.

Pöttinger
Apart from the relatively recent introduction of its Tegosem cover crop drill, for use with the firm’s stubble cultivators or compact disc harrows, Pöttinger’s drill offering stays largely unchanged for 2018-19. A key new option for its primary Terrasem cultivator drill range is the new 510mm Wave Disc cultivation element, targeted at those seeking to work just narrow strips of soil. Available on models from the R3 3m rigid to the C9 9m folding Terrasem, and spaced at 12.5cm or 16.7cm, working depth is infinitely hydraulically adjusted. Pöttinger calculates that at the former spacing around 36% of the working width is cultivated, suiting high-yielding, homogenous soils. That figure falls to 27% with 16.7cm spacing, with related draft/power and fuel consumption benefits, particularly when working wetter, heavier or trashier land. Overload protection pressure is 100kg/disc.

The discs offer a number of potential benefits over alternative options, says the firm, including minimal surface movement to limit soil smearing and germination of weed seeds in more moist conditions, plus moisture evaporation and soil erosion in dry areas. On the other hand, says the firm, it also offers the ability to open up the land slightly for drying of wetter soils. The Wave Disc units cultivate the soil in strips, with only a 50mm band either side of the seed slot being disturbed. As these warm up faster than the undisturbed areas in between, the planted crop is reckoned to have a growth advantage over any weeds that manage to establish themselves in the undisturbed rows. Pöttinger also points to the reduced cultivation intensity and tractor power required, the land being loosened only in 45mm-wide strips.

Opico Maschio
Complementing the strip-/min-/no-till implements it sources from other makers, such as Sky’s MaxiDrill and EasyDrill and the HeVa AccuDisc, Opico continues to offer a full range of Maschio drills for those whose systems move more soil.

Available in 4.0, 4.8, 5.0 and 6.0m working widths, the Primavera tine drill features four rows of tine coulters, and single central coulters pressure adjustment. Alitalia units come in 3.0 or 4.0m sizes and feature two or three rows of Suffolk coulters, two rows of Perfecta double-disc coulters or two rows of single disc coulters. Metering is electronic, with variable seed rate capability. Like the other drills, the Centauro uses Maschio’s own Flexeed metering system, but in this case from a front-mounted hopper to a rear coulter bar with two or three rows of Suffolk coulters or two rows of single disc coulters.
McConnel AGRIBUGGY

The ultimate low ground pressure sprayer just got better.
As a result of new players entering the UK market and some familiar names making a return, farmers and contractors have never had such a big choice of mid-market to premium-spec tyre designs. CPM rounds up the recent introductions.

By Peter Hill

While so-called ‘standard’ tyres continue to evolve in terms of rubber compounds, internal structure and tread pattern, much of the development focus falls on higher performance tyres identified by the ‘IF’ and ‘VF’ prefixes to the tyre size markings. These tyres have a carcase structure with a combination of strength, durability and flexibility to outperform ‘standard’ tyres in terms of the load they can carry at a particular inflation pressure, and their ability to sustain fast and extended road travel at modest pressures, subject to certain load limits.

The performance parameters that earn these designations is defined by European Tyre and Rim Technical Organisation (ETRTO), the industry body that ensures interchangeability of different brands of tyres of a given size.

Its ‘IF’ (Increased Flexion) category is for tyres with a 20% load-carrying or operating pressure advantage over standard tyres, while the ‘VF’ (Very High Flexion) prefix identifies tyres that can carry a load at least 40% greater than a ‘standard’ tyre of equivalent size or manage with a 40% lower inflation pressure.

Significant advantages

As such, these tyres offer significant advantages for tractors carrying heavy implements because they need not be pumped up as hard and therefore spread a larger footprint across the soil surface to the benefit of compaction and traction.

Mitas (which is now part of the Trelleborg Group), has recently developed a selection of new ‘VF’ designated tyres, including the HC2000 line for high horsepower tractors.

The Mitas HC2000 range will expand to 12 sizes initially, with traction tyre sizes from VF 420/85R28 to three 42in sizes of 520/85, 650/65 and 710/70, plus a trio of taller tyres up to 2.17m diameter comprising VF 480/80R46, VF 480/95R50 and the very high profile VF 380/105R54.

Bridgestone Group has stepped up its activities with the introduction of the ‘VF’ designated premium-spec VT-Tractor design. This caters for tractors of 150hp upwards, and is available in several 28in to 38in rim sizes in various low-profile configurations.

It carries the ‘Bridgestone’ brand to distinguish it from more ‘middle market’ products such as the Maxi Traction that carry the group’s Firestone name.

Outwardly, the new tyre is distinguished from its Firestone forebears by a longer inner end to the lug, which projects further into the centreline of the tread, a pointed lug nose to encourage penetration, and a larger leading-edge surface to the lug to enhance traction.

Mitas recently developed a selection of new ‘VF’ designated tyres, including the HC2000 line for high horsepower tractors.
These tyres have a carcase structure with a combination of strength, durability and flexibility.

As a ‘VF’ tyre, the VT-Tractor will normally need a wider rim than its ‘conventional’ counterparts but a new bead design means versions of tyre marked ‘NRO’ — narrow rim option — can be used on a standard rim.

BKT has become part of the agri tyre establishment through some notable tractor factory OEM contracts, which not only helps credibility but can also boost replacement-tyre sales.

The company produces an extensive range of ‘standard’ Agrimax RT tyres in its Indian factory and joined the ‘IF’ technology set with its Agrimax Force range, which now extends to 17 sizes from an IF 600/70R28 front axle tyre to an IF 900/60R42 rear fitment.

The tyres are rated as capable of sustained use at up to 65km/h according to their ‘D’ speed rating, which is in line with similar tyres from other manufacturers.

However, BKT’s Agrimax Sirio high speed tyre range includes an IF 600/70R30 size with 70km/h speed rating suitable for JCB Fastrac tractors.

Moreover, BKT has just introduced its first ‘VF’ category tyre — the Agrimax V-Flecto.

This is available in just two sizes for now: a front axle VF 600/60R30 and a VF 710/60R42 rear fitment.

Both have the NRO designation that indicates they can be used on a standard rim, so are suitable as an upgrade from a set of worn regular or ‘IF’ category tyres.

Innovation in detail could be the mantra for some manufacturers looking for a performance advantage from their traction tyres.

Trelleborg found it with the new lug design of the TM700 ProgressiveTraction, a 70% aspect ratio tyre available in sizes from 380/70R28 to 620/70R42.

The manufacturer claims 18% improved grip over the industry average, largely as a result of modifying the lug contact face and the way the lug deforms under vertical (weight) and horizontal (torque) loads.

The so-called ‘double lug’ is reinforced at its base to increase resistance to bending back under torque load.

Instead of blending this extra rubber into the main structure, it’s formed as a ledge with a flat top and sharp edge, which Trelleborg engineers found increased the soil contact area of the lug by 5% and gives it two ‘bites’ at the soil.

They add that the complete structure results in better distribution of forces to the

'Standard' AC65 tyres – 710/70R38 on the rear – from the Mitas range.
The ‘VF’ rated Bridgestone VT-Tractor tyre can operate at 1 bar inflation pressure or less.

The V-Flecto is BKT’s first ‘VF’ category tyre; this is rear size VF 710/60R42 NRO, which replace equivalent standard tyres without needing new rims.

The BKT range includes big, flexible tyres such as this IF 900/60R42 Agrimax Force.

The Vredestein Traxion Optimall is a ‘VF’ tyre that has shone in DLG performance comparative testing with its ability to operate at a lower pressure than other traction tyres

The innocuous-looking ledge on the face of the TM700 ProgressiveTraction tyre makes a big difference to traction, says Trelleborg.

The Vredestein Traxion+ and TraxionXXL tyres at the Claas plant in France.

The tyres are available as extra-cost optional equipment, initially on Arion 500

BKT has put its Agrimax Force tyres to the test during a 6,000km off and on-road trek across South Africa on a pair of McCormick X8 VT-Drive tractors.
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Exceptional sidewall flexibility is the key feature of ‘VF’ category tyres such as the new Traxion Optimall from Vredestein.

The CEAT products are said to have more generous tread width and larger air volume than designs considered competitors in terms of price and performance.

So-called mud breakers between the lugs are claimed to enhance the self-cleaning characteristics of the tyres, while the double lug angle and lug overlap at the centre of the tyre are said to give the tyres a traction advantage in the field with low vibration levels on the road.

The CEAT Farmax R85 line-up currently amounts to four sizes from 340/85R24 to 460/85R38, with further options becoming available in due course.

Continental has built a €50 million factory in Portugal to make farm tyres once more, having previously sold its agri tyre interests to Czech manufacturer Mitas as part of the restructuring plan.

CEAT Specialty Tyres, which has a new factory in Mumbai producing a range of ‘standard’ and lower profile traction tyres. The company’s entered the UK market through Dumfries-based distributor Nordic Tyres.

The TraxionXXL is produced in a unique 710/75R38 configuration, giving it an overall diameter of 2m to fit beneath the mudguards of today’s increasingly powerful mid-size tractors from 175hp.

That gives it a load-carrying capacity advantage of 600kg over a 710/70R38 due to its greater air volume without being as tall as a 710/70R42 tyre.

Among the newcomers — and returning names — is CEAT Specialty Tyres, which has a new factory in Mumbai producing a range of ‘standard’ and lower profile traction tyres. The company’s entered the UK market through Dumfries-based distributor Nordic Tyres.

Titan’s Goodyear product line includes ‘IF’ designated and LSW technology ultra-low profile designs such as these 800/55R46 tyres in dual formation.

Goodyear-branded tyres are also back on the scene thanks to US manufacturer Titan International, which has made and supplied tyres in North America under licence for several years following Goodyear’s withdrawal from the agricultural sector.

It now has a licence to do the same in Europe and has purchased moulds for some familiar designs, which are now produced in a Titan plant in Russia.

The company makes much of its flexible LSW (low side wall) technology, which allows tyres to deflect under load and place a larger footprint on the soil.

The Pirelli name is another making a comeback through the newly-formed Prometeon Tyre Group based in Italy, which effectively has been formed from the assets of Pirelli’s truck and bus and South American agricultural tyre operations with the backing of Chinese tyre and industrial chemicals businesses.

The PHP – Pirelli High Performance — range is being produced in Brazil to compete with more advanced radial tyre designs commonly used in Europe.

Prometeon’s agriculture specialists say comparative testing shows the 85-, 70- and 65-section tractor tyres in sizes up to 710/70R42 are at least a match for leading competitor products in most respects, with especially good wear characteristics.

Continental is kicking off its return to the agricultural market with 85- and lower profile 70-series standard tyres.

Titan’s Goodyear product line includes ‘IF’ designated and LSW technology ultra-low profile designs such as these 800/55R46 tyres in dual formation.

The Pirelli name returns to the European agri tyre market through Prometeon, a new manufacturing and distribution business.
Muddy fields, slippery grasslands, mountainous landscapes and lengthy roads. Mitas tyres work reliably and efficiently in all conditions. Fitted on various types of agricultural machinery and suitable for numerous applications, Mitas tyres ensure farming professionals keep pace with the fast developing world of agriculture. Mitas; hardworking tyres since 1932.
Modern high-performance tyres are remarkably tolerant of low inflation pressures, which allow the tyre to deform and lay the biggest possible contact patch on the ground.

Speed, weight and its distribution, tyre design and inflation pressure all have an influence on how efficiently tractor power is converted into usable work. 

**Sufficient air**

The basics are these — it’s not so much the tyres as the air inside them that supports the weight of the tractor and that of any implement it carries, so there must be sufficient air within the tyre to support a given load in line with the manufacturer’s specifications.

But too much air stiffens the tyre carcase unnecessarily, reduces the contact patch area and generally makes the tyre less able to transmit power and torque.

With speed comes heat, generated by friction between the many and various components that form the finished tyre.

And while plenty of heat is needed in the tyre manufacturing process to fuse those components together, too much heat too frequently — when running under-inflated tyres for extended periods on the road, for example — can soon have them coming apart again!

Getting the balance right for different applications using different implements, and exploiting the extraordinary advances in traction tyre capabilities made over recent years brings the rewards of optimum performance in terms of productivity, cost-efficient fuel use and minimised impact of weight and wheel slip on soils.

This is the broad message that Stephen Mills, Fendt brand manager at Lincs machinery dealership Peacock and Binnington, aims to get across to
Pulling ahead – the advantage of using more advanced tyres of a good size and correctly set up is illustrated within just a few metres as a 168hp Case IH Puma 155 on XeoBib VF 710/60R38 rear and VF 600/60R28 front tyres gains a lead on an identical tractor and subsoiler combination running 20.8R38 and 16.9R28 needing 1.72 and 1.37 bar (25psi and 20psi) respectively to cope with the loads imposed.

Soil compaction

“Over-inflation limits sidewall flexibility so you get a smaller footprint, resulting in less grip and greater soil compaction,” he explains. “Increased levels of tyre wear result from the lower traction, and you use more fuel because of the lower work rate.

“As a general rule of thumb, 20% over-inflation can result in a 30% loss of performance, and with the low inflation pressures we use today, 20% can be as little as 0.16 bar or 2.4psi.”

For starters, then, best get a good quality pressure gauge.

And then consider tractor weight management before tackling the tyres, Stephen advises, because getting overall weight and weight distribution right is just as valuable as managing tyre inflation pressures.

“Slapping on too much ballast, especially for higher speed operations that don’t really need it, is among the most common errors,” he points out.

Carrying insufficient weight and distributing ballast incorrectly also rank high in his list of wayward practices.

“All these scenarios result in fuel being wasted because the tractor is not being operated to its potential,” Stephen emphasises. “Soil damage through smearing or compaction are additional penalties.”

While the type of implement involved — whether it’s mounted, semi-mounted or trailed — clearly has an impact on the amount and distribution of weight carried by the tractor in addition to its own mass, the effect of working speed is less well appreciated.

“It’s true that power and weight go hand in hand — you generally need more weight to transmit more power as far as traction with draft implements is concerned,” says Stephen.

“But it’s also the case that greater speed mitigates the need for weight, so higher speed operations need less weight to achieve the same levels of traction.”

There’s a formula for calculating the impact of this effect and rule of thumb figures for tractor operating weight: multiply the tractor’s pto power in kilowatts by 650, then divide the result by the working speed in km/h.

Take a 240hp Fendt 724 Vario as an example; it delivers 158kW at the pto and has an unladen weight with a full tank of diesel of 8000kg.

When working at 6.5km/h, the formula above produces a target weight of 15,800kg and therefore a need for participants in his driver clinics.

Slight variations in tyre inflation pressures can make a significant difference to the resulting contact patch

Most tyre manufacturers now have an inflation management app that effectively digitises the tyre index tables to help users find the most appropriate pressures for the circumstances.
7800kg of ballast to achieve optimum heavy draft traction. When the working speed increases to 9.5km/h, the total operating weight drops to 10,810kg and the ballast requirement to 2810kg.

Working faster still — operating a compact disc cultivator on stubbles at 13km/h, for example, and the calculated figure falls to less than the tractor weighs, so any ballast is superfluous.

Having determined the appropriate weight of the tractor, the contribution of the implement to the load the tyres must support needs to be worked out. The ideal method is to commit some time to hitching on the relevant equipment and running the outfit over a weighbridge — although some tyre manufacturers offer a service using portable weigh cells to gather this data.

**Worst-case configuration**

The key thing here is to weigh each axle in the ‘worst case’ configuration; so that means with the implement up in the air in the case of rear-mounted equipment in order to measure the maximum weight the rear tyres will have to bear.

Conversely, placing the implement on the ground loads the front tyres to the most they will experience: and in both cases, remember to divide the results by two to get the weight per tyre before thumbing through the tyre manufacturer’s data table.

Exploring the columns for the tyre and size concerned, as well as the target operating speed, will reveal the recommended inflation pressure, which should be tweaked upwards a touch to counter the added loading and sidewall stress that comes from working across hilly ground.

No weighbridge or friendly tyre adviser to hand? Then resort to rule-of-thumb methods for a quick fix before the job can be done properly.

These include measuring the static laden radius, which is from hard surface to the top of the loaded tyre, and adjusting the inflation pressure until that measurement matches the figure in the tyre manufacturer’s data chart.

Alternatively, adjusting inflation pressure until a loaded tyre has three or four lugs in firm contact with a hard, smooth surface will also yield a broad-brush result.

**Stripping tractors of ballast when it’s not needed**

Stripping tractors of ballast when it’s not needed saves fuel and tyre wear by reducing overall weight — linkage-mounted ballast blocks make that easier.

**Tyres**

Over-inflation limits sidewall flexibility so you get a smaller footprint, resulting in less grip and greater soil compaction, says Stephen Mills.

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Fendt 724 Vario weighing 8000kg bare needs 7800kg of ballast to get its tyres — Trelleborg TM800 in this case — working at optimum performance for heavy tillage at 6.5km/h.

In this application, countering the weight of the rear-mounted power-harrow seed drill combination is the main consideration when selecting inflation pressure.

**Fendt 724 Vario weighing 8000kg bare needs 7800kg of ballast to get its tyres — Trelleborg TM800 in this case — working at optimum performance for heavy tillage at 6.5km/h. In this application, countering the weight of the rear-mounted power-harrow seed drill combination is the main consideration when selecting inflation pressure.**

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Sufficient ballast is needed to achieve optimum traction, but less is needed as working speeds increase.

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Stripping tractors of ballast when it’s not needed saves fuel and tyre wear by reducing overall weight — linkage-mounted ballast blocks make that easier.

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**Technet**

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**August 2018**
Choice opens up for one-tracked minds

Machinery Tracks

Can’t decide whether tyres or tracks are best for high horsepower tractors? Well, growers with that particular dilemma hedge their bets with a half-track set-up that uses both. CPM reports.

By Peter Hill

Both traction and soil compaction benefit, while avoiding the disadvantages inherent in purpose-built twin track tractors.

Machinery Tracks

Can’t decide whether tyres or tracks are best for high horsepower tractors? Well, growers with that particular dilemma hedge their bets with a half-track set-up that uses both. CPM reports.

By Peter Hill

The concept of installing tracks instead of wheels to back axles of high horsepower is picking up pace with Claas set to join Case IH and New Holland in offering a factory solution.

Interest has been hovering there or thereabouts with the retro-fit options supplied by Canadian manufacturer Soucy and Zuidberg in The Netherlands (see panel on p70).

But the ‘works’ machines are more than mere conversions.

New Holland engineers point out that the rear track installation on the five T8 Series SmartTrax models available in the UK involves front and rear axles engineered specifically for this configuration and other detailed modifications to the transmission and driveline.

Dependable performance

These are necessary to ensure that maximum power and torque can be transmitted to the tracks for dependable performance in demanding applications.

And the tractors run on larger diameter front wheel assemblies to match the added overall height — and ground clearance — that results from installing the track system.

The front axle is designed to transfer full power to wheels shod with large diameter 85-section tyres while still allowing a 55° turn angle.

Despite advances in tyre size, flexibility and contact patch potential made with tyres of late, New Holland maintains its argument that SmartTrax can deliver significant increases in ground contact area over typical tyre sizes.

Both traction and soil compaction are said to benefit, while avoiding the disadvantages reckoned to be inherent in purpose-built twin track tractors.

SmartTrax versions of the New Holland T8 Series tractors are available for the 347/382hp T8.380 and 374/409hp T8.410 equipped with the Ultra Command 18x4 powershift transmission.

The same models are available with the Auto Command stepless transmission, as well as the range-topping 417/435hp T8.435.

While these are the only tractors in the New Holland range to feature tracks, ▶

New Holland engineers argue that turns can be made without the power loss and surface scuffing experienced with twin-track tractors.
Full speed ahead with retro-fit tracks

One of the major issues with retro-fit track systems is that compromises need to be made, not least of which is driving speed — this can be reduced by as much as 40%. Dutch manufacturer Zuidberg claims it’s addressed this, with a high-speed track system imported into the UK by Northants-based Lynx Engineering.

As well as the speed, there’s also been an issue with four-wheel drive, explains Lynx’ Nick Ewbank. “Where customers would like rubber tracks only at the rear and the front wheels remain in place, the tractor’s four-wheel drive has had to be disengaged completely.”

Zuidberg’s design solution has an integrated transmission, which keeps the tractor’s mechanical front wheel, rear wheel ratio intact, he continues. “The result is that the tractor suffers no speed reduction and its four-wheel drive remains available at all times.”

The track system also features a suspension arrangement — not only are the bogie wheels suspended, as is common in other track systems, but the entire track system including the idler wheels are also suspended. This is achieved by fitting a fixed mounting frame to the tractor’s rear axle, complete with pivot points and a hydraulic cylinder with an accumulator.

The suspension has a stroke of 80mm. In addition, the bogie wheels can independently rotate sideways in order to follow the contour of the road.

“Easy interchangeability between the high speed tracks and wheels and tyres is another bonus of this solution,” adds Nick. “You can have all the advantages of tracks, such as increased traction, narrow construction and lower ground pressure which are important for certain jobs, while still retaining maximum manoeuvrability of the tractor for other tasks.”

Case IH has a history of tracked power units with Quadtrac.

Rowtrac versions of the powershift and CVX Magnum tractors mirror those of their blue cousins.

Top speed in all cases is limited to 40km/h, whereas the wheeled versions can be given their head to top 50km/h where appropriate, and although no creep option is available with the powershift transmission, L1 is said to provide a sufficiently low start-up speed for the common applications these tractors will undertake.

The tractors are said to combine the versatility of a wheeled tractor with the high traction and flotation of rubber tracks. The contact patch of the 610mm traction belts is calculated as being up to 65% greater than a 710/75R42 pairing, while the 460mm alternative provides a 35% larger contact patch than a set of 480/95R50 rear duals.

Earlier access

Any reduction in ground pressure clearly makes the tractors suited to top work, allowing earlier access to drying land and also providing extended working late in the season with reduced risk of damage to the soil structure.

Agility is another attraction, since topsoil disturbance in a tight headland turn is minimised, with the rear tracks following the path of the front tyres without forming a ‘berm’ ridge.

Also, the combination of wheeled front axle and rear tracks enables the tractors to operate at full power in turns — handy in wet field areas or on headlands — unlike a dedicated twin track machine, which shuts down power to the inside track to make the turn.

The track assembly itself is a triangular design with a large diameter drive wheel bolted to the axle hub.

This design ensures there are seven or eight lugs on the inner side of the rubber belt in contact with the drive wheel at all times for positive traction, while automatic hydraulic tensioning keeps the belt taught at all times.

Rubber block ‘ suspension’ is the only compliant element in the design to reduce vibration and shocks being transmitted to the rest of the tractor.

But three independent rollers between the front and rear idlers help matters in the field and front axle suspension helps keep the driver comfortable.

Having seen growing interest — and commercial sales — of competitor wheeled tractors adapted to a semi-tracked configuration, Claas is investigating whether its engineers can successfully apply long-held experience in track applications to tractors.

So far, the company has tested the waters with a 445hp Axion 960 — the latest and
The Rowtrac version of the Case IH Magnum 380 CVX boasts strong traction with good manoeuvrability across a range of conditions.

Claas is conducting field trials with the machine to gather data on its performance in relation to matters such as tractive effort, ground pressure and traction belt life.

It’s also assessing practical matters such as yard-to-field travel, and servicing and repairs — time will tell whether a Terra Trac option emerges as a commercial product from this work.

The undercarriage installed on the tractor is similar in principle to the design used on combine harvesters and also being trialled for commercial introduction on Jaguar self-propelled forage harvesters.

However, there are differences, not least a larger diameter drive wheel for the tractor version to ensure sufficient drive torque; the tracks on the harvesters are primarily there to carry their weight rather than to power the vehicles forward with high torque loads.

Using a telescopic shaft to take drive down to track level avoids the triangular-shaped configuration of other track designs but the unique feature is that the Terra Trac incorporates hydraulic suspension.

Unlike a rigid track undercarriage, the front and rear wheels of the Claas design can rise and fall independently, working against a horizontal hydro-pneumatic suspension cylinder and a similar forward angled unit that also allows the two mid rollers to deflect over humps and hollows.

The latest design also permits the front wheel to be powered up to reduce the contact area for reduced scuff turns on delicate surfaces.

The full size contact patch is the main attraction of the system, however, in that it spreads the weight of the tractor over a large surface area measuring 1825mm long and 635mm, 750mm or 890mm wide.

Yet the overall width of an Axion fitted with tracks is narrower than one running on generous single or dual tyres.

"I like that we are dealing directly with Agrifac, the guys are totally on the ball and up to speed."

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Very little of this would be profitable and sustainable without the retention of soil and moisture that’s made possible by minimising soil movement.

American farmers have considerable experience dealing with issues increasingly prevalent here: soil erosion, water shortages and quality, nutrient retention. Courtesy of Case IH, CPM visited a Nebraska family farm business to discover how it tackles these and other issues.

By Martin Rickatson

Indeed, farmers from the Lincs or Cambs fens could feel quickly at home out in the American Midwest. Average rainfall levels aren’t far different, at around 600mm — although states such as Iowa average 1000mm as a comparison. The sandy/silty clay loams are similar in type, although they tend to be coarse-textured loess silt types and shallow in places. In the heart of the state, the soils of Merrick County range from silty clay to sand and gravel, and were deposited by the Platte River, resulting in a wide degree of variability and water-holding capacity. This can lead to challenges with maintaining nutrient levels, soil structure and drainage, resulting in water and salt accumulation and leaving soils prone to iron chlorosis in the soybean and corn crops that dominate the area’s production.

Conversely, it’s the shallow soil profile in some areas that reduces water-holding capacity, meaning that in the event of a spring/early summer dry spell the land has less of a moisture buffer, making water and nutrient management more of a challenge. The flatness of the land means drainage can in some areas be very poor, but in others can be excessive given the region’s shallow groundwater tables.

But it’s the collective scale, rather than that of individual businesses, that still sets the US apart. Feed crops dominate the Midwest, and if it was a standalone state, Nebraska would rank third globally in terms of corn/maize-producing nations. The key to its productivity is not just the scale, soils and reasonable average rainfall, but the fact that precipitation can...
be easily supplemented by irrigation. The entire central and west-central area — almost two-thirds of the state — sits above a massive natural groundwater reservoir, the Ogallala Aquifer, and via irrigation permits the state’s farmers are able to tap into this, transporting water across a network of natural and man-made waterways throughout the Platte River Valley. As a result, land prices in the area are higher than in some less well-endowed areas of the state — and indeed the country — at around $5000/ac (£3795/ac/£9377/ha).

This is where Evan and Roxanne Brandes, whose family business trades as Brandes and Sons, farm seed and commercial corn (maize), soybeans and wheat with their daughter Carly and her husband Jeff Johnson, plus their other daughter Cortney and her husband Beau Bearnes. Evan’s brother Roger and his wife Sharon, plus their son Kane and his wife Julie, are also partners in the ten-person family business, with all having individual business responsibilities in the arable and livestock operation, as well as off-farm interests. A younger son from each side of the family is also involved.

For a number of previous generations the family operated gravity irrigation systems fed by open ditches, using conventional tillage to form ridges for directing and retaining water. However, having identified issues with physical structure, the 1960s saw the business begin to adopt minimum tillage practices to build organic matter levels and enhance retention of moisture and soil. A little later, the introduction of centre-pivot irrigator technology in the 1970s saw the family combine this with the adoption of ridge-till — similar to strip-till — in the 1980s to reduce trafficked area and tillage requirements, cultivating between rows for weed control.

“We now run a total of 45 pivot irrigators, all of which today are fitted with the technology that allows them to be operated via smartphone for precise scheduling, and we’re able to irrigate 99% of our cropping,” explains Jeff.

“Not only does this mean we have the ability to supply water to almost all areas of our land, but we can also utilise the same irrigation equipment for liquid fertiliser application, resulting in further reductions in field traffic as well as labour requirements.”

When glyphosate-tolerant corn/maize became available in 1997, the family used the opportunity to switch to full no-till corn establishment, and four years later was establishing all of its commercial corn this way (seed corn is also grown for Pioneer), retaining surface residue to prevent soil and moisture loss. While a conventional rowcrop planter worked well when drilling corn into soybean trash, planting soybeans into cornstalk stubble was a little more challenging, notes Evan.

**Cornstalk stubble**

“In 2005 we stopped shredding our cornstalks before planting, instead sowing soybeans each side of the old cornstalk stubble rows. Now when we plant corn, we use row cleaners ahead of each of the seed units to clear soybean trash from the path of the coulter so it isn’t hairpinned into the slot with the seed and allowed to affect seed-to-soil contact.

“In fields where seed corn is grown, ridge-till still provides the best weed control method, as we obviously can’t use glyphosate, and we can benefit from also being able to apply nitrogen when cultivating for weed control.”

While there’s a focus on extracting maximum value from rainfall and applied water, the family is also dedicated to maximising the efficiency of applied and existing nutrients, not only to get the most out of crop performance but also to protect local drinking water quality by minimising leaching risk. Grown as a corn/bean break crop every other year, wheat’s role in the rotation is largely to help here by scavenging residual nitrates from seed corn production, with soybeans planted directly between the wheat rows when the latter flowers in spring.

“This keeps nitrogen in the growing cycle and reduces the chance of it leaching into groundwater. Where wheat doesn’t follow corn, we use turnips as a cover crop to scavenge nitrates, establishing them once the male corn ©
World farming

The business also runs a suckler cow herd, enabling good use to be made of the stubble turnips at the end of their season.

“We’ve tried oilseed rape and rye as cover crops, but the seed is quite a bit more expensive, and we didn’t see any additional advantage from using them.”

One of the key benefits the Brandes family business has seen over the course of its gradual move to no-till has been increased water-holding capacity of the soil, with both rainfall and irrigation water reckoned to be penetrating the soil more thoroughly in fields where no-till is used.

“Water is clearly soaking into the soil and recharging the water table, which is fairly shallow,” says Evan.

“The only place we may see a degree of water ponding is in the wheel tracks of the centre-pivot irrigators, which shows the difference between trafficked and untrafficked land. No-till practices help keep water in the soil profile, retaining it for later in the season, and encouraging deeper plant rooting, while reducing irrigation demand. In the fields where we still use gravity irrigation, you almost need the added compaction and tillage to make the irrigation furrows operate correctly, and here the cover crops aid nitrogen control and break up some of the compaction.”

The benefits of no-till are clearly more pronounced in seasons where rainfall is below average, he suggests.

“We’ve seen that previously, in years when we planted in drier soil and then had good spring rains, resulting in clearly improved plant stands. With no-till, we always have adequate soil moisture retained through into the spring, so getting a good stand isn’t such an issue and yields are more consistent. Soil structure is also maintained, improving infiltration, and increasing water-holding capacity for later in the year when rainfall is lower and the water is required.”

The family has further improved soil structure by using RTK technology and Case IH’s Rowtrac version of its Quadtrac 400 articulated tracked tractor, with 610mm (24in)-wide tracks spaced at 3m (120in), to minimise trafficked areas. The business’s main wheeled tractors, all Case IH Magnum models, are run on wide-spaced, narrow-profile dual wheels for the same reason.

“As we are using the articulated Rowtrac to work wide and shallow rather than deep, we can get sufficient power to the ground from narrow tracks,” says Jeff. “With articulated steering and this narrow track width, plus the use of RTK signal technology for auto-steering, the Rowtrac version of the Quadtrac enables us to keep within the crop rows, limiting damage to both the soil and the crop.

“Coupled with running front track units on our 9230 Axial-Flow combines, this helps to complement our other measures aimed at soil, moisture and nutrient retention.”

Yield target

With a rotation based primarily on corn and beans, July and much of Aug are preparation months rather than harvest ones, and seed corn is the first crop to be harvested, in early Sept, followed by soybeans before finishing up with commercial corn. Bean yield target is 100 bushels/acre, while for corn the figure is double that. At a specific weight of around 60lbs/bushel, that soybean yield equates to around 6.7t/ha. For corn, a specific weight of 56lbs/bushel means the weight yield equivalent is approximately 12.3t/ha.

“In addition to all having work interests outside the farm, one of the other ways in which we have been able to expand the business and accommodate more family members is by contract farming for others,” Jeff explains.

“We’re now working on this basis for a number of neighbouring farmers, under a deal whereby they retain 40% of the yield by volume, and are responsible for all input costs.

“But very little of this would be profitable and sustainable without the retention of soil and moisture that’s made possible by minimising soil movement, trafficking and compaction, enabling us to obtain the yields we do.

“We’re lucky enough to sit above a hugely beneficial natural resource in the Ogallala, and the responsibility of using just the right amount of water to maximise yields, keep our energy costs to a minimum, minimise nitrate leaching and try to preserve and maintain the aquifer is something we take very seriously.”

Row-cleaning spider wheels ahead of each of seed unit clear soybean trash from coulter paths and prevent hairpinning on this 36-row Monosem seeder.

Farm facts

Brandes and Sons, Central City, Merrick County, Nebraska, USA

- **Area farmed:** 2200ha – part owned by various family members, part contract-farmed
- **Farm partners:** Evan and Roxanne Brandes, Roger and Sharon Brandes, Kane and Julie Brandes, Jeff and Carly Johnson, Beau and Cortney Bearnes, Alex Brandes, Jess Brandes
- **Additional labour:** Two full-time, two part-time
- **Annual rainfall:** 610mm – almost all land also irrigated
- **Cropping:** 880ha seed maize, 480ha commercial maize, 840ha soybeans, plus wheat in some years
- **Livestock:** 200-head sucker cow herd
- **Soils:** Loess-type silty clay loam
- **Tractors:** Case IH Steiger Rowtrac 400, Magnum 335, Magnum 315 x2, 7230, plus IH 1066 and Farmall 450 plus 300 for light yard duties
- **Harvesters:** 2x Case IH Axial-Flow 9230 with 12m grain/bean heads and 12-row corn heads; 2x Oxbo seed corn pickers
- **Sprayer:** 40m front-boomed Miller Nitro 5345 self-propelled
- **Irrigators:** 45 pivot-type, also used to distribute liquid fertiliser
- **Planters:** 24-row Monosem, 18-row Case IH

Spraying is handled by this front-boomed 36m Nitro made by Wisconsin firm Miller, part of CNH Industrial since 2014.
Healthy life starts with the soil

Groundswell 2018

Groundswell, that took place in Herts at the end of June, has now become a key event for growers looking to understand how to bring the benefits of conservation agriculture into their arable system. CPM was there.

By Tom Allen-Stevens and James Hacker

Health. This was the running theme for the Cherry family’s third annual Groundswell Show. From twelve direct drill demonstrations, to keynote speaker Dan Kittredge’s opening presentation covering nutrient level in food supply: what is meant by health is more than simply maintaining soil structure.

“Farmers hold the key to improving human and planetary health,” say the event organisers, and over 1200 farmers and scientists attending the two-day event was evidence in itself of a commitment to investment in sharing information regarding conservational practices.

Drill demonstrations

If the future of soil health lies in innovation, then some of the features on the drills that lined up during this year’s demonstrations will surely ensure a healthy foundation for farming. Twelve of the leading names in drilling presented their very best equipment designed to meet the individual needs of customers. All drills were demonstrated on ground with standing cover crops.

SlyAgri demonstrated its Boss drill, with its emphasis on control. The drill applies pressure through hydro-pneumatics. The coulter is angled so that it is pulled into the ground, lessening the amount of weight needed from the drill itself. With its connection to a sensor on the gauge wheel, the hydraulic down pressure gives precision control of the coulter pressure. This allows for close monitoring and control of furrow depth. When combined with the V double disc which allows for a range of soil conditions, this drill offers a better early life for the seed, says the manufacturer.

Hutchinsons and Cousins’ collaboration formed the basis of their demonstration. This featured a new crimper roller which, Hutchinsons’ Dick Neale says, fully crimps cover crops as opposed to simply bruising them. The roller is fitted with helical blades, rolling over and crimping the crop ahead. The fallen crop forms a very dense cover on the soil surface which effectively earns several weeks extra benefit from the crop through protecting soil and suppressing weeds.

John Deere demonstrated its 750A, and these proven drills continue to impress. Although not much has changed, the 750A shows off several features which David

The Cousins crimper roller is fitted with helical blades, rolling over and snapping the crop ahead.
**Sixty-minute worms**

The advantages of earthworm population to soil health are no secret; improving soil structure and moisture content.

In an effort to measure (and hopefully improve) their numbers, Jackie Stroud — a NERC soil fellow based in Rothamsted — developed a traffic-light rating system to be used by farmers across the UK. The result she shared at Groundswell reveal the benefits of no-till practices on soil health.

The test works as follows. Ten topsoil pits (roughly the size of a spade) must be dug. Farmers then identify the three types of earthworms found (Epigeic, Endogeic, and Anecic). The test has informed Jackie’s traffic-light system, which functions as an easy way to identify soil health, based on the population and diversity of earthworm species. For example, a higher distribution and variety of worms indicates a healthier soil structure.

“A farmer’s decisions on how they treat their soil can have a significant effect on earthworm population beneath the ground,” points out Jackie. “No-till fields proved to have the highest chance of a good distribution across the field, while ploughed had the lowest.” No-till fields were also likeliest to have higher numbers of earthworms with a 46% probability, with ploughed or pastured land offering a very low likelihood at only 11% each.

“Even when the individual earthworm types are assessed, the diversity of the population is highest in fields which employ no-till practices. The benefits of no-till practices to earthworm population, and soil health as a result, are clear,” Jackie says.

Reflecting on her results, Jackie notes a lack of awareness of the role of earthworms. “43% of participating farmers requested better support in realising soil health practices, and better opportunities to share these practices with others.”

She intends to publish a leaflet to be downloaded online, explaining her findings from this first round of research. She has also produced an online test for participants to practice their earthworm knowledge.

The next earthworm sampling will take place between 25 Sept 30 Oct this year, with the aim that the results will benefit from this shared knowledge. [www.wormscience.org/earthworm-id-quiz.html](http://www.wormscience.org/earthworm-id-quiz.html)
Seed depth on the Sky Easydrill is controlled by the “Tandem” – a rubber depth wheel and two rear press wheels.

Feed the soil gut flora
Maintain a healthy soil and you’ll grow healthy, quality food. Keynote speaker at Groundswell and farmer from Massachusetts, USA, Dan Kittredge believes there’s a direct correlation between how food is grown and how it tastes.

“Plants have a gut flora, just as we do,” he says. “It’s a symbiotic relationship with the microbes in the soil, such as bacteria and mycorrhizal fungi. It’s the microbes in the soil that enable plants to flourish.”

Dan founded the Bionutrient Food Association (BFA) in 2010, that aims to improve food quality through biological management and regenerative agricultural methods. The priority he says is to build soil vitality for better crop nutritional quality, vigour, flavour and yields.

“There are components of food that translate into flavour. But the average nutrient levels of food have been reducing. Meanwhile food-related disease is going up — we are degenerating and it’s because most of what we’re producing is relative junk,” he says.

He believes there are secondary metabolites that are only built into a plant once the essential primary ones have been laid down. “It’s these secondary metabolites that give a food its flavour.”

So what are the conditions that allow this to flourish? Dan claims he’s been into organic farming since he was five years old, but criticises the sector for producing food in a way he feels is very similar to conventional agriculture. On his own farm, he struggled with organics, but reached a turning point around 12 years ago.

“We got to a point where the pest pressure diminished. Yields were going up. It became a functional farm. Viability was getting better.”

The principles of biological management, he says, lie in understanding that plants are feeding the soil with sugars. This feeds the soil microbes which in turn are feeding the plant with the complex array of nutrients and metabolites they need not only to thrive, but to produce healthy, flavoursome and nutritious crops.

Dan has five key principles about the soil that allow this process to take place:
1. **It must be aerobic**
   Without air in the soil, there’ll be systemic issues you’ll have year after year, he says, and if it’s too tight, the microbes will die. A good root mass is essential to maintain this. “As a rule of thumb, if you allow grass to grow to just 6in high above ground, there’ll be only 6in of roots below ground — you need to let swards grow before cutting them. Cover crops will open up the soil.”

2. **Manage the water**
   Dan believes that tidal forces are in operation on land, just as they are at sea. “If you have water in your soil, the influence of the moon will move this through the profile — it’s a beautiful, healthy process that happens twice a day. But if you damage your soil through tillage, this process is broken, and it’s not available to you.”

   In general, farmers don’t manage soils for sufficient hydration and should focus on proactively establishing “an infrastructure” that allows it to manage both too much water and not enough, he says.

3. **Feed the soil**
   Soil needs food, he says, and this relies on carbon compounds. “There must be a stockpile of food in the ground for microbes to eat. If not, they’ll die, and you’ll end up with nothing more than lifeless dirt.” This is where over-wintered cover crops come in, and he likes to have around 60cm of top growth by Oct. This ensures there’s plenty of “food” in the soil by spring to make it biologically active for the established crop.

   “The ability of plants to sequester carbon is really an amazing story,” he says. “You can influence excess CO₂ in the atmosphere by increasing soil organic matter. You can increase SOM by 0.5% per year, and if everyone did that it would take just eight years to bring CO₂ levels down to where they were in 1750.”

   But one of the ways to be “part of the problem” of climate change, he says, is to apply fertiliser. “To take an analogy, we eat food, we don’t take nutrients intravenously. If we did, our gut microflora would die. That what we do to our soils if we apply fertiliser.”

Groundswell provided the first true no-till demonstration of Weaving’s new GD8000T.
Dan Kittredge believes there’s a direct correlation between how food is grown and how it tastes.  

> 4. Stimulate the life of the soil itself  
This is critical to the soil’s gut flora, says Dan. “Inoculate your seed to make sure there’s a full spectrum of microbes at birth. This is like colostrum and you should ensure at least one or two dozen family

of bacteria on the seed.”

But he believes that using fungicides counteracts the beneficial fungi you’re aiming to encourage. “If you use fungicides you won’t encourage a biological system,” he says.

**5. Maintain the mineral balance**

These are the enzymes a soil need to process, he says — the tools of biochemistry. As well as the macro and micronutrients farmers are familiar with, there are others he believes are also important for a healthy soil. “80% of soil species are dependent on vitamin B12 – if you don’t have it the microbes cannot exist. This requires a trace level of cobalt.”

The BFA is now engaged in a project through which it aims to put quantitative values on the flavour and nutritional quality of food. Dan says they’re currently developing a tool, based on a spectrometer, that you’ll be able to point at a carrot, for example, and it’ll tell you how flavoursome it is. “We don’t know yet what specific elements we’re looking to detect in food — this is a collaborative effort and the answers will come as the project evolves.”

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**Groundswell visitors gather at the Soil Tent to hear about the principles of biological management.**

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### Direct drill comparison – 6m models

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<tr>
<th></th>
<th>Row spacing (cm)</th>
<th>Hopper capacity (litres)</th>
<th>Seed/ fertiliser</th>
<th>Weight (kg)</th>
<th>Coulter configuration</th>
<th>Starting price (£)</th>
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<tr>
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<td>2800</td>
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<td>both</td>
<td>7100</td>
<td>36 in pairs on tandem</td>
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Farmer focus drives harvesting innovations

There’s always been an innovation infrastructure at Grimme UK that’s encouraged new ideas to come forward.

Machinery Innovation Insight

Celebrating 25 years since it first set up, supplying machines to UK potato growers, Grimme UK now dominates the British root-crop harvesting market. CPM tracks some of the product developments that helped achieve this.

By Tom Allen-Stevens

When Grimme UK first started trading 25 years ago, there was little doubt it was going to be a successful business. But sealing that success and allowing the business to grow and dominate the root-harvesting sector in the UK have involved a series of innovations specifically tailored to the UK market.

“Grimme is a company with a 156-year history, and Grimme UK was the first daughter company set up by the German parent,” explains the company’s marketing manager Adam Johnson. “The root-harvesting market potential was huge and everyone recognised that the UK was an important player in the potato sector.”

Grimme kit was already well established, with over 50% of the UK potato crop at the time passing through the red-liveried machines. These were imported by Pearson, but the company was given notice in 1993 and seven staff members started the new operation from premises opened in Sleaford, Lincs, in Nov that year.

New dealer network

“We started with a clean sheet and built up a new dealer network throughout the UK,” recalls Barry Burrell, one of the seven. “A few of the dealers who’d been selling Grimme machinery joined us but most were new companies.”

The range of machines included the new CombiStar destoner, that was launched at the 1993 Smithfield Show (see panel on p80). But it was Grimme’s potato harvesters that really defined what it offered to UK growers.

The leading model at the time was the Exel, that was renamed in 1994 as the Variant DL 1700. Most machines were fitted with the roller separation (RS) system, that became increasing popular during the 1990s, although other options and variations were available. UK growers were moving away from the web and pintle belts deemed too aggressive for the crop.

But it was other features that found favour with farmers, says Barry. “The new Variant machine was 1700mm wide, offering more sieving area than most of the competition, that was at 1500mm. It handled the wider row widths with better flow of the digging shares onto the main and second webs.

“Also at this time, Grimme introduced the hydraulic wheel-drive system, which revolutionised the traction of the harvesters in wet conditions — it was like four-wheel drive for your potato crop. It wasn’t long before the option was copied by other potato-harvester manufacturers.”

Key for the UK market was that this was the first trailed machine with a straight-through separation system. “There were fewer direction changes, which meant higher throughput with less damage to the crop,” says Barry. This focus on reducing damage was becoming a defining feature for UK harvesters that brought in more pre-pack crop than their continental counterparts. ▶

Key for the UK market was a trailed machine with a straight-through separation system.
Alongside the harvesting technology, the Grimme UK team has helped develop soil separation and bed-forming machines to suit the UK grower, as well as planting technology.

Launched at the 1993 Smithfield Show, the new Grimme Combistar destoner was one of the first machines traded by Grimme UK. “The innovation here is the star roller,” says Barry. “The machine is fitted with seven rows of adjustable stars that roll the soil to separate it, giving it far more sieving than on a conventional web destoner. It also has height adjustment the operator can make on the move. Spacers are fitted between each row, depending on soil type, so in heavy cloddy conditions this can be three to give extra separation.”

1997 saw the introduction of the new Grimme Combi-web separator, which consists of two webs, with the first having a cascade point to form a drop onto the main web. The following year, they were built as a three-web machine.

In 1999, a prototype three-bed stone and clod separator came for trial work in the UK. Designed for larger growers, it was lugged along by a 300hp Caterpillar Challenger tractor. But only two commercial units were ever sold, notes Adam. “We always listen to our customers and look to develop machines that will suit their needs. Sometimes it doesn’t work out, but it’s worth having nine ideas that aren’t so good if the tenth one flies.”

The Shapeforma was another development introduced in this year. “Growers were looking to form deeper beds, up to 50cm,” notes Barry. “Mouldboards can achieve this in heavier soils, but the Shapeforma can pretty much shape any deep light soil into a sandcastle. It then holds its shape much better.”

In 2010, planter technology moved on with the introduction of Grimme’s GL42K belt planter. “Growers were looking to form deeper beds, up to 50cm,” notes Barry. “Mouldboards can achieve this in heavier soils, but the Shapeforma can pretty much shape any deep light soil into a sandcastle. It then holds its shape much better.”

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Technology sweetens the task for sugar beet growers

In Sept 2003, Grimme UK formed a new company, Root Systems to sell Grimme’s recently introduced sugar beet harvesting technology. Barry Burrell headed up the new team.

“Grimme was established in potato harvesting, but we really had to prove our value to sugar beet growers,” he says.

Again, a focus on innovations is how the company began to take market share. The Maxtron introduced tracks to harvesters that had usually run on tyres. Among other key features are the Oppel wheels which lift the beet more gently than walking shares with less soil intake, says Barry.

At over 15m long, the newer Rexor is a commanding presence in the field, although a steering and wheel configuration allow remarkable manoeuvrability. The roller table came across from Grimme’s potato technology, and this, plus just three turbines, ensure a gentler cleaning process as well as high throughput, he adds.

“Advances in the in-cab technology have really accelerated on the sugar beet side. ErgoDrive brings all the functions of the machines to the joystick and terminals.” Buttons to control ram functions, such as share height, and dials to adjust speed of the turbines, for example, are all programmable. Two terminals put a host of settings and readings for drive and harvest control into a standard format, while the soil off the wash pit, put through the machine. The difference between the standard stars and the new spirals was amazing in terms of how they removed the soil.

Vast difference
“The following day Barry White and myself took two spiral shafts to a customer’s harvester in N’ Yorks who carried out more test work. Because of the vast difference in the amount of soil which the new rollers were taking out, the decision was made to fit the new spiral system into all new GZ Multi-Sep machines as standard for the following year.”

In 2005, in-field testing put a new machine through its paces that was set to replace the GZ. “The new Grimme GT170M and GT170S machines were launched onto the UK market in 2006,” continues Barry.

“The M version consists of a main web leading onto a second web, then a single Multi-Sep separation system, or the second main web can be replaced with a second Multi-Sep. This gives the machine a tremendous advantage over other manufacturers’ as it offers double separation. The GTS machines are fitted with a short intake web leading onto the shorter main web, making it into a higher output harvester for the larger grower.”

Sales took off and have continued strong ever since, with 90% of machines fitted with the double Multi-Sep separator. The GT Multi-Sep continues to be the UK number one trailed potato harvester, with around 85% of the market.

Earning Grimme a DLG silver medal at Agritechnica in 2005 and launched with the GT machines was Terra-Control. This system uses special hydraulic cylinders, guided by the diablo as it runs over the ridge, to set the depth of the share. “The hydraulic cylinders register every deviation of the ridge crest height and automatically adjust the height of the two swing frames,” explains Barry.

“It means the digging depth and diablo pressure remain constant at all times and with every contour.”

Such innovations have also been included across Grimme’s range of self-propelled potato harvesters. The all-new SF 170 GT was introduced in early 2007, that were rebadged as Varitron. “These are available unmanned or manned, such as the Varitron 200 with no bunker, the Varitron 220 with 2t buffer bunker and the Varitron 270 with a 7t bunker.

The new Platinum range brings in much of the technology, such as ErgoDrive, from Grimme’s sugar beet harvesters (see panel on p81), topping out with the Varitron 470 Platinum, on Terra Tracs with a 7t bunker. “Fitted with Terra-Control and also Delta control, that allows you to adjust one side individually, it makes light work of lifting four rows. With the twin separation system, you
Innovation Insight

On-farm demonstrations, such as this event at Dunstone Fen near Lincoln have been a key part both of showing farmers Grimme innovations and getting ideas for where to go next.

▶ also get a clean sample into the trailers,” says Barry.

Now, with a staff just short of 100 and new purpose-built training facilities recently added to its headquarters at Swineshead, the emphasis on innovation is as strong as ever, notes Adam.

The CleanLoader is a recent example. “During harvest between 3-20% of the crop in the trailer is trash, depending on the conditions. This means an increase in transport costs followed by an intense separation and disposal back at the farm yard.”

In very harsh conditions up to 100t of trash could be produced from a 10 ha field. “The CleanLoader allows you to clean the crop in the field, cutting down on transport and separation costs.”

Coming through are some “major leaps” in spring equipment technology. “These address the issues of reduced chemical use and greater care for the soil, as well as increased use of cover crops. We’re also developing machines with reduced labour costs, particularly in the field veg sector — with Brexit in mind, our customers are telling us this is a priority.”

This technology is also being developed with export opportunities from the Grimme factory in mind. “We’ve received a lot of interest from the US, where the industry faces the same pressure with labour shortage. We’ve come a long way from where we started 25 years ago as a daughter company focused on the UK market to be leading research in new harvesting technology for worldwide opportunities,” notes Adam.
The spring wheat crop was drilled in the knowledge it was going to be sprayed off.

The creativity that comes from conversation

While crops trials have been a core feature for Yorks farming family the Hinchliffes, it’s the discussion around them where the true value lies. CPM dropped in on the trials’ open day.

By Tom Allen-Stevens

Turning up for the open day at the end of June on the Hinchliffes’ farm at Rawcliffe Bridge, near Goole, E Yorks, you pass a large area of crop that’s clearly been sprayed off with glyphosate.

That in itself is no surprise, especially considering the family’s well documented zero-tolerance approach to blackgrass. But Richard Hinchliffe’s explanation for what happened to the 40ha of spring wheat does slightly knock you sideways. “We drilled it knowing we were going to spray it off,” he says.

“The primary driver was blackgrass — everything we do is geared around integrated weed management (IWM). But we did the numbers and at best that field was only ever going to make a small profit, so it was best in the long term to establish the crop but then spray it off. We’ll establish a cover crop over the winter then put the field into linseed and beans next spring.”

Farm Network
The family farms 560ha, based at Rawcliffe Bridge, which includes Dikes Marsh Farm nearby. While much of the land at Rawcliffe Bridge lies on a rich layer of alluvial silt over clay, ground at Dikes Marsh is a tougher high magnesium clay. There have been trials of one sort or another on the farm for as long as Richard can remember, while it was the first farm in BASF’s Europe-wide Farm Network, developing sustainable farming practices, that are then promoted to other farmers and policy makers.

It’s no surprise then that there’s also a Real Results trial on the farm (see panel on p84), but for Richard the results themselves are only a part of what on-farm trials involve.

“We’re living in a post-truth era,” he says. “People don’t trust experts any longer, knowledge is so accessible, and communication of ideas is so quick. More photos are taken and shared on social media in one year now than were taken in the entire history of time up to the point these platforms existed. It’s a totally different world where you can join the conversation shared by thousands of different farmers with your smart phone and benefit from their experiences.”

And the dead spring wheat is part of that conversation, not just for the local farming community that’s turned up for the open day. “When I sprayed the crop off, I shared the photos on Twitter. I received a really positive reaction and I think it helped people who were facing a similar tough decision. What I’ve learnt is that the subtle approach doesn’t work. You have to get a grip and do something about it.”

He set out to explore sustainable resistance management through a Nuffield scholarship, sponsored by the Yorkshire Agricultural Society, and completed his report last year. His main findings were:

• Herbicide resistance is a global issue
• Genetically modified crops are not a solution

The spring wheat crop was drilled in the knowledge it was going to be sprayed off.
The open day at Rawcliffe Bridge was a chance for around 100 local growers who turned up to see trials undertaken.

- Peer-to-peer learning and knowledge exchange is absolutely pivotal in building an effective IWM approach
- Herbicide labels should clearly state mode of action and training should be provided to understand what it means.
  “On this last point, it looks as though the industry is now adopting this measure. Education on MoA is also key, however, especially in this post-truth era,” says Richard.

He’s beginning to see results from his own blackgrass battle, though. “When we took on Dikes Marsh Farm 18 years ago, we hired in a combine because it was so full of blackgrass we wanted to keep it contained. Now, we don’t spray any post-emergence blackgrass herbicides and rely on pre-em herbicides followed by rogueing as the main control methods.”

Sustainable resistance management is only a means to an end, however. “You have to decide what your end game is in farming. For me I don’t want to spend my whole career battling blackgrass — there’s so much more to explore.”

Glyphosate resistance is a massive threat
IWM is the only sustainable way farmers will stay in control of the problem
Industry needs to unite behind one initiative for dealing with herbicide resistance

Trials show way on crop chemistry

The open day at Rawcliffe Bridge was a chance for around 100 local growers who turned up to see trials undertaken, including a guided tour of the 32 wheat variety plots. “This year, the whole site was direct drilled, which adds extra interest,” notes Richard Hinchliffe.

It was also a chance to see plots that had been treated with Revysol, the new triazole from BASF currently going through registration. This had been included in a number of programmes applied across KWS Santiago.

Some of the plots partnered Revysol with BASF’s Xemium SDHI chemistry, and local agronomy manager Dave Belshaw notes that good fungicide stewardship remains and will continue to be a top priority.

“Tests have shown Revysol exhibits effective control of septoria isolates found to be partially resistant to other triazoles. It’s understood this is down to a unique isopropanol moiety which allows it to form a hook, so it binds better to the target site,” he explains.

Effective control of septoria relies on every grower managing disease effectively and using a programme of fungicides involving a number of different modes of action. We need every tool in the fungicide toolbox to be working at its best."

Pending regulatory approval, commercial roll-out of Revysol is expected in 2020.

The benefits of an early PGR programme were also evident from the trials. A split dose at T0 and T1 of Canopy (mepiquat chloride) or Medax Max (trinexapac ethyl) are the favoured approaches Dave picks out from the trial.

“What’s noticeable is that in this treatment the flag leaf currently sticks out above the ear, while in the untreated plot, the flag’s more shaded by the ear — this may have an effect on sunlight interception,” he suggests.
It’s the conversation around the technology where the real opportunities lie.

Which is where the wealth of on-farm trials come in. “I remember in the mid 1990s we were one of the first farms to have epoxiconazole. They were exciting times and we’ve seen the progress of fungicides since, through kresoxim-methyl, boscalid, F500, then Xernium and now Revysol.”

They provide some local data and insight into the technology, and Richard feels he’s already gleaning the benefits — farm yields are lifting off the yield plateau. But it’s the conversation around the technology where he believes the real opportunities lie. “Firstly, we must get a grip on responsible stewardship — it’s been important for herbicides, but it’s doubly so for fungicides and it’s a collective responsibility. Resistant septoria isolates are not confined to the farms that generate them.”

As with herbicides, he feels solutions come from farmers sharing experience. But the opportunity for rewards for those who take part are far greater, he believes. “From what I’ve seen of Revysol, it can reset the clock on septoria. If we master an integrated approach to disease, imagine what other properties we can explore and to what heights we can take crop management — I think there are some exciting times ahead.”

Registration moves for new blackgrass herbicide

BASF has started the global registration initiatives for its new blackgrass herbicide. The company has submitted the regulatory dossier for Luximo in the European Union (EU), with first sales expected in the UK in 2021.

The new compound has demonstrated excellent performance against grassweeds, says BASF, making the initiative an important milestone in expanding its global herbicide portfolio.

“BASF has a long history for more than seven decades of successful herbicide research and development,” says Markus Heldt, president of the BASF Crop Protection division.

“Luximo is one of the latest solutions, and an outstanding example. The constant and close exchange with our customers has helped us find the right, effective solutions answering growers’ challenges: support for resistance management, environmentally friendly approaches and fast-acting solutions.”

Luximo will be positioned at the heart of grassweed management programmes. BASF says the active ingredient provides pre-emergence, residual control against a broad range of grasses, including difficult-to-control blackgrass and ryegrass in winter cereals. The molecule boasts a novel mode of action that controls grasses that have developed resistance.

Pending regulatory approval, BASF expects first market introductions of Luximo-based product formulations in 2021 in the UK, with a release in Australia expected a year earlier.

BASF’s Ruth Stanley notes there’s no known cross-resistance with Luximo. “So it’ll strengthen existing integrated weed management systems and aid sustainable resistance management. But it makes it all the more important to have an effective blackgrass control strategy in place.”

To that end, she’s been encouraged by the positive steps taken by growers who have climbed on board BASF’s Blackgrass Battle bus on its recent tour of open days and events. Around 30-200 people have taken part at each stop, signing up to be Blackgrass Beaters and offering their own tips for effective control.

“We’ve now picked up around 200 of these — I’ve learned things I’d never have considered,” says Ruth.

The plan is to bring these together in 2019 at a conference to which Blackgrass Beaters will be invited. “The whole initiative is about sharing the knowledge. What we’ve found on this tour is that attitudes have really changed and there’s now a much more holistic approach to tackling blackgrass. The solutions lie with those farmers who are making progress, and the more these ideas are shared and practised, the less pressure herbicide chemistry will face.”

https://basfrealresults.co.uk/awc/
Canopy-canny desiccation

With serious question marks hanging over the future use of diquat, alternative methods of potato haulm destruction are still firmly on the agenda for most UK potato growers. CPM looks at two different approaches.

By Lucy de la Pasture and Rob Jones

The future for potato production may eventually be a move back to a more holistic crop management process.

The European Commission has not been able to decide on renewed authorization of diquat. At the last meeting of the Standing Committee on Plants, Animals, Food and Animal Feed (Scopaff), the EC put the proposal to the vote to no longer allow diquat use. But there was no required majority for the proposal, nor a required majority against renewed admission.

What will happen next isn’t entirely clear, but the EC can put the proposal to the appeal committee and if the voting ratio is the same, they can impose the prohibition. The EC can also make a new proposal.

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What will happen next isn’t entirely clear, but the EC can put the proposal to the appeal committee and if the voting ratio is the same, they can impose the prohibition. The EC can also make a new proposal. In the meantime, diquat remains available but many agronomists and producers are experimenting with other desiccation methods, just in case.

County Crops agronomist Tom Smith advises on 400ha of potatoes in West Lancs and the Yorks Wolds. He believes diquat’s effectiveness has set up a culture where growers and advisers barely have to give desiccation a second thought, but its potential loss would prove a significant game changer for the industry.

Losing active ingredients is a problem the potato industry is getting used to adapting to. “In recent years we’ve seen the loss of key products such as sulphuric acid, paraquat and most recently linuron. Diquat has been under regulatory pressure for over two years now so it’s given me a useful opportunity to work with growers on effective alternatives,” says Tom.

“Perhaps the future for potato production may eventually be a move back to a more holistic crop management process, rather than separating the agronomy into a sequence of events — pre-emergence, post-emergence, blight control and desiccation — all heavily reliant on fast-acting chemicals,” suggests Tom.

“Successful desiccation is a critical phase in the growing season, enabling growers to stop growth of the canopy when tubers reach the optimum marketable size. It also helps to reduce the risk of tuber blight, blackleg and other diseases before the potatoes go into store” he adds.

Although ‘flail and spray’ seems to have become the go-to alternative to diquat, Tom points out that it does have drawbacks, particularly in regions like his which often experience more than their fair share of rain.

“With flail and spray there’s always the risk of flailed stems and canopy lying across the newly flailed crop, particularly in wet weather. Poor weather, combined with a lack of investment in a good flail machine, can hinder the effectiveness of alternative desiccants that rely on contact activity with...”
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* Full data list for the 2019 BBBD Sugar Beet Recommended List: www.bbra.co.uk
Desiccation

▶ exposed stems,” he says. In dry weather Tom recommends using Gozai (pyraflufen) at a rate of 0.8 l/ha for stem desiccation as part of a flail and spray approach. But it’s not just the choice of desiccant that makes the process successful, believes Tom, canopy management has a big part to play too and that means planning for desiccation right at the start of the season.

Tom advises managing and manipulating the size of the crop canopy using ▶

### Soil type biggest influence on greening

Where irrigation hasn’t been an option this summer, tuber greening may well prove a problem on heavier soil types. Late planting this spring may have meant seed wasn’t planted deep on soils prone to cracking because a further delay in emergence was the last thing growers wanted.

On average 5% of yield is affected by greening in most seasons, but in severe cases as much as 20% of yield can be lost due to outgrades. Tubers turn green when they are exposed to light, causing the production of chlorophyll and glycoalkaloids. While chlorophyll is tasteless and harmless, glycoalkaloids are bitter-tasting and can occur at potentially toxic concentrations in green tubers, consequently packers have very low thresholds for greens in contrast to tuber blemishing diseases.

A research project, carried out at NIAB-CUF, has been investigating the factors that may contribute to greening. These included tuber formation, stolon architecture and nitrogen rates, but it was concluded that none of these was as important as the amount and type of soil that sits above the potatoes as they grow, says Dr Simon Smart, research associate at NIAB-CUF.

“Factors known to influence tuber greening include row width, planting depth, ridge shape, soil cracking and variety. Differences between varieties are considered anecdotally to be caused by differences in stolon length and stolon depth between varieties — if tubers develop on stolons close to the surface or on long stolons, they should be more likely to turn green.”

Stolon length is known to vary between varieties but the influence of this on the position of tubers in the ridge and their susceptibility to tuber greening had not been investigated before. A fellowship from AHDB and additional support from Cambridge University Potato Growers Research Association (CUPGRA) provided an opportunity to investigate the physiological and agronomic causes of tuber greening over three years.

Seven varieties (Estima, Jelly, King Edward, Marfona, Maris Piper, Markies and Melody) were grown in a replicated experiment to investigate the relationship between stolon architecture and tuber greening. Plots were sampled around the time of tuber initiation and the length and depth of every stolon was measured. In the middle of the season, stolon length and depth, and the position of each tuber were measured by painstakingly removing soil from around each plant — a process similar to an archaeological dig. Samples were also taken after desiccation to assess for tuber greening.

In addition to the replicated trial, 36 commercial crops were surveyed to quantify stolon architecture and to relate the position of tubers in the ridge to tuber greening. Both within and between years, differences in stolon architecture between varieties didn’t account for differences in tuber greening.

“This was probably due to tuber depth not being directly related to stolon depth because of differences in tuber size. In commercial crops, planting depth varied widely both between and within crops,” explains Simon.

The work showed that planting depth and soil type are two of the most significant factors when it comes to in-field tuber greening. Soil cracking was found to be a significant factor, so clay-based soils require more soil above the tubers to prevent greening.

Crops grown on soils with a high clay content and planted shallowly are particularly at risk from tuber greening, especially when yields are high and tubers are large. The optimum planting depth to limit tuber greening may be deeper on soils with a higher clay content but may reduce overall yield.

“On sandy and peat soils, few green tubers were found with more than 2.5cm soil coverage, but on clayey soils, green tubers were found with more than 5cm of soil coverage. Tuber greening was most severe on sites where more tubers were close to the soil surface and where the clay content of soil was higher.

“Unfortunately, planting deeper is known to delay emergence and therefore reduce yield, so growers must find the balance between achieving a high yield while also minimising tuber greening. Where tuber greening is substantial, it’s advisable to investigate where the green tubers are in the ridge. Check to see if they’re exposed at the surface, growing out of the flanks or unexposed and this will aid any decisions to adjust planting depth and ridge geometry in the future.”

### Average stolon length and depth and tuber greening over three years of the variety experiment

<table>
<thead>
<tr>
<th>Variety</th>
<th>Stolon length (cm)</th>
<th>Relative stolon depth (%)*</th>
<th>Tuber greening (% yield)</th>
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<tbody>
<tr>
<td>Estima</td>
<td>5.1</td>
<td>76.1</td>
<td>19.5</td>
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<td>Jelly</td>
<td>7.5</td>
<td>81.1</td>
<td>15.1</td>
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<td>King Edward</td>
<td>4.8</td>
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<td>Marfona</td>
<td>5.8</td>
<td>82.5</td>
<td>20.1</td>
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<td>Maris Piper</td>
<td>3.9</td>
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<td>9.5</td>
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<td>6.1</td>
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</tr>
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<td>Melody</td>
<td>5.9</td>
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<td>.20</td>
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</tbody>
</table>

*Mean stolon depth as a percentage of planting depth
Source: NIAB-CUF, 2018
Achieving the correct criteria for the market is an essential part of crop management for any potato grower but for Perthshire farmers Bob and his son Rob Strachan, critical tuber size is all important for his 40ha crop of Cultra destined for the pre-pack market.

Whilst skin finish and shape are largely determined by the varietal characteristics of the breed, the size can be more easily manipulated by the grower using different management tools.

Spring barley, broccoli and vining peas make up the balance of the Strachans’ rotation at their 240ha Blarugrowie farm, with part of the acreage being rented out, but it’s the potato crop that is the predominant feature at Lochlands Farm and reasonable yields can be achieved on the irrigated, silty loams.

Maris Piper had traditionally made up 30% of the crop, but difficulty in controlling common scab meant a switch to all Cultra, which has proved an easier variety to manage.

Achieving the ideal size for their buyers, (40% baking grade over a 65mm riddle) means careful attention to detail and test-digging regularly and monitoring of the tubers is an important part of the process prior to desiccation. Flailing of the canopy has always been the preferred method of haulm destruction here and timing is crucial, usually at first signs of early senescence. Ideally flailing should be carried out leaving stalks of 20-30 cm with the haulm being deposited in the bottom of the ridge away from the exposed stems.

“We usually start around 1 Sept,” says Bob. “Flailing for us, followed by an application of Spotlight Plus (carfentrazone-ethyl) definitely produces the best results. We have used both acid and diquat in the past, but with the withdrawal of acid, this combination suits our system.”

Manufacturer FMC advises that Spotlight Plus, a contact desiccant, is applied at 1 l/ha in 300 l/ha water, preferably within two days after flailing has occurred and in sunny, dry conditions. Desiccation then occurs rapidly, being complete usually within 10-14 days, says Bob, with the product being rainfast in one hour. It has approval for all soil types, only a seven-day harvest interval and no buffer zone.

“We hope to achieve an adequate skin set about 21 days after application,” he concludes. “For us, flailing of the crop followed by Spotlight Plus ticks all the boxes without having to resort to diquat. Working with a variety like Cultra, using this system seems to deliver us the best returns.”
Desiccation

Wayne Dyer believes successful desiccation is as much about the application as product choice.

- controlled-release fertilisers, with the ultimate goal of potentially reducing nitrogen rates to create more stable canopy growth. He believes this approach is suited to growers who want to flail and spray more efficiently, or growers who are averse to flailing and are considering other options without diquat, such as sequencing contact herbicides in a longer desiccation process.

“Use of controlled release fertiliser still gives growers the yields, but the crop canopy is less dense due to the more gradual release of nitrogen. The added benefit to this approach is that you’re able to select a desired release period for the nitrogen, which is influenced by the polymer-coating used. This adaptability makes it a useful canopy management tool for many different varieties and soil types.

“Over the past two years I’ve used a polymer-coated fertiliser called Promax at rates of 150-170kgN/ha on varieties such as Harmony, Estima and Sagitta. All the crops have yielded well, even at the reduced rate,” he says.

“Looking beyond the cost savings from reduced nitrogen application to the crop, canopy growth is also far more controlled, making it easier to manage at desiccation” he adds.

Tom is keen to stress that his research is still at an early stage and more trials will be required to gain a greater understanding of what is and what isn’t possible.

Potential loss

“With the potential loss of diquat, it’s vital for both agronomist and grower to plan ahead for desiccation with a constant evaluation of tuber size, weather forecasts and disease pressure. For those growers and advisers who are currently trialling sequences of Gozai and Spotlight Plus (carfentrazone) as an alternative to diquat or flail and spray, the use of controlled-release fertilisers could be a positive step forward in helping them to achieve better results.”

Lincs grower, Wayne Dye, says for him consistency and speed of action are all-important factors for when it comes to haulm desiccation. The amount of canopy on his crops means that it’s not just product choice that’s critical, but how it’s applied and attention to detail.

On his farm near Spalding, Wayne grows the variety Markies, destined for the chip trade. Maintaining tuber quality and consistency of product are obviously high on the list when it comes to maximising marketable yield, but with that particular variety comes another challenge that requires careful management, he says.

Wayne’s medium silt soils are ideal for growing high yielding potato crops in very drought-tolerant conditions. But with an exceptionally late-maturing variety like Markies, the amount of haulm generated can be colossal. With thick stems, an efficient burn-down that will keep the crop disease-free and maintain tuber quality for consistent fry colour is critical. He finds using Spotlight Plus within his desiccation programme is an essential part of that management, particularly because it has a seven-day harvest interval.

“The variety produces such vast amounts of haulm that ensuring an even and penetrating application of desiccant is paramount,” he explains. “We generally make two applications, firstly with a diquat-based product at the first sign of senescence. Once enough leaf has been removed, then a second application of Spotlight at 1.0 l/ha is made, which hopefully finishes off the stems.

“We’ve experimented sequencing the two desiccants the other way around, using Spotlight Plus followed by the diquat, but that wasn’t nearly as effective. It’s all about a progressive take-down of the canopy and that has to occur as soon as the crop shows the first signs of senescence. The programme has to be quick-acting and capable of doing the job required,” he comments.

With such a dense canopy, water volume is also critical, points out Wayne. He always applies the product in at least 400 l/ha (the minimum volume being 300 l/ha). “We’re looking for large tubers with Markies, ideally with a bag count of 100 or less. To achieve this the crop requires a long season of growth, although the tubers initiate early enough, the maturity is late,” he explains.

Wayne usually manages to complete the desiccation process with two applications, but in 2017 three were needed (an additional 0.6 l/ha Spotlight Plus being applied seven days after the first) as prolonged wet weather meant that the growing season was more protracted, and the haulm volume was significantly greater.

“During the first application we had the booms of our self-propelled Sands SLL4000 up as high as they’d go. The height of the crop was unbelievable, and we needed the three applications to do the job.”

An initial application of diquat to remove the leaf from the haulm followed by carfentrazone to desiccate stems is common practice on many farms.

With flail and spray there’s always the risk of flailed stems and canopy lying across the newly flailed crop, particularly in wet weather.

Crops with lots of haulm can prove awkward when a rapid burn-down is necessary.
advances in fungicide technology to keep making progress and little else.

Fungicides are a valuable resource that we need to learn to use more wisely but in order to tailor rates, timings and products to the true potential of disease developing we firstly need more information and secondly, we need to grow confident in the ‘new way’. That will take time, experience and thoroughly tested disease models that aren’t going to leave us in the lurch. Only then will the industry be able to move away from insurance spraying and find a better, more sustainable way of supporting crops to their maximum yield potential.

Monitoring the air for disease spores may be in its inception but it’s something that could revolutionise the way we farm. Imagine being able to test spores in the air for their sensitivity toazole and SDHI chemistry before a fungicide recommendation is made. Imagine how that would help resistance management. Currently we’re reacting to changes in the septoria population well after the event. Real-time monitoring would change this, even if there isn’t the scope to change the active ingredients we’re using, there’s an opportunity to dose appropriately. At the current time deciding the appropriate dose is a decision made relatively in the dark, based on nothing more than experience and disease pressure, with little knowledge of actual latent infection.

What’s even more exciting is this technology is already here, becoming commercially available next year. It’s interesting that there will be two rival systems but hopefully this will turn out to be a good thing, accelerate the process of finding the most robust disease models and some sort of collaboration will eventually happen, resulting in a broader network of spore traps across the country.

Speaking to Kieran Walsh about his involvement in the Hands Free Hectare, his view is very much that new technology in scouting and monitoring will help him manage his time better. It won’t mean he isn’t required to walk crops but will enable him to home-in on potential problem areas, taking some of the randomness out of the crop-walking process. When I was walking crops, even when making a conscious effort to take a different route, it was amazing how many times you’d find yourself retracing the same path as in previous visits. It means you miss things when scouting and it’s physically impossible to cover every inch of every field. But new technology makes this possible.

Keiran believes that while most of his time is taken up driving and inspecting the aerial parts of the crop, he’s missing 50% of the equation, ie what’s going on under the soil surface. If drone footage, live-sensing on machinery and other advances in technology can give the heads up when things are heading in the wrong direction above ground, then he can spend more time looking at the soil, trials, varieties, costs and the other factors that make a difference between farming profitably or not.

As hard as it sometimes is to envisage, we’re on the path to a new age in farming. When mobile phones first became pocket sized it was hard to imagine the capability they’d pack a couple of decades later. Exciting times for agriculture.

Based in Ludlow, Shrops, Lucy de la Pasture has worked as an agronomist, while among the Twitterati, she’s @Lucy_delap. lucy@cpm-magazine.co.uk

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